PROPEL:
A Look Ahead

PROPEL

PROFESSIONAL RESOURCE OPPORTUNITIES IN PLASTIC AND RECONSTRUCTIVE SURGERY EDUCATION AND LEADERSHIP

Dear PROPEL Participants,

Congratulations on acceptance into the PROPEL (Professional Resource Opportunities in Plastic and Reconstructive Surgery Education and Leadership) Program. We are looking forward to seeing your progress as teams work together throughout the year. As you know, your team is composed of both junior and senior residents, as well as early and established faculty to promote bidirectional learning and opportunity. While the program is successful from the perspective of the mentor-mentee relationships that are built, we also know that it can be challenging to find time to meet and topics to discuss. To assist with that, this syllabus can serve as a guide for suggested meeting times and potential topics and articles to discuss. This resource was created by trainees and faculty together to account for a diverse set of needs and ideas. Throughout this year, please feel free to contact us if there is anything we can do to make this process more efficient, organized and, most importantly, meaningful for you. Thank you for your participation in this program.

Sincerely,

The PROPEL Work Group

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PROPEL Frequently Asked Questions:

1. What is the goal of PROPEL?

In an effort to restructure and enhance mentorship in Plastic Surgery, ASPS designed a program called PROPEL (Professional Resource Opportunities in Plastic and Reconstructive Surgery Education and Leadership). Launch teams were created as part of this approach to mentorship and collaboration in the specialty. Teams consist of a combination of senior and junior faculty and residents. It was set up so that everyone has the opportunity to serve as both a mentor and mentee. For example, while a junior faculty may be a mentor to residents, he or she can also receive mentorship from the senior faculty in the group. Each senior resident has the opportunity to mentor a junior resident as well as receive mentorship from a faculty member. The goal of each group is to build relationships and create a continuum of learning opportunities that reflects the vast, yet overlapping experiences between faculty members and trainees in a longitudinal fashion.

2. How were the teams formed?

The goal is for each team to be composed of a spectrum of members including junior residents, senior residents, junior faculty, and senior faculty. These teams have been carefully curated based on the preferences submitted by each member in order to align the interests of all members of the group. The goal is for everyone to have the opportunity to serve as both a mentor and mentee. For example, while a faculty member may be a mentor to residents, they can also receive mentorship from the other faculty member in the group. Each senior resident has the opportunity to mentor a junior resident as well as receive mentorship from a faculty member.

3. How often should our team meet, and what should be discussed?

This program is very flexible and is designed so that each team can operate in a way that is most beneficial to those team members involved. However, we do recommend that you meet at least every 3-4 months. Reminders and discussion materials will be sent out periodically, but feel free to discuss anything that would be helpful for those in the group and utilize each other's expertise as this program is focused on mentorship!

A general suggestion for meeting would be to touch base for 30-40 minutes every 2 months and below is a sample outline of possible topics to cover:

1) Background of each team member
   a. Personal
   b. Professional - Current position and practice environment

2) Career Goals
   a. Personal
   b. Professional

3) Barriers/Challenges to career goals
   a. Personal barriers
   b. Professional barriers

4) Means to overcome barriers to career goals
   a. Personal
   b. Professional

5) How can the PROPEL team members help one another to achieve these goals?

4. What tools are recommended to use to set up and conduct a team meeting?

There are several ways a group can communicate to set up and conduct a team meeting. In addition to relying on email correspondence, below are a few suggestions for free programs that may be more useful to schedule a time that works for everyone conduct the meeting.

A. **Doodle Poll** – You can choose to create a free account (there are also upgraded paid account options as well) in which you can send a poll to your teammates. We recommend sending 2-3 options to keep it simple and everyone can select the option(s) that work best for them. It may also be helpful to determine in advance whether daytime, evenings or weekends work best for those on your team or include both options in your Doodle Poll.

B. **Survey Monkey** – There are free accounts available within Survey Monkey as well. You can set up the free account (upgraded paid accounts are available as well, but not needed for this purpose) and then create a brief survey for any questions you would like your teammates to answer. This could be to identify certain interests, time of day availability for meetings or goals for what they would like to accomplish through this program.

C. **Zoom** – Zoom is a great tool used by a lot of organizations and individuals for face-to-face interaction when meeting virtually. Zoom offers a basic account option, which is free. It provides an easy way to set up a meeting and send the applicable link to join the meeting at the chosen time. The basic account does have a time limit of 40 minutes. However, we would advise that you conduct shorter meetings on a more frequent basis rather than meet for an extended period of time. With everyone's busy schedules, it may be easier for everyone to attend meetings if they are shorter in duration. Otherwise, some team members may already have a paid account without a time limit, or everyone can also rejoin the same link after the 40-minute expiration to continue if additional time is needed for the meeting.

D. **FaceTime** – If those in your group have Apple devices, FaceTime may be an available option and easier to manage for some.

E. **Google Hangouts** – This is another platform that can be used on various devices, rather than just Apple, for messages, voice calls and video calls.

F. **WhatsApp** – This is a free app you can download on your device and can be utilized for things like text messaging and video calls. It's especially helpful for teams that have international members as it's a free app available all over the world.

MEETING 1 (Months 1-3)
Mentorship: Past, Present, and Future

Discussion Questions:

- Do you find mentorship to be imperative for your success both personally and professionally?
- Past: What forms of mentorship did the current mentors receive throughout their training experience?
  - –Do you feel you had adequate mentorship/mentors?
  - –How did this affect your career? What challenges did you face?
  - –Do you feel you would have benefitted from having both a formal model like PROPEL and an informal model?
- Present: How do current trainees feel about the mentorship opportunities currently available to them?
  - –What types of mentorship models do trainees feel would most benefit their success?
  - –How has the advice of your current mentors influenced your career?
- Future: What can be improved?

The Importance of Mentorship in Shaping the Careers of Academic Leaders in Plastic Surgery

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Background: The majority of successful academic physicians cite mentorship as a critical element of their achievements. The goal of this study was to survey established leaders in plastic surgery to identify the importance that mentorship played in their career development, and to identify common themes that enabled them to "pay it forward" in helping to develop the next generation of leaders in plastic surgery.
Methods: The authors performed a qualitative survey of 14 established leaders in plastic surgery (mentors) in the United States with a strong reputation for mentorship. The authors asked each to identify a key mentor (senior mentor) and mentee, grouping them in triads of a senior mentor, mentor, and mentee. The authors then submitted a similar survey to the mentee.
Results: Thirteen mentor-mentee pairs for which both members had responded were included. After reviewing responses to these questions, the authors elicited a number of recurring themes. All respondents emphasized the importance of mentorship to their success in academic plastic surgery. Additional themes included encouraging mentees to find their passion, leading by example, discussing complex cases with residents/students, and using research time as an opportunity.
Conclusions: Strong patterns of mentorship are highlighted among the careers of leaders in academic plastic surgery. The authors advocate for formation of mentorship relationships within training programs and more national mentorship programs such as those emerging through the American Society of Plastic Surgeons and the Plastic Surgery Research Council for interested medical students, residents, and junior faculty. (*Plast. Reconstr. Surg.* 150: 224, 2022.)

The majority of successful academic physicians cite mentorship as a critical element to their achievements. It is influential in career guidance, research productivity, and personal development. Systematic reviews on mentorship in academic medicine suggest that effective mentorship produces faculty who are more productive (obtaining more grants and publications than colleagues without mentors), promoted more quickly, more likely to stay at their academic institution,[1–5] and more satisfied with their career.[6]

Mentorship is mutually beneficial. Mentors perceive enhanced job satisfaction, and 83 percent of surveyed medical students felt that their mentor relationship influenced their decision to pursue plastic surgery.[7,8] Most trainees will have several different types of mentors. The primary mentor provides advice and professional development in a very broad manner that integrates the input from other types of mentors. Other types of mentors include clinical mentors, research mentors, peer mentors, project mentors, and work-life balance mentors.[9]

Duties of the plastic surgery mentor include both educational and professional components.[10]

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Educational duties include teaching professional skills (e.g., research methods, ethical conduct, and time management), transferring technical skills, and teaching by example. Professional duties include helping the mentee set and achieve career goals; providing resources for research, networking, and collaboration; and introducing the mentee to leading figures in the field. The goal of this study was to survey leaders in plastic surgery regarding what they learned from their mentors, and their philosophies of how to teach these concepts to the next generation of plastic surgeons.

METHODS

We performed an institutional review board–exempt survey of senior plastic surgeons in the United States with a strong reputation for mentorship. We identified 14 senior plastic surgeons that have a history of academic leadership and asked each to identify one to two key mentors who they felt significantly impacted their careers (senior mentors), and one mentee who they felt was significantly impacted by their mentorship. We selected academic leaders that represent the breadth of plastic surgery: craniofacial, cleft, hand, reconstructive, and aesthetic. The mentor and mentee were then asked the following three questions: (1) Do you recall a particular event or series of events with a particular mentor that helped to direct you toward a career focused in plastic surgery? (2) If you could encourage current residents/fellows to pursue a career in plastic surgery, what advice would you give them? (3) Is there a particular method that you have found to be the most effective in directing residents/fellows toward a stable long-term career in plastic surgery? Survey responses were solicited by email correspondence and/or phone according to the mentor's preference, and responses were categorized into themes.

RESULTS

Twenty-seven of the 28 surgeons (96 percent) responded, with responses by both mentor and mentee in 13 of the 14 pairs surveyed. Highlights taken from the responses for the latter two questions are provided for each of the 13 mentors and their mentees. (**See Table, Supplemental Digital Content 1**, which shows responses by each mentor-mentee pair for three questions. Question 2: If you could encourage current students and residents to pursue a career in plastic surgery, what advice would you give them? Question 3: Is there a particular method or methods that you have found to be the most effective in directing students and residents toward careers in plastic surgery? Responses have been edited for brevity, ***http://links.lww.com/PRS/F165***.) This enabled development of mentorship triads, each consisting of the senior mentor(s), the mentor, and the mentee (Fig. 1). These 13 mentor-mentee pairs in which there was a complete set of responses formed the basis for the review (Figs. 2 through 8). [**See Figure, Supplemental Digital Content 2**, which shows (*left*) Paul Tessier (*on the left*) and Bahman Guyuron (*on the right*); Dr. Guyuron was a junior attending physician. (*Right*) From left to right: Ali Totonchi, Jeff Janis, and Bahman Guyuron; Ali Totonchi was a junior attending physician, ***http://links.lww.com/PRS/F166***. **See Figure, Supplemental Digital Content 3**, which shows (*left*) (*front row*) Linda Phillips; (*back row*) Marty Robson (*on the left*) and Robert McCauley (*on the right*); Linda Phillips was a midlevel attending physician. (*Right*) Linda Phillips (*on the left*) and Jennifer Walden (*on the right*); Jennifer Walden was in practice, ***http://links.lww.com/PRS/F167***. **See Figure, Supplemental Digital Content 4**, which shows (*left*) Jack Mustarde (*on the left*) and Ken Salyer (*on the right*); Ken Salyer was a junior attending physician. (*Right*) Akira Yamada (*on the left*) and Ken Salyer (*on the right*); Akira Yamada was a junior attending physician, ***http://links.lww.com/PRS/F168***. **See Figure, Supplemental Digital Content 5**, which shows (*left*) Arthur Barsky (*first row, third from left*) and Lester Silver (*second row, fourth from left*) shown with the first group of Vietnamese doctors who trained under Dr. Barsky in Vietnam at their graduation. (*Right*) Lester Silver (*on the left*) and Peter Taub (*on the right*); Dr. Taub was a junior attending physician, ***http://links.lww.com/PRS/F169***. **See Figure, Supplemental Digital Content 6**, which shows (*left*) Maurice Jurkeiwicz (*on the left*) and Luis Vasconez (*on the right*); Dr. Vasconez was a junior attending physician. (*Right*) Henry Vasconez (*on the left*) hosting his brother, Luis Vasconez (*on the right*) as a visiting professor; both brothers were chiefs of plastic surgery at their respective medical schools, ***http://links.lww.com/PRS/F170***. **See Figure, Supplemental Digital Content 7**, which shows Michael Neumeister (*left*) and El Zook (*right*); Dr. Neumeister was chief of the division of plastic surgery at Southern Illinois University, ***http://links.lww.com/PRS/F171***.] After reviewing responses to these questions, we elicited a number of recurring themes. Many respondents noted the importance of sponsorship to their success in academic plastic surgery. Additional

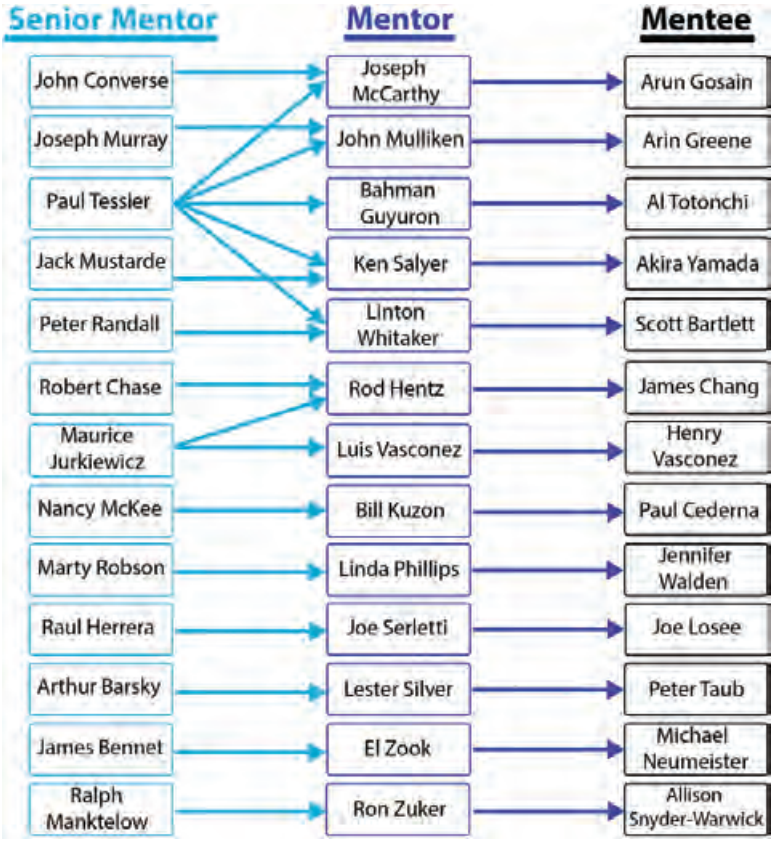

Fig. 1. Senior mentors, mentors, and mentees in plastic surgery.

themes included encouraging mentees to find their passion, leading by example, discussing complex cases with residents/students, and using research time as an opportunity.

DISCUSSION

The Importance of Sponsorship

Sponsorship is critical to ascend into leadership within organized plastic surgery. Examination of our triads demonstrated members within each generation that were past or upcoming directors/chairs/presidents of the major academic organizations within the United States (Table 1). Successful mentors in academic plastic surgery demonstrate a consistent history of guiding their mentees to become national leaders in their field.

Reflecting on the importance of this, Alison Snyder Warwick stated, "In addition to mentorship, sponsorship is critical for an academic career. Ron [Zuker] has graciously suggested me for patient referrals, trainee mentorship, and talks at national meetings. He is a master at pushing others ahead of himself, particularly trainees and

Fig. 2. (*Left*, from *left* to *right*) William Littler, Robert Chase, and Rod Hentz; Rod Hentz was a junior attending physician. (*Right*, from *left* to *right*) James Chang, Robert Chase, and Rod Hentz; all three individuals had served as chief of the division of plastic surgery at Stanford University and president of the American Society for Surgery of the Hand.

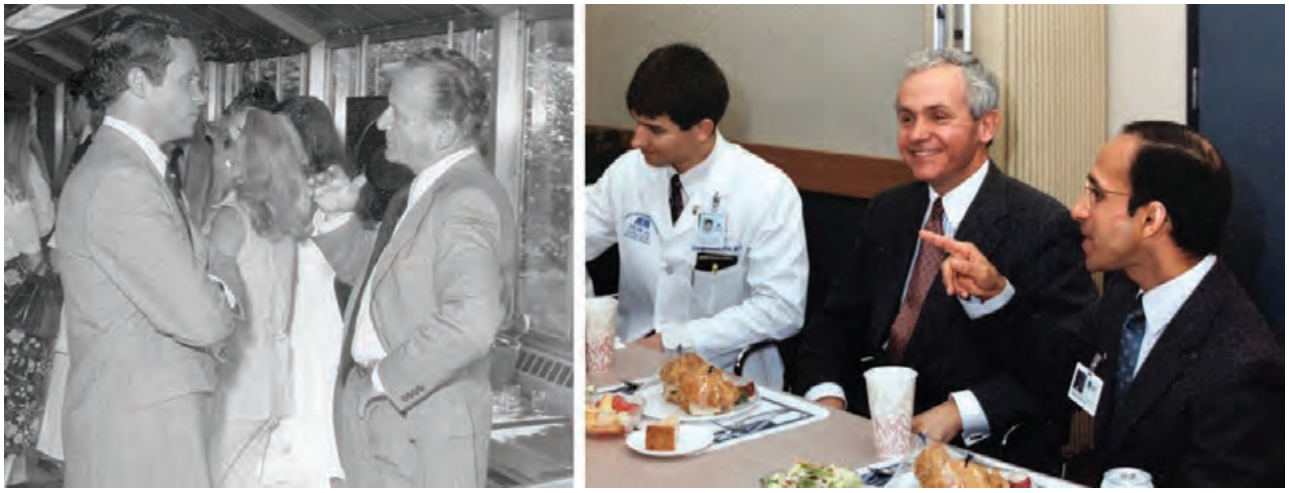

Fig. 3. (*Left*) Joseph McCarthy (*on the left*) with John Converse (*on the right*). Joseph McCarthy was a junior attending physician. (*Right*, from *left* to *right*) Steven Bonawitz, Joseph McCarthy, and Arun Gosain. Dr. McCarthy served as a visiting professor in Milwaukee where Arun Gosain was a junior attending physician and Steven Bonawitz was a fellow in craniofacial surgery.

Fig. 4. (*Left*) Nancy McKee working in her laboratory. (*Center*) William Kuzon working in Dr. McKee's laboratory; William Kuzon was a research fellow. (*Right*) Paul Cederna (*on the left*) and William Kuzon (*on the right*); Paul Cederna was a junior attending physician.

Fig. 5. (*Left*) Paul Tessier (*on the left*) and John Mulliken (*on the right*); John Mulliken was a junior attending physician. (*Right*) Arin Greene (*on the left*) and John Mulliken (*on the right*); Arin Greene was a junior attending physician.

Fig. 6. (*Left*) Joseph Serletti (*in the center*) and Raul Herrera (*on the right*); Joseph Serletti was a junior attending physician. (*Right*) Joseph Losee (*on the left*) and Joseph Serletti (*on the right*); Joseph Losee was a resident.

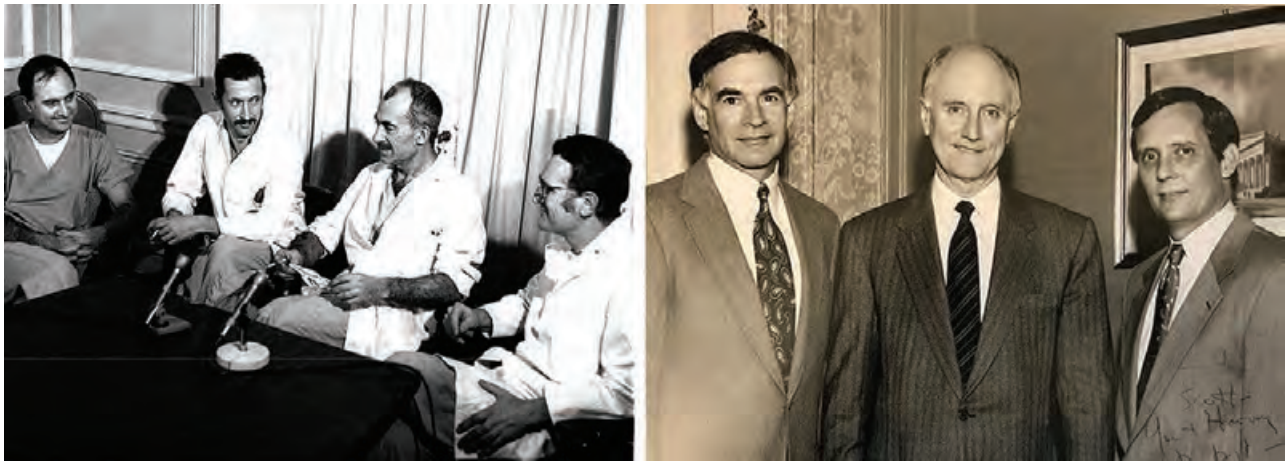

Fig. 7. (*Left*, from *left* to *right*) Linton Whitaker, Hans Peter Freihofer, Paul Tessier, and Peter Randall; Linton Whitaker was a junior physician. (*Right*, from *left* to *right*) Harvey Rosen, Linton Whitaker, and Scott Bartlett; Scott Bartlett was a junior attending physician.

Fig. 8. (*Left*) Ralph Manktelow (*on the left*) and Ron Zuker (*on the right*); Ron Zuker was a junior attending physician. (*Right*, from *left* to *right*) Allison Snyder Warwick, Ron Zuker, and Karen Wong-Riff, taken during and Operation Smile trip to India when Drs. Warwick and Wong-Riff were fellows.

Table 1. Leadership Positions Held by Mentors and Mentees (*n* = 26)

Position	No. (%)
President, American Society of Plastic Surgeons	3 (12)
President, Plastic Surgery Foundation	7 (27)
President, American Association of Plastic Surgeons	8 (31)
Chair, Plastic Surgery Research Council	12 (46)
President, American Council of Academic Plastic Surgeons	10 (3)
Director, American Board of Plastic Surgery	19 (73)

junior faculty. He provides his trainees with networking opportunities at national and international meetings. The importance of sponsorship in academic pediatric plastic surgery cannot be ignored."

Similarly, Paul Cederna reflected on the sponsorship he received from William Kuzon: "He encouraged me to pursue national leadership opportunities and gave me great advice about what to pursue and when to pursue it.... He also helped to promote me nationally by introducing me to prominent plastic surgeons, encouraging me to pursue committee work, and giving me a chance to show the plastic surgery community what I was capable of accomplishing. He was selfless in his support of me and for that, I will be forever grateful.… It is the only way to help society and help our specialty, 'pay it forward.'"

Encourage Mentees to Find What They Are Passionate About

Nurturing passion was repeatedly highlighted as a strategy to initiate mentorship relationships. "I would advise them to choose the area that they are most passionate about which will help them innovate and stay in the field," said Arin Greene. "I try to tell them that it is more important to do what you are passionate about than where you live and how much money you make."

Akira Yamada noted, "The first thing I would do is to identify the resident who wants to pursue craniofacial surgery from curiosity, sense of wonder, or pure passion: this motivation should come natural. If the resident loves craniofacial work, he or she is likely to pursue this career for a long time."

"The advice I give medical students is to follow you heart, meaning your passion. Passion will always rule the day and leads to success," states Joseph Serletti. These sentiments were echoed by Joseph Losee and Paul Cederna.

Mentorship of course can extend to medical students who are interested in plastic surgery. As Lester Silver says, "Students usually become interested in plastic surgery by doing rotations and shadowing plastic surgeons, and when they see the breadth of material that plastic surgeons are involved with, they immediately have an interest in this specialty." He continues, "it is important to continue with dialogue with the medical students who have expressed an interest in our specialty to show them the wide spectrum of interesting case material that is available and how patients are treated in a professional manner." Joseph Serletti agreed, saying "The most effective method that can direct a student towards Plastic Surgery is the one-on-one clinical experience. With the right attending, you serve as an incredible role model." Peter Taub offered a memorable experience: "I recently interacted with a student whose career was headed towards another surgical specialty. The student asked if they could shadow me in the operating room one day. When the student saw the spectrum of conditions and diseases a plastic surgeon was asked to treat and the variety of operative procedures that fell within the realm of the plastic surgeon, they changed to pursue a residency in plastic surgery. I was amazed at the effect 1 day in the operating room could have over the career of an aspiring surgeon." Rod Hentz emphasized the importance of stimulating inquiry in medical students: "For a medical student as yet undecided, involving them in the day-to-day experience (shadowing) and encouraging them to question anything they did not understand."

Lead by Example

"Most important method is to set an example" says Joseph McCarthy. "Private and professional lives have to serve as examples. Leadership by example. This is what I believe in. This is how I live my life. You have to bring them into your life. You have to live with them, have lunch together, write papers together."

Having been on the receiving end of such mentorship, Arun Gosain reflected on his experience, "This is a direct reflection of Dr. McCarthy's mentorship. Don't expect residents/fellows to do what you would not want to do. Demonstrate your enthusiasm when interacting with families such that residents appreciate that no patient's problems are too trivial to focus on if this is what the patient focuses on. Take responsibility for all outcomes, whether good or bad. It is never a resident's fault if things do not work out as planned—all decisions for patient care should reflect your own, and if not, then you did not communicate or teach properly."

In the words of Luis Vasconez: "Seeing a teacher enjoy what he or she does is essential to teaching.… Residents emulate their teachers, often in the good and the bad. Teachers should give a little bit of themselves to every resident."

"Students feed off of your enthusiasm," says Michael Neumeister. "If you have none, students will not enter plastic surgery. If, on the other hand, you have passion and enthusiasm that is palpable and makes you love to come to work every day, that is what captivates your students. Also, teach them operate, i.e., give them the scalpel so they feel like a surgeon. To me, it's all about entrustable moments."

Alison Snyder Warwick noted, "In addition to his medical expertise, Ron [Zuker] exemplifies the ideal attitude. He leads by example and lives by the golden rule. No matter the scenario, Ron is always calm and collected. He is reflective about people and situations rather than reactionary. He remains positive even at times of overwhelming adversity, whether it be in the OR, in a board meeting, or during international travel. That 'no problem' attitude is a valuable driver of his success. Emulating his optimism and relaxed attitude is something I continue to strive for in both my professional and personal lives." Leading by example of course means different things to different surgeons, and for some it even comes naturally, as John Mulliken says, "Don't think there is a 'particular method' other than being a teacher (doctor, from the Latin *docere*). I never thought of myself as an inspiration or a role model while working closely with fellows in the clinic, OR, and writing papers—it is just great fun! In retrospect, guess I unconsciously presumed the residents/fellows would learn by 'osmosis.'"

Linton Whitaker emphasized the importance of evaluating your results. "Be brutally honest about your results; see the connection between facial aesthetic surgery and craniofacial surgery to make the result normal or where possible, ideal normal, with constant attention to detail; careful and long term follow up (including the entire growth curve where appropriate) of your patients to see the real 'end result.'" Ken Salyer echoed this, "Follow your patients over time so you can see the consequence of your surgery, particularly with the added dimension of growth."

Discuss Complex Cases with Mentees

Ron Zuker responded, "In trying to suggest areas of interest for residents and fellows, I have found that personal conversations that specifically analyze a patient problem is the best way to stimulate interaction.… By focusing on specific patient problems, we can encourage a dialogue and stimulate the trainee into working on solutions for these problems." Scott Bartlett emphasized that time in the operating room is precious. "I found that the most productive times are in the OR, when you can show them new procedures, new approaches, etc., that will pique their interest." Bahman Guyuron expressed similar sentiments, noting that the visual transformation of a patient that can occur in the operating room can be very influential for students and residents.

Arun Gosain shared similar sentiments in his response: "Encourage inquisition through case presentations and discussions.... Such sessions stimulate both the resident and teacher and serve to enhance curiosity about this set of problems that can continue to add to the fund of knowledge of both resident and teacher as similar cases are encountered."

Use Research Time as an Opportunity for Mentorship

Several respondents emphasized the utility of research time in providing a mentorship opportunity. This includes Linda Phillips: "I enjoy research projects with my residents and students, as we all learn from them and hope to teach others what we have learned. I let them run with the project as much as they can but am ready to critique and shape the work as it progresses. We faculty critique our residents' research proposals, papers and presentations, helping them to hone their work into the best product we can make it."

Paul Cederna agreed. "In the lab, Bill Kuzon shared with me all of his resources, time, energy and expertise to ensure that I gained the fundamental knowledge to become a successful academic surgeon. He gave an immense amount of time to me and for that I will forever be grateful. People can provide you financial support, or space, or equipment. However, the gift of time and mentorship is priceless. More than anything, I needed the help and training to develop the foundational skills to make me competitive for extramural funding in the future. Bill Kuzon provided all of that for me."

Arun Gosain also reflected on the importance of research time with the students and residents: "Optimize dedicated research time. In our program, all residents are given an extra year for research between their third and fourth clinical years of a 6-year integrated program. This is the year I find most valuable in the residency program, as it gives you an opportunity to get to know

the resident, to help nurture their investigative potential, and to help direct their career pathway. The bond that forms lasts well beyond the lab year or residency, and this sets up the potential for a lifelong relationship between the lab mentor and the resident. This is clearly the most satisfying part of my role as a teacher."

Extend Lessons from the Mentor-Mentee Relationship to Advance Plastic Surgery

Mentors repeatedly described the satisfaction they receive in seeing mentees succeed and go on to advance the field of plastic surgery as a result. Ron Zuker reflected, "Equally gratifying is to see our trainees take the information that we have given them and take it one step further and advance the field one step further than you have taught them. That is a true measure of success that we have not just transmitted our knowledge but also stimulated our trainees to take that knowledge further." Paul Cederna expressed a similar sentiment, "Make sure you learn everything there is to know. After that, think creatively so you can develop new solutions that are even better." Joseph McCarthy demonstrated the impact of "reverse mentorship" as integral to his own accomplishments in advancing the field of plastic surgery, "The mentor-mentee relationship is a two-way street. Both must give to it. The mentee must challenge the mentor. Mandibular distraction was born when the residents introduced me to the Ilizarov device during rounds." Limitations of this study include the subjective selection of academic leaders through which the triads were developed, the qualitative nature of the responses that did not lend themselves to quantitative analysis, and the potential bias introduced by grouping responses.

Future Directions

We advocate for formation of mentorship relationships within training programs as well as more national mentorship programs such as those that have been developed through the American Society of Plastic Surgeons, the American Association of Plastic Surgeons, the Plastic Surgery Research Council, and the American Council of Academic Plastic Surgeons. In addition to the career development of academic plastic surgeons, mentorship is equally as important for the career development of surgeons in nonacademic practice. Realizing the importance of organized mentorship for both academic and nonacademic surgeons, the Resident Council of the American Society of Plastic Surgeons has developed a new program, Professional Resource Opportunities in Plastic and Reconstructive Surgery Education and Leadership. Professional Resource Opportunities in Plastic and Reconstructive Surgery Education and Leadership is a comprehensive mentorship program that incorporates all forms of practice opportunities to help foster mentorship relationships for junior and senior residents in plastic surgery, with junior and senior faculty, pairing residents and faculty based on academic versus nonacademic practice aspirations.[11] At present, medical students enrolled at a highly ranked medical school may have the greatest access to research opportunities and career advice.[12] This highlights the importance of mentorship programs being initiated through the American Council of Academic Plastic Surgeons and the Young Plastic Surgeons group of the American Society of Plastic Surgeons to increase the accessibility of plastic surgery leaders to medical students across the country. Mentorship may be even more important to those from underrepresented gender (women) and ethnic backgrounds (African American and Hispanic) if our specialty is to increase the diversity of its members and eventually diversity of its leadership.[13,14] Whereas it is not clear whether mentors should be of the same gender or ethnic background as the mentee, it is clear that such individuals should be encouraged to enter plastic surgery and guided toward leadership positions. Evolution of mentorship programs to help direct aspiring plastic surgeons from their medical student through midcareer years can help to foster these relationships.

CONCLUSIONS

The present review provides a strong demonstration that a large part of the career path of successful academic leaders can be attributed to mentorship by senior academic leaders, and in turn develops a culture of mentorship in the individuals influenced by these leaders. The collective academic accomplishments of the senior mentor–mentor-mentee triads are clearly demonstrated, and the leaders interviewed attributed much of this to their ongoing mentorship relationships. When the 13 mentor-mentee pairs were each asked the same fundamental questions focusing on the impact of mentorship on their careers and how they went on to impact those whom they had mentored, the responses continued to revolve around the same common themes outlined. Therefore, it appears that the selection of academic mentors is

not as critical as the themes that have guided their respective careers. The impact that mentorship has had on our specialty going forward and the effort that organized plastic surgery is making to extend mentorship opportunities to all plastic surgeons, irrespective of practice type, is highlighted (see Future Directions section). The collective experience of 39 academic surgeons compiled over five or more decades serves to remind us of the tremendous impact that mentorship has had on the careers of our established academic leaders. We provide this as a model by which each of us may actively pursue such relationships to foster further development of our own careers, and more importantly, the careers of young surgeons who may seek to emulate us.

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PHOTOGRAPHIC CONSENT

All subjects provided written informed consent for the use of their images.

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Mentorship in Plastic Surgery: A Critical Appraisal of Where We Stand and What We Can Do Better

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Summary: Mentorship is a critical tool for professional development and career success. In academic surgery, supportive mentorship affords higher job satisfaction, academic productivity, and diversity and inclusion. It protects against burnout and increasing academic surgery attrition rates. Women, underrepresented minorities, and junior plastic surgeons report lower job satisfaction and fewer mentorship opportunities. Given the unique challenges these groups face in a constantly changing health care system, the importance of mentorship cannot be overstated. Through a survey of American Society of Plastic Surgeons members, this study evaluated different aspects of mentorship to describe the current state in plastic surgery. Despite 94.05 percent of plastic surgeons believing that mentorship is valuable, only 15.16 percent reported a structured mentorship system, often without evaluation. Male and female participants agree that mentorship is needed for both professional (clinical judgment) and personal (work-life balance) development. Interestingly, women plastic surgeons felt it was important for mentees to have gender and race/ethnicity concordance to their mentors ($p < 0.001$). There was no agreement regarding the most effective method to implement mentorship programs, highlighting the challenges of this problem. Through thoughtful planning and commitment, mentorship programs can be instituted to benefit not just the mentee, but the mentor as well. (*Plast. Reconstr. Surg.* 148: 667, 2021.)

A mentor with skills, knowledge, and experience provides advice, guidance, and support to his or her mentee.[1,2] In plastic surgery, mentorship impacts a variety of domains, including clinical acumen, academic proclivity, business management, and personal life.[3] It is clear that mentorship is a critical tool for professional development and career success,[3,4] as supportive mentorship affords higher job satisfaction, academic productivity, and diversity and inclusion.[1,4–6] It protects against increasing burnout and academic surgery attrition rates.[6–10] Mentorship is especially important in academic medicine, as it is estimated that fewer than 10 percent of physicians entering academia will remain there throughout their career,[8] primarily because of increasing personal sacrifices and professional demands. Women, underrepresented minorities, and junior plastic surgeons are at higher risk, reporting lower job satisfaction and fewer mentorship opportunities.[6,9,11–14] Given the unique challenges these groups face in a constantly changing health care system, the importance of mentorship cannot be overstated.

Although mentorship is well studied among medical students[15,16] and physicians-in-training,[7] few data exist for those already in practice despite the established benefits.[1] Given that this is a high-risk group, we sought to obtain more information on this group's perceived importance of mentorship through a survey of American Society of Plastic Surgeons' members. The goals of this study are to describe the current state of mentorship in plastic surgery, determine why plastic surgeons believe it is important in all stages of one's career,

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identify current barriers to successful mentorship, and discuss methods to overcome these challenges. The differences between men and women plastic surgeons' views on mentorship are also compared.

METHODS

With institutional review board approval, a survey assessing demographics, mentorship, and career pathways was designed by means of SurveyMonkey (Portland, Ore.) and e-mailed to plastic surgeons in various stages of practice using the 2018 American Society of Plastic Surgeons membership directory. Domains specifically addressed were demographics, academic appointments, leadership roles, experience of mentorship (at the resident and attending levels), and opinions regarding ideal implementation of mentorship model, including the necessity for racial and gender concordance. In addition, participants were asked to prioritize the reasons why they could benefit from effective mentorship. Data were collected over a period of 8 weeks with four rounds of invitations. A nonresponder analysis was performed to address differences between the study cohort, nonresponders, and the greater American Society of Plastic Surgeons membership directory. (**See Appendix, Supplemental Digital Content 1**, which shows a nonresponder analysis performed to address differences between the study cohort, nonresponders, and the greater American Society of Plastic Surgeons membership directory, ***http://links.lww.com/PRS/E585***.) Survey participation was voluntary and nonincentivized, and responses were anonymous. All demographic data are either categorical or discrete and are reported as percentages. Chi-square tests were used to analyze differences, and a value of $p < 0.05$ was considered significant.

RESULTS

A total of 292 responses of 2555 surveys deployed were received, for an overall response rate of 11.4 percent, with 70 percent of these responses from male plastic surgeons. Through a nonresponder analysis, differences were discovered between the responders and nonresponders regarding practice demographics ($p = 0.012$) and gender ($p = 0.019$). Practice type ($p = 0.127$), age ($p = 0.571$), and geographic location of practice ($p = 0.971$) were similar between responders and nonresponders. Women were less likely to have been practicing for longer than 25 years (12.94 percent versus 28.64 percent; $p = 0.036$) and more likely to have graduated from an integrated plastic surgery residency (58.54 percent versus 39.49 percent; $p = 0.004$) (Table 1). Approximately 50 percent of participants pursued postresidency training, most commonly completing a hand/upper extremity fellowship (17.22 percent) (Table 1). Among female respondents, 6.67 percent were full professors, compared to 19.05 percent of male participants (Table 1). Men were more likely to hold leadership positions in local institutions; however, this difference converges at the national level (Table 1).

One-third of participants departed from their initial employment within their first 10 years of practice only, with a majority changing only one time (66.28 percent) and a small percentage (10.49 percent) changing more than three times, most commonly within the private practice realm (45.74 percent). No difference emerged between men and women (Fig. 1). Both male and female respondents most commonly reported unfavorable working conditions as the primary motivation for change. Women then cited lack of upward mobility potential and family/personal reasons as their rationale, and men also noted financial incentives and lack of upward mobility. Nearly one-quarter of women reported leaving their employment because of a lack of mentorship (Fig. 2).

Not surprisingly, 56.88 percent and 37.17 percent of plastic surgeons "strongly agree" and "agree," respectively, that mentorship is a critical tool for professional development (Table 2). What is surprising is that only a small minority indicated they receive formal mentorship in their current practice, with infrequent evaluations. Many respondents received mentorship in training, yet only 3 percent of respondents indicated that they formally continued that collaboration on graduation (Fig. 3).

When asked about mentorship techniques (Table 3), most respondents participated in the traditional dyad model (Fig. 4). More female plastic surgeons (22.22 percent) reported also having a functional mentorship (paired for only a specific project with a measurable outcome), whereas more male plastic surgeons (19.05 percent) reported a facilitated peer relationship (peer model but overseen by senior mentors). Women participants reported having female mentors 44.44 percent of the time (compared to 13.64 percent of male respondents), although this study is underpowered to detect a statistically significant difference. Many participants commented that they had mentors of both genders (Fig. 5). When

Table 1. Demographics and Practice Details

	Total (%)	Female (%)	Male (%)	*p*
No.	284 (100)	85 (29.93)	199 (70.07)	
Time in practice				0.036*
≤5 years	63 (22.18)	26 (30.59)	37 (18.59)	
5–9 years	56 (19.72)	19 (22.35)	37 (18.59)	
10–14 years	27 (9.51)	10 (11.76)	17 (8.54)	
15–19 years	25 (12.32)	11 (12.94)	24 (12.06)	
20–24 years	25 (12.32)	8 (9.41)	27 (13.57)	
≥25 years	68 (23.94)	11 (12.94)	57 (28.64)	
Race/ethnicity				0.4
Caucasian	227 (79.93)	63 (74.12)	164 (82.41)	
Black/African American	4 (1.41)	3 (3.53)	1 (0.50)	
Asian	33 (11.62)	11 (12.94)	22 (11.06)	
Hispanic/Latino	13 (4.58)	3 (3.53)	10 (5.03)	
Native Hawaiian/American	0 (0.00)	0 (0.00)	0 (0.00)	
Other	17 (5.99)	6 (7.06)	11 (5.53)	
Practice pattern				0.168
100 reconstructive	68 (23.94)	26 (30.59)	42 (21.11)	
75 reconstructive/25 cosmetic	71 (25.00)	25 (29.41)	46 (23.12)	
50 cosmetic/50 reconstructive	39 (13.73)	9 (10.59)	30 (15.08)	
75 cosmetic/25 reconstructive	45 (15.85)	12 (14.12)	33 (16.58)	
100 cosmetic	61 (21.48)	13 (15.29)	48 (24.12)	
Practice type				0.19
Solo practice	100 (35.21)	21 (24.71)	79 (39.70)	
Solo practice-shared facility	14 (14.93)	3 (3.53)	11 (5.53)	
Small plastic surgery group practice (2–5 surgeons)	39 (13.73)	13 (15.29)	26 (13.07)	
Large plastic surgery group practice (>6 surgeons)	13 (4.58)	5 (5.88)	8 (4.02)	
Medium multispecialty group practice (6–20 physicians)	8 (2.82)	3 (3.53)	5 (2.51)	
Large multispecialty group practice (>20 physicians)	18 (6.34)	6 (7.06)	12 (6.03)	
Academic practice	67 (23.59)	29 (34.12)	38 (19.10)	
Academic practice (salaried with private practice)	5 (1.76)	1 (1.18)	4 (2.01)	
Military	2 (0.70	0 (0.00)	2 (1.01)	
Employed physician	18 (6.34)	4 (4.71)	14 (7.04)	
Type of training program†				0.0036*
Integrated	125 (45.13)	48 (58.54)	77 (39.49)	
Independent	152 (54.87)	34 (41.46)	118 (60.51)	
Type of fellowship‡				0.111
Aesthetic	28 (10.26)	6 (7.50)	22 (11.40)	
Body contouring	4 (1.47)	1 (1.25)	3 (1.55)	
Craniofacial	20 (7.33)	5 (6.25)	15 (7.77)	
Hand/upper extremity	47 (17.22)	18 (22.50)	29 (15.03)	
Reconstructive microsurgery	29 (10.62)	10 (12.50)	19 (9.84)	
Other	17 (6.23)	8 (10.00)	9 (4.66)	
None	128 (46.89)	32 (40.00)	96 (49.74)	
Academic appointments				
Clinical instructor	3 (41.7)	2 (6.67)	1 (2.38)	0.061
Assistant professor	39 (54.17)	21 (70.00)	18 (42.86)	
Associate professor	20 (27.78)	5 (16.67)	15 (35.71)	
Full professor	10 (13.89)	2 (6.67)	8 (19.05)	
Local leadership roles				0.16
0–1	145 (52.35)	47 (57.32)	98 (50.26)	
2–3	75 (27.08)	24 (29.27)	51 (26.16)	
≥4	57 (20.58)	11 (13.41)	46 (23.59)	
National leadership roles				0.718
0–1	191 (68.95)	58 (70.73)	133 (68.21)	
2–3	56 (16.61)	12 (14.63)	37 (17.44)	
≥4	40 (14.44)	12 (14.63)	28 (14.36)	

*Statistically significant ($p < 0.05$).
†Seven participants did not respond.
‡Eleven participants did not respond.

asked how important it is to have a mentor of the same gender or race/ethnicity, there was a significant difference in opinions based on respondent gender. Female plastic surgeons overwhelmingly agreed this was necessary, whereas male plastic surgeons more often responded "neutral" or "disagree" ($p < 0.001$) (Figs. 6 and 7).

To define the role of mentorship in plastic surgery, both male and female participants agreed that the most important goal of mentorship is to help with clinical judgment, managing work-life balance, and developing leadership techniques. Objectives were also aligned with the type of practice within our cohort—women and men

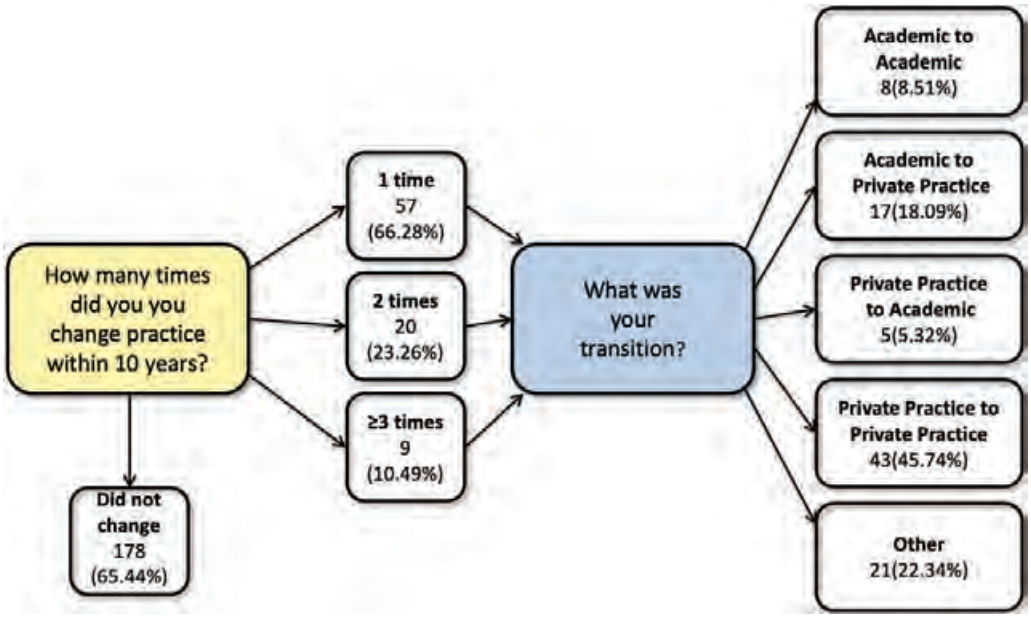

Fig. 1. Practice changes of respondents.

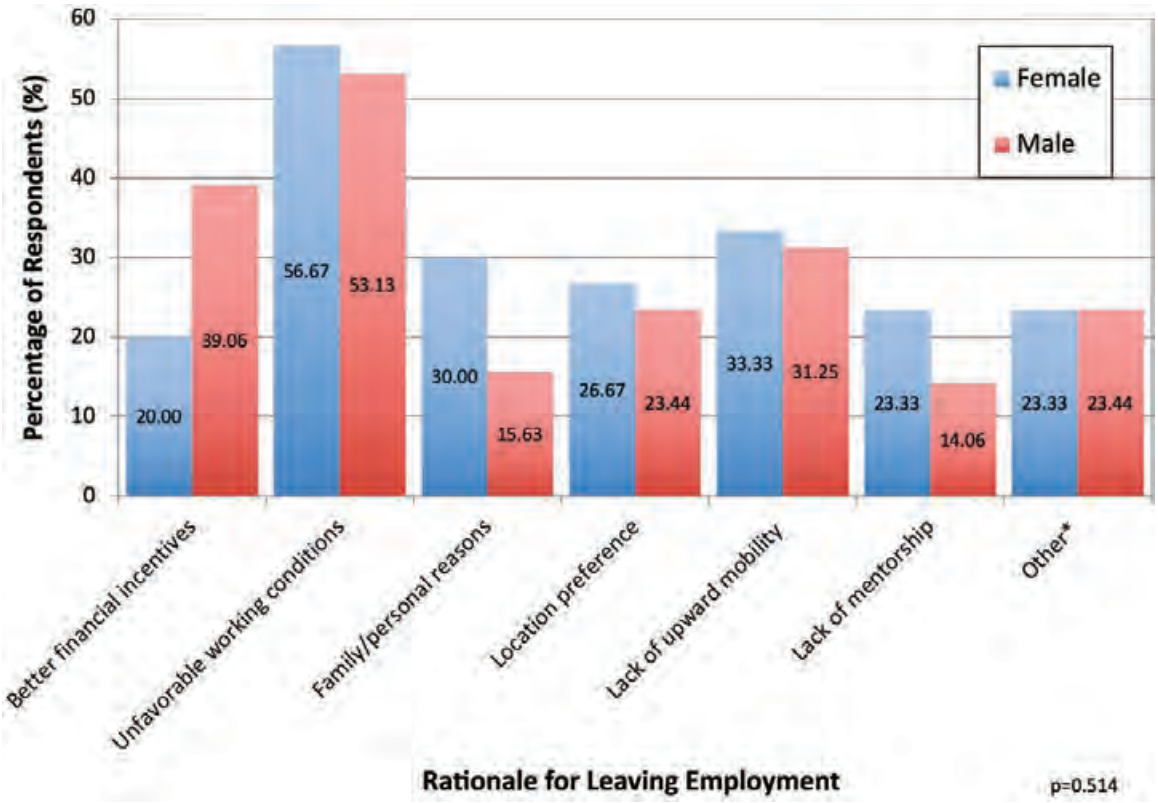

Fig. 2. Reasons listed for why respondents changed employment. *Several participants stated specific reasons unique to their individual employment situations.

prioritized academic proclivity and billing and documentation, respectively (Fig. 8).

Although participants agreed that mentorship is imperative, there was no consensus on the optimal delivery (Table 2). Approximately one-half of male and female participants believe leadership should mandate formal systems, but 37.45 percent disagreed that it should be enforced. It is

Table 2. Mentorship Is/Should Be…

	Total (%)	Female (%)	Male (%)	*p*
A critical tool for development				0.478
Strongly agree	153 (56.88)	52 (65.00)	101 (53.44)	
Agree	100 (37.17)	25 (31.25)	75 (39.68)	
Neutral	10 (3.72)	2 (2.50)	8 (4.23)	
Disagree	5 (1.86)	1 (1.25)	4 (2.12)	
Strongly disagree	1 (0.37)	0 (0.00)	1 (0.53)	
Chosen by the mentor				0.773
Strongly agree	7 (2.62)	1 (1.27)	6 (3.19)	
Agree	27 (10.11)	8 (10.13)	19 (10.11)	
Neutral	113 (42.32)	37 (46.84)	76 (40.43)	
Disagree	108 (40.45)	29 (36.71)	79 (42.02)	
Strongly disagree	12 (4.49)	4 (5.06)	8 (4.26)	
Chosen by the mentee				0.037*
Strongly agree	32 (11.94)	13 (16.25)	19 (10.11)	
Agree	114 (42.54)	38 (47.50)	76 (40.43)	
Neutral	92 (34.33)	27 (33.75)	65 (34.57)	
Disagree	26 (9.70)	2 (2.50)	24 (12.77)	
Strongly disagree	4 (1.49)	0 (0.00)	4 (2.13)	
Responsibility of seniors				0.149
Strongly agree	114 (53.53)	52 (65.00)	92 (48.68)	
Agree	94 (34.94)	18 (22.50)	76 (40.21)	
Neutral	25 (9.29)	10 (12.50)	15 (7.94)	
Disagree	3 (1.12)	0 (0.00)	3 (1.59)	
Strongly disagree	3 (1.12)	0 (0.00)	3 (1.59)	
Mandated by leadership				0.354
Strongly agree	71 (26.59)	27 (33.75)	44 (23.53)	
Agree	76 (28.46)	23 (28.75	53 (28.34)	
Neutral	85 (31.84)	20 (25.00)	65 (34.76)	
Disagree	29 (10.86)	9 (11.25)	20 (10.70)	
Strongly disagree	71 (26.59)	1 (1.25)	5 (2.67)	

*Statistically significant ($p < 0.05$).

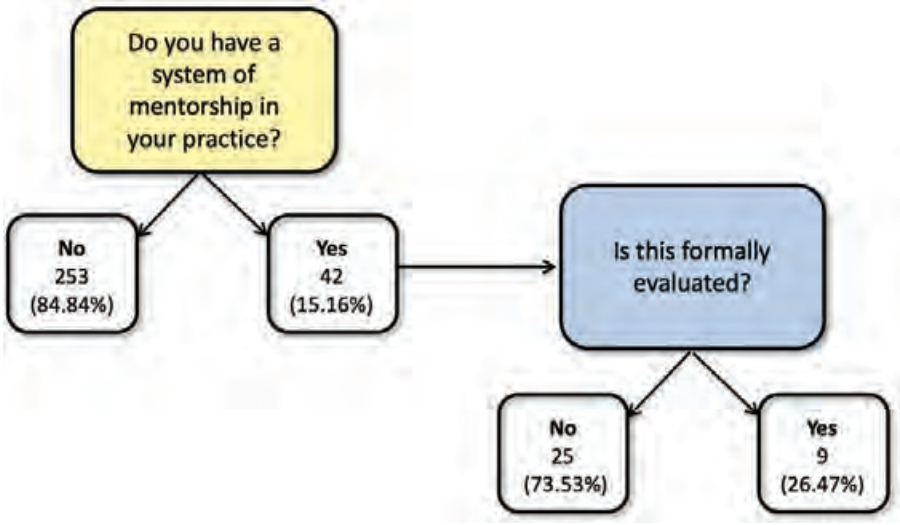

Fig. 3. Current mentorship practices among participants.

also unclear whether the relationship should be chosen by the mentee rather than by the mentor, although female plastic surgeons believed the mentee should choose ($p = 0.037$). Most do agree that it is the responsibility of senior surgeons to mentor their junior partners (88.47 percent).

Two themes emerged from participants' open-ended comments. Many respondents echoed that it is important to have multiple mentors, even outside medicine, as each provides unique guidance based on individual needs and experiences. In addition, competition may be a pervasive barrier to mentorship, particularly in private practices, as senior surgeons may be weary to help junior surgeons in a given geographic region.

Table 3. Types of Mentorship Programs*

Type	Description
Dyad	Traditional method of pairing a senior with a junior faculty member
Peer	Individuals grouped with similar age, experience, rank
Facilitated peer	Peer model but overseen by senior mentors
Speed	One-time event with mentees/mentors paired for 10-minute periods
Functional	Paired for only a specific project with a measurable outcome
Group	Mentor-facilitated group discussion
Distance	Mentee collaborates with senior faculty at another institution.

*Adapted from Kashiwagi DT, Varkey P, Cook DA. Mentoring programs for physicians in academic medicine: A systematic review. *Acad Med.* 2013;88:1029–1037.

DISCUSSION

Practicing plastic surgeons agree that mentorship is imperative for success, both professionally and personally. Despite dedicated efforts for improvement, this study illustrates the need for further progress. A large barrier is widely differing opinions about implementing mentorship to female, underrepresented minority and young attending plastic surgeons—one size *does not* fit all. This is epitomized when asked about the importance of same gender mentors/mentees: female plastic surgeons believe it is important to have female mentors, whereas male plastic surgeons did not.

Women in surgery face unique challenges that male surgeons do not perceive.[17] They are less likely to achieve leadership roles, negotiate for raises, and remain in academia. Women inherently believe success at work is alone representative and are less likely to self-advertise then men. This precipitates a vicious cycle of dejection, insecurity, and ultimately academic attrition.[18–21] Perhaps these differences contribute to the finding that women report fewer meaningful mentoring relationships,[9] when a majority of available mentors are men. Although this study may have been underpowered to detect such findings, it is pervasive in the literature, beginning as early as in medical school.[16]

A comparable theme emerged regarding racial/ethnic concordance in mentorship: female plastic surgeons felt this was important, whereas men did not. Although this study did not analyze deeper into this interesting result, minority medical students, residents, and faculty surgery express similar sentiment.[12,13,22] Racial/ethnic discordance is perceived as an obstacle to effective mentorship, as nonminority mentors do not inherently perceive and appreciate the same challenges.[12] This also likely contributes to the fact that minority faculty report lower opportunities for mentorship.[13]

In our study, approximately one-third of plastic surgeons abandoned their initial employment within 10 years of practice (Fig. 1)—an

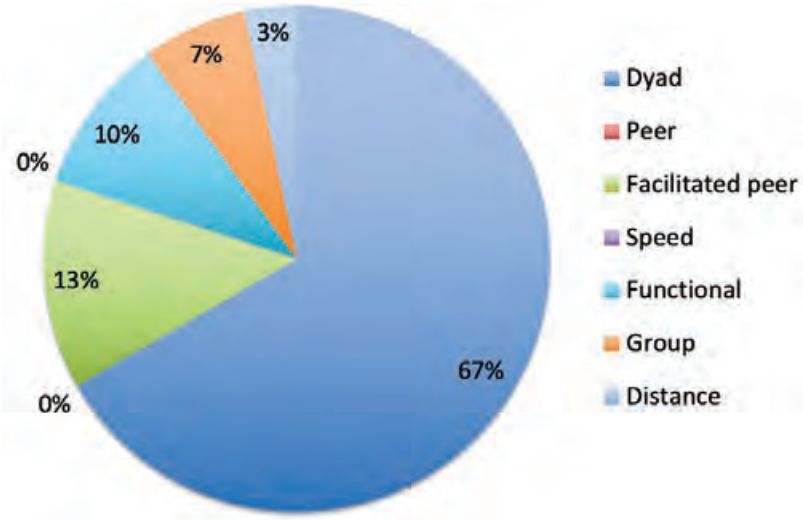

Fig. 4. Participation by respondents in different types of mentorship programs. (Adapted from Kashiwagi DT, Varkey P, Cook DA. Mentoring programs for physicians in academic medicine: A systematic review. *Acad Med*. 2013;88:1029–1037).

Fig. 5. Genders of mentors for male and female participants.

attrition rate consistent with the literature (9 to 50 percent).[6,8,23,24] A significant proportion (18.09 percent) of respondents transitioned from academic to private practice most commonly because of "unfavorable working conditions" (Fig. 2). Several factors are known to contribute to the decline of academic faculty, such as increasing administrative duties and clinical production expectations with diminishing institutional support and compensation.[6,8,10,23–25] As in previous studies,[24] women reported leaving for "family and personal reasons" more often than their male colleagues (Fig. 2). Mentorship can help mitigate high attrition rates and low job satisfaction. Compared with faculty without mentors, those with goal-directed mentorship expressed greater satisfaction with leadership, autonomy, expectations, balance, compensation, and career advancement, and thus an overall greater satisfaction with their job.[6]

Improving mentorship for plastic surgeons begins with recognizing current problems and discovering creative solutions. A worthwhile finding that emerged from this study is the priorities of mentees; specifically, regarding different arenas in which they need guidance (Fig. 8). Both male and female participants agreed that clinical judgment is the highest priority in relation to mentorship. They are also looking for strategies to better maintain work-life balance and to developing strong leadership techniques. Women, more likely to be in academic surgery, were also looking for support in academic proclivity; whereas men, more likely to be in private practice, also prioritized guidance for billing and documentation. Innovation and biotechnology were the least prioritized; however, this is likely a niche specific to those surgeons with particular interests. In highlighting these results, this study can be a resource for mentors when formulating ways to help their mentees.

Another important consideration when improving mentorship for plastic surgeons is that mentees must be able to identify with their mentors and mentors must also be able to relate to their mentees. Although women surgeons are holding higher leadership positions and academic rankings, male plastic surgeons remain in the majority.[8,18,21] When compared to nonminority faculty, black professors are subject to lower 10-year promotion rates, academic ranking, and retention rates.[26–29] Despite improved diversity in medical school, there is a paradoxic decline in the number of black integrated plastic surgery residents.[30] The decision to pursue a surgical career by underrepresented groups is heavily influenced by mentors; identifying mentors early is advantageous for career trajectory.[22] These findings highlight the need for institutional programs dedicated to the support and development of women and minority faculty and leadership. By continuing to deconstruct pervasive traditional race and gender norms, junior plastic surgeons will have access to more relatable mentors, the need for which is expressed in this study (Figs. 6 and 7).

Generational differences can also lead to lower job satisfaction of junior faculty,[6,10] lost mentor-mentee relationships, and even contention between junior and senior faculty.[11] It has been described[11] that younger generations of surgeons and trainees seek constant feedback for clear direction and continual self-improvement

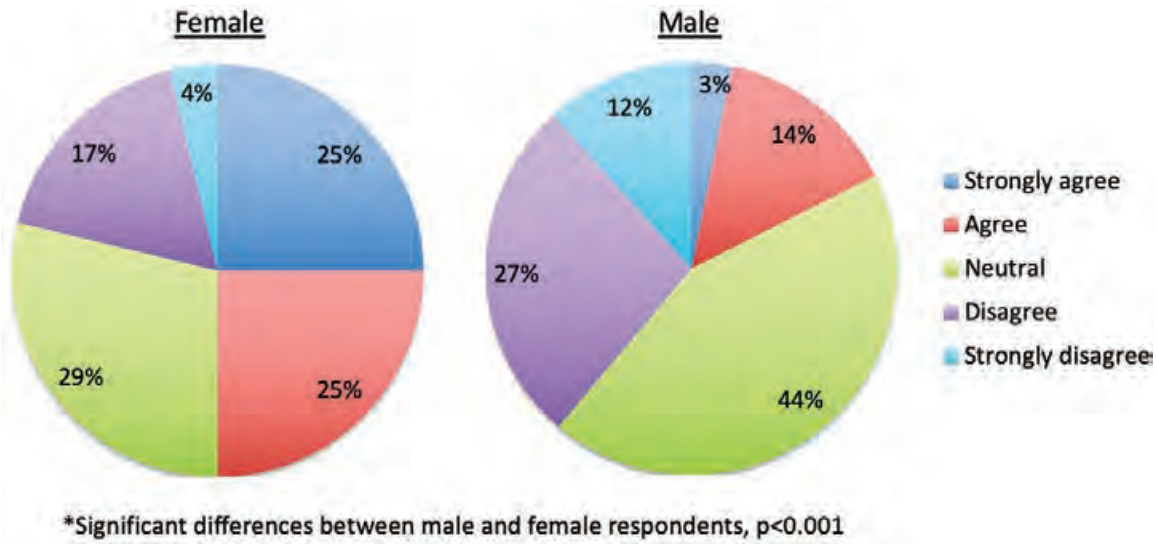

Fig. 6. Participants' views on the statement, "It is important for female plastic surgeons to have a female mentor."

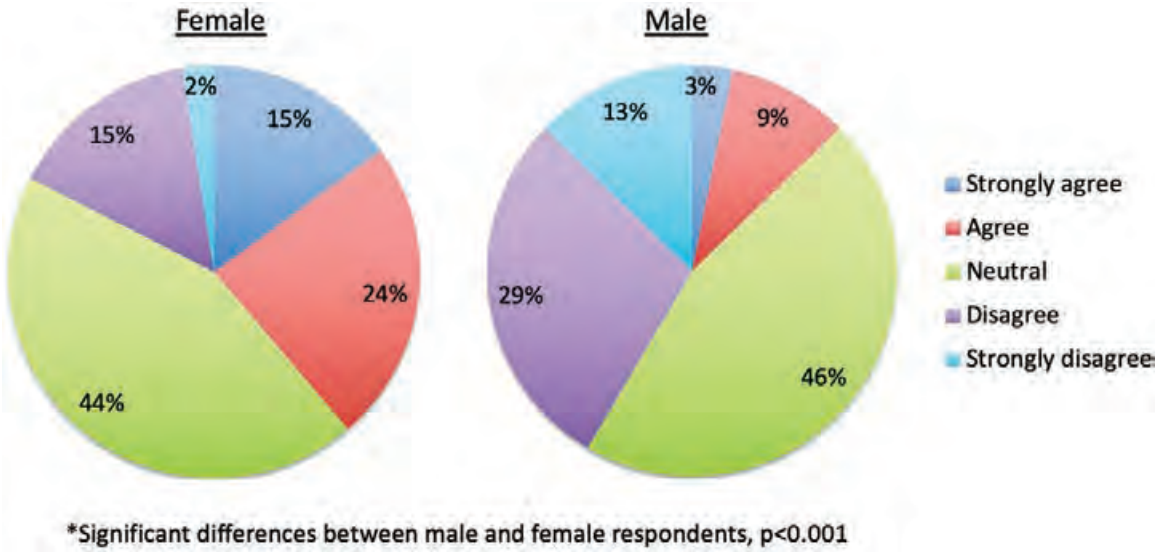

Fig. 7. Participants' views on the statement, "It is important for a mentee to share the same race/ethnicity as his or her mentor."

while also valuing personal time. They welcome frequent collaboration and accessibility across all team members. Traditionally, more senior surgeons prefer greater structure and hierarchy, in contrast to the fluid cooperation appreciated by "millennial" physicians. It is the purpose, rather than process, that is paramount to the younger generation.[11,16] Without recognition of these differences, senior faculty can express frustration and annoyance, and junior faculty can feel dismissed and insignificant. Waljee et al.[11] provide perspectives and strategies for mentoring millennial faculty members, residents, and medical students. Micromentoring (constant, brief moments of feedback), reverse mentoring (mentee providing feedback to mentor), and mentorship teams (larger groups working together) are useful techniques to bridge the gap and facilitate a successful relationship.

It may be beneficial to institute changes at the resident, or even medical student,[15,16] level. Koltz et al.[5] note differences in priorities of graduating residents compared with their faculty mentors, with the latter focusing more on incentives and benefits. Perhaps this disconnect contributes to unhappiness in initial employment opportunities and can be improved with senior faculty guidance not only for academia,[9] but also for business,

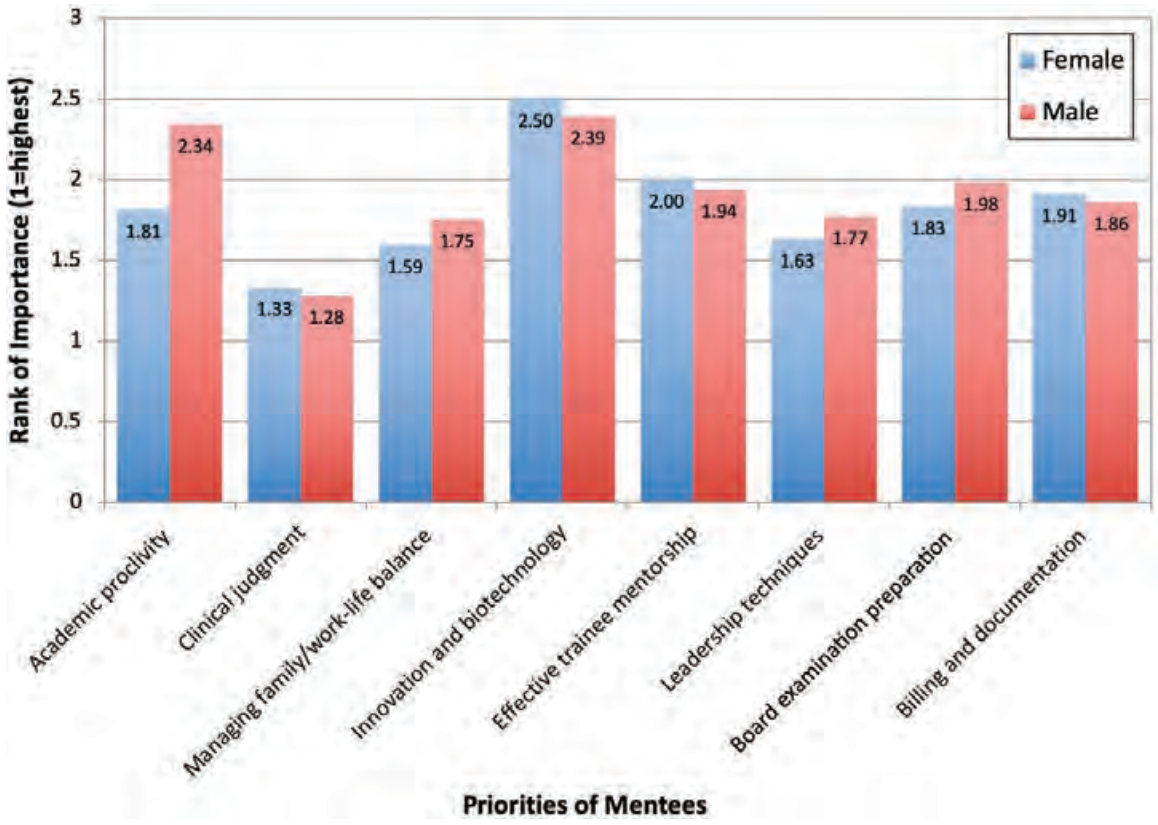

Fig. 8. Mentee priorities of the perceived goals of mentorship.

family, and the shifting priorities from training,[5] specifically regarding private practice. To this end, Shah et al.[31] published concise information regarding different practice models to provide insight for junior plastic surgeons. It is reiterated that through honesty and introspection, happiness is unique to personal and professional goals. Similarly, Davison and Clemens[23] describe high physician turnover in a broader sense: inadequate self-evaluation and/or ineffective evaluation of the employer. Purposeful mentorship during residency can help prepare individuals to identify their aspirations and how best to find this in their first employment opportunity. This may also directly improve the growing rate of burnout in plastic surgeons.[10]

In our study (Fig. 3) and in the literature,[1,24] there is a disconnect between the appeal for formalized mentorship and its availability for surgeons after residency. Perhaps a misconception exists that mentorship is less of a priority when finishing training, although this study shows that is clearly not the case. Kashiwagi et al.[1] outline helpful tactics to establish mentorship programs, beginning with thorough review of the literature. It is necessary to then assess organizational readiness through open discussions with faculty and administrators. Potential challenges to program development and implementation should be thoughtfully examined and collaborative solutions found. Effective mentors are considered an individualized career guide[2] requiring deliberate planning to determine the appropriate pairing (or whatever arrangement if a nontraditional dyad is formed) based on the mentee's needs and the mentor's expertise while maintaining an organic dynamic. Based on the results of our study, is it important to consider gender and racial concordance when organizing mentorship arrangements. Multiple mentors can be valuable—even outside medicine—as each provides unique guidance based on the individual's experiences.

To ensure compliance, Kashiwagi et al.[1] suggest mentees and mentors formulate contracts or mission statements outlining their objectives and commitments. Efficacious mentorship is goal-directed with formal curricula and frequent evaluation—simply having a mentor is not enough. Constant evaluation and data interpretation are required to ensure program effectiveness through subjective surveys and objective data (e.g., retention rates, meeting attendance, professional

society nominations, promotions).[1] Both the mentor and the mentee derive benefit when they are mutually engaged and focused on success.

Additional challenges to improvement in mentorship are the inevitable time and resource requirements in a system where both are already stretched thin. As clinical and administrative demands placed upon surgeons escalate, mentorship will dwindle if the personal requirements are too cumbersome. It is beneficial for leadership to protect professional time dedicated to mentorship to offload any excess time burden. Effective mentorship will fail if mentees are taken advantage of (to benefit the mentor) or if an inefficient model is used (i.e., facilitated peer).[1] Interestingly, many respondents in our study stated competition might be a barrier to mentorship, particularly in the private practice realm, as senior surgeons are wary to help their junior surgeons in the same geographic region to protect their financial interests. Deconstructing perceived competition is a critical step to improve mentorship plastic surgeons, given the high proportion of American Society of Plastic Surgeons members in private practice (Chris Simmons on behalf of ASPS, email, May 13, 2020).

This study is limited by selection bias inherent within the 11 percent of respondents in the study, although the typical response rate for a survey deployed through this platform is 12 percent. Through the nonresponder analysis, differences were discovered between the responders and nonresponders regarding practice demographics (p = 0.012) and gender (p = 0.019). Several domains were similar, including practice type (p = 0.127), age (p = 0.571), and geographic location of practice (p = 0.971). In the study responder cohort, younger participants were female surgeons in academia, whereas the more senior surgeons primarily practiced aesthetic surgery. There were significant differences within the demographic makeup, with fewer women and underrepresented minorities (Table 1). In addition, several open-ended comments, outside of the predetermined responses, were sent, illustrating the difficulty of accurately studying this topic.

Despite these disagreements, this study shows that mentorship is essential, although surgeons have yet to elucidate the most efficient, inclusive, and efficacious method of implementation. Mentorship is personal, and people's needs both professionally and personally are different. These must be considered when developing a mentor-mentee relationship. In addition, there must be a structure in place, without undue burden, with both parties mutually dedicated to success. This is achieved with programs designed to consider the qualities and goals of both mentees and mentors.[14,20,32,33]

CONCLUSIONS

Plastic surgeons agree that effective mentorship is paramount to success, both personally and professionally. This relationship correlates to higher job satisfaction, academic productivity, and diversity and inclusion,[1,4–6] with lower burnout and academic surgery attrition rates.[7–9] Although challenges persist with widespread implementation, continued efforts for personalized mentorship can be fruitful. It is important to recognize that junior, women, and underrepresented minority face different challenges with unique needs that must be considered when forming mentoring relationships. With dedication and understanding, mentorship programs can be developed to benefit not just the mentee, but the mentor as well.

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MEETING 2 (Months 4-6)
Mentorship: Good vs. Bad Mentorship

Discussion Questions:

- *What do you identify as factors of a good versus bad mentor?*
- *Is it important to have more than one mentor at a time (ex: home institution, outside institution, private practice, etc)? Does it foster growth from providing various perspectives?*
- *What are your thoughts on creating a more structured and formal mentorship program, such as PROPEL, compared to informal mentorship? Is it important to have both?*
- *Does mentorship foster productivity for the both the mentor and mentee?*
- *What are your thoughts on this quote from the article on Mentors Malpractice? "The delicate balance of mentoring someone is not creating them in your own image, but giving them the opportunity to create themselves." - Steven Spielberg*
- *Have you experienced any of the following mentorship malpractice from the following table in the article Mentors Malpractice?*

Table. Diagnosing and Treating Mentorship Malpractice

	Phenotype	Underlying Pathology	Diagnostic Symptoms and Signs	Complicit Mentee Acts	Potential Countermeasures
Active Mentorship Malpractice	The Hijacker	Self-preserving behavior related to string of failures.	Academic and intellectual insecurity, financial challenges, limited creativity, fear of being overtaken by others.	Sacrifice first-author positions; name mentor as principal investigator on projects.	Quick and complete exit. There is no way to protect yourself in this relationship.
	The Exploiter	Self-serving philosophy with tendency to self-worship; promotes personal interests over mentees.	Assignment of tasks such as supervising staff, managing projects unrelated to mentee. Believes mentee should be privileged to work with them.	Willing to accept nonacademic chores that support mentor rather than self.	Trial of firm boundary setting and use of additional mentors to evaluate requests. If or when mistrust ensues, exit the relationship.
	The Possessor	Anxious personality with powerful feelings of inadequacy, fears loss of mentee to others.	Specific instructions to not engage with other mentors or collaborators; constant supervision of mentee activities.	Foster isolation by following mentor demands; misinterpret undivided attention.	Insist on a mentorship committee; confront mentor with concerns regarding siloed approach.
Passive Mentorship Malpractice	The Bottleneck	Internal preoccupation coupled with limited bandwidth or interest to support mentee growth.	Often busy with own tasks or projects; limited time to meet face-to-face; inadequate response to requests for help; delays in feedback.	Allow the mentor to set timelines; facilitate behavior by silence or lack of insistence on clarity/detail.	Set firm deadlines and be clear about what happens on those deadlines; follow through with action and articulate frustration with mentor inability to prioritize.
	The Country Clubber	Conflict-avoidant personality, needs to be liked by colleagues; values social order more than mentee growth.	Avoids advocating for mentee resources such as staff, protected time; discourages mentee from similar debates.	Fail to ask mentor to advocate for mentee.	Develop a mentorship team so other mentors may engage in conflict on your behalf. Approach conflict/debate with focus on impact if not addressed.
	The World Traveler	Academic success fueling personal ambitions, travel requirements, desire for fame/appreciation.	Internationally renowned, highly sought-after for speaking engagements. Limited face-to-face time due to physical unavailability.	Accept lack of mentor availability; fail to connect with mentor via alternative methods of communication.	Establish a regular cadence of communication. Reserve time well in advance for in-person meetings. Use alternative methods for communication.

Mentorship in a Surgical Residency: A Comprehensive Review of the Literature

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Abstract

Mentorship in surgical training is an experience that extends beyond the teacher-student interaction. Effective mentorship is crucial in surgical training and requires ongoing support at all stages of graduate surgical education, particularly in the context of busy surgical residency programs. It is important to recognize that mentors and mentees may have different styles of learning and teaching, making it essential to discuss and review these approaches to ensure effective mentorship. By acknowledging these differences and developing a supportive mentorship program that addresses them, surgical residents can receive the guidance they need to progress successfully through their training and prepare for independent practice. This review provides a comprehensive analysis of mentorship styles in various surgical training residencies. By including 30 publications, this study highlights different mentorship approaches and their contributions to education in surgical residency programs. Moreover, this study summarizes the 10 stages of mentorship, offering a clearer understanding of the mentorship model in the context of graduate surgical education. Finally, the review provides insight into the common challenges and pitfalls among mentorship programs. The findings of this study aim to provide valuable guidance for developing effective mentorship programs in surgical residency programs, contributing to better support and outcomes for surgical trainees.

Categories: General Surgery, Orthopedics
Keywords: graduate medical education, stages of mentorship, residency, surgery, mentorship

Introduction And Background

Mentorship can be traced back through history to Homer's epic, The Odyssey [1-3]. Mentor is the human form of the goddess Athena, who takes care of Odysseus' son Telemachus while Odysseus is at war in Troy. Today, mentorship has been described by surgical residents as an experience that extends beyond teacher-student interaction, with the mentor acting as a guardian and promotor of the young physician's personal and professional development [3,4].

In the late 1800s, William Halsted created the first surgical residency at Johns Hopkins Hospital, envisioning a system in which surgeons hand-picked their apprentices for training [5,6]. Halsted's original model has drastically changed over time, manifested today as "The Match," which provides a more structured approach for continued education for new physicians, rather than simply pairing them with mentors [6-8].

Surgical education has a need for effective mentors at all levels of training [9,10]. Medical students working closely with residents develop relationships that influence their future career choice [11]; likewise, mentorship plays an influential role for residents when choosing a specialty [12,13]. An effective mentor can also lead to a more productive research career and greater job satisfaction in junior faculty [14,15]. The relationship that is formed between the mentor and mentee takes many forms. Often, mentees and mentors have different styles of learning and teaching. It is therefore important to discuss and classify the different approaches. The aim of this paper is to provide a comprehensive review of the literature and synthesize recommendations for identifying mentorship styles while avoiding common pitfalls throughout graduate surgical training.

Review

Methods

Identifying and reviewing articles that met inclusion criteria involved two phases. During the first phase, we conducted a search of articles, yielding 68 articles using medical subject heading (MeSH) terms in PubMed, including residency, graduate medical education, mentorship, surgery, orthopedics, otolaryngology, plastic surgery, general surgery, vascular surgery, mentor, and mentee. Publications were included if they were published in English in a peer-reviewed publication and described mentorship in graduate surgical education.

Studies were excluded if they did not describe mentorship in surgical training, were limited to an abstract that lacked the detail necessary to evaluate surgical mentorship, or described a mentorship model that was specific to alternative fields of healthcare such as, but not limited to, psychology, nursing, and advanced care

practitioners.

A preliminary review of all articles for inclusion criteria was performed, with each author independently reviewing the full text of included publications to extract data regarding mentorship styles and common shortcomings of surgical mentorship (Figure *1*). Based on the publications reviewed, a framework was developed for surgical educators to assess styles of mentorship to provide a road map for the development of future surgeons. Following an article review, the authors reviewed the data for comprehensiveness and consistency. A consensus was reached by utilization of the International Narrative Systematic Assessment Tool of the discussion portion of the manuscript [16]. The framework delineates various mentorship styles, including the following: near-peer, peer-to-peer, reverse, one-on-one, group, self-directed, alumni, and speed.

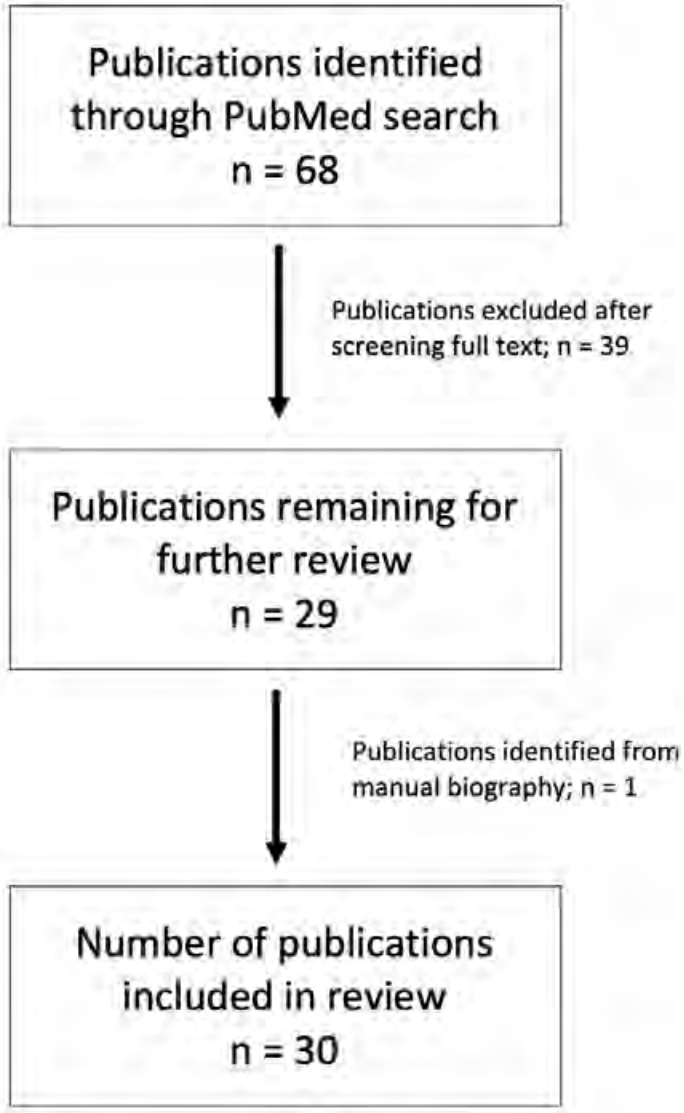

FIGURE 1: Article selection

The initial search yielded 68 articles, of which 29 (43%) met the inclusion criteria. A manual search for reference sections identified one book chapter. From those publications, eight styles of mentorship were identified and described. In addition, 10 stages of mentorship progression were reported and summarized, to better elucidate mentorship steps within graduate surgical education. Finally, common pitfalls encountered during mentorship programs were explored in an effort to synthesize and present possible solutions to these problems. Figure *1* highlights the steps involved in our two-phase article selection method.

Mentorship styles

Near-Peer

Definition: The mentor is a single step ahead of the mentee, such as a medical student receiving guidance from a first-year resident or intern.

Pros: The near-peer model may be best utilized during the transition to clinical years in medical training, which are traditionally perceived as the most stressful times in medical education, and is quite effective as the gap in the level of knowledge and training tends to be smaller [17].

Cons: The near-peer model is a less formal style of mentorship, so learning objectives for the mentee are crucial to achieving an effective education [17]. Among residents, negatives include extending work hours and an antagonistic work environment [5].

Best application setting: From the first few years of medical school continuing to early residency [17]. It can also be applied in surgical skill training, as younger surgeons still rely on a step-by-step method and not muscle memory [18].

Peer-to-Peer

Definition: The mentor and mentee are at approximately the same level of training or education.

Pros: More familiarity with the mentor, easy to establish a mentor-mentee relationship. Just as helpful as faculty or professor feedback [19].

Cons: Mentors lack the wide experience of knowledge typically employed by a more senior mentor.

Best application setting: Mills et al. showed that third- and fourth-year dental students were able to motivate each other during various steps of patient treatment [19].

Reverse

Definition: A younger trainee who has specialized or unique knowledge and skill sets, assisting a more experienced individual, usually a more advanced resident or attending physician [20].

Pros: Older physicians can learn new skills essential to the continuation and refinement of their careers.

Cons: Reverse mentorship is rarely used in surgical specialties, or healthcare, in general, as senior-level physicians are so revered [20].

Best application setting: Reverse mentoring could be a useful tool as medicine becomes increasingly electronically oriented.

One-on-One

Definition: The most traditional form: one mentor, one mentee.

Pros: The benefits of this style cannot be over-emphasized; one-on-one teaching was found to be the preferred method of mentorship for medical students [21].

Cons: Not always feasible if a program does not have the resources to employ enough faculty.

Best application setting: Applicable in a variety of educational settings; even weekly one-on-one sessions provide adequate support to medical students [22].

Group

Definition: Exceeds the 1:1 ratio, one mentor to multiple mentees.

Pros: Utilizes a fewer number of senior-level mentors, which maximizes resources, educating the same number of students.

Cons: Less favored by medical students than a one-on-one mentorship style.

Best application setting: Students tend to require more than what surgeon mentors can provide, so group mentorship has become a necessity at smaller, less well-equipped institutions [21].

Self-Directed Mentorship (SDM)

Definition: The mentee does most of the work as the mentor provides general guidance and advice throughout the training and educational process.

Pros: SDM employs fewer instructional resources and a more efficient and effective approach to resident training [23].

Cons: It requires a highly motivated learner.

Best application setting: SDM is best used in conjunction with a simulation center, which historically is often under-utilized [23].

Alumni

Definition: Alumni from a given institution mentor recent graduates.

Pros: Supports graduates as they enter the professional world. Many schools have an extensive alumni network, which lends itself to this style of mentorship [24].

Cons: Not commonly used, possibly because of the concomitant presence of resident training for the mentees.

Best application setting: Alumni mentorship may be suited more toward professional students that do not go through post-graduate training [24].

Speed

Definition: Mentorships that are either a single day or long term, with short sessions lasting only a few minutes.

Pros: This form of mentorship aids the resident and mentor as they are frequently overwhelmed with time commitments.

Cons: Some learners may require more in-depth mentoring sessions to achieve their full potential.

Best application setting: Early clinical training; rapid teaching sessions between medical students and residents are considered beneficial to both parties [22].

Mentorship stages and effective traits

Mendler [25] outlined 10 different stages of relationship evolution in mentorship that were further expanded upon by Pellegrini (Table *1*) [3].

The 10 Stages of Mentorship	
Attraction	Pairing based on similarities or sought-after qualities in the mentor by the mentee
Cliché exchange	The initial meeting
Recounting	The sharing of experiences by the mentor
Personal disclosure	Each party discussing what they expect to gain from the relationship
Bonding	The two parties attempting to form a deeper connection
Fear of infringement	This signals a change in the relationship dynamic where the mentor senses that their protégé is transitioning into a colleague. A mentor with a secure ego is vital for advancing beyond this stage
Revisiting the framework	The mentor accepts the changing relationship dynamic and acknowledges it to the protégé
Peak mentoring	This stage depicts that a successful mentor-mentee relationship has taken place and has flourished. It is the beginning of the end of the relationship
Reciprocity	Clear mutual benefit to both mentor and mentee, both personally and professionally
Closure	The end of the relationship with satisfaction of both parties

TABLE 1: The 10 stages of mentorship

The first five stages represent the initial relationship-building process between the mentor and mentee, including preliminary introductory meetings, recognizing personality similarities, and planning goals for the partnership. These stages often occur harmoniously, but by the fifth stage, the relationship can crumble due to ineffective mentoring [3]. Stages 6 and 7 represent how this relationship must be dynamic to succeed. The learner will progress, and the mentor must keep pace with this, or the mentorship will fail. Stages 8-10 represent the conclusion of the mentorship, which ideally results in a smooth transition for the learner to the next stage of their training and education.

Rowley suggests that there are six substantial traits that make a good mentor [26]. These include the following:

1) Commitment to the role of mentoring - Mentors should be engaged in the improvement of their mentees without personal gains or profits.

2) A sense of empathy - Mentors must appropriately assess the mentee's level of experience while understanding the difficult process of medical education.

3) Skills in providing instructional support - Mentors should be refined teachers in their field while imparting their skills and wisdom to their learners.

4) Versatility in different interpersonal contexts - Mentors should be adaptable to a wide variety of learners and their individual needs. For example, resident education is different than medical student education, and a good mentor should understand this difference.

5) A modeled life of continuous learning - Mentors are able to instill strong core values of hard work and advancement of the mentorship cycle to future generations of learners.

6) The ability to communicate hope and optimism to their learner - Good mentors are not negative and do not unnecessarily berate their students.

Mentorship pitfalls and areas for improvement

A robust mentor-mentee relationship can be challenging to achieve. In a study by Flint et al., less than half of all the surveyed surgical residents were satisfied with their mentoring relationships [7]. One possible solution to increase satisfaction in the relationship is implementing a personality survey [27], which can give the mentor the ability to predict potential problems based on specific traits of their learner.

The lack of quality mentorship impacts surgical training at various levels of education and throughout multiple specialties. A recent survey of orthopedic surgery residents noted that, while 95% see value in a formal mentorship program, only 26% of respondents have a formal mentor [7]. This highlights the large discrepancy that is often seen in residency programs between the supply and demand of high-quality mentorship.

It is notable to mention that some authors believe that choosing a mentee is more of an art form, and not a decision that is necessarily based on resident test scores or clinical abilities [28]. Unfortunately, many surgeons do not always have personalities that are conducive to being successful mentors [7]. Becoming an excellent educator and mentor is a skill, and like any worthwhile endeavor, it requires patience, hard work, and practice. Surgical residents fortunate enough to have a mentor that possesses these traits will likely have a more satisfying and fulfilling relationship with their mentor. Not every educator placed in the position of mentor will have these qualities, and this can unfortunately result in a counterproductive mentorship. Pellegrini describes four different types of mentors for students to recognize and avoid (Table *2*) [3].

Pellegrini's Four Bad Mentors	
The Uncommitted Phony	They are not involved in teaching and are easily distracted from their duties; look out for insincerity and dishonesty.
The Perfectionist-Turned-Tyrant	This individual leads by example and will initially seem like a great fit; do not be fooled. They will always expect perfection, and refuse to reinforce teaching with compliments, continuously raising expectations to near impossible standards. This relationship will quickly sour.
The Insecure Egocentric	This mentor-mentee relationship serves as an ego-builder for the mentor. Their insecurity will never allow for the relationship to flourish beyond the initial stages of mentorship.
The Begrudger	This mentor will be very protective of their own work and is extremely proud and self-righteous in their own path to success; they will only help the mentee by providing fragmented information in a cryptic and unhelpful manner.

TABLE 2: Pellegrini's four bad mentors

Impediments to a successful mentorship program can also come from the core values of the mentor's own institution or place of employment. Wilson discusses these obstructions [8]:

1) A culture that does not favor seeking help - Mentorship programs should strive to surround themselves with faculty and students who are willing to ask for help when needed.

2) Time constraints - Institutions should make it a priority to set aside time for the mentors to meet with their learners.

3) Providing resources to aid mentorship - It is difficult for one single individual to possess all of the tools necessary to be an effective mentor to every student at every level of their professional development. Institutional support ensures they have resources available to them to increase their repertoire of mentorship skills.

4) Lack of mentoring skills - Good mentors need to have enough foresight to ask thoughtful questions about their own abilities and the insight to not impose their own beliefs onto their mentees.

5) Lack of institutional support - Successful mentorship programs have visible support of their agenda by faculty in positions of power; discernable support should be evident at every level to convey the message of the importance of the mentorship program.

To be truly successful, mentoring needs to be viewed as a professional activity and should be formalized and treated like any other activity in medicine. Institutions involved in surgical training should set forth a formal mentoring program and ensure that their educators have the tools and the time needed to be excellent mentors, as well as ensure that their students understand what a good mentor is. Irrespective of the type of surgical training, residents will still seek to mimic good clinicians. Cultivation of future successful surgeons is imperative to the advancement of our surgical specialties and a good mentor realizes the credit for their efforts lies in the success of their student [29,30]. There is no amount of innovative educational replacements that can make up for the absence of a truly great mentor [5].

Conclusions

Effective mentorship is a surprisingly difficult relationship, not only to form but to maintain throughout the length of a surgical residency. Medical education is a challenging journey, and this path is only more difficult without compassionate and caring leaders to help guide the way. There are numerous different styles of mentorship, some more appropriate than others in surgical education. Whatever the style, effective mentoring should be a dynamic relationship that evolves as the learner progresses in their own education. Both parties should have compatible personalities, and the mentor should possess traits that enable them to provide a healthy learning environment. The importance of quality surgical mentorship cannot be overstated, and surgical residency programs should make a definitive and continuous effort to provide this essential service for their residents.

Additional Information

Disclosures

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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JAMA Surgery | Original Investigation

Characterization of Mentorship Programs in Departments of Surgery in the United States

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IMPORTANCE Mentorship is considered a key element for career satisfaction and retention in academic surgery. Stakeholders of an effective mentorship program should include the mentor, the mentee, the department, and the institution.

OBJECTIVE The objective of this study was to characterize the status of mentorship programs in departments of surgery in the United States, including the roles of all 4 key stakeholders, because to our knowledge, this has never been done.

DESIGN, SETTING, AND PARTICIPANTS A survey was sent to 155 chairs of departments of surgery in the United States in July 2014 regarding the presence and structure of the mentorship program in their department. The analysis of the data was performed in November 2014 and December 2014.

MAIN OUTCOMES AND MEASURES Presence and structure of a mentorship program and involvement of the 4 key stakeholders.

RESULTS Seventy-six of 155 chairs responded to the survey, resulting in a 49% response rate. Forty-one of 76 of department chairs (54%) self-reported having an established mentorship program. Twenty-five of 76 departments (33%) described no formal or informal pairing of mentors with mentees. In 62 (82%) and 59 (78%) departments, no formal training existed for mentors or mentees, respectively. In 42 departments (55%), there was no formal requirement for the frequency of scheduled meetings between the mentor and mentee. In most departments, mentors and mentees were not required to fill out evaluation forms, but when they did, 28 of 31 were reviewed by the chair (90%). In 70 departments (92%), no exit strategy existed for failed mentor-mentee relationships. In more than two-thirds of departments, faculty mentoring efforts were not recognized formally by either the department or the institution, and only 2 departments (3%) received economic support for the mentoring program from the institution.

CONCLUSIONS AND RELEVANCE These data show that only half of departments of surgery in the United States have established mentorship programs, and most are informal, unstructured, and do not involve all of the key stakeholders. Given the importance of mentorship to career satisfaction and retention, development of formal mentorship programs should be considered for all academic departments of surgery.

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Mentorship has been recognized as a key element of career satisfaction because it has a very important influence on career guidance, research productivity, and personal development.[1-22] Traditionally, mentoring has been seen as a relationship between a senior person, the mentor, and a less experienced colleague, the mentee. This relationship is both dyadic, because it is between 2 individuals (the mentor and the mentee), and hierarchical, because the mentor is usually several years older and serves as a role model, teacher, advisor, and sponsor for the younger mentee. While this classic dyad was the cornerstone of mentoring for many decades, an increasing number of academic health science universities are recognizing the need for establishing a formal and structured mentorship program, a program that must include not only the mentor and the mentee but also the department and the institution.[1,6,10,12,16,18,20,22] The department and the institution are key stakeholders who have an important role in the establishment of a mentoring program and derive substantial benefits from its success.

Given the importance of mentorship to career satisfaction and retention[3-6,11,12] and that, to our knowledge, the presence and structure of mentorship programs in departments of surgery in the United States remains unknown, the goal of this study was to characterize the status of mentorship programs in departments of surgery in the United States. We hypothesized that significant variability existed among departments with respect to the structure of the faculty mentorship program and the involvement of the key stakeholders. To address this hypothesis, a survey was developed that addressed the following 6 areas: (1) mentee-mentor pairing, (2) training for mentees and mentors, (3) commitment to the mentee-mentor relationship, (4) evaluation of the mentee-mentor relationship, (5) how failed mentee-mentor relationships are addressed, and (6) recognition of the mentee-mentor relationship. Information from this study will provide insight into mentorship programs and may help the chairs of academic departments of surgery to establish structured mentorship programs that involve all 4 key stakeholders.

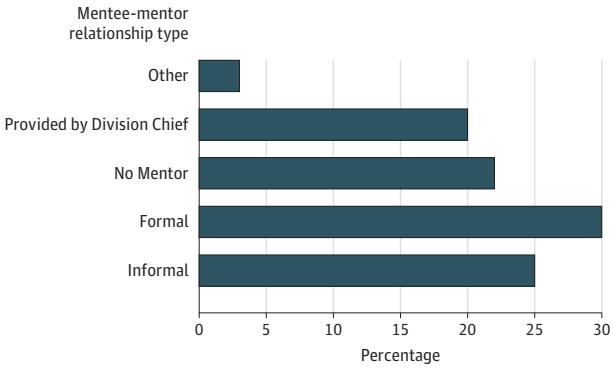
Key Points

Question What is the status of mentorship programs in departments of surgery in the United States?

Findings Results of a survey sent to 155 chairs of departments of surgery with a 49% response rate showed that only half of departments of surgery in the United States have established mentorship programs, and most are informal, unstructured, and do not involve all of the key stakeholders.

Meaning Given the importance of mentorship to career satisfaction and retention, development of formal mentorship programs should be considered for all academic departments of surgery.

Figure 1. Types of Pairing of Mentees With Mentors



Methods

Study Approval

This research project was reviewed by the institutional review board of Northwestern University, Chicago, Illinois. This research was determined to not constitute research with human participants; thus, institutional review board approval was not required.

Study Design

A survey regarding the presence and structure of a mentorship program was sent to all chairs of departments of surgery in the United States. The email list for the department of surgery chairs was obtained from the Society of Surgical Chairs membership directory, which is available online from the American College of Surgeons website. Participation in the survey was anonymous and voluntary. The invitation to respond to the questionnaire was sent by email in early July 2014 to all the members of the Society of Surgical Chairs in the United States (n = 155). The survey response tool was set up such that each surgeon was able to respond only once to the survey. Respondents answered online using an internet-based survey tool (SurveyMonkey.com Corporation). To improve the response rate, 2 subsequent follow-up emails were sent to all members of the Society of Surgical Chairs in late July 2014 and early September 2014. In addition, all incorrect email addresses were identified and corrected, and appointment of any new chairs during the prior year were confirmed to be on the membership list and were added if they were not.

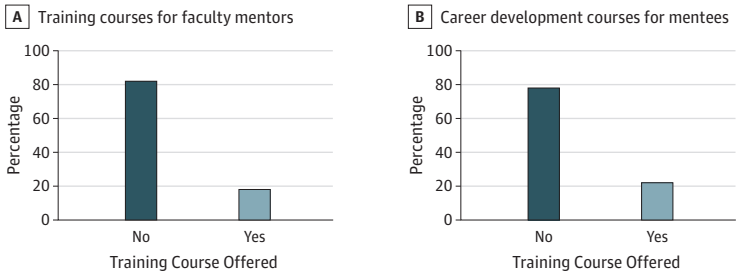
Survey

The questionnaire consisted of 19 questions regarding the presence and description of a departmental mentoring program (eAppendix in the Supplement). Most questions were either a yes/no or a multiple-choice answer. One question about a continuous variable contained a free-text answer box. The questions addressed the presence of an established mentorship program within each department and characterized the role of the 4 stakeholders (ie, mentor, mentee, department, and institution).

Data Analysis

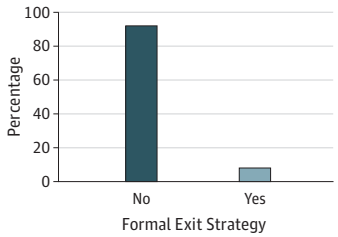
Results presented in the article were calculated based on the number of responses received to each individual question. Thus, a nonresponse was not considered a negative answer

Figure 2. Training Courses Associated With Mentorship Programs



A, Percentage of departments that offer training courses for faculty mentors. B, Percentage of mentees who are required to attend career development courses.

Figure 3. Exit Strategies for Failed Mentor-Mentee Relationships



Percentage of departments of surgery that have formal exit strategies in place for failed mentor-mentee relationships.

because it was not included in the numerator or denominator in determining the percentage of responders who answered each question.

Statistical Analysis

Data were analyzed using the 1-sample χ^2 test, the Mann-Whitney rank sum test, and the Fisher exact test. Data are presented as mean (SE) where appropriate. For statistical analysis, test statistics with a *P* value at or less than .05 were considered to be significant.

Results

Overall, 76 of 155 responses were received, resulting in a 49% response rate. Among the departments included in the results, the mean (SE) number of faculty was 59 (5), and the median was 50. Forty-one chairs (54%) self-reported that they had an "established" mentorship program in their department, while 35 chairs (46%) felt that while mentoring occurred within their department, it was nonstructured.

Pairing of Mentors and Mentees

In 53 of 76 departments (70%), the faculty were paired with mentors, with the pairing being either informal (17 of 76, mentee chooses the mentor [22%]), formal (19 of 76, mentee is assigned to mentor [25%]), provided by the division chief (15 [20%]), or via other means (2 [3%]) (**Figure 1**). The remaining faculty members (23 [30%]) did not have a mentor. Of the programs that paired mentors with mentees, 25 of 48 programs (52%) paired mentees with 1 mentor, while 23 of 48 programs (48%) paired mentees with 2 or more mentors.

Training for Mentors and Mentees

Sixty-two departments (82%) offered no official training courses for faculty mentors (**Figure 2**A). Of the 14 departments that offered training courses for mentors, 3 were offered by the department (21.4%), 8 were offered by the medical school (57.2%), and 3 were offered by the university (21.4%). Seventy-eight percent of programs did not require mentees to attend a career development course (Figure 2B). When required, the career development course was offered by the department (6 of 17 departments [35%]), medical school (7 of 17 departments [41%]), university (2 of 17 departments [12%]), or outside of the institution (2 of 17 departments [12%]).

Commitment to the Relationship

In almost all departments, neither the mentors (71 [93%]) nor the mentees (70 [92%]) were required to sign a mentor or mentee contract. In addition, only 28 departments (37%) asked mentees to fill out a form stating their short-term and long-term goals on establishing the mentor-mentee relationship. Forty-two programs (55%) had no formal requirement regarding how often the mentor should meet with the mentee. Of the 34 programs that did have requirements (45%), 6 required meetings annually (18%) while 28 required meetings every 3 or 6 months (82%).

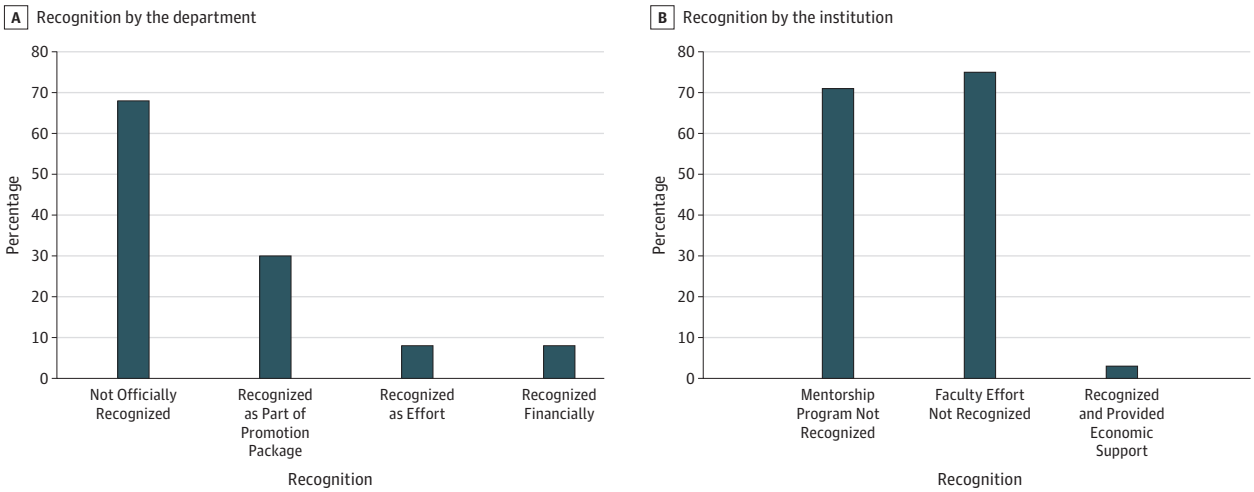
Evaluation of the Mentor-Mentee Relationship

Only 28 of 76 departments (37%) required mentors to fill out an evaluation form on the faculty mentee while only 9 departments (12%) required mentees to fill out an evaluation form on the faculty mentor. When required, the frequency of the requirement to fill out the evaluation form was at least annually for the mentors in 26 of 28 programs (93%) and annually for the mentees in 7 of 9 programs (78%). In the 31 departments where evaluation forms were filled out, 28 had evaluation forms reviewed by the chair (90%), 11 by a division chief (35%), 6 by a vice chair (19%), 3 by a mentoring committee (10%), and surprisingly, 7 by a medical school faculty affairs committee, dean, or vice/associate dean (23%).

Failed Mentor-Mentee Relationship

In 70 departments (92%), no exit strategy (ie, "no-fault divorce" or meeting with the department chair) had been set for failed mentor/mentee relationships (**Figure 3**).

Figure 4. Recognition of Faculty Mentoring Efforts



A, Recognition of faculty mentorship activity by the department. B, Recognition of the faculty mentorship programs by the institution.

Recognition of the Mentor-Mentee Relationship

In 52 departments (68%), the work of the mentor was not officially recognized either financially or academically (**Figure** 4A). Twenty-three departments (30%) recognized faculty mentoring activities as part of the promotion package, 6 recognized the effort (ie, time or relative value unit considered in the calculation for overall compensation) (8%), and 6 recognized it financially (ie, salary or bonus) (8%). Regarding institutional recognition, most institutions (54 [71%]) did not recognize the mentorship program within the department of surgery or the effort of the faculty mentors (57 [75%]) (Figure 4B). Only 2 institutions (3%) provided economic support for the mentorship program within a department of surgery.

Comparison of Programs With and Without Established Mentorship Programs

Characteristics of programs that self-identified as having an established mentorship program were compared with programs that self-identified as not having an established mentorship program. Interestingly, programs with established mentorship programs were larger (mean faculty of 70 vs 47, $P = .02$). As would be expected, programs with established mentorship programs were significantly more likely to require mentees to fill out forms stating their short- and long-term goals (61% vs 9%, $P < .001$), require a regular frequency of meetings between the mentor and mentee (73% vs 11%, $P = .002$), require mentors to complete an evaluation form about the mentees (63% vs 6%, $P = .009$), and have the evaluation form reviewed by the department chair (63% vs 6%, $P < .001$). Lastly, programs with established mentorship programs were more likely to be recognized by the institution (49% vs 6%, $P = .001$), and the mentoring activities of the faculty member were more likely to be recognized for academic promotion or by effort (61% vs 11%, $P = .004$).

Discussion

Our study shows that approximately half of departments of surgery have established mentorship programs and that, among those that have them, the structure varies significantly. Indeed, while more than two-thirds of departments helped to pair mentors with mentees, less than one-fourth used an informal pairing that allows the mentees to choose their mentors. For most departments, no formal training existed for either the mentor or mentee. Only slightly more than half of departments had requirements for the frequency of scheduled meetings between the mentor and mentee, but most departments did not require the mentor or mentee to fill out evaluation forms about the success of the relationship, nor were exit strategies in place for failed mentor-mentee relationships. Lastly, in most departments, faculty mentoring efforts were not recognized formally by either the department or the institution. These data clearly show that significant variability exists among departments of surgery with respect to the structure of faculty mentorship programs and that active engagement of all 4 key stakeholders is lacking in most of them.

These data have important implications for the career development of academic surgeons. When successful academic physicians are asked about the factors that played a significant role in their career, mentorship is uniformly quoted as a key element.[3,4,6,8,12] However, review of the literature shows little evidence to support this claim because, to our knowledge, there are no prospective randomized trials comparing the careers of physicians who had mentors with the careers of those who did not, and there are no long-term longitudinal studies assessing the value of mentorship. Even with the lack of prospective data on mentorship, there are several studies that have described the positive effects of mentorship. For instance, in a survey of 4000 mentees in 24 medical schools in the United States, Palepu et al[5] found that compared with nonmentored faculty, men-

tored faculty spent more time on research and were more likely to obtain grants. Other studies have shown a positive effect of mentoring on faculty retention[6] and scholarship.[11] In addition, mentorship has been associated with career satisfaction in the areas of career guidance, research productivity, and personal development.[3,4] For instance, DeCastro et al[4] surveyed 1708 clinician-researchers between 2010 and 2011 who received National Institutes of Health K08 and K23 career development awards between 2006 and 2009.[4] Although the study had limitations, such as the self-reported nature of data collection and the fact that the participants had already shown the ability to secure funding from the National Institutes of Health, it identified a correlation between some aspects of mentoring (eg, mentor behavior, mentor prestige, and collegiality of the mentor-mentee relationship) and career satisfaction. Finally, a report from the University of Toronto has shown that mentoring is also important for promotion, a surrogate for academic success.[12] In their study, Morrison et al[12] examined the time to promotion for faculty before and after implementation of a formal mentorship program and also between mentored and nonmentored faculty regardless of the time to promotion. These authors found that mentorship was independently associated with a reduction in time to promotion. Based on their observation, they concluded that a formal mentoring program supported by the institution has a positive effect on faculty advancement.

Considering the positive effect of mentoring on career satisfaction and possibly on career success, we and others[1,6,10,12] believe that a mentorship program within a department of surgery should be carefully designed, with the involvement of the 4 key stakeholders (the mentor, the mentee, the department, and the institution) clearly defined. Our study showed that when established mentorship programs were compared with those without a structure, important differences became evident. Specifically, in departments with self-identified mentorship programs, there was more often the involvement of the department in pairing mentors with mentees; the requirement for the mentees to clearly state their short- and long-term goals and to schedule regular meetings; the requirement for the mentor to evaluate the mentee and for the chair to review the evaluation forms; recognition of the mentoring activities for academic promotion; and recognition of the mentoring program by the institution. Similarly, in a review of 18 academic mentoring programs, Kashiwagi et al[10] recognized the value of a formal and structured program and identified 7 components that were considered essential for its success: (1) pairing of mentors and mentees; (2) mentor preparation; (3) planning committees; (4) formal curricula; (5) mentor/mentee contract; (6) mentoring activities; and (7) program funding and participant compensation.

We found that 30% of faculty were not mentored. Among the 70% who were mentored, only 22% of the mentees were able to choose their mentor (ie, informal pairing). This is probably the most successful dyadic relationship because the mentee can select somebody who is knowledgeable, is honest, has experience with the department and the institution, has a well-established track record of mentorship, and shares common values. Mentees should be able to choose more than 1 mentor because the health care environment makes it very difficult for 1 mentor to provide adequate guidance for all aspects of an academic career (ie, research, grant writing, clinical activities, participation to academic medical societies).[10,16] This strategy of having mentees choose their mentors allows mentees "to manage up," a common corporate concept in which the mentee must clearly state his or her needs, must plan and set the meeting agenda, complete assigned tasks, and request feedback.[15] In our study, 20% of the mentees were assigned a mentor by the department (ie, formal pairing). We believe this is not an ideal situation because mentees often believe that an assigned mentor is a forced type of relationship and a cause of failure.[13] For this reason, we believe it is best when the department chair helps the mentee to identify a mentor, supporting a natural, unforced process. The remaining 20% of faculty members were mentored by the division chief. This relationship can be problematic because it has an inherent imbalance of power and potential conflict of interests and should thereby be managed carefully and with proper oversight to avoid abusive situations.[19]

In most departments, there was no official training for faculty mentors. This may be a problem because while some individuals, particularly those who had effective mentors, are ready to serve this role, others need formal training on how to be a good mentor. Mentoring skills can be taught like any other skill through book reading and attending workshops, seminars, or courses.[10] The University of California, San Francisco has been a leader in the development of mentorship programs, and this institution has recognized the seminal importance of training mentors through established Mentor Development Programs to be effective teachers, particularly in the area of translational research.[1,20] Thanks to this program, mentors uniformly reported increased confidence in their mentoring skills such as the ability of helping their mentees in approaching translational research, managing their laboratory, identifying professional goals, building professional collaborations, and understanding the expectations for advancement and promotion.[1]

At the same time, it is essential to provide formal training to the mentees. There are well-established career development courses for residents, fellows, and junior faculty such as the one sponsored by the Association for Academic Surgery. During this course, participants are taught how to choose a mentor, write and revise a manuscript, deliver an effective presentation, prepare an abstract for a national meeting, properly design a study, and statistically analyze the study results. These courses provide essential information for the academic surgeon. For instance, during the Academic Surgical Congress in 2013, the Association for Academic Surgery held a session on "The Art and Science of Publishing," during which the results of a survey of Association for Academic Surgery and Society of University Surgeons members were disseminated.[23] It was disappointing to discover how many of the respondents did not know about key elements of publishing such as authorship, guest authorship, plagiarism, self-plagiarism, fraud, fabrication, and conflict of interest.[23] Thus, we believe attending career development courses such as these are beneficial for all mentees pursuing a career in academic surgery.

Regarding commitment to the mentor-mentee relationship, we found that in almost all of the departments, neither

the mentor nor the mentee were required to sign a contract. This simple document guarantees that both parties in the relationship understand the expectations established in the beginning of the relationship.[10] In addition, most programs did not require the mentors (63%) or mentees (88%) to fill out a form assessing how the relationship was progressing and which goals had been achieved. Monitoring the relationship in regards to personal (eg, respect, punctuality, honesty, and frequency of meetings) and professional (eg, manuscripts, grants, promotion, participation, and leadership positions in national and international societies) aspects of their career is of key importance.[2,16,20] Another reason routine evaluation of the mentor-mentee relationship should be performed is to determine whether potential areas of conflict are present and whether the relationship is failing.[13,14] On the part of the mentors, failure is present when the mentee does not perform according to the initial plan or lacks respect. On the part of the mentees, failure is often expressed as the mentor not giving credit to their work, such as taking ownership of research grants, patents, or publications, or focusing on his or her research and not allowing the mentees to explore their own ideas. After careful analysis, if the relationship is deemed failed, an exit strategy, such as a "no-fault divorce," should be implemented.[14,24] Our study showed that in 92% of departments, no exit strategy had been set for failed mentor-mentee relationships. Thus, we believe that evaluation forms should be regularly filled out by both the mentor and the mentee, and they should be reviewed by a mentoring committee and the chair of the department to ensure ongoing successful mentor-mentee relationships.

Our study also shows that most departments and institutions do not recognize or reward the work of the mentor either financially or academically. This is a potential barrier to effective mentoring for the following reasons: (1) the time a mentor dedicates to a mentee is time not spent on his or her own professional and personal activities; (2) mentors are usually senior surgeons who have an increased demand for clinical, research, and administrative tasks; and (3) it takes away an important incentive. Some institutions reward the effort of mentors either financially (eg, relative value units, salary support) or academically (eg, awards for excellence in mentoring, consideration in the promotion application).[10-13,16,20] For instance, the University of California, San Francisco formally recognizes mentoring as equivalent to teaching in the promotion process, and faculty are required to describe their mentoring activities in the curriculum vitae.[20] Lastly, we found that only 3% of institutions provided economic support for the mentorship program within a department of surgery. We believe that an effective mentoring program cannot be established by the chair of the department of surgery without the open and transparent approval and support of the institution. Given the return on investment that the medical school can receive from a formal mentoring program in terms of economic gain (federal and nonfederal grants), program development, national ranking, and particularly retention and recruitment,[6,7,9,14,17] support for these programs should be developed at all institutions.

Our study has some limitations. First, the data obtained in this study were via self-reporting; thus, bias may exist. Second, the survey was entirely anonymous. This limited our ability to track the data back to individual institutions and perform additional analyses such as the impact on extramural funding, publications, retention, promotion, private vs public institution, safety-net burden of the hospital, and term of the chair of surgery. Third, while we achieved a response rate of nearly 50%, the data in this article are not representative of all 155 departments across the United States. A response bias may exist such that chairs of departments of surgery with more structured mentorship programs were more inclined to answer the survey. Fourth, these data are survey data representing a single point in time and do not reflect longitudinal data on the effect of a mentorship program on the career development of faculty. Even with these limitations, we believe the data presented herein provide meaningful insights into the nature of mentorship programs.

Conclusions

Our data show that the presence and structure of mentorship programs in departments of surgery across the United States are highly variable with respect to the pairing of mentors with mentees, commitment to the relationship, training provided, and recognition by all 4 key stakeholders. Because mentorship has been shown to be one of the most important factors for career satisfaction (and possibly success), development and maintenance of an established faculty mentorship program with the involvement of the department and the institution may lead to greater faculty satisfaction, productivity, and retention.

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Study concept and design: Kibbe, Pellegrini, Townsend, Patti.
Acquisition, analysis, or interpretation of data: Kibbe, Helenowski, Patti.
Drafting of the manuscript: Kibbe, Pellegrini, Patti.
Critical revision of the manuscript for important intellectual content: Kibbe, Townsend, Helenowski, Patti.
Statistical analysis: Kibbe, Helenowski.
Administrative, technical, or material support: Kibbe, Pellegrini, Townsend.
Study supervision: Kibbe, Patti.

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eAppendix. Department of Surgery Mentorship Program Survey

This supplementary material has been provided by the authors to give readers additional information about their work.

Department of Surgery Mentorship Program Survey

1. How many full-time faculty members are there in your department? _____

2. Do you have an established mentoring program for faculty in your Department of Surgery? Y/N

3. How are faculty mentors paired with faculty mentees?
    a. Informal (mentee chooses mentor)
    b. Formal (mentee is assigned to the mentor)
    c. Division Chief serves as the mentor to their faculty
    d. N/A – faculty are not paired or assigned to faculty mentees
    e. Other _____

4. How many faculty members are paired with one faculty mentee?
    a. 1
    b. 2
    c. 3
    d. >3
    e. N/A – faculty are not paired or assigned to faculty mentees

5. Do you have an official training course for faculty mentors?
    a. No
    b. Yes – a course offered by the Department of Surgery
    c. Yes – a course offered by the Medical School
    d. Yes – a course offered by the University
    e. Yes – a course offered outside of the Institution (i.e., a regional or national course)

6. Are faculty mentees required to attend a career development course?
    a. No
    b. Yes – a course offered by the Department of Surgery
    c. Yes – a course offered by the Medical School
    d. Yes – a course offered by the University
    e. Yes – a course offered outside of the Institution (i.e., a regional or national course)

7. Do faculty mentors sign a mentor contract about his/her duties and expectations as a mentor?
    a. Yes
    b. No

8. Do faculty mentees sign a mentee contract about his/her duties and expectations as a mentee?
    a. Yes
    b. No

9. Do faculty mentees fill out a form stating their short-term and long-term goals (or equivalent) upon establishing the mentor-mentee relationship?
    a. Yes
    b. No

10. Who is provided a mentor and included in your formal or informal mentoring program? (check all that apply)
    - ☐ Instructors (i.e., chief residents, fellows, or others who qualify as Instructors)
    - ☐ Assistant Professor
    - ☐ Associate Professor
    - ☐ Professor
    - ☐ Research Assistant Professor
    - ☐ Research Associate Professor

- ☐ Research Professor
- ☐ Other _____

11. How often are faculty mentors required to meet with their faculty mentees?
    a. No formal requirement
    b. Q 3 months
    c. Q 6 months
    d. Q 12 months
    e. Q 24 months
    f. Other _____

12. Are the faculty mentors required to fill out an evaluation form on the faculty mentee?
    a. No
    b. Yes, every 3 months
    c. Yes, every 6 months
    d. Yes, every 1 year
    e. Yes, but the interval is not defined, it is up to the mentor or mentee

13. Are the faculty mentees required to fill out an evaluation form on the faculty mentor?
    a. No
    b. Yes, every 3 months
    c. Yes, every 6 months
    d. Yes, every 1 year
    e. Yes, but the interval is not defined, it is up to the mentor or mentee

14. If evaluation forms are completed, who reviews these forms? (check all that apply)
    - ☐ Not applicable (i.e., no forms are filled out)
    - ☐ No one reviews the forms
    - ☐ The mentor and mentee
    - ☐ Division or Department Administrator(s)
    - ☐ Division Chief(s)
    - ☐ Vice Chair
    - ☐ Department Chair
    - ☐ Departmental Mentoring Committee (or equivalent)
    - ☐ Medical School Faculty Affairs Committee (or equivalent)
    - ☐ Vice or Associate Dean of the medical school
    - ☐ Dean of the medical school
    - ☐ Other _____

15. Does your Department of Surgery have a formal exit strategy in place for failed faculty mentor-mentee relationships (i.e., no fault divorce)?
    a. Yes
    b. No

16. How does the Department of Surgery formally recognize faculty mentoring activities?
    a. Financially (money, bonus, etc.)
    b. Effort (time considered in RVU calculation for compensation)
    c. Academically (part of the promotion package)
    d. Mentoring is not recognized formally
    e. Other _____

17. Does the Institution recognize the mentorship program in your department?
    a. Yes
    b. No

18. Does the Institution recognize the work/effort of the faculty mentor?
    a. Yes
    b. No

19. Does the Institution provide economic support for the mentorship program within your Department of Surgery?
    a. Yes
    b. No

A PIECE OF MY MIND

Mentorship Malpractice

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The delicate balance of mentoring someone is not creating them in your own image, but giving them the opportunity to create themselves.
Steven Spielberg

The word *mentorship* evokes strong emotional and intellectual chords. In formal parlance, *mentorship* has been defined as "a dynamic, reciprocal relationship in a work environment between an advanced-career incumbent (mentor) and a beginner (mentee) aimed at promoting the career development of both."[1] In our careers in academic medicine, we have seen mentees benefit from mentors through development of critical thinking skills and advice on research ideas, scholarship, and networking opportunities. Similarly, now as mentors we have also benefitted by gaining an ally to support our work, developing larger circles of influence, and establishing legacies as academic leaders. It is thus not surprising that mutually beneficial mentor-mentee relationships are a key predictor of academic success.[2]

While much has been written about the qualities that constitute an ideal mentor,[3] little attention has been given to behaviors that make one less desirable. This gap is important because mentor-mentee relationships are, by definition, unequal, with mentees being more vulnerable. Mentees are also likely to disproportionately suffer in a dysfunctional relationship, behooving them to be cognizant of mentor behaviors that threaten success. In our combined 50 years in academic medicine, we have borne witness to—and, sadly, even occasionally participated in—suboptimal mentoring. While small intermittent lapses are natural when managing various responsibilities, mentor behavior that puts a mentee's academic career at risk crosses a threshold we term *mentorship malpractice*. Here, we outline active and passive prototypes of mentorship malpractice, using tongue-in-cheek names to portray behaviors and characteristics of the unwanted behavior. We then offer solutions for mentees to approach these important mentorship problems.

Active Mentorship Malpractice

Characterized by dysfunctional behavior, active mentorship malpractice is often blatant and easy to spot. Three classic phenotypes exist.

The Hijacker

Hijackers are bullies who take hostage a mentee's ideas, projects, or grants, labeling them as his or her own for self-gain. Mentors who engage in this form of malpractice often do so in the setting of career challenges such as shortages of funds, publications, or intellectual creativity. Notably, some mentees are unknowingly complicit in this behavior, comforted by feeling valued regardless of the underlying pretext. Like a Stockholm syndrome variant, the mentee willingly gives up lead positions on manuscripts or grants, mistakenly expecting that the success of the mentor will ultimately cascade down to him or her. It is only when this fails to occur that mentees realize they have been cheated, but usually the damage from such a negative association is already done.

The Exploiter

The Exploiter torpedoes mentees' success by saddling them with low-yield activities. Typified by self-serving advice, Exploiters commandeer mentees by thrusting their scientific agenda or nonacademic responsibilities onto them, often justifying such behavior as "the price of mentorship" or "a valuable learning experience." Exploiters may assign mentees to mentor other trainees, supervise project staff, or manage projects central to the mentor, but not the mentee's area of expertise. In this way, Exploiters value managers, not independent scientists, and have no interest in cultivating mentees.

The Possessor

The trademark of the Possessor is domination of the mentee. Possessors are insecure and view seeking assistance from others as a threat to their position. Such anxieties lead possessors to take a passive-aggressive approach to collaboration, disparaging potential co-mentors or demeaning the mentee for reaching out to others. Like a battered spouse, mentees in this relationship become isolated from social and collegial interactions, making it difficult to recognize or be rescued from the Possessor. Rather, mentees are often lured into feeling special by the attention of the Possessor, who does so only to fulfill his or her own needs.

Passive Mentorship Malpractice

Passive mentorship malpractice is insidious and shares inaction by the mentor across three distinct subtypes.

The Bottleneck

Bottlenecks are preoccupied with their own competing priorities and have neither the bandwidth nor the desire to attend to mentees. Their internal focus quickly diminishes mentee productivity, a phenomenon that is particularly problematic for early-career researchers. The rate-limiting behavior of Bottlenecks is accentuated when they insist on signing off on a work product, essentially handcuffing mentees to their timeline. While the quality of the feedback may offset this cost, mentees always pay the price in diminished academic output when working with Bottlenecks.

The Country Clubber

The mentor who wants to be everybody's friend and evades conflict—regardless of need—is the Country Clubber. These mentors avoid engaging in difficult but necessary conversations on behalf of the mentee such as negotiations regarding protected time, authorship po-

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Table. Diagnosing and Treating Mentorship Malpractice

	Phenotype	Underlying Pathology	Diagnostic Symptoms and Signs	Complicit Mentee Acts	Potential Countermeasures
Active Mentorship Malpractice	The Hijacker	Self-preserving behavior related to string of failures.	Academic and intellectual insecurity, financial challenges, limited creativity, fear of being overtaken by others.	Sacrifice first-author positions; name mentor as principal investigator on projects.	Quick and complete exit. There is no way to protect yourself in this relationship.
	The Exploiter	Self-serving philosophy with tendency to self-worship; promotes personal interests over mentees.	Assignment of tasks such as supervising staff, managing projects unrelated to mentee. Believes mentee should be privileged to work with them.	Willing to accept nonacademic chores that support mentor rather than self.	Trial of firm boundary setting and use of additional mentors to evaluate requests. If or when mistrust ensues, exit the relationship.
	The Possessor	Anxious personality with powerful feelings of inadequacy, fears loss of mentee to others.	Specific instructions to not engage with other mentors or collaborators; constant supervision of mentee activities.	Foster isolation by following mentor demands; misinterpret undivided attention.	Insist on a mentorship committee; confront mentor with concerns regarding siloed approach.
Passive Mentorship Malpractice	The Bottleneck	Internal preoccupation coupled with limited bandwidth or interest to support mentee growth.	Often busy with own tasks or projects; limited time to meet face-to-face; inadequate response to requests for help; delays in feedback.	Allow the mentor to set timelines; facilitate behavior by silence or lack of insistence on clarity/detail.	Set firm deadlines and be clear about what happens on those deadlines; follow through with action and articulate frustration with mentor inability to prioritize.
	The Country Clubber	Conflict-avoidant personality, needs to be liked by colleagues; values social order more than mentee growth.	Avoids advocating for mentee resources such as staff, protected time; discourages mentee from similar debates.	Fail to ask mentor to advocate for mentee.	Develop a mentorship team so other mentors may engage in conflict on your behalf. Approach conflict/debate with focus on impact if not addressed.
	The World Traveler	Academic success fueling personal ambitions, travel requirements, desire for fame/appreciation.	Internationally renowned, highly sought-after for speaking engagements. Limited face-to-face time due to physical unavailability.	Accept lack of mentor availability; fail to connect with mentor via alternative methods of communication.	Establish a regular cadence of communication. Reserve time well in advance for in-person meetings. Use alternative methods for communication.

sitions, or research support. They minimize the importance of conflict and encourage mentees to do the same. Country Clubbers view mentorship as a ticket to popularity, with the number of mentees serving to promote social capital rather than responsibility. Mentees in this relationship are not only unsupported, but also find it difficult to assert themselves given the "nice guy" routine.

The World Traveler

These mentors are highly successful and sought after for meetings, speaking engagements, and leadership positions. Consequently, they have little time for their trainees on a day-to-day basis. Ironically, the more successful a mentor becomes, the more at risk of developing this form of malpractice. The world traveler can take a laissez-faire approach, leaving the mentee effectively mentorless from lack of face-to-face time and direction.

Preventing Mentorship Malpractice

It is important to understand that mentorship malpractice does not occur in a vacuum; rather, such dysfunctional relationships require both parties to participate either willingly or unknowingly. Therefore, a key step in preventing mentor malpractice is recognition of the malady and deployment of key strategies (**Table**).

Don't Be Complicit

Whether it is sacrificing papers to the Hijacker or accepting chores with no academic yield for the Exploiter, mentees are tacitly complicit when mentors malpractice. Mentees must therefore insist on change when mentors malpractice.

Set Boundaries and Communicate Needs

Effective communication helps prevent mentorship malpractice.[4] This is particularly important when dealing with passive phenotypes; with active phenotypes, mentees must set firm boundaries and confront mentors when violations occur.

Establish a Mentorship Team

All forms of mentorship malpractice become more dangerous when the mentee is dependent on one mentor. Having several mentors allows mentees to not only learn from each advisor, but also more easily recognize dysfunction. For example, Hijackers stand out like a sore thumb in comparison to Country Clubbers, whereas the World Traveler's lack of availability can be partly overcome by the involvement of others.

Know When to Walk Away

Some malpractice is so egregious and refractory to countermeasures that it should be viewed as a deal breaker. This is most true of the Hijacker but should be considered for others when countermeasures fail. If a mentor is sabotaging the mentee's career, consciously or otherwise, mentees must be prepared and willing to end the relationship.

Conclusions

In times of tight research funding, the need for effective mentors has never been as acute. Mentorship malpractice is a serious barrier to achieving this goal. Mentees must identify these problems within themselves and their mentors in order to remedy such issues. Failure to do so can result in catastrophic loss. Academic medicine can no longer afford such behavior.

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MEETING 3 (Months 7-9)
Research and Residency: Benefits and Challenges

Discussion Questions:

- *What are the benefits of performing research throughout residency?*
- *Is research during residency perceived as a "check-mark exercise", considering the many other personal and professional demands that come with being a surgical resident?*
- *What can mentors do to engage residents in research, especially for those who have not had formal training or time towards clinical/basic science research prior to entering residency?*
- *Does your training program influence research productivity?*
- *Is it important to collaborate and have research mentors at outside institutions?*
- *Does research productivity influence fellowship opportunities?*

Research and surgical residency: moving beyond one-and-done projects and motivating for scholarly excellence

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SUMMARY

Among surgical residents, research is often perceived as a check-mark exercise. Focus then turns to studying for exams and honing skills for independent practice. While some residents are passionate about research and enroll in other formalized training, pragmatists argue that not every surgeon should engage in research at this level. However, no resident should view research as a one-and-done activity. Rather, research should be viewed as an exercise to improve practice, share gaps in knowledge, collaborate, and empower others to formally study and implement change. The skills acquired during research experiences, at minimum, have value in improving the trainee's literature literacy, which in turn serves as a foundational element of continuing medical education. A culture supportive of scientific discovery, facilitated by both faculty and peer-to-peer mentorship, will result in better collaborative efforts and lead to improved knowledge generation and resident research satisfaction.

Within surgical residency, few activities evoke such a myriad of responses as research. On one end there will be residents who relish the opportunity to break new ground in knowledge generation and may even extend their training timelines to obtain graduate degrees. On the opposite end, some residents will work to actively fill their dedicated research blocks with other pursuits and hope that what output they may have to reluctantly generate will meet their program requirements. Most residents fall between these ends of the spectrum, neither entirely avoiding nor actively contributing to scholarly pursuits. Changes in the current training model need to occur to allow research to play a more foundational role in the development of surgical residents.

Perceptions of the value of resident research in surgical residency and quantification of output is sparse, especially in the Canadian literature. Following the implementation of a formal surgical resident research program at a Canadian academic centre, the number of abstracts and publications per resident increased dramatically.[1] However, during the same time period, a decreased percentage of residents agreed with the idea that residents should be expected to conduct research during their training.[1] The biggest barriers identified to successful surgical resident research included lack of hypothesis guidance; lack of methodological support; lack of time; and, for nearly 20% of residents, lack of interest.[1] None of these barriers are insurmountable, and they require more attention from residency training programs.

Cynicism among trainees should not be entirely surprising. Surgical residency is an onerous commitment following at least 6 previous years of postsecondary education. Given the tight job market for many surgical specialties in Canada, particularly in academic centres, research is increasingly perceived as a means of improving the odds of not only securing a fellowship, but also getting a staff position. A recent cross-sectional survey of academic general surgery in Canada showed that nearly three-quarters of graduates had

completed at least 1 fellowship, with more than 50% having some form of supplementary graduate research training.[2] In the United States, participation in more than 1 year of dedicated research time during surgical residency is an independent predictor of full-time academic appointment and research grant accruement.[3] To support the calibre of research that is now becoming standard within academic medicine, research programs like the Royal College–affiliated Clinician Investigator Program have become central to the research mandate of many residency programs.[4] Unfortunately, these resources essentially cater only to support the few motivated residents who really need no convincing to become researchers. In turn, this may distort the perception of the role of research in surgical training and its practical application to future practice for the majority of residents who do not plan to pursue dedicated research careers.

Apart from the existential benefits research may have on academic career path development, the resident research experience should be nurtured and encouraged for several reasons. A commitment to scholarly pursuits enhances individual practices and promotes dedication to achieving and surpassing health care advances. Within the Royal College of Physicians and Surgeons of Canada's mandated Competency by Design process, development of a proposal for a scholarly project and/or critical appraisal of the literature are Entrustable Professional Activities within surgical residencies. As a by-product of systematic investigation, agility with literature summation is likely the single most important skill residents build from research experiences. The scientific literature evolves faster than any 1 individual can keep pace with, thus requiring trainees to develop critical and efficient appraisal skills of emerging evidence. As health professionals, residents take on a social responsibility mandate to be users — and ideally producers — of new knowledge to improve patient care. Therefore, research engagement in any form, from a quality-improvement study to publication and knowledge translation, cultivates modes of thinking that motivate personal action initiation via reflection on practice outcomes. Activities including an annual resident research day and regular journal clubs as well as financial support for residents who present at scientific meetings are a few examples of how this can be achieved (Box 1).

Box 1. Factors that can improve surgical resident engagement in research

- Dedicated residency research director
- Motivated faculty
- Peer-to-peer research mentorship
- Defined research curricula
- Ongoing research projects for multi-resident involvement
- Regular journal clubs
- Annual resident research day/celebrations of research accomplishments
- Funding for conference participation

To encourage resident research, a brief research course should be delivered to all first-year residents. This training will provide residents with basic research knowledge that will help them develop a research question and provide tools to help them execute a successful project. None of this can occur without a culture, led by interested faculty, that promotes scholarly activity. A recent meta-analysis demonstrated that characteristics of top publishing residency programs include appointment of a residency research director and defined research curricula.[5]

Residents should be encouraged to seek input from peer residents who may have particularly strong backgrounds in research. Peer-to-peer mentorship has transcendental characteristics that benefit all aspects of career development and advancement. This type of collegiality also serves for cooperative inputs resulting in more impactful projects. While many resident research projects are conducted as siloed studies, modern published research is almost entirely multi-authored. Residents in leadership research roles, together with the oversight of involved faculty, should identify impactful areas for study. Such projects, particularly if they are ongoing and potentially have several angles of investigation, would enable residents with novice research interests to productively participate without being saddled with the nuances of hypothesis generation and project initiation. This multifaceted approach to research using a foundational research course, promotion of a culture of scientific discovery, and peer-to-peer collaboration should improve the odds of successful knowledge generation and resident satisfaction.

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Influence of Residency Training on Research Productivity and Plastic Surgery Career

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Background: The impact of residency training on academic productivity and a career in academic plastic surgery remains uncertain. Previous literature has explored the influence of training institutions on academic careers in surgery. The aims of the study were to assess research productivity during plastic surgery residency training and to illustrate how differences in training programs impact resident research productivity.

Methods: Academic plastic surgery faculty that graduated in the past 10 years were identified through an Internet search of all Accreditation Council for Graduate Medical Education–accredited residency and fellowship training programs. Research productivity was compared based on *h*-index, number, and quality of peer-reviewed articles published during residency.

Results: Three hundred seventy-five academic plastic surgeons were identified and produced 2487 publications during residency. The 10 most productive training institutions were Johns Hopkins, Georgetown, University of Michigan, Stanford, University of California Los Angeles, Northwestern, Harvard, New York University, University of Pennsylvania, and Baylor. Academic productivity was higher among integrated residents (integrated = 8.68 publications, independent = 5.49 publications, $P < 0.0001$). The number of publications positively correlated to faculty size ($r = 0.167$, $P = 0.0013$), National Institute of Health (NIH) funding ($r = 0.249$, $P < 0.0001$), residency graduation year ($r = 0.211$, $P < 0.0001$), and negatively correlated with Doximity ranking ($r = -0.294$, $P < 0.0001$). *H*-index was positively correlated with number of publications ($r = 0.622$, $P < 0.0001$), faculty size ($r = 0.295$, $P < 0.0001$), and NIH funding ($r = 0.256$, $P < 0.0001$) and negatively correlated with Doximity ranking ($r = -0.405$, $P < 0.0001$) and residency graduation year ($r = -0.163$, $P < 0.0001$).

Conclusions: Our study has found that there is an elite cohort of programs that are the most productive research institutions. Resident research productivity is higher among integrated residents, recent graduates, and programs that are larger in size, with a higher Doximity ranking and NIH funding. This study can guide medical students and future applicants who are interested in a career in academic plastic surgery in the selection of programs that match their career aspirations.

Key Words: residency, training, research, academia, productivity, career

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Academic plastic surgeons play an integral part in shaping the future of the field by educating and training prospective leaders in the field, both in the academic and clinical setting.

Before becoming academicians, emerging physicians have to make difficult but important decisions throughout their medical career when choosing their medical school, residency program, and fellowship. Previous literature has looked into the influence of both medical school and specialty training programs on the pursuit of an academic career in medicine.[1–3] In the field of plastic surgery, a previous study has shown that 39% of all academic plastic surgeons in academic practice were trained in a total of 11 residency programs.[1] Peer-reviewed literature in other fields confirms that trend, as studies have shown that there is a correlation between academic career and select training institutions, with the top 3 residency programs accounting for 10.8% and 10% of the academic faculty in the United States in the fields of neurology and neurosurgery, respectively.[2,3] The tendency of top programs producing a disproportionate number of academicians was also confirmed in the field of otolaryngology, as the top 4 residency programs accounted for 11.2% of academic otolaryngologists.[4] The factors underlying that trend remain unclear and require further investigation in order for us to understand what aspects of training contribute to the aspiration of pursuing an academic career in plastic surgery. There are many significant factors that determine the quality of a residency training program, including the quality of faculty, access to a broad spectrum of clinical experiences, as well as areas of emphasis that programs focus on. Furthermore, a significant part of being an academician is the contribution to scientific achievement and progress, and involvement in research during residency training could be an important factor to determine whether a plastic surgery trainee pursues an academic path over a career in private practice. To our knowledge, there are no previous inquires in the literature into this particular correlation.

The main aim of this study is to assess research productivity during plastic surgery residency training and illustrate the differences in opportunities those training programs offer for a future academic career. The goal of the study is to guide medical students and surgery residents interested in pursuing an academic career in plastic surgery as well as educating prospective residents about which training program may offer them the most research opportunities. Furthermore, the study can be used as another data point for program chairs to use when exploring opportunities to improve their program for future residents.

METHODS

Study Sample

A retrospective review of plastic surgery resident research productivity was conducted in April 2019. Current accredited plastic surgery programs were identified through a search of the 2018 Accreditation Council for Graduate Medical Education (ACGME) program listings. The accredited plastic surgery training programs (n = 140) were then identified as either integrated or independent. Programs that had both were unified under a single listing with duplications being removed (n = 100). Institution Web sites for these residency programs were examined to identify characteristics of clinical, adjunct, tenure, and nontenure track plastic surgery faculty at each institution. Faculty excluded from the analysis were emeritus processors, research faculty without medical degrees, faculty who trained outside of the United States, and faculty without formal plastic surgery training. The identified academic plastic surgery faculty were then organized by their residency graduation year, and only those who finished their residency training in the past 10 years were included to most accurately guide future applicants in the constantly evolving landscape of medical training.

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Data Collection

Resources such as online faculty profiles, LinkedIn, Doximity, private-practice, and public records Web sites were used to obtain faculty data including age, sex, race, residency graduation year, and plastic surgery residency program characteristics (independent vs integrated, department vs division, size, and ranking). Determinations of race and sex were made during data collection by using faculty profile information, surnames, and photographs and were based upon previously established methods in published work.[1,5,6]

Research productivity in this study was determined by the number of published peer-reviewed literature by the academic plastic surgeons during their residency training and *h*-index (Hirsch index). Measurement of the number of peer reviewed publications was performed using Scopus (Elsevier, Philadelphia, Pa). Scopus is currently the largest abstract and citation bibliographic database for peer-reviewed literature.[1] The inclusion criteria for publications collected in this search required the author to be affiliated with their residency institution at the time of publication, as well as for the manuscript to have been published between the beginning of residency and no later than 2 years after residency graduation. This 2-year postgraduation period was designed to recognize the idea that publishing peer-reviewed work is a process that often requires a significant amount of time and to account for the possibility of academic work done during residency being published after graduation. This means that for an integrated resident, the period analyzed was typically 6 plus 2 for a total of 8 years and that for independent residents, 3 plus 2 for a total of 5 years.

Hirsch Index, Doximity, and Levels of Evidence Classification as Metrics for Academic Productivity

The *h*-index is a metric that helps account for both quantity and quality of work produced by an individual.[7] The *h*-index was collected using Scopus, and it was confirmed by manual calculation when an individual had multiple Scopus profiles.

The Doximity Residency Reputation rankings, which were used in this study, are based on 3 major criteria: resident satisfaction surveys, reputation among board-certified physicians, and measurement of research output by the program's alumni and faculty in the past 15 years. The Doximity rankings are one of the main tools used by medical students during residency selection process and therefore were considered to be an important correlator for the study.

The published work of the identified academic plastic surgeons during their residency training was further classified as either clinical articles, basic science articles, or book chapters. The clinical articles were then classified using the well-established 5 levels of evidence defined by the American Society of Plastic Surgeons Rating Levels of Evidence and Grading Recommendations for Therapeutic Studies.[8] The levels of evidence were as follows: I, high-quality, multicenter, or single-center randomized controlled trial with adequate power or systematic review of these studies; II, lesser-quality randomized controlled trial, prospective cohort or comparative study, or systematic review of these studies; III, retrospective cohort or comparative study, case-control study, or systematic review of these studies; IV, case series with pretest/posttest or only posttest; and V, expert opinion developed via consensus process, case report or clinical example, or evidence based on physiology, bench research, or "first principles."[8]

Analysis

Comparisons of mean number of publications per year, total clinical research papers, total basic science research papers, total book chapters, and clinical publication by level of evidence were made using Student *t* test. Initial evaluations of average number of publications, average basic science papers, average book chapters, and *h*-index by residency training type were completed using Wilcoxon rank-sum analyses with normal approximation. Measurements of correlation for age, residency graduation year, program size, National Institute of Health (NIH) funding, and Doximity ranking were made using the Pearson correlation coefficient with a *P* value to measure a null hypothesis of zero correlation. Determination of top publishers within each institution was made using the frequency of publication during time spent in residency. All analyses were completed through SAS University Edition 9.04.01 (SAS Institute Inc, Cary, NC).[9]

RESULTS

A total of 375 academic plastic surgeons were included in the study. There were 133 integrated and 242 independent trained academic plastic surgeons. The study population consisted of 71.0% male surgeons and 29.0% female surgeons. The average age was 40.8 years (SD, 4.4). Of the academic plastic surgeons included, 67.0% were white surgeons and 33.0% nonwhite surgeons.

Research Productivity

Overall, 2487 publications were analyzed and categorized based on levels of evidence (Table 1). The average numbers of publications produced during residency for both integrated and independent residents are 6.61 publications and 1.09 publications per year. Overall, integrated residents produced a greater mean number of publications than independent residents (integrated = 8.68 publications, independent = 5.49 publications, $P < 0.0001$). The maximum number of publications one resident produced was 66 publications and the minimum number of publications was 0. Independent residents had a higher overall number of clinical research ($P = 0.0022$), basic science research ($P = 0.028$), and book chapters (P = NS). However, integrated residents had a higher mean number of clinical research papers ($P = 0.0017$), basic science papers ($P = 0.0285$), and book chapters ($P = 0.0033$) than independent residents. Integrated residents have a higher *h*-index than independent residents as well (integrated = 7.56, independent = 6.82, P = NS). Most clinical research papers produced for both integrated and independent residents was level 5 (integrated = 56.13%, independent = 55.40%, $P = 0.0039$). The highest level of evidence, level 1, accounted for the least amount of clinical research papers for both independent and integrated residents.

Ranking by Institution

After analyzing each publication produced during residency by each academic plastic surgeon, the plastic surgeons were categorized by where they trained in plastic surgery. The average number of publications produced by each institution was calculated and ranked (Table 2). The top 10 institutions that enabled the greatest number of publications during residency were Johns Hopkins, Georgetown, University of Michigan, Stanford, University of California Los Angeles, Northwestern, Harvard, New York University, University of Pennsylvania, and Baylor. Johns Hopkins had the highest average number of publications (23.33 publications per resident; SD, 22.73) and basic science publications (3.56 basic science publications per resident; SD, 4.80). Georgetown had the highest clinical research average (20.29 clinical publications per resident; SD, 15.11) and book chapter average (1.14 book chapters per resident; SD, 0.69). Johns Hopkins had the highest total number of publications (233 publications).

Potential Factors Affecting Productivity

Total Number of Publications

Academic productivity can be represented by the number of publications (clinical, basic science, book chapters), *h*-index, and NIH funding. The total number of publications per resident was found to positively correlate with the plastic surgery division or department faculty size ($r = 0.167$, $P = 0.0013$), residency graduation year ($r = 0.211$, $P < 0.0001$), and NIH funding ($r = 0.249$, $P < 0.0001$). On the other hand, the number of publications per resident was found to inversely

TABLE 1. Resident Research Productivity Breakdown

	Overall (N = 375)	Integrated (n = 133)	Independent (n = 242)	*P*
Total no. publications	2487	1154	1333	<0.0001
Mean no. publication ± SD	6.61 ± 9.06	8.68 ± 9.22	5.49 ± 8.79	<0.0001
Mean no. publication per year ± SD	1.09 ± 1.57	1.08 ± 1.15	1.10 ± 1.76	
Publications				
Max	66	45	66	
Min	0	0	0	
Total no. breakdown, n (%)				
Clinical research	2004 (80.57%)	921 (79.81%)	1083 (81.25%)	0.0022
Basic science research	382 (15.36%)	188 (16.29%)	194 (14.55%)	0.028
Book chapters	101 (4.06%)	45 (3.90%)	56 (4.20%)	0.13
Clinical research breakdown				
Level 1	3 (0.15%)	2 (0.22%)	1 (0.09%)	0.41
Level 2	75 (3.74%)	31 (3.37%)	44 (4.06%)	0.47
Level 3	447 (22.32%)	215 (23.34%)	232 (21.42%)	0.013
Level 4	365 (18.22%)	159 (17.26%)	206 (19.02%)	0.09
Level 5	1117 (55.77%)	517 (56.13%)	600 (55.40%)	0.0039
Clinical research papers, mean ± SD	5.32 ± 8.00	6.89 ± 8.14	4.44 ± 7.79	0.0017
Basic science papers, mean ± SD	1.02 ± 2.32	1.41 ± 2.85	0.80 ± 1.95	0.0285
Book chapters, mean ± SD	0.27 ± 0.69	0.34 ± 0.64	0.23 ± 0.71	0.0033
h-index, mean ± SD	7.08 ± 5.69	7.56 ± 5.48	6.82 ± 5.79	0.068

correlate with Doximity ranking of training institutions ($r = -0.294$, $P < 0.0001$; Fig. 1). This showed that the higher the rank of the institution, the more publications were produced.

Clinical, Basic Science, and Book Chapters

Clinical research publications was positively correlated with residency graduation year ($r = 0.234$, $P < 0.0001$), NIH funding ($r = 0.229$, $P < 0.0001$), faculty size ($r = 0.161$, $P < 0.0019$), and negatively correlated with Doximity rank ($r = -0.263$, $P < 0.0001$). Basic science research publications was positively correlated with NIH funding ($r = 0.185$, $P = 0.0004$) and faculty size ($r = 0.205$, $P < 0.0001$) and negatively correlated with Doximity ranking ($r = -0.227$, $P < 0.001$). No significant correlation was found between basic science research and residency graduation year. Book chapter publication was positively correlated with residency graduation year ($r = 0.141$, $P = 0.0061$). No significant correlation was found between number of book chapters and NIH funding, Doximity ranking, and faculty size.

Hirsch Index

The *h*-index is defined as the maximum value of *h* such that the given author has published *h* papers that have each been cited at least *h* times. The *h*-index was positively correlated with number of publications ($r = 0.622$, $P < 0.0001$), faculty size ($r = 0.295$, $P < 0.0001$), and NIH funding ($r = 0.256$, $P < 0.0001$) and negatively correlated with Doximity ranking ($r = -0.405$, $P < 0.0001$) and residency graduation year ($r = -0.163$, $P < 0.0001$).

NIH Funding

NIH funding was positively correlated with faculty size ($r = 0.180$, $P = 0.0005$) and negatively correlated with Doximity ranking ($r = -0.409$, $P < 0.0001$).

Integrated Versus Independent

Integrated residents clearly produced a higher average number of publications than independent residents as shown in Figure 2 ($P < 0.0001$).

TABLE 2. Ranking of Institutions by Residency Productivity

Residency Program	Average No. Publications	Clinical Research	Basic Science	Book Chapters	Total No. Publications
Johns Hopkins	23.33 ± 22.73	19.2 ± 20.61	3.56 ± 4.80	0.90 ± 1.27	233
Georgetown	21.57 ± 15.46	20.29 ± 15.11	1 ± 0.38	1.14 ± 0.69	151
University of Michigan	16 ± 13.62	13.58 ± 12.21	1.92 ± 3.68	0.5 ± 0.67	192
Stanford	15.13 ± 20.99	12.88 ± 18.63	2 ± 3.21	0.25 ± 0.46	121
University of California Los Angeles	14.38 ± 12.53	11.5 ± 10.41	2.125 ± 4.12	0.75 ± 1.39	115
Northwestern	10.67 ± 10.22	7.11 ± 8.57	2.89 ± 1.83	0.67 ± 1	96
Harvard	10.37 ± 8.77	7.68 ± 6.83	2.42 ± 3.55	0.26 ± 0.56	197
New York University	10.13 ± 8.11	7.56 ± 8.37	2.50 ± 3.37	0.0625 ± 0.25	162
University of Pennsylvania	9.3 ± 5.83	7.6 ± 5.62	1.2 ± 1.32	0.5 ± 1.58	93
Baylor	8.33 ± 1.86	8.33 ± 1.86	0 ± 0	0 ± 0	50
University of Pittsburgh	6.13 ± 5.14	4.10 ± 3.83	1.87 ± 2.64	0.29 ± 0.59	92
Duke	6.2 ± 3.55	5 ± 3.09	1.1 ± 1.1	0.1 ± 0.32	62

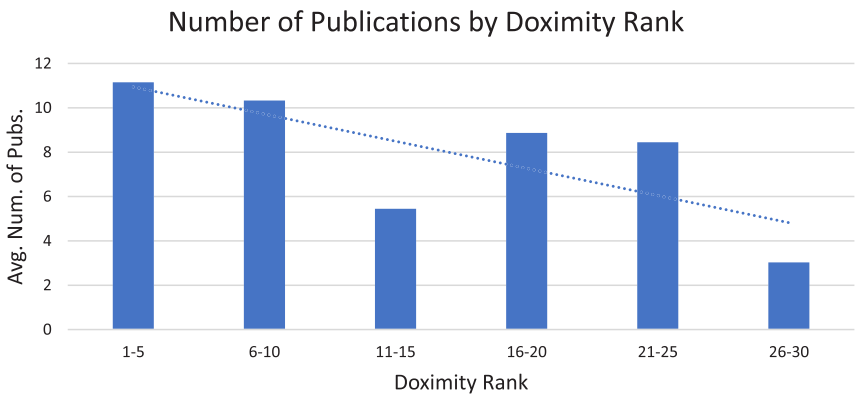

FIGURE 1. Correlation between number of publications and Doximity reputation ranking of plastic surgery training program. full color online

There is a trend (especially among integrated residents) toward producing more publications in recent years compared with 10 years ago as it can be seen that the average number of publications during residency for integrated residents graduating in 2007 was 4 publications and in 2017 was 15.33 publications.

DISCUSSION

Educational factors that promote the pursuit of a career in academic plastic surgery remain uncertain.[1] The academic setting promotes a climate of intellectual curiosity and a protected environment.[10] An academic position can be a rewarding yet challenging field as one has to balance clinical, teaching, and research duties.[11] Herrera et al[11] showed that there was no clear reason to pursue academics after plastic surgery residency graduation. One key factor in making this important decision is the impact of the training institution. The influence of medical school and residency on academic career and academic productivity has been studied in other fields such as neurosurgery, neurology, and otolaryngology.[2–4] All of these studies found that the top programs produce most academic neurosurgeons, neurologists, and otolaryngologists, respectively. In the field of plastic surgery, this phenomenon has also been seen as 39% of academic plastic surgeons are trained from 11 institutions.[1] Similarly, our study shows that there is an elite cohort of institutions that allow residents to be significantly more productive than the rest. Johns Hopkins, Georgetown, University of Michigan, Stanford, and University of California Los Angeles had the most productive residents. Our results were comparable with Gast et al's top plastic surgery training programs that trained the most academic physicians.[1] Of their top 11 training programs, we had an overlap of 7 institutions and 2 of their rankings were international programs, which we did not include in our study.[1] These top institutions clearly have an impact on research productivity and academic career.

Research is an important part of plastic surgery residency training especially for a career in academics.[12] There are numerous benefits to research including helping aid fellowship or job applications and being able to critically review literature. Factors that may make these programs more productive than others are resources available such as NIH funding, number of active laboratories, and research staff support.[13] In addition, leadership and mentorship are crucial to creating an engaging and welcoming research culture for the program. Barriers that may make programs less productive than others include no dedicated time for research, inability to access mentors, and the research ethics process.[14] Further analysis was conducted to see what specific factors may have contributed to these institutions having the most productive residents.

It has been shown that factors such as protected research time, research curriculum, and specialized research tracks in residency improve productivity.[15] Our study shows that there may be additional factors influencing residency productivity. Programs with a greater number of faculty were positively correlated to a higher number of publications and higher *h*-index. More faculty lend itself to a wider variety of research interests and projects available. The greater number also allows for more personalized mentorship. It has been shown that the strength of mentor relationships is correlated with more academic productivity during residency training in plastic surgery.[16] In addition, the amount of NIH funding each institution received was correlated with number of publications to see whether there was an effect. The amount of NIH funding an institution has is a critical factor for allowing more opportunities for research. Ruan et al[17] demonstrated that the NIH R award is the strongest predictor of productivity in academic plastic surgery. In

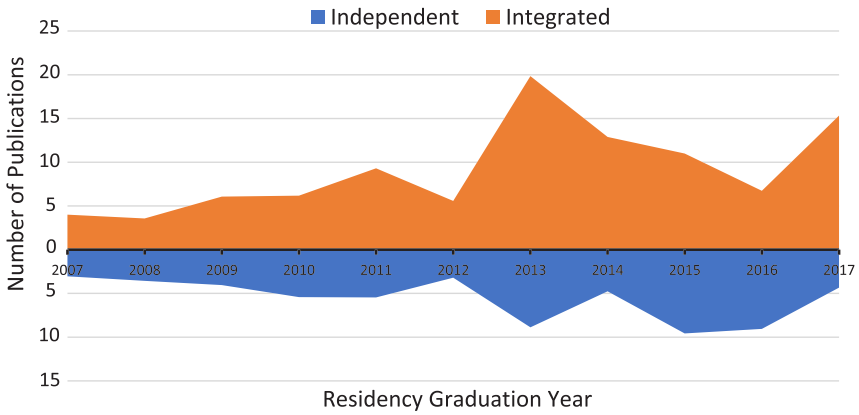

FIGURE 2. Integrated versus independent residents' number of publications by residency graduation year. full color online

addition, it has been shown that NIH-funded faculty tend to have higher *h*-indices compared with non-NIH–funded faculty.[18] Finally, there was a correlation with residency graduation year and number of publications, which shows that in recent years, there seems to be a shift to produce more research to be a more competitive applicant for academic faculty positions or fellowship training. Our results emphasized an increase in research productivity for the past 10 years for integrated residents. This is in part due to the increasing competitiveness of matching into integrated plastic surgery programs[19,20] and subsequently plastic surgery subspecialty fellowships.

Research productivity during residency is an important predictor for a successful career in academia and can certainly jumpstarts one's career. Zhang et al[21] investigated the correlation between integrated plastic surgery reputation and academic productivity of their full time faculty. They did find a correlation with reputation of program and scholarly activity of faculty. Our study further investigated reputation of program by looking specifically at the productivity of residents and then correlating it with the institution Doximity reputation ranking. There was an inverse correlation showing that the better the Doximity ranking, the more number of publications were produced.

Our analysis also showed that there is a superstar effect, where specific individuals are significantly more productive than their peers. The top 10% of residents produced 43% of all publications analyzed. This top 10% was not all concentrated from one institution but rather from a variety of top ranked institutions. Whether it was the residency institution or personal factors that contributed to those specific individuals being so productive in residency remains unclear. However, passion for research is an important factor in determining academic research productivity regardless of the institutional environment.[20] In addition, the top publisher in each of the top 12 institutions collectively accounted for 26% of all publications. This is evidence that although some programs might provide better support and mentorship for a productive residency, individual characteristics such as passion and drive will supersede any other factors.

Limitations of this study include that data collection relied on public information on institutional Web sites. Some Web sites may not have been up-to-date and reflect current active academic plastic surgeons. In addition, there was no nonacademic group to compare research productivity with. The 2-year cutoff was an arbitrary number, which means that publication productivity might have been overestimated or underestimated. Lastly, the academic plastic surgeons that met inclusion criteria underwent predominantly independent training; therefore, the overall number of publications does not represent a true difference in academic productivity and readers should consider the mean number of publication a more accurate measure.

CONCLUSIONS

Educational factors that determine a career in plastic surgery remain uncertain. Our study has found that there is an elite cohort of programs that are the most productive research institutions. Resident research productivity is higher among integrated residents, more recent graduates, and programs that are larger in size, with a higher Doximity ranking and higher NIH funding. There is a clear superstar effect among some residents, which highlights the individual potential for academic success. This study can guide medical students and future applicants who are interested in a career in academic plastic surgery in the selection of their ideal programs that match their career aspirations.

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Research Productivity of Integrated Plastic Surgery Residents: Does Reputation Matter?

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ABSTRACT

Introduction: It is unknown whether the ranking of plastic surgery residency programs influences resident research output. This study aims to determine whether program reputation and other factors are associated with integrated plastic surgery resident academic productivity.

Materials and methods: Programs were divided into four tiers based on Doximity reputation rankings. Residents from 2019 to 2020 were found through program websites and social media accounts. Works published during residency were identified through PubMed and Scopus from July 1 of each resident's intern year to August 10, 2020. Variables included resident demographics and medical school, residency reputation ranking, geographic region, and medical school affiliation. 'High research output' was defined as having ≥75th percentile of publications adjusted by training year.

Results: In total, 921 residents in 80 programs were identified. The median (IQR) number of total publications and original articles was 3 (1-6) and 2 (0-4), respectively. On multivariable analysis, residents in top-20 ranked programs (OR = 2.31, 95% CI [1.55; 3.43], $P < 0.001$) or from programs associated with top-20 medical schools (OR = 1.61, 95% CI [1.08; 2.41], $P = 0.020$) were more likely to have higher research output. On the other hand, coming from a top-50 in research medical school (OR = 1.80, 95% CI [1.31; 2.47], $P < 0.001$) or being in a program affiliated with a top-20 medical school (OR = 2.52, 95% CI [1.69; 3.78], $P < 0.001$) were associated with higher original article output. Gender and geographic location were not associated with higher research output.

Conclusions: Program reputation and affiliated medical school research rankings are associated with research productivity during integrated plastic surgery residency. Applicants with a particular interest in research careers may consider this as they apply to residency.

Introduction

As a rapidly evolving specialty tasked with generating creative solutions, plastic and reconstructive surgery utilizes research to describe and disseminate new and innovative findings through presentations at academic meetings and publication in peer-reviewed journals.[1] Consequently, academic productivity has become important in the field at all levels of training.

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Applicants who match with top-tier integrated plastic surgery programs tend to have higher research output and have often completed research fellowships.[2-4] Similarly, academic rank is positively correlated with quantitative measures of research output for academic attending plastic surgeons, with advancement often contingent upon research productivity.[5] Research is, therefore, also an important component of residency training, especially for those pursuing careers in academia. Not only does the Accreditation Council for Graduate Medical Education (ACGME) require plastic surgery residency programs to provide an environment that promotes scholarly activities, but research productivity is also an objective selection criterion for subspecialty fellowship applicants.[6-9] Therefore, the authors aim to evaluate factors correlated with greater academic productivity during plastic surgery residency and determine if program reputation plays a significant role.

Methods

Identification of residency programs, residents, and publications

ACGME-accredited integrated plastic surgery residency programs were identified using Doximity, Fellowship, and Residency Interactive Database and American Council of Academic Plastic Surgeons (FRIEDA), and American Council of Academic Plastic Surgeons (ACAPS). Program rank was established using Doximity reputation ranking, which is based on annual surveys of current and recent residents who nominate their top five programs.[10] Program geographic regions and medical school affiliation were collected. Current integrated plastic surgery residents from 2019 to 2020 were identified through the 'Current Residents' page from each program's website. Residents' years of matriculation, medical school attended, and gender were collected. Gender was dichotomized as male or female based on the resident's name and photograph.

Identified residents were searched on PubMed and Scopus for all peer-reviewed publications from July 1 of their intern year through August 10, 2020. Publications were cross-referenced between the two search engines to rule out duplicates. Abstracts, posters, and illustrations were excluded. Once a publication was identified, it was classified as an 'original article' if it included original research. All other types of articles, including case reports/series, review articles, systematic reviews, meta-analyses, letters to the editor, editorials, perspective/viewpoint articles, and book chapters, were classified as a 'nonoriginal article'.

Variables analyzed

Programs were split into four reputation quartiles based on their Doximity ranking (1-20, 21-40, 41-60, and >60). Resident variables to be analyzed included the number and type of publications, gender, year of training (PGY-1, PGY-2, etc.), and the US News and World Report research ranking of the medical school from which they graduated. This ranking measures research activity via the total number and dollar amount of federal grants and contracts per full-time faculty member.[11] Descriptive statistics of the number of publications were done by training year, with 'high research output' being defined as being at or above the 75th percentile of residents adjusted by year of training. Residents with and without high research output were analyzed for discrepancies.

Statistical analysis

The number of original and total articles were shown to be nonnormally distributed via Shapiro–Wilk tests. Comparisons between the number of publications by training year, program rank quartile, gender, and geographic location were compared using Mann–Whitney *U*-tests and Kruskal–Wallis analysis of variance, where appropriate. Comparisons between categorical attributes of residents with and without higher research output were made via chi-squared analysis. Univariable and multivariable logistic regressions were completed to find predictors of higher research output among plastic surgery residents. The multivariable analysis was adjusted for variables significant on univariable analyses. Statistical significance was set at a *P*-level of 0.05. SPSS version 24 (IBM Armonk, NY) was used for this analysis.

Results

Eighty ACGME-accredited integrated plastic surgery residency programs were identified; one program was excluded due to a lack of information about its residents. Within these programs, a total of 931 integrated plastic surgery residents were identified. One resident was excluded due to a lack of identifiable information. Overall, the median number of total publications was 3. The median number of total publications per resident were 1, 2, 3, 4, 4, and 6 for the PGY-1 to PGY-6 classes, respectively (Table 1). The median number of original articles overall was 2. The median number of original articles per resident were 1, 1, 2, 2, 3, and 4 for the PGY-1 to PGY-6 classes, respectively (Table 1).

Direct comparisons for the number of publications

Residents with higher years of training ($P < 0.001$), from the Northeast ($P = 0.011$), and from top-20 reputation programs ($P < 0.001$) tended to have more total publications (Figs. 1-3). There was no difference between the number of publications based on gender ($P = 0.411$) (Fig. 4). Residents from higher-ranked programs tended to have more publications for residents in all years combined and for each individual training year. The same trend held true for original articles only, with the exception of PGY-1, where the trend fell just short of significance (Table 1).

Attributes of residents with higher research output

The 75th percentile of the number of total publications by training year was 3, 4, 7, 7, 8, and 13 for PGY-1 to PGY-6, respectively. The 75th percentile for original articles were 2, 3, 4, 5, 6, and 9, respectively. Residents coming from a top-50 ranked medical school ($P < 0.001$), in a residency program affiliated with a top-20 medical school ($P < 0.001$), or from a top-20 a reputed residency program ($P < 0.001$) were more

Table 1 – Comparison of the number of total and original article publications for plastic surgery residents by training year and program reputation.

All articles

Post-graduate year	N	Overall	Top 20	21-40	41-60	>60	P value
PGY-1	171	1 (0-3)	2 (1-4)	2 (1-3)	0 (0-2)	1 (0-3)	**0.003**
PGY-2	168	2 (1-4)	3 (1-5)	2 (1-4)	2 (1-3)	1 (0-1)	**0.002**
PGY-3	167	3 (1-7)	5 (2-10)	3 (1-6)	2 (0-4)	1 (0-4)	**<0.001**
PGY-4	154	4 (1-7)	5 (3-9)	4 (3-7)	3 (1-4)	2 (1-3)	**<0.001**
PGY-5	144	4 (2-8)	8 (4-15)	4 (2-7)	4 (2-5)	1 (0-2)	**<0.001**
PGY-6	127	6 (3-13)	11 (6-21)	5 (2-10)	5 (2-7)	3 (1-4)	**<0.001**
All	931	3 (1-6)	5 (2-9)	3 (1-6)	2 (1-4)	1 (0-3)	**<0.001**

Original articles only

Post-graduate year	N	Overall	Top 20	21-40	41-60	>60	P value
PGY-1	171	1 (0-2)	1 (0-2)	1 (0-2)	0 (0-1)	0 (0-2)	0.057
PGY-2	168	1 (0-3)	2 (1-3)	1 (0-3)	1 (1-2)	0 (0-1)	**0.006**
PGY-3	167	2 (0-4)	3 (1-7)	1 (0-4)	1 (0-3)	1 (0-3)	**0.001**
PGY-4	154	2 (1-5)	3 (1-6)	2 (1-5)	2 (1-3)	1 (0-1)	**<0.001**
PGY-5	144	3 (1-6)	5 (2-9)	3 (1-4)	2 (1-3)	1 (0-1)	**<0.001**
PGY-6	127	4 (1-9)	7 (4-14)	3 (1-5)	2 (1-5)	1 (0-2)	**<0.001**
All	931	2 (0-4)	3 (1-7)	2 (1-4)	1 (0-3)	1 (0-2)	**<0.001**

Reported as median (IQR).
Bold = $P < 0.05$.

likely to have higher total research output. Geographic region and gender did not differ significantly between residents with and without higher total research output (Table 2). Residents from northeastern programs ($P = 0.034$), coming from a top-50 ranked medical school ($P < 0.001$), in a residency program affiliated with a top-20 medical school ($P < 0.001$), or from a top-20 reputed residency program ($P < 0.001$) were more likely to have higher research output with regard to original articles only. Original article productivity did not differ significantly by gender (Table 2).

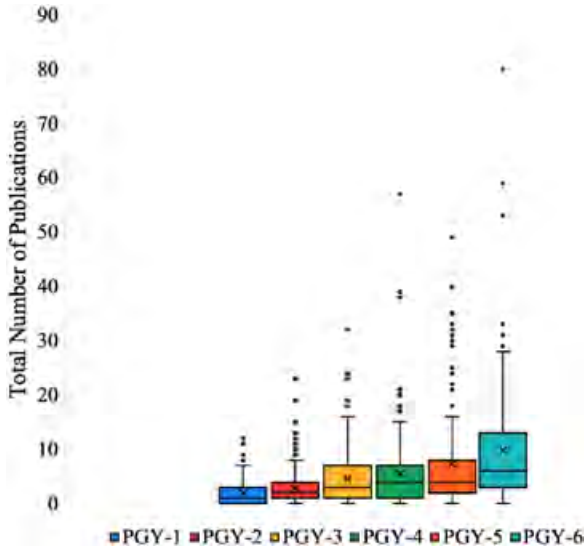

Fig. 1 – Range in the number of total publications of integrated plastic surgery residents by training year; P value <0.001. Each box represents the interquartile range from the 25th percentile (lower border) to the 75th percentile (upper border). The middle line represents the median. The upper and lower whiskers represent the higher and lower 25% of publications, respectively (not including outliers). The 'x' represents the mean.

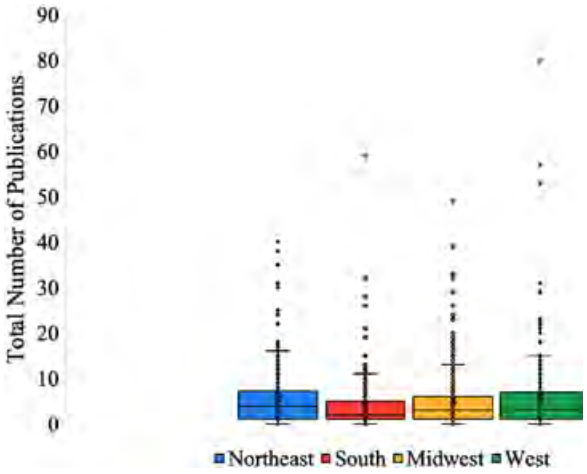

Fig. 2 – Range in the number of total publications of integrated plastic surgery residents by geographic location; P value = 0.011. Each box represents the interquartile range from the 25th percentile (lower border) to the 75th percentile (upper border). The middle line represents the median. The upper and lower whiskers represent the higher and lower 25% of publications, respectively (not including outliers). The 'x' represents the mean.

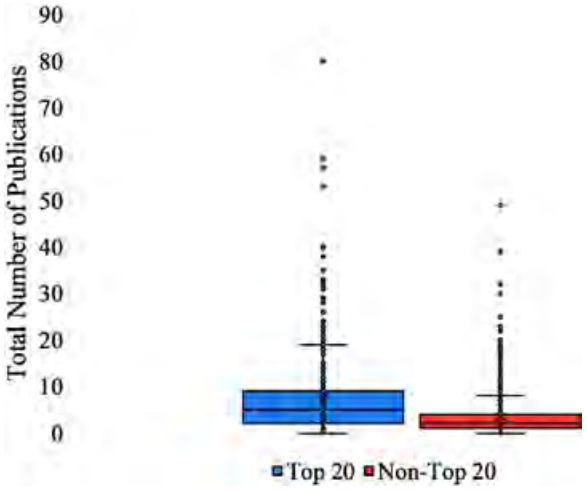

Fig. 3 – Range in the number of total publications of integrated plastic surgery residents by program reputation; *P* value < 0.001. Each box represents the interquartile range from the 25th percentile (lower border) to the 75th percentile (upper border). The middle line represents the median. The upper and lower whiskers represent the higher and lower 25% of publications, respectively (not including outliers). The 'x' represents the mean.

Predictors of higher research productivity

On univariable analysis, geographic location, attending a top-50 in research medical school, and coming from a residency program ranked in the top-20 in reputation and/or affiliated with a top-20 medical school were all associated with higher research output for total and original articles only. On multivariable analysis, residents in a top-20 Doximity reputation ranked residency program (OR = 2.31, 95% CI [1.55; 3.43], $P < 0.001$) or in a program affiliated with a top 20 in research medical school (OR = 1.61, 95% CI [1.08; 2.41], $P = 0.020$) were more likely to have higher total research output (Table 3). On the other hand, residents coming from a top-50 ranked medical school (OR = 1.80, 95% CI [1.31; 2.47], $P < 0.001$) or in a program affiliated with a top-20 in research medical school (OR = 2.52, 95% CI [1.69; 3.78], $P < 0.001$) were more likely to have higher original article research output. On multivariable analysis, being from a program with a higher reputation was not associated with having higher original article output (Table 4).

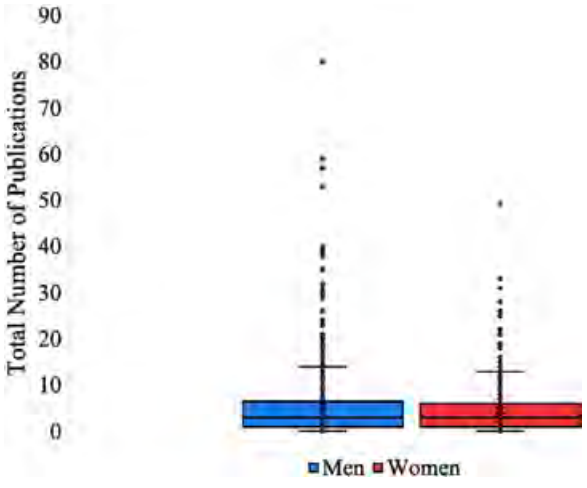

Fig. 4 – Range in the number of total publications of integrated plastic surgery residents by gender; *P* value *P* = 0.411. Each box represents the interquartile range from the 25th percentile (lower border) to the 75th percentile (upper border). The middle line represents the median. The upper and lower whiskers represent the higher and lower 25% of publications, respectively (not including outliers). The 'x' represents the mean.

Discussion

Research plays an integral role in plastic surgery. Prior to this article, little has been studied about plastic surgery resident academic productivity. This analysis of 80 ACGME-accredited integrated plastic surgery programs has elucidated multiple factors influencing resident research output.

The average number of publications per resident was approximately 5.1, similar to 6.3 publications per resident in neurosurgery, a surgical field that highly prioritizes research, suggesting the importance of academic productivity during plastic surgery residency.[12] Factors significantly associated with greater academic productivity during integrated plastic surgery residency include the number of years of training, program reputation, and graduation from a medical school with a high research ranking on US News. As expected, residents of a higher training class have had more time during residency for research and thus have a higher number of total publications. Attending highly ranked research medical schools may be associated with greater research output for several reasons. First, premedical students may have intentionally chosen schools that would provide ample opportunities and resources for them to pursue their research interests and prepare themselves for careers in academia. Second, these higher-ranked medical schools may emphasize research or even require research participation. In either case, such individuals may already possess motivation toward research, contributing to increased productivity during residency.

The impact of program geographical location on resident research output is likely the result of program ranking as a confounding variable, particularly given its loss of significance on multivariable analysis. Surprisingly, resident gender did not have a significant impact on academic productivity. It is an established pattern that male plastic surgeons have higher research output than female plastic surgeons.[13-15] Further, a 2018 study found that female residents are underrepresented in the plastic surgery literature.[16] Reasons for this gender discrepancy may include lack of female mentorship and time limitations due to unequal home responsibilities.[16,17] Our results may be a sign that the gender gap may finally be starting to close at a resident level.

The fact that residents in top-tier programs have higher research output is consistent with studies showing that

Table 2 – Characteristics of integrated plastic surgery residents with high research output.

	Total ($n = 931$)		All articles					Original articles only				
			No ($n = 680$, 73.0%)		Yes ($n = 251$, 27.0%)		P value	No ($n = 665$, 71.4%)		Yes ($n = 266$, 28.6%)		P value
	N	%	N	%	N	%		N	%	N	%	
Gender							0.099					0.426
Male	534	57.4%	379	55.7%	155	61.8%		376	56.5%	158	59.4%	
Female	397	42.6%	301	44.3%	96	38.2%		289	43.5%	108	40.6%	
Geographic region							0.067					**0.034**
Northeast	222	23.8%	151	22.2%	71	28.3%		147	22.1%	75	28.2%	
South	270	29.0%	207	30.4%	63	25.1%		207	31.1%	63	23.7%	
Midwest	256	27.5%	195	28.7%	61	24.3%		188	28.3%	68	25.6%	
West	183	19.7%	127	18.7%	56	22.3%		123	18.5%	60	22.6%	
Resident from Top-50 medical school							**< 0.001**					**< 0.001**
Yes	475	51.0%	317	46.6%	158	62.9%		298	44.8%	177	66.5%	
No	456	49.0%	363	53.4%	93	37.1%		367	55.2%	89	33.5%	
Program Top-20 in reputation							**< 0.001**					**< 0.001**
Yes	367	39.4%	215	31.6%	152	60.6%		216	32.5%	151	56.8%	
No	564	60.6%	465	68.4%	99	39.4%		449	67.5%	115	43.2%	
Program affiliated with Top-20 medical school							**< 0.001**					**< 0.001**
Yes	327	35.1%	191	28.1%	136	54.2%		177	26.6%	150	56.4%	
No	604	64.9%	489	71.9%	115	45.8%		488	73.4%	116	43.6%	

High research output defined as ≥75th percentile of total publications adjusted for the training year.
Bold = $P < 0.05$.

faculty and applicants of these same programs have more research.[2,3,18] However, it is unclear why this relationship exists. In addition to probable greater research opportunities, funding, and resources, these programs house faculty members who serve as mentors for trainees and may more greatly foster resident and medical student research pursuits. Program directors may also select applicants who are interested in research and thus are motivated to get involved with research upon entering residency.[18] Alternatively, these residents may be driven trainees who create their own research opportunities, going out of their way to work with faculty members to help guide and publish their research. Regardless, it is clear that higher-ranked integrated plastic surgery programs tend to have greater academic productivity. This is important for medical students to consider as they apply to integrated plastic surgery programs for multiple reasons. First, this may impact an applicant's program choice based on career goals. Those interested in fellowship training or academic plastic surgery should consider program location and programs with greater program ranks. Pursuing one's own research interests will be easier to accomplish at a program with greater academic productivity, whether this is due to increased opportunities, funding, or mentorship. This is important for those considering fellowship training as previous studies have shown fellowship program directors for craniofacial, microvascular, and hand surgery fellowships value clinical and subspecialty-specific research experience.[7-9] In addition, prior studies have shown that high research output during plastic surgery residency leads to a higher likelihood of pursuing an academic career and having increased future academic productivity.[19]

Residents in programs affiliated with top-20 research medical schools and coming from top-50 research ranked medical schools had higher original article research output. As previously stated, this is likely because these programs and their affiliated schools have greater research funding and opportunities, encouraging new studies that lend themselves to publication as original articles. Interestingly, multivariable analysis showed that residents from programs with higher Doximity rankings did not have significantly higher original article publications, despite having higher total research output. Higher reputed programs may place greater pressure on its residents to publish, and original articles generally involve designing and implementing new studies, analyzing data, and writing longer manuscripts. These factors may make other kinds of articles, such as case reports, letters to editors, and commentaries, more appealing to residents from these programs.

Limitations

Our study had several limitations. One resident and one program were excluded due to a lack of information on the program websites. In addition, our analysis did not consider program size as a variable. This may confound our analysis as

Table 3 – Predictors of high research output for total articles in integrated plastic surgery residents.

	All articles					
	Univariable OR	95% CI	*P* value	Multivariable OR	95% CI	*P* value
Male gender	1.28	0.95; 1.72	0.100			
Geographic region						
Northeast	Reference			Reference		
South	0.65	0.43; 0.97	**0.033**	0.77	0.49; 1.19	0.235
Midwest	0.67	0.45; 1.00	**0.047**	0.70	0.46; 1.07	0.095
West	0.94	0.62; 1.43	0.766	0.78	0.50; 1.23	0.289
Resident from Top-50 medical school	1.95	1.45; 2.62	**<0.001**	1.34	0.97; 1.85	0.076
Program Top-20 in reputation	3.32	2.46; 4.48	**<0.001**	2.31	1.55; 3.43	**<0.001**
Program affiliated with Top-20 medical school	3.03	2.24; 4.08	**<0.001**	1.61	1.08; 2.41	**0.020**

High research output defined as ≥75th percentile of total publications adjusted for the training year.
Bold = $P < 0.05$.

larger programs may receive more funding, which leads to increased research opportunities.

In order to determine the beginning of the academic year for training programs, we used a July 1, cutoff date. This likely allowed for the inclusion of a limited number of publications completed and submitted before the beginning of residency. However, because affiliations are sometimes not updated and there is no way to verify whether the resident completed all of their work on the project prior to starting residency training, this cutoff date was selected to maintain consistency.

Another limitation of our study is the inability to account for residents taking research years. Programs such as Stanford University, University of Pittsburgh, University of California, San Francisco, and the University of Michigan even require their residents to take a year off for professional development. We were only able to identify residents currently taking research years but not retroactively identify all of those who did in the past. As a result, this may impact the analyses of research output per year of training.

A further limitation involves our method of determining gender. The information available on program websites pertaining to resident gender was limited to photographs and names. As a result, our classification of residents' genders may not align with their gender identities. Further, we categorized gender as male or female, which is not inclusive of nonbinary and transgender identities.

Last, some female residents changed their surnames upon marriage before or during residency. We attempted to identify publications under all surnames, but it is possible that some were omitted. This would lead to artificially lower research productivity in female residents.

Conclusions

Program-related factors such as prestige and geographic location and residency-related factors such as research ranking of the resident's medical school were significantly associated with academic productivity during integrated plastic surgery residency. Resident gender did not significantly predict research output. Thus, plastic surgery applicants considering careers in academia may wish to consider these findings during their residency applications and match list ranking decision-making.

Table 4 – Predictors of high research output for original research articles in integrated plastic surgery residents.

	Original articles only					
	Univariable OR	95% CI	*P* value	Multivariable OR	95% CI	*P* value
Male gender	1.12	0.84; 1.50	0.426			
Geographic region						
Northeast	Reference			Reference		
South	0.60	0.40; 0.89	**0.011**	0.85	0.55; 1.32	0.472
Midwest	0.71	0.48; 1.05	0.086	0.81	0.54; 1.23	0.324
West	0.96	0.63; 1.45	0.832	0.90	0.58; 1.42	0.904
Resident from Top-50 medical school	2.45	1.82; 3.30	**<0.001**	1.80	1.31; 2.47	**<0.001**
Program Top-20 in reputation	2.73	2.04; 3.65	**<0.001**	1.32	0.89; 1.96	0.174
Program affiliated with Top-20 medical school	3.57	2.65; 4.80	**<0.001**	2.52	1.69; 3.78	**<0.001**

High research output defined as ≥75th percentile of total publications adjusted for the training year.
Bold = $P < 0.05$.

Author Contributions

Study concepts and design (RSM and HSA). Data acquisition (CS, PT, LZ, and VR). Data analysis and interpretation (JBC). Manuscript preparation (CS, JBC, and RSM). Manuscript editing, revision, and final approval (All authors). Supervision (HSA).

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Disclosure

None declared.

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MEETING 4 (Months 10-12)
Resident Wellness

Discussion Questions:

- *How do trainees feel that plastic surgery programs today have addressed resident burnout and wellness?*
- *What can be done to improve resident burnout and wellness across all programs?*
- *Is there a negative stigma within plastic surgery and surgical specialties in general surrounding the topics of burnout and wellness activities? Is there fear of appearing "weak" by advocating for this?*
- *How does this affect our personal life and those in it?*

Factors associated with burnout syndrome in surgeons: a systematic review

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ABSTRACT

INTRODUCTION To date, studies have shown a high prevalence of burnout in surgeons. Various factors have been found to be associated with burnout, and it has significant consequences personally and systemically. Junior doctors are increasingly placing their own health and wellbeing as the most important factor in their decisions about training. Finding ways to reduce and prevent burnout is imperative to promote surgical specialties as attractive training pathways.

METHODS The MEDLINE, PsychInfo and EMBASE databases were searched using the subject headings related to surgery and burnout. All full text articles that reported data related to burnout were eligible for inclusion. Articles which did not use the Maslach Burnout Inventory or included non-surgical groups were excluded; 62 articles fulfilled the criteria for inclusion.

FINDINGS Younger age and female sex tended to be associated with higher levels of burnout. Those further in training had lower levels of burnout, while residents suffered more than their seniors. Burnout is associated with a lower personal quality of life, depression and alcohol misuse. Academic work and emotional intelligence may be protective of burnout. Certain personality types are less likely to be burnt out. Mentorship may reduce levels of burnout.

CONCLUSIONS Workload and work environment are areas that could be looked at to reduce job demands that lead to burnout. Intervening in certain psychological factors such as emotional intelligence, resilience and mindfulness may help to reduce burnout. Promoting physical and mental health is important in alleviating burnout, and these factors likely have a complex interplay.

KEYWORDS

Burnout, professional – Burnout, psychological – Surgeons

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Introduction

Burnout is most commonly defined as a state of depersonalisation (loss of empathy), emotional exhaustion (emotional fatigue) and a sense of reduced personal accomplishment (competence and achievement). There are several validated tools to measure burnout, the most prevalent being the Maslach Burnout Inventory (MBI), which uses these three parameters as separate components of burnout.[1]

The often-quoted rate of burnout in surgeons is 40%, and it may be rising.[2,3] The effects of burnout are both personal and systemic. On a personal level, burnout is correlated with depression, suicidal ideation and a whole host of other mental health issues.[4,5] It affects personal and professional relationships,[6] while those experiencing burnout are much more likely to express a desire to leave the profession.[7] Systemically, there is concern that burnout is associated with increased attrition and dropout rates.[8] In addition, it has been shown that burnout is associated with poorer patient satisfaction and outcomes.[9]

Within the NHS in the UK, morale appears to be low. The junior doctors' contract dispute is fresh in the mind of trainees, and foundation doctors cite their health and wellbeing as the most common factor when deciding what to do beyond their foundation years.[10] Recruitment uncertainty for the NHS will only be worsened with the upcoming exit from the European Union. High burnout rates manifest anecdotally within medical workforces, putting off junior medical staff from applying to surgical specialties. Addressing the issue of burnout is an important and realistic way to promote surgical specialties to junior doctors.

There exists a proposed framework for explaining the variance in burnout.[11] In this review, we aim to identify all the factors associated with burnout in order to expand on

this framework and elicit tangible areas that can be targeted to alleviate burnout in surgeons.

Methods

The study was undertaken using standard PRISMA guidelines.[12] An electronic search of titles, abstracts and subject headings from the MEDLINE, PsycINFO and EMBASE databases was undertaken in October 2018. Search terms were ('surgeon' OR 'surgeons' OR 'colorectal surgery' OR 'general surgery' OR 'gynaecology' OR 'neurosurgery' OR 'obstetrics' OR 'ophthalmology' OR 'orthognathic surgery', OR 'orthopaedics' OR' otolaryngology' OR 'surgery, plastic' OR 'surgical oncology' OR 'thoracic surgery' OR 'traumatology' OR 'urology') AND ('burnout' OR 'professional burnout' OR 'occupational burnout').

Search results were de-duplicated and then screened for appropriate titles and abstracts. All full text articles reporting data related to burnout in surgical specialties using the MBI were eligible for inclusion. Abstracts from which full texts were not obtainable were excluded. Articles that did not use the MBI were excluded to aid comparison and increase reliability. Full exclusion criteria were as follows:

- meta-analyses
- reviews
- commentary
- poster/presentation abstracts
- MBI not used to measure burnout
- included non-surgical specialties/health-care professionals
- primary purpose was to validate a measurement tool
- only included interns.

The papers were then analysed qualitatively. Owing to the variance in definitions of burnout (high emotional exhaustion and high depersonalisation, emotional exhaustion and depersonalisation or personal accomplishment, or high on any single subscale), where a variable is correlated to solely emotional exhaustion or depersonalisation, we have reported this as a correlation with burnout. Variables that associated solely with personal accomplishment have been deemed not associated, as there is uncertainty whether it should be included in the measurement of burnout.[13] Outcomes that significantly correlate with burnout are reported. Significant association from univariate, multivariate and logistic regression analyses are reported.

Results

A total of 117 full text articles were identified from the literature search. Of these, 19 were excluded as they did not use the MBI or the abbreviated version, 7 included non-surgical specialties or other healthcare professionals, 4 did not report data related to burnout appropriately, 2 used data from other studies, and 21 were poster/presentation abstracts. One article was a commentary and one only included interns. This, a total of 62 articles were included in the review (Appendix 1). The study selection process can be seen in Fig 1.

Prevalence

The prevalence of burnout ranges from 22.2% in one cross multispecialty study,[14] to 85.1% in a study of Chinese adult reconstructive surgeons.[15] The variance is probably explained by the differing definitions of burnout.

Age

Younger surgeons are likely to suffer from higher levels of burnout.[2,11,16–23] The exception is from a study of general surgery residents, which found the opposite using a multivariate logistic regression model (n = 665).[8]

Sex

Women are associated with higher risk of burnout.[8,11,14,16–18,22,24–27] However, three studies found men to have higher levels of burnout, specifically depersonalisation.[4,28,29] A longitudinal study found that there was a greater increase in burnout in men compared with women over one year, although this was based on a small cohort at intern level (n = 21).[28]

Training level and experience

Studies reporting association with training level and experience show mixed outcomes.[2,4,8,19,23,24,27,30–35] Three studies found that those in their second year of training had significantly higher levels of burnout,[4,23,30] while those in their fifth year of training have been noted to have lower burnout in a multivariate analysis.[8] One multispecialty study found that those in their third year had higher levels of burnout, but this association was lost when logistic regression was performed.[31]

A longer period of years in practice is associated with higher burnout.[2,23,32] One study of plastic surgeons found that those who had been practising for more than 15 years had lower burnout in a multivariate analysis.[19] Another study reported a difference between number of years in specialty and emotional exhaustion, however it only explained a small proportion of variance (R^2 = 0.026).[33]

Residents tend to have higher burnout than faculty,[23,24,34] but no studies looked at change in burnout in individuals before and after appointment to consultancy. Issues with tenure or promotion are associated with higher levels of emotional exhaustion in orthopaedic surgeons, although it is not clear what these issues are.[35]

Family

A number of studies have reported an association with family factors.[2,6,15,19,21,24,34–41] Being single is correlated with burnout,[15,21,36–39] independently in two orthopaedic studies,[37,39] but not in a study of UK colorectal and vascular surgeons.[21]

Surgeons who had more supportive partners suffered from less burnout.[35,37,40] This was an independent association in obstetricians,[37] but was not found to have an independent effect in neurosurgeons.[40] Having a spouse who is working has been found to independently increase risk of burnout.[2,19,38] More time spent with a spouse has been found to be associated with less burnout.[34]

Having children is associated with less burnout,[2,19,24,29,34,38] although in one study this effect was only valid for faculty and not residents.[34]

Self-reporting more irritable behaviour towards loved ones correlates with higher burnout,[6] as does those who report more friction with or withdrawal from family in orthopaedic surgeons.[41]

Workload

Studies generally show that burnout is associated with an increased workload.[2,6,8,17,19,20,24–27,31,34,35,39,42–52] All studies used self-report measures to identify hours worked. Four studies reported more hours worked being independently associated with burnout.[2,8,19,26] Two studies found correlation in univariate but not multivariate analysis.[39,43] The two longitudinal studies captured that measured burnout before and after a regulated reduction in working hours found reduced burnout with less hours worked.[45,48] Another study of orthopaedic surgeons that looked at two different cohorts before and after working hour directives found increased hours to be associated with higher depersonalisation in residents but lower depersonalisation in faculty.[52] A study of gynaecologists in Pakistan found that working 50–60 hours was associated with higher burnout than working over 80 hours.[32] Eight studies found no correlation.[6,17,25,27,35,50,51]

Burnout is associated with working nights,[2,15,19,46] work home,[21,47] number of on-calls in plastic surgeons[20,53] and out of hours in orthopaedic surgeons.[35]

Work environment

Career satisfaction is consistently associated with less burnout,[6,17,19,21,22,29,32,38,50,51,54] while those who would

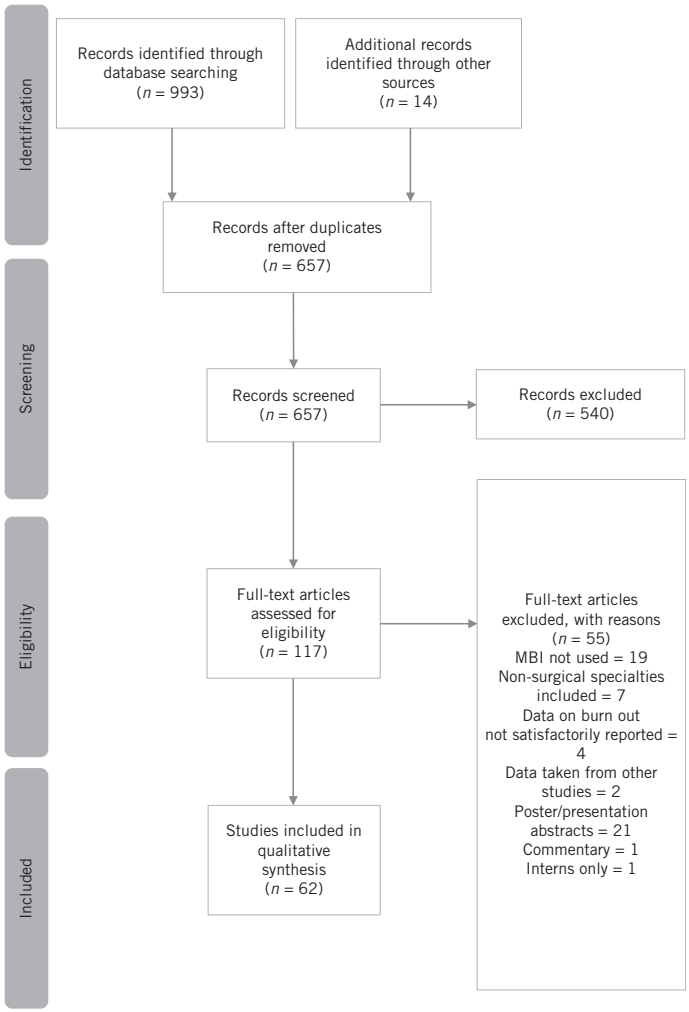

Figure 1 PRISMA chart of search strategy

choose their specialty or job again,[15,21,40] or who would encourage children to enter their profession, had lower levels of burnout.[17] A desire to leave is associated with higher burnout.[29,38]

A number of studies found some association of burnout with colleague factors.[11,14,18,23,34,35,39,47,54–57] Support from co-workers as measured by the validated Job Content Questionnaire is independently associated with less burnout,[18] but only in univariate analysis in a study of transplant surgeons.[54] Poor working relationships are associated with more burnout,[34,39,47] as are disputes.[35] Support for poor performers and for exams,[55] as well as access to feedback,[11] is associated with less burnout. Frequent shaming and a culture of bravado are associated with more burnout.[56,57] A sense of belonging was associated with less burnout in a multispecialty study.[14]

Conflict with patients and higher patient expectations are correlated with burnout.[18,39,43,54,58] Being accused of malpractice is associated with higher burnout in neurosurgeons (n = 783).[40]

A lack of administrative support and inadequate time for administrative duties has been found to correlate with more burnout,[6,47,54] as has spending more time on non-patient care tasks.[2]

Autonomy and decisional authority are associated with lower burnout.[11,54] Being challenged at work is associated with lower burnout,[40,59] although the perception of too much responsibility correlates with higher burnout.[43] Anxiety over personal competence is associated with higher burnout among residents and faculty.[34]

Surgeons with access to mentoring have lower levels of burnout.[8,23] A prospective interventional study found lower levels of burnout in otolaryngology residents after mentorship (n = 8),[30] but this was not replicated in another randomised controlled trial of obstetric and gynaecological surgeons (n = 27).[60]

Training programme satisfaction has been shown to be associated with less burnout.[21,38] Opportunities for development,[11] growth,[59] personal learning[61] and more practical training[43] correlates with less burnout.

Better perceived work–life balance is associated with less burnout,[6,34,37–41,47,53] as is lower levels of work–life or work–home conflict.[23,26]

Errors

Errors have been shown to be independently associated with burnout in a large multispecialty study (n = 7905)[9] and a smaller study of orthopaedic and trauma surgeons.[36] Correlation has also been found in plastic surgeons.[19] All three used self-reported errors as a measure rather than documented errors.

Health and wellbeing

A lack of extracurricular activities is associated with higher level of burnout,[3,22,43,50] while those reporting lower quality of life,[18] or physical quality of life[21,23] also have more burnout.

Physical activity and exercise are associated with less burnout,[23,42,53] as is general health.[6,20,38,53]

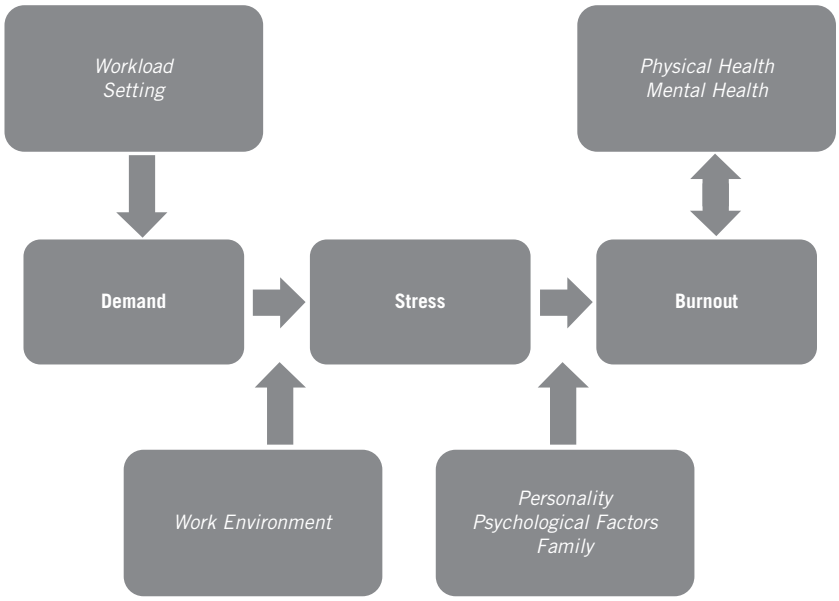

Figure 2 Modifiable factors of burnout

Increased sickness and time off work is associated with more burnout.[16,59]

Depression has been found to be independently associated with burnout,[17,36] and has been found to be predictive of burnout using the Profile of Mood States scale.[33] Univariate analysis has also shown depression to be associated with burnout using various validated measures,[4,19,42,51] as has anxiety.[4] A multispecialty found that post-traumatic stress disorder is associated with higher burnout.[62]

Suicidal ideation is associated with burnout,[4,5,17,43] as is stress.[4,17,39] Self-reported lack of sleep, sleep deprivation and suffering from sleep disorders are all associated with burnout.[15,23,24,43]

Those who drink more or misuse alcohol have higher levels of burnout.[17,19,21–23,28,34,47] One study looking specifically at sex found this effect only in women (odds ratio of depersonalisation 1.91)[28] and another only in faculty.[34] Substance abuse is associated with higher burnout (n = 1691),[19] as is smoking cigarettes (n = 29).[47]

Psychological factors

Higher levels of emotional intelligence are associated with less burnout as measured by the Trait Emotional Intelligence Questionnaire,[11,63,64] while average resonating level (self-awareness and emotional intelligence) is associated with lower burnout scores in general surgery residents (n = 48).[65]

Personality factors have also been found to be associated with burnout.[11,24] Extraversion, agreeableness, conscientiousness and openness have been linked with lower levels of burnout, while neuroticism is linked with higher burnout in obstetrics and gynaecologists.[24] A study of general surgery residents found that agreeableness, emotional stability and conscientiousness correlated with lower burnout.[11]

General surgery residents with higher dispositional mindfulness and resilience are associated with lower burnout scores (n = 566),[4] while grit correlates with burnout in a multispecialty study (n = 141).[66] Increased levels of self-efficacy are related to lower levels of burnout.[31,35]

Setting

Academic or research work has been found to be protective of burnout.[4,15,20,22,40,67] One study has found that there was no significant difference between clinical and research status,[11] while another found that there was no difference between private and academic paediatric urologists.[49]

Income

Lower income is associated with higher levels of burnout.[19,38,43,47] A study of orthopaedic residents and faculty showed that debt load was associated with higher burnout in faculty members, while financial concerns were also associated with burnout in this group.[34] Conversely, two small studies in Fiji and Saudi Arabia found that income did not make a difference to levels of burnout.[44,53]

Discussion

The findings of the review suggest that the following factors are associated with a higher risk of burnout:

- younger age
- female
- residency training
- single
- increased workload
- conflict with colleagues and patients
- depression and substance misuse
- neuroticism.

The following factors are associated with a lower risk of burnout:

- children
- supportive work environment
- mentorship
- physical activity
- emotional intelligence, grit and mindfulness
- extraversion, agreeableness, conscientiousness
- academic work
- less concern over income/finance.

The definition of burnout has changed over time.[68,69] The most prevalent one used currently is a rather functional statement, used to assist in the continuing research by affirming the inventory used to measure it – a state of depersonalisation (loss of empathy), emotional exhaustion (emotional fatigue) and a sense of reduced personal accomplishment (competence and achievement).[1]

Not all researchers agree on this definition, and there are several other validated measures. The Copenhagen Burnout Inventory suggests that burnout be characterised along the lines of fatigue and exhaustion,[70] while Bianchi has suggested that burnout is simply a depressive disorder.[71] In this review, we looked only at studies that used the MBI, to maximise the reliability of comparison of results. However, even when using the MBI there is no consensus on how to define burnout. This significantly limits the generalisability of results from individual studies and makes it hard to perform valid systematic reviews or meta-analyses.

Eckleberry-Hunt and colleagues suggest that it may be more effective to separate emotional exhaustion and depersonalisation to stratify those at risk for the individual components and plan more targeted interventions.[72] This could be a route forward to counter the lack of consensus in defining burnout and provide more translatable results and facilitate interventions. A recent meta-analysis found that emotional exhaustion was strongly correlated with depersonalisation, while both emotional exhaustion and depersonalisation were moderately correlated with personal accomplishment.[73]

At present, there is no agreed model that encompasses the cause and effects of burnout. We found just one framework put forward. Here, occupational stress is caused

by demands placed upon an individual. Response is modulated by intrinsic (personal) factors and extrinsic (workplace/environmental) factors, which leads to a severity of burnout in that individual.[11]

Based on the findings of this review, we have elicited some possible modifiable factors for intervention. We present an altered model containing these factors, where external factors such as workload and setting add to the intrinsic demands of the job, leading to stress (Fig 2). This is moderated primarily by work environment. Stress leads to burnout, the severity of which depends on personality and psychological factors (emotional intelligence, resilience/grit and mindfulness). Family and social relationships also play a role here. Physical and mental health, including sleep and substance misuse, likely have a complex bidirectional relationship with burnout.

While it is difficult to reduce workload, ensuring trainees do not work excessive hours and have accessible mechanisms to highlight workload concerns is important. Similarly, promoting a positive culture at work where trainees feel supported could help mitigate the demands of the job. Formalising mentorship programmes is likely to reduce burnout in residents, where it is most prevalent. Having a positive family life outside of work is clearly associated with lower levels of burnout. Helping trainees build lives outside of the profession should be prioritised. Finding ways to improve emotional intelligence and resilience, as well as promoting mindfulness, may also lower levels of burnout in surgeons. Ensuring that trainees are able to stay physically and mentally healthy may also reduce burnout, as well as reducing its consequences.

Schwenk and Gold are right to point out that we know very little about the causal relationship between burnout and its associated factors without significant longitudinal cohort and randomised controlled studies.[74] The generalisability of this review is limited significantly by the fact that studies report different levels of statistical analysis, with many not controlling for confounding variables. A systematic review and meta-analysis published in *The Lancet* found that interventions designed to reduce burnout do have some effect.[75]

Another area where there is a lack of research is looking at burnout in different medical systems and cultures. The majority of research into burnout has been done in the United States. This review found just three studies taking place in the UK. Given the significant heterogeneity in prevalence of burnout, studies from specific systems or cultures may not be generalisable. Given the unique set-up of the NHS, there needs to be further investigation into the conditions which give rise to burnout within the UK to gain a more applicable understanding of the issues.

Conclusions

There remains significant heterogeneity in how burnout is measured, and this hampers current research. Research to date has led to a solid body of evidence for the associated factors of burnout, but more work is required with regards to causality. There is a lack of longitudinal and interventional studies at present, as well as research in local healthcare systems. We have proposed a model for burnout that identifies targets for intervention. There are some promising areas for further research, and there should be renewed focus into these areas, to prevent and reduce the burden of surgical burnout.

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Resident Burnout and Well-being in Otolaryngology and Other Surgical Specialties: Strategies for Change

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Abstract

Objective. To perform a literature review on burnout prevalence, factors that affect burnout and well-being, and solutions to address burnout in otolaryngology–head and neck surgery (OTO-HNS) residents and residents in other surgical specialties.

Data Sources. Ovid Medline, Embase, and article reference lists.

Review Methods. A literature search was performed to identify articles on resident burnout, distress, wellness, well-being, and quality of life. Articles deemed outside the scope of the current work were excluded. Search was limited to the past 5 years.

Conclusions. Moderate to high burnout has been reported in 35% to 86% of OTO-HNS residents. Among other surgical specialties, resident burnout ranges between 58% and 66% in plastics, 11% and 67% in neurosurgery, 38% and 68% in urology, and 31% and 56% in orthopedics. Highest burnout rates were seen in postgraduate year 2 residents. Factors significantly associated with burnout included hours worked (>80 h/wk), level of autonomy, exercise, and program support. Reported resident work hours have steadily increased: 8% of OTO-HNS residents in 2005 vs 26% in 2019 reported averaging >80 h/wk. Practical implications of resident burnout include decreased empathy, moral distress and injury, poor health, decreased quality of life, increased attrition, decreased desire to pursue fellowship, and increased likelihood of medical errors. Structured mentorship programs, wellness initiatives, and increased ancillary support have been associated with lower burnout rates and improvements in resident well-being across specialties.

Implications for Practice. Addressing burnout, which is prevalent in OTO-HNS residents, is critical to improving patient care and physician well-being. Surgical specialties can share strategies to effectively address resident burnout through institutional interventions, which can be essential quality improvement initiatives, to promote well-being.

Keywords

resident burnout, otolaryngology, surgical specialties, well-being, wellness initiatives, mentorship, quality of life, hierarchy, moral distress, mental health

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Residency is a stressful period of training. Sudden increases in responsibility, work hours, and work-life imbalance contribute to significant burnout.[1] Burnout, a maladaptive response to job-related stressors, can lead to decreased physician productivity, personal dysfunction, physician attrition, and reduced quality of patient care.[2,3] In contrast, adaptive responses include activities, such as exercise, hobbies, and time with family/friends, that promote well-being.[4,5] Resident burnout has been implicated in patient harm and suboptimal patient care: burned-out residents are less likely to fully discuss treatment options or address patients' questions and more likely to order incorrect medications/doses and have decreased empathy for patients.[3,6-8] Understanding factors that exacerbate resident burnout is critical for developing evidence-based solutions.

Although burnout affects individuals at all levels, from medical students to attending physicians, residents consistently report significantly greater burnout.[6,9] A 2018 meta-analysis indicated that burnout was most prevalent in residents in surgical/high-urgency specialties.[1] Surgical residents face unique stressors: physically demanding work, high-stakes procedures, hierarchical culture, and greater risk of occupational hazards. These stressors over a lengthy training period could impair well-being, health, and education and even cause surgical residents to revisit their career choice.[9-11]

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Explicitly addressing resident well-being and combating burnout are vital to retaining residents and maintaining quality training, which ultimately improves patient care.

This review aims to (1) define burnout and its prevalence among otolaryngology–head and neck surgery (OTO-HNS) residents, (2) examine factors that affect OTO-HNS burnout and downstream effects of burnout, (3) compare resident burnout in OTO-HNS to that of other surgical specialties, and (4) propose solutions to address burnout and improve resident well-being.

Methods

Identification of Surgical Specialties

Six surgical specialties were identified based on recognition by the American College of Surgeons: OTO-HNS, orthopedic surgery, neurosurgery, urology, plastic surgery, and oral and maxillofacial surgery (OMFS).[12] Obstetrics and gynecology and ophthalmology were excluded because a period of general surgery training is often not required, and most training programs are shorter in duration than those of other surgical specialties. General surgery was excluded due to differences in training length/pathway and residency program size; general surgery residency involves rotations through services with wider variability and typically has a greater number of residents per year, which has implications for the call-pool and program culture, compared to the 6 surgical subspecialties.

Search Strategies and Study Selection

A comprehensive literature search related to resident burnout in each specialty was performed in Ovid Medline and Embase databases using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (**Figure 1**). Databases were searched between January 2016 and May 2021 in line with state-of-the-art review guidelines. Search was limited to articles available in English and conducted separately for each specialty using the following keywords: *burnout, wellness, wellbeing, well-being, mental health, distress, QOL (quality of life as abbreviation), residency, resident, trainee*, and *training.* The following specialty specific terms were used as keywords: *otolaryngology, otorhinolaryngology, ENT, head and neck surgery, head and neck, orthopedic, orthopaedic, neurosurgery, plastic surgery, plastics, urology, oral and maxillofacial*, and *OMFS*.

The search revealed 862 partially overlapping results, of which 582 were unique. Title and abstract screening were performed independently by 2 reviewers (H.P.S. and J.I.). In total, 415 articles deemed outside the scope of the review were excluded. Exclusion criteria included basic science articles, editorials, conference abstracts, and articles that did not address burnout or wellness. Full-text analysis was performed by 2 reviewers for 167 articles. Articles containing data about only general surgery residents or solely on burnout in attending-level physicians were excluded. Articles reporting data on both resident and attending burnout were included for analysis. Articles were excluded if they only evaluated the impact of coronavirus disease 2019 (COVID-19) on resident burnout. After implementing these exclusion criteria, 73 articles were selected by the reviewers.

Given major policy changes in resident duty hours instituted by the Accreditation Council for Graduate Medical Education (ACGME) in 2003, 4 articles were included from outside the 5-year reference window, dating no further back than 2003, as foundational to the field. Twelve additional articles were included through review of reference lists. Five articles deemed integral to this topic were added during revision stages.

Discussion

Defining Burnout and Well-being

Burnout is a syndrome of emotional exhaustion (EE), depersonalization (DP), and decreased sense of personal accomplishment (PA). These subdimensions are defined as follows: EE denotes feelings of overload and depletion of emotional resources, DP is the development of callousness and dehumanization of others, and low PA is the feeling of decreased competence and meaning in one's work.[1,2] DP is often used as a proxy for decreased empathy.[1] The Maslach Burnout Inventory (MBI), which encompasses these 3 subdimensions, is the most commonly used validated instrument to assess burnout. Well-being, which refers to both the presence of positives (personal health, good relationships, workplace engagement, etc) and the absence of negatives (physical injury, fatigue, mental illness, etc), has been studied in residents using the Physician Well-Being Index (PWBI).[13,14] Fatigue and sleepiness, components of well-being and burnout, have been assessed with the Epworth Sleepiness Scale (ESS). These validated instruments have provided ways to quantify burnout and well-being and to identify factors that influence resident mental health.

Prevalence of Burnout in OTO-HNS Residents

In OTO-HNS, resident burnout was first studied 15 years ago and has gained attention in recent years. In 2005, Golub et al[2] conducted the largest burnout study in 514 OTO-HNS residents that showed 86% experiencing moderate to high burnout. Although burnout predates the 21st century, the advent of the MBI in 1981, the death of patient Libby Zion in 1984 attributed to overworked residents that prompted ACGME reforms, and the rise of electronic medical records (EMRs) in the 2000s enhanced awareness of burnout in medicine. From 2005 to 2020, national and multi-institutional surveys found moderate to high burnout in 35% to 86% of US OTO-HNS residents, assessed by various MBI versions.[2,14,15] While burnout is also prevalent among OTO-HNS faculty (with rates up to 70% in the literature), residents were consistently found to experience higher burnout, greater distress, and lower quality of life (QOL).[2,6,9,14] Given the pervasiveness of burnout in OTO-HNS residents, identifying factors that contribute to burnout is critical.

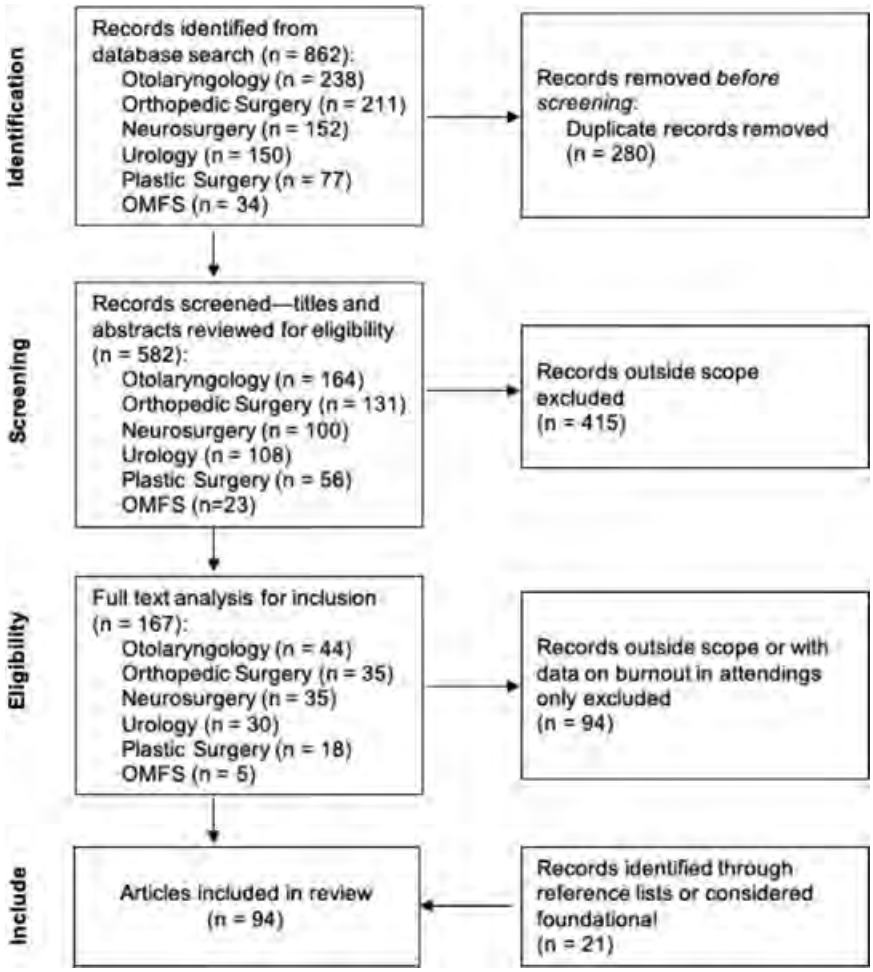

Figure 1. Modified Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram outlining search process and selection of manuscripts. OMFS, oral and maxillofacial surgery.

Factors Contributing to OTO-HNS Resident Burnout

Institutional and systemic factors. Factors associated with burnout can be organized into institutional/systemic and personal elements. System-level factors that affect OTO-HNS resident burnout and well-being include hours worked, year of training, nights on-call, administrative tasks, and so on. Increased hours worked correlated with increased burnout and lower QOL.[2,14-16] Despite changes in ACGME duty hours, work hours reported by otolaryngology residents increased: 8% of residents in 2005 vs 14% in 2014 vs 26% in 2019 reported averaging >80 h/wk.[2,7,15] This trend may reflect increasing awareness of burnout among residents and support for wellness within the medical community. Violation of work hour restrictions was significantly higher among postgraduate year (PGY)–2 residents (14%) in 2005 relative to other years.[2] Burnout rates were highest among PGY-2 residents and lowest in PGY-1 and PGY-5 residents.[2,14-16] Lower burnout rates among PGY-1 residents relative to subsequent years were attributed to increased responsibilities associated with surpassing intern year and cumulative effects of burnout over time in residency.[15,16] Percentage of time spent on paperwork correlated to burnout, which parallels the finding that PGY-5 residents spent the least time on paperwork.[15] In a single-institution study, 79% of residents reported completing work-related items after work hours daily; this responsibility is not unique to residents and contributes to burnout in trainees and attendings.[17] One institution found their residents averaged 5.5 h/wk on work-related documentation outside the hospital.[13] Insufficient time for exercise and extracurriculars correlated with greater burnout and lower QOL.[2,15,16]

Larson et al[14] found significant associations between number of nights on-call and increased burnout and distress, although only in univariate settings. This parallels that of greater burnout/distress among junior residents, as call burden often decreases from PGY-2 to PGY-5.[2] Residents taking in-house call slept fewer hours compared to those taking home-call.[7] Specific subspecialties within OTO-HNS created greater burnout among residents; residents on head and neck rotations had increased sleepiness and the worst well-being.[7,16] A single-institution longitudinal survey over an academic year found higher resident burnout rates by year end.[18] Other factors correlated to burnout, specifically increased EE,

include lack of autonomy, challenging colleague interactions, attending demands, and inability to eat healthily.[2,19] The aforementioned institutional/systemic practices provide targets for interventions to improve resident wellness.

Personal factors. Along with institutional/systemic risk factors, personal factors also affect burnout. The influence of sex on resident burnout and well-being remains undefined; while most studies found no significant associations, there are exceptions. Female residents had higher EE, whereas DP and PA did not differ between sexes.[2] On the ESS, female residents had significantly higher sleepiness compared to male residents.[7,16] Female residents experienced increased distress and burnout in multivariate and univariate settings, respectively.[14] Association of marital/relationship status with burnout differed significantly by sex.[14] Married/partnered male trainees experienced less burnout than those who were single, whereas for female trainees, being married/partnered was associated with increased burnout.[14] Female trainees are often expected to fulfill both their responsibilities as residents and wives/mothers, whereas married/partnered male trainees may be able to focus more on their training with their partner's support. Although most studies found no association between having children and burnout, residents with children reported greater work-life strain.[19] Understanding these personal risk factors can improve support for all residents and address residents' unique needs.

Consequences of Resident Burnout: Safety, Health, and Education

Burnout can compromise both patient and resident safety. Of 178 OTO-HNS residents surveyed, 44% had an incident or near incident, such as a motor vehicle accident, needle stick injury, or medication dose error, in the previous 6 months.[7] In the aforementioned survey, 73% of residents reported experiencing at least 1 such incident during residency, attributed to sleep deprivation, stress, and being postcall.[7] Given the negative patient care implications, efforts to mitigate resident burnout should be considered essential quality improvement initiatives.

Burnout impairs residents' physical and mental health by contributing to substance use and depression. About 40% of OTO-HNS residents reported using sleep aids; of these, 42% used alcohol as a sleep aid.[7] A multicenter study revealed significant symptoms of depression and anxiety in 5% and 16% of OTO-HNS residents, respectively.[14] More than 10% of OTO-HNS residents experienced depression from being shamed.[20]

Burnout can affect resident education. Burnout may reduce education quality by increasing amotivational behaviors and decreasing job involvement.[2] Organizational support is a key factor associated with burnout; strong organizational support is present when hierarchy functions well and leadership supports residents.[21,22] OTO-HNS residents who perceived greater organizational support performed better on the Otolaryngology Training Examination.[19] Burned-out OTO-HNS residents were significantly more likely to forego fellowship.[19] Burnout and poor well-being can compromise trainee education and personal health, thereby affecting surgical workforce quality and ultimately patient care.

International OTO-HNS Trainee Burnout

Outside the United States, burnout and QOL have been studied in otolaryngology residents, although often without validated questionnaires. Resident QOL was assessed across 6 European countries with an internal questionnaire; lower QOL was associated with greater work hours, administrative workload, and decreased departmental support.[23] A UK study found grit, defined as perseverance for achieving long-term goals, was inversely related to burnout and significantly higher in attendings than trainees.[24] Among residents in Canada, 33% reported burnout, and 80% to 90% were satisfied with training.[25] In Australia, 73% of residents reported burnout attributed to discomfort approaching supervisors and work-life imbalance.[26] First-year and female residents in Brazil reported lower QOL.[27] In Saudi Arabia, 33% of residents had high burnout attributed to dissatisfaction with work-life balance, income, and spousal support.[28] While resident burnout appears prevalent globally, comparing US and international burnout is challenging due to differences in training environments.

Resident Burnout in OTO-HNS vs Other Surgical Specialties

Prevalence. Among surgical specialties, resident burnout in the United States is reported to range from 31% to 56% in orthopedic surgery,[29-35] 11.2% to 67% in neurosurgery,[36-38] 38% to 68.2% in urology,[5,39] and 57.5% to 65.5% in plastic surgery.[8,40] These rates are comparable to that of OTO-HNS resident burnout (35%-86%) (**Figure 2**). Studies reporting lower burnout rates in neurosurgery attributed this to higher rates of PA.[36] An overall burnout rate has not been quantified for OMFS residents, although values for MBI subscales exist, and factors affecting burnout have been studied.[41-43] High DP was reported in up to 85.7% of OMFS and 81.5% of orthopedics residents, the highest among surgical specialties, followed by 53.3% for OTO-HNS, 54% for plastic surgery, 49.6% for urology, and 43% for neurosurgery.[1,4,38,40,42,44,45]

Wide ranges in burnout rates may relate to variations in assessment instruments, different sampling years, and self-reporting biases.[14] Although the MBI was the most widely used in surgical specialties, different MBI versions make direct comparisons challenging. For example, the reported 86% OTO-HNS resident burnout rate was from data collected in 2005 and encompasses moderate to high burnout scores on 2 MBI subscales.[2] Burnout studies are susceptible to recall bias from inaccurate self-reporting and response bias attributable to nonresponders.[2] Despite these limitations, the importance of these studies in understanding burnout is paramount.

Resident burnout has been studied more extensively in orthopedic surgery than the other 5 surgical specialties, based on publication count. Following orthopedics, many studies

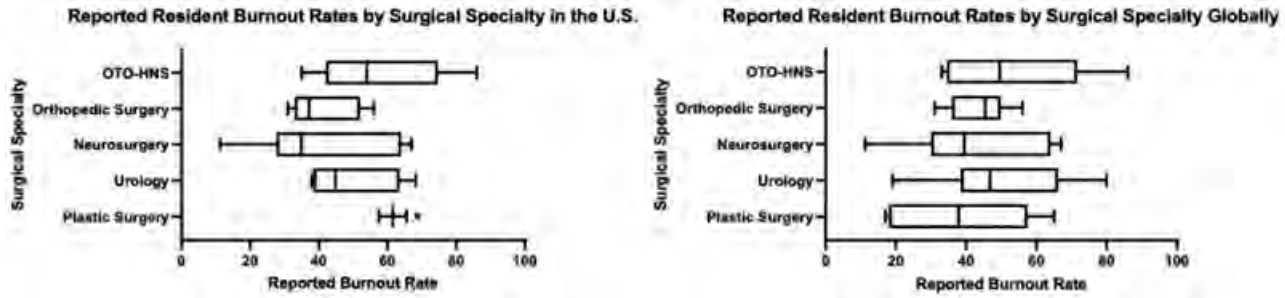

Figure 2. Depiction of reported resident burnout rates in the United States (left) and globally (right) by surgical specialty. *There are only 2 studies on plastic surgery resident burnout in the United States. OTO-HNS, otolaryngology–head and neck surgery.

investigated US resident burnout in neurosurgery, otolaryngology, and urology, whereas only 2 to 3 studies have been published in plastic surgery and OMFS (**Table 1**). Most of these studies were published in the past 3 to 5 years, increasing awareness of trainee burnout potential.

Factors affecting burnout. Despite ACGME duty hour restrictions, overwork is still cited as a leading cause of burnout and worse well-being among residents across all 6 surgical specialties.[8,14-16,33,34,40,41,46-49] Surgical residents report working >80 h/wk: 26% of OTO-HNS residents reported averaging >80 h/wk in 2019 and 18% of orthopedics residents in 2018.[15,35] Working >80 h/wk may increase risk of burnout by nearly 3-fold.[35] Increasing burden of documentation was associated with resident burnout in OTO-HNS and orthopedics; more than half of surveyed orthopedics residents used EMR for >20 h/wk, doubling risk of burnout.[35,47] As in OTO-HNS, resident burnout was exacerbated in neurosurgery, urology, and plastic surgery by number of nights and/or weekends on-call and increased hours, which contribute to scheduling inflexibility.[5,8,48,49]

Burnout peaks in the second year of training across the surgical specialties. Most studies found highest EE, DP, and psychological distress in PGY-2 residents.[29,32,33,45] In junior OTO-HNS residents, sleep deprivation was significantly worse than more senior residents.[16] Junior residents often shoulder much of the call burden and thus work more hours.[31] Moreover, in each of these specialties, PGY-2 entails transition from general surgery training to specialty-specific rotations. PGY-2 residents are most junior within the resident hierarchy in these specialties. Thus, PGY-2s have a considerable lack of control over their schedules. Peak burnout in PGY-2s supports findings of detrimental effects of dysfunctional hierarchy.[21] Dysfunctional hierarchy can create moral distress, which arises when one feels compelled to act contrary to one's moral beliefs and feelings of disempowerment.[21,50] Recurrent moral distress may progress to moral injury, which is a systems-level challenge related to burnout that can erode self-worth and well-being.[50]

Level of program support has been widely discussed in the literature as a source of burnout. Although associations between burnout and hostile environments have not been studied directly in OTO-HNS residents, half of OTO-HNS residents reported experiencing personal shame and nearly 70% witnessed shaming of a colleague.[20] In the other surgical specialties, many studies linked unsupportive, hostile, and shame-based learning environments with resident burnout and depression.[10,33,42,46,47,51,52] Verbal abuse from faculty made orthopedics residents 3.7 times more likely to experience burnout.[35] Only about 50% of orthopedics residents felt supported by their programs and that their programs provided adequate wellness resources.[33] Among plastic surgery residents, 33% did not feel involved in program decisions that directly affected them, which was associated with higher burnout.[8] Modifying these systemic factors, among others (**Table 2**), may improve resident wellness across specialties.

While correlations between resident burnout and personal factors are often statistically insignificant in studies, there are notable exceptions. Female sex was associated with greater burnout in orthopedics residents and increased risk of depression in urology residents.[31,47,53] More female than male OMFS trainees reported effects of shaming: depression, decreased self-esteem, and isolation.[42] Relationship stress with spouses and colleagues correlated with increased burnout in orthopedics, neurosurgery, and urology.[38,44,54] As programs implement strategies to support trainees, being mindful of these personal factors is important.

Consequences of burnout. Residents in the other surgical specialties are susceptible to burnout repercussions: substance use, depression, suicidality, and patient harm. Among plastic surgery residents, burnout was significantly associated with ''major medical errors,'' which were errors that the resident believed could have caused patient harm.[8] Of the plastic surgery residents who made an error, which included incorrect medication/dosing and labs, within the previous 3 months, 61.5% reported burnout.[8] A national survey of 661 orthopedics residents found that 61% met criteria for hazardous alcohol use, measured by the Alcohol Use Disorder Identification Test—Consumption.[33] Higher EE correlated with increased alcohol use in urology residents.[4] Studies found that 16% to 26% of orthopedics residents struggle with depression or anxiety.[29,33,45,47] Burnout increased likelihood of depression (odds ratio [OR], 16.7) in urology trainees.[53] Among urology residents, self-reported burnout alone was predictive of suicidal ideation (OR, 7.6).[53] These

Table 1. Studies Investigating Resident Burnout Across the 6 Surgical Specialties Inside and Outside the United States.[a]

Study	Year	Country	No. of residents	Burnout rate/well-being	Assessment scale
OTO-HNS					
Larson et al[14]	2021	USA	137 (across 12 programs)	35% burnout 49% distress	2-item MBI (EE and DP) EPWBI
McLaren et al[77]	2021	UK	36	58% felt surgical complications affect confidence	11-item questionnaire
Reed et al[15]	2020	USA	182	50%	1-item MBI
Dodson et al[19]	2019	USA	46 (14 programs)	No burnout rate provided	9-item MBI
Raftopulos et al[26]	2019	Australia	60	73.3% high in at least 1 subscale	MBI-HSS
Geelan-Hansen et al[17]	2018	USA	14	71% moderate to high in $\geq$2 subscales	MBI
Garcia-Rodriguez et al[16]	2017	USA	196	58% positive ESS 33% positive PWBI	ESS PWBI
Oker et al[23]	2017	Europe (6 countries)	476	60%-89% would choose same training again	90-item questionnaire
Nida et al[7]	2016	USA	178	44.5% positive ESS	ESS
Walker et al[24]	2016	UK	33	Grit correlates with burnout	Short Grit Scale; OBI
Aldrees et al[28]	2015	Saudi Arabia	85	33% high EE and DP + low PA	MBI-HSS
Vu et al[25]	2010	Canada	92	33% self-perceive burnout	21-item questionnaire
Hill et al[18]	2009	USA	22	13.6% high	MBI-HSS
Golub et al[2]	2007	USA	514	10% high 76% moderate 14% low	MBI-HSS
Orthopedic surgery					
Verret et al[34]	2021	USA	41	34% high DP 34% high EE	MBI
Ho et al[78]	2021	Singapore	44	45.5%	MBI-HSS
Lichstein et al[33]	2020	USA	661	52%	MBI (abbreviated)
Somerson et al[35]	2020	USA	203	38%	MBI
Driesman et al[45]	2020	USA	27	11% high EE 37% high DP 74% high PA	MBI PHQ-9
Kollias et al[79]	2020	Canada	493	40% distress	Resident Well-Being Index
Yu et al[80]	2020	China	643 orthopedic 690 neurosurgery	46.97% 42.32%	MBI Utrecht WES Job Descriptive Index
Shaher Al-Otaibi et al[81]	2020	Saudi Arabia	37	35%-39%	MBI
Sochacki et al[31]	2019	USA	12	33.3% burned out; 25% at risk	MBI PROMIS-29
Strauss et al [32]	2019	USA	62	25.8% moderate EE 51.6% moderate DP	MBI
Wong et al[44]	2019	Global	973 across 8 resident studies	37.2% high EE 48% high DP 33.1% low PA	MBI
Gosselin et al[47]	2019	USA Canada	279	26.1% poor mental health	MHI-5
Oladeji et al[30]	2018	USA	243	30.9%	2-item MBI
Faivre et al[82]	2018	France	107	26% high EE 63% high DP 33% low PA	MBI

(continued)

Table 1. (continued)

Study	Year	Country	No. of residents	Burnout rate/well-being	Assessment scale
Sargent et al[29]	2009	USA	384	56% high DP 28.4% high EE	MBI
Neurosurgery					
Mackel et al[38]	2021	Global	32 studies total	11.2%-67%	MBI Self-reported burnout
Salloum et al[83]	2021	UK, Ireland	75		CBI
Berardo et al[36]	2020	USA	7 resident studies	30%-67%	MBI
Jean et al[49]	2020	Global	797	20.7% overall 11.2% US and Canada 26.9% Europe	16-item questionnaire
Zaed et al[37]	2020	USA China	7 resident studies	45.4%	MBI
Shakir et al[84]	2020	USA	427	33.3%	9-item MBI
Tang et al[52]	2020	USA	64	30%	1-item questionnaire
Ares et al[51]	2019	USA	21-25	63% moderate in at least 1 subscale	MBI
Attenello et al[10]	2018	USA	364	67% (high EE and/or DP)	MBI
Shakir et al[85]	2018	USA	255	36.5%	9-item MBI
Urology					
Aljuhayman et al[86]	2021	Saudi Arabia	215	19.1% high EE	CBI
Marchalik et al[53]	2020	USA	210	17.6% depressed 11% suicidal ideation	MBI PHQ-9 QOLS
Cheng et al[4]	2020	USA	99	49.6%	MBI
Mahesan et al[87]	2020	UK	49	50% considered leaving urology; 63% cited burnout as reason	10-item questionnaire
Marchalik et al[39]	2019	USA	211	68.2%	50-item questionnaire MBI PHQ-9
Marchalik et al[5]	2019	USA Europe	158	40% overall 38% USA 44% Europe	MBI
Fainberg et al[48]	2019	USA Europe	Review	40%-80%	
Gas et al[88]	2019	France	239	91% moderate in at least 1 subscale 25% global burnout 9% severe in all 3 subscales	MBI
Bolat et al[54]	2019	Turkey	362	60% high EE	MBI
Plastic surgery					
Grome et al[89]	2021	USA Canada UK	17 studies total: 2 studies on plastics residents	57%-65%	MBI; self-reported; subjective scales
Coombs et al[8]	2020	USA	146	57.5%	MBI SPFI
Hart et al[40]	2020	USA	113	65.5%	MBI-HSS
Fell et al[90]	2020	UK	131	17% reported feeling burned out	Self-developed questionnaire
Panse et al[91]	2020	India	185	48.4% moderate to severe	Abbreviated MBI
Bin Dahmash et al[92]	2019	Saudi Arabia	37	37.9%	MBI-HSS
Ribeiro et al[93]	2018			36.7%	MBI

(continued)

Table 1. (continued)

Study	Year	Country	No. of residents	Burnout rate/well-being	Assessment scale
		USA, France, Israel, Saudi Arabia	90 (across 6 studies)		
Aldrees et al[94]	2017	Saudi Arabia	38	18%	MBI
OMFS					
Alkindi et al[95]	2020	Saudi Arabia	51	78.4% moderate stress; 11.8% high stress	PSS
Smith et al[41]	2019	USA	300	25% dissatisfied	45-item questionnaire
Al Atassi et al[43]	2018	USA	238	23% low PA	MBI (PA subscale)
Shapiro et al[42]	2017	USA	217	51% EE 85.7% DP 53% PA (moderate to severe)	MBI

Abbreviations: CBI, Copenhagen Burnout Inventory; DP, depersonalization; EE, emotional exhaustion; EPWBI, Expanded Physician Well-Being Index; ESS, Epworth Sleepiness Scale; MBI, Maslach Burnout Inventory; MBI-HSS, Maslach Burnout Inventory–Human Services Survey; MHI-5, Mental Health Inventory-5; OBI, Oldenburg Burnout Inventory; OMFS, oral and maxillofacial surgery; OTO-HNS, otolaryngology–head and neck surgery; PA, personal accomplishment; PHQ-9, Patient Health Questionnaire–9; PROMIS-29, Patient-Reported Outcomes Measurement Information System–29; PSS, Perceived Stress Scale; PWBI, Physician Well-Being Index; QOLS, Quality of Life Scale; SPFI, Stanford Professional Fulfillment Index; WES, Work Engagement Scale.
[a]Studies are listed in chronological order within each specialty.

Table 2. Factors Associated With Increased Burnout and/or Worse Well-Being and Protective Factors for Each of the 6 Surgical Specialties.

Surgical specialty	Factors associated with increased burnout	Protective factors
OTO-HNS	Hours worked[2,14-16] Documentation time[15] Number of nights on-call[14] PGY-2[2,14-16] Increased involvement in procedures[15] Perceived lack of independence[2] End of academic year[18] Discomfort approaching supervisor[26] Insufficient exercise[15] Insufficient time for extracurricular interests[2] Lack of work-life balance[26,28] Children[19] Female trainee[2,14,16] Married/partnered as a female[14,28] Relationship stress[2] Lack of spousal support[28] Distance from support system[26] Training affects partner/family[26]	Protected nonclinical time[13] Mentorship[18,60] PGY-1 and PGY-5[15,16] Coaching on how to deal with nontechnical aspects of training[63,77] Program-supported wellness activities[63,66] Mindfulness training[15,63,64] Self-efficacy[2,18] Satisfaction with career choice and work-life balance[2] Exercise[16] Meditation[65] Nutrition[63] Relationship stability[2] Married/partnered as a male trainee[14]
Orthopedic surgery	Hours worked[33-35,46,47,80] Unmanageable work volume[33,34] Increased use of EMR[35,47] Number of overnight calls[31] PGY-2[29,32,33,45,47] Unsupportive, hostile, or shame-based learning environment[33,46,47,80] Verbal abuse from faculty[35] Lack of program support[33,47] Lack of quality mentorship[30,47] Stressful work relationships[29,44,78] Larger program (>6 residents/y)[29] Stressful research requirements[78]	Adequate nursing support[34,35] Surgical independence[47] Educational opportunities[47] Mentorship[29,47] Satisfied with career[29] Support from other medical families or program[29,47] Separates work and home life[29] Exercise[29] Religious/spiritual[29] Makes time for hobbies[29]

(continued)

Table 2. (continued)

Surgical specialty	Factors associated with increased burnout	Protective factors
	Worse OITE performance[32]	
	Lack of job control[34,47]	
	Lack of work-life balance[29,33,44,78]	
	Sleep deprivation[29,78,80]	
	Insufficient exercise[33]	
	Regular alcohol use[29,78,81]	
	Inability to attend health care appointments[33]	
	Financial pressure[33,35,44,47,78]	
	Female trainee[31,47]	
	Divorced or living alone[80-82]	
	Insufficient time with family[46]	
Neurosurgery	Hours worked[49,80,83]	Mentorship[10,36,38]
	High workload (United States and Canada)[37,49]	Operative caseload[49]
	Frequency of being on-call[49]	End of rotation/year[52]
	PGY-2[10,52]	Wellness education, exercise program[68]
	Inadequate operating time[10,36-38]	Program-led social events, outdoor activities[52]
	Lack of independence[37]	Meaningful relationships with colleagues[52]
	Workplace violence/bullying[51,80,83]	Adequate sleep[52]
	Stressful work relationships[83]	Marriage and/or children[84]
	Feeling underappreciated[37]	Grit[84]
	Coresident attrition[37]	Strong sense of purpose[52]
	Unstable work routine[37,52]	
	Lack of work-life balance[36,52]	
	Lack of sleep[80,83]	
	Lack of leisure time[37,83]	
	Insufficient exercise[83]	
	Divorced[80]	
	Stressful social relationships[10,38,84,85]	
Urology	Hours worked[39,48]	Mentorship[5,39,48,53]
	Workload[86]	Access to mental health services[39,48,53]
	Weekends on call[5,48]	Institutional support[54]
	PGY-2[96]	Support from colleagues[54]
	Stressful work relationships[54]	Sense of competency[88]
	Lack of access to mental health services[39]	Exercise[4]
	Lack of work-life balance[5,53]	Makes time for hobbies[88]
	Stress eating[4]	Time with family/friends[4,39,54]
	Alcohol use[4]	Male trainee[88]
	Fatigue[5,53,54]	Reading for relaxation and socialization[4,5,39,48]
	Female trainee[53]	
	Dissatisfaction with salary[54]	
Plastic surgery	Hours worked[8,40]	Exercise[91,92,94]
	Volume of work[91]	Makes time for hobbies[91]
	Frequency of call[8]	High emotional intelligence[92]
	PGY-1 to PGY-3[40]	
	Programs with <7 residents total[40]	
	Stressful work relationships[91]	
	Lack of adequate support staff[91]	
	Feel matched into wrong program[8,92]	
	Lack of involvement in program decisions[8]	
	Insufficient faculty involvement[91]	
	Lack of formal teaching[91]	

(continued)

Table 2. (continued)

Surgical specialty	Factors associated with increased burnout	Protective factors
	Dissatisfaction with role in OR[92]	
	Self-reported medical error[8]	
	<2 weeks of vacation per year[40]	
OMFS	Hours worked[41,95]	Use of relaxation techniques[41]
	Administrative duties[95]	Access to mental health services[41]
	Length of time on-call[95]	
	Being shamed frequently[42]	
	Poor communication with other health care providers[95]	
	Lack of schedule flexibility and control[95]	
	High anxiety[43]	
	Female trainee[42,43]	

Abbreviations: EMR, electronic medical record; OITE, orthopedic in-training examination; OMFS, oral and maxillofacial surgery; OR, operating room; OTO-HNS, otolaryngology–head and neck surgery; PGY, postgraduate year.

negative impacts of burnout on trainees' health have real implications for the long-term health of the physician workforce.

Strategies for Change

Screening. Recently, there has been an increased focus on recognizing and treating burnout. A survey of 44 OTO-HNS program directors (PDs) revealed that 47.7% regularly surveyed residents' emotional health, with a third using the MBI.[55] Screening and treatment of depression among OTO-HNS residents was found cost-effective with improvements in quality-adjusted life years.[56] Of 46 plastic surgery PDs surveyed, 76% believe residents should be formally screened for burnout, but only 27% routinely do.[57] About half of plastic surgery PDs agreed they should be required to screen residents for burnout in-person annually.[57] While in-person screenings may strengthen relationships between PDs and residents, anonymous screenings for burnout and related factors, including substance use, are easier to administer and may yield more truthful responses. Abbreviated versions of the MBI and other scales (eg, Short Grit Scale) may facilitate anonymous screening.[24,58] Screening and supporting residents' well-being can be time-consuming for PDs; including resident wellness in PD job descriptions to acknowledge their investment and training PDs on how to support residents can improve screening efforts.[59] Providing residents with self-screening tools can help PDs and trainees share the responsibility of screening.

Formal mentorship programs. Structured mentorship programs are among the few evidence-based solutions for combating burnout. A survey of PDs showed 73% of OTO-HNS programs assigned residents a faculty mentor; this was significantly more common for programs with female PDs (54% vs 17% for male PDs).[55] Twenty-seven percent of programs assigned senior resident mentors to junior residents.[55] A single-institution prospective study in Canadian OTO-HNS residents showed a formal mentorship program reduced stress and burnout and improved QOL after 1 year.[60] Formal mentorship programs were proven beneficial in orthopedics, neurosurgery, and urology.[5,29,36,39] More frequent contact with mentors was associated with significantly lower EE and higher PA.[29] Programs with structured mentorship established for >5 years had higher board pass rates, publication output, and faculty engagement in resident education.[61] Time was a frequently cited barrier to the implementation of mentorship programs.[61] However, even 2 meetings with mentors per academic year can improve resident satisfaction and perception of organizational support.[62] Assigning faculty and senior residents as formal mentors, based on trainee preferences for mentor characteristics, may help junior trainees navigate challenging times, such as PGY-2 year when burnout peaks.

Wellness initiatives. Wellness initiatives are gaining popularity among surgical specialties; however, components and efficacy of these programs vary. While 90% of OTO-HNS residency programs had wellness lectures, far fewer programs provided seminars in mindfulness or meditation (32%), healthy food for residents (36%), team-building events (23%), and physical wellness activities (29%).[55] Single-institution studies have assessed the impact of wellness interventions on otolaryngology resident burnout. With a needs assessment focus group, Kashat et al[63] identified wellness topics most important to residents and systemic barriers to well-being. They implemented a 6-week mindfulness course with guided group meditations during didactics that demonstrated significant improvement in mood after sessions and feasibility of incorporating mindfulness training into resident curricula.[64] Weekly virtual reality–guided meditation and paced breathing was associated with decreased EE.[65] OTO-HNS resident burnout improved after 1 year of a department-supported, resident-led wellness program that targeted institutional and personal factors that included wellness retreats, monthly wellness afternoons, physical activity programs, and nourishment refrigerators.[66]

In 2015, the La Sierra wellness project was offered to neurosurgery residents and faculty at an institution along with Fitbits to track activity.[67] It comprised weekly wellness lectures, team-based 1-hour exercise sessions incorporated into the workweek, and healthy food at conferences. The program's cornerstone was the weekly team-based workout that led to resident-reported improvements in camaraderie. Spiotta et al[68] reported program participation demonstrated no perceived impairments in clinical, academic, or research work. After 1 year, resident perceptions of the program were favorable and improvements were observed in physical fitness, anxiety, depression, QOL, and sleepiness.[68] Although the La Sierra program initially encountered resistance from attendings, endorsement from the chairman and PD increased faculty engagement.[69] Benefits of the La Sierra program drastically differ from the effects of another program's attempt to foster wellness. A wellness initiative by Ares et al,[51] comprising wellness lectures, hospital gym membership, and formal mentorship, showed no statistical difference in resident burnout after 1 year. Residents of this program cited a lack of faculty support for the initiative.[51] Such dramatic difference in outcomes between 2 similar programs emphasizes the importance of faculty support for trainee wellness initiatives.

Costs of wellness initiatives are variable, although not insurmountable; average annual cost for wellness programs was $6000 (range, $1500-$15,000).[69] Programs can start with low-cost measures such as group fitness or small outings and add elements as initiatives mature. Efficacious wellness initiatives (1) employ needs assessments to identify factors important to an individual program's residents, (2) require department support, and (3) are feasible to incorporate into resident schedules (eg, during didactics), minimizing disruption to operative experiences and patient care.

Institutional support. Reducing administrative burden on residents can mitigate burnout. Sufficient nursing support can make residents 5 times less likely to burn out.[34,35] Assistance with clerical burden by hiring patient coordinators, dictation services, and medical scribes reduces resident burnout.[70] After working with outpatient scribes for 12 months, 80% to 90% of general surgery residents felt scribes enabled them to focus more on patient care, reduced workload, and improved well-being and adherence to duty hour restrictions.[71] Residents and faculty believed outpatient scribes enhanced quality of surgical education by allowing more time for teaching.[71]

Protected nonclinical time can also improve resident well-being. Two hours per week of protected nonclinical time was associated with decreased EE and increased well-being without affecting surgical case or clinic coverage; there were improvements in job stress, control over workload, and time for documentation.[13] Residents used protected time to complete personal errands, research, dictations, and case preparation.[13] Protected nonclinical time can address an important factor in burnout: inadequate time for personal health care appointments.[29,33] Protected time can also increase accessibility of mental health services, which can increase resident satisfaction up to 6-fold.[41] Although ACGME set a requirement in 2017 for residents to be able to attend health care appointments, only two-thirds of OTO-HNS residency PDs had plans for residents to get medical care during weekdays.[55]

Provision of resources alone is not enough to combat burnout. Creating a culture of wellness within residency programs is essential for encouraging residents to use resources. Stigma around seeking help remains a key barrier. Residents across surgical specialties expressed concerns about being perceived differently for discussing mental health with faculty and being shamed by peers for prioritizing wellness.[5,33,41,44] Stigmatization by faculty and peers indicates a pervasive framework without psychological safety, or the quality of feeling comfortable to speak openly, reinforced by rigid hierarchy.[21] Ensuring psychological safety is important for supporting trainees of diverse backgrounds. Trainees from minority groups are more likely to face burnout triggers: racial discrimination, feelings of isolation, and discordant cultural expectations.[72] Creating spaces for trainees to discuss the impact of these triggers on their well-being is vital to mitigating burnout.[72]

Programs can increase psychological safety by demonstrating how important trainee well-being is to the organization.[19,21,22] Implementation of an ''opt-out'' mental health service, in which the program scheduled appointments for trainees, increased residents' comfort with using these services.[73] This opt-out strategy can improve resident perception of organizational support. Most US health organizations have a chief quality officer to assess safety and change processes and culture to improve the organization.[3] Like a chief quality officer, a wellness champion can mitigate stigma and improve access. A dedicated faculty wellness champion, who is not the PD or associate PD, was shown to decrease trainee burnout.[70] Wellness champions and leadership can promote wellness and resilience by modeling these themselves, maintaining updated lists of well-being resources, providing psychological safety training, and so on.[50] Leadership support for these measures may also alleviate moral injury.[50]

Limitations and Future Directions

Complexities of studying resident burnout are reflected in broad ranges of burnout rates and underscored by many contributing factors. Limitations include heterogeneity of assessment tools, temporal differences in sampling, inaccurate self-reporting, and nonresponder bias. Future research may address some limitations: standardization of assessment tools and longitudinal studies. Another limitation of studies is the exclusion of military residents, who encounter additional stressors including required physical training, combat, and increased risk of moral injury. Further exploration of military resident burnout may provide insight for solutions that nonmilitary residency programs can also implement to improve well-being.

While this review focuses on resident burnout before the COVID-19 pandemic, the urgency to address burnout has increased. The pandemic has exacerbated psychological burdens, moral injury, and distress experienced by trainees due to

viral exposure risk, resource shortages, providing care outside their normal practice, and so on.[74-76] Future efforts to examine effects of the pandemic on providers' well-being are imperative.

Implications for Practice

Our literature review highlights factors contributing to surgical resident burnout and negative effects of burnout on trainee health and quality of patient care. Burnout is prevalent in OTO-HNS residents, ranging from 35% to 86%, and comparable to other surgical specialties. Resident burnout compromises mental health, contributing to substance use, depression, anxiety, and increased suicidality.[7,14] Consequent fatigue and loss of empathy increase likelihood of medical errors and patient harm.[6-8] Poor trainee well-being has implications for the entire specialty of OTO-HNS: burned-out OTO-HNS residents are more likely to forego fellowship.[19] Concerted efforts from individuals and institutions can address burnout. Routine screening, formal mentorship, wellness initiatives, ancillary support, functional hierarchies, and top-down advocacy for a culture of wellness are crucial.[3,55,56,60]

Department leadership and faculty must advocate for resident well-being to effect positive change. As a relatively small specialty, OTO-HNS is well positioned to implement institutional changes that increase leadership involvement and advocacy. It is crucial for OTO-HNS to continue exploring strategies to mitigate burnout for the benefit of patients, trainees, and the entire specialty. OTO-HNS can lead efforts to assess the impacts of interventions on well-being, identify more standardized methods of quantifying burnout, and perform longitudinal studies to see how resident well-being evolves over time.[64-66] Institutional advocacy and interventions for resident well-being are worthwhile investments for the betterment of trainees, patient care, and health systems.

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National Comparison of Program Director Perceptions vs. Resident Reports of the Learning Environment and Well-Being

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OBJECTIVE: Our research objectives were to (1) assess the correlation between PD perceptions and their residents' reported experiences and (2) identify PD and program characteristics associated with alignment between PD perceptions and their residents' reports.

DESIGN, SETTING, PARTICIPANTS: A survey was administered to US general surgery residents following the 2019 American Board of Surgery In-Training Examination (ABSITE) to study wellness (burnout, thoughts of attrition, and suicidality) and mistreatment (gender discrimination, sexual harassment, racial/ethnic/religious discrimination, bullying). General surgery program directors (PDs) were surveyed about the degree to which they perceived mistreatment and wellness within their programs. Concordance between PDs' perceptions and their residents' reports was assessed using Spearman correlations. Multivariable logistic regression models examined factors associated with alignment between PDs and residents.

RESULTS: Of 6,126 residents training at SECOND Trial-enrolled programs, 5,240 (85.5%) responded to the ABSITE survey. All 212 PDs of programs enrolled in the SECOND Trial (100%) responded to the PD survey. Nationally, the proportion of PDs perceiving wellness issues was similar to the proportion of residents reporting them (e.g., 54.9% of PDs perceive that burnout is a problem vs. 40.1% of residents experience at least one burnout symptom weekly); however, the proportion of PDs perceiving mistreatment vastly underestimated the proportion of residents reporting it (e.g., 9.3% of all PDs perceive vs. 65.9% of all residents report bullying). Correlations between PDs' perceptions of problems within their program and their residents' reports were weak for racial/ethnic/religious discrimination ($r = 0.176$, $p = 0.019$), sexual harassment ($r = 0.180$, $p = 0.019$), burnout ($r = 0.198$, $p = 0.007$), and thoughts of attrition ($r = 0.193$, $p = 0.007$), and non-existent for gender discrimination, bullying, or suicidality. Multivariable regression models did not identify any program or PD characteristics that were consistently associated with improved resident-program director alignment.

CONCLUSIONS: Resident and PD perceptions were generally disparate regarding mistreatment, burnout, thoughts of attrition, and suicidality. Reconciling this discrepancy is critical to enacting meaningful change to improve the learning environment and resident well-being. (J Surg Ed 000:1−9. © 2022 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Mistreatment, burnout, program director, graduate medical education, resident education, perception

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COMPETENCIES: Professionalism, Interpersonal and Communication Skills

INTRODUCTION

Mistreatment is prevalent among general surgery residents, reported by 50%: bullying is reported by 66.9%, racial/ethnic discrimination by 41%, and gender discrimination and sexual harassment by 65% and 20% of women, respectively.[1-3] Mistreatment contributes to burnout,[4] which has been reported by 39% of general surgery residents.[1-3] While many have reported that women and minorities experience burnout at higher rates, our recent data attribute these disparities to higher rates of mistreatment..[1-3,5] Mistreatment and burnout are associated with thoughts of attrition and suicidal ideation.[2,4,6]

Program Directors (PDs) have a key role in fostering a healthy learning environment and the well-being of their residents. The Accreditation Council for Graduate Medical Education's Common Core Requirements state, "Residency education must occur in the context of a learning and working environment that emphasizes. . .commitment to the well-being of the students, residents, faculty members, and all members of the health care team."[7] However, little direction is given in addressing the challenges associated with this responsibility. While specific programmatic responsibilities related to well-being are spelled out (e.g., "efforts to enhance the meaning that each resident finds in the experience of being a physician. . .opportunity to attend medical, mental health, and dental care appointments. . .attention to resident and faculty member burnout, depression, and substance abuse"), little guidance is given on how to accomplish these directives.

Mistreatment, burnout, attrition, and suicidality must be recognized before they can be addressed. Program Directors (PDs) are uniquely positioned to help residents suffering from mistreatment and/or poor well-being. However, significant stigma prevents physician disclosure and reporting around these issues.[8-11] For a resident, the stakes seem particularly high because their PD, the person from whom they are instructed to seek help, also holds a key evaluative position in their training; they perceive that admitting vulnerability to PDs could have career-long consequences and may avoid reporting to them. Therefore, it is currently unclear whether PDs are made aware of these resident experiences and/or how well they are able to perceive them. Thus, we conducted a survey to assess PD perceptions of mistreatment and resident well-being, and we compared the results with their residents' responses on an annual national survey. Our research objectives were to (1) assess the correlation between PD perceptions and their residents' reported experiences, and (2) identify PD and program characteristics associated with alignment between PD perceptions and their residents' reports.

METHODS

Survey Administration

Residents

A voluntary multiple-choice computer-based survey was administered immediately after the 2019 American Board of Surgery In-Training Exam (ABSITE) to all clinically active residents training in general surgery programs accredited by the Accreditation Council for Graduate Medical Education (ACGME). The survey was preceded by 2 preambles. The first, from the ABS, explicitly states "The survey is not mandatory and has no effect on your ABSITE scores," and gives an option to continue or exit/end the testing session." In the second, we further specified that the purpose of the survey was research, that their responses would be de-identified, and that their programs would not have access to their individual responses. The delivery software was constructed such that participants could exit the survey at any time without penalty. Residents had no incentives or disincentives to respond to the survey. Survey responses were de-identified by the ABS before being transferred to Northwestern University to be analyzed. All data were examined at the program level; protocol prohibits any attempt to identify or analyze data from individual residents. As such, the study was determined by the Institutional Review Board (IRB) of Northwestern University to be exempt from full human subjects review.

The SECOND Trial

This study is a secondary analysis of data from the Surgical Education Culture Optimization through targeted interventions based on National comparative Data (SECOND) Trial (NCT03739723), a national cluster-randomized trial of 215 general surgery residency programs focused on the learning environment and resident well-being.[12] Programs randomized to intervention receive an annual Learning Environment and Resident Well-Being Program Report that contains their residents' aggregated, anonymized post-ABSITE survey data, benchmarked against other programs in the country. The SECOND Trial protocol allows for concatenation of multiple datasets at the program-level in order to identify systems-level drivers of resident well-being. Because the SECOND Trial utilizes de-identified data for the purposes of

program evaluation/improvement, the Northwestern IRB determined the post-ABSITE survey to be non-human subjects research.

Program Directors

Program directors of programs enrolled in the SECOND Trial are required to complete an annual survey prior to the release of their SECOND Trial Report. In 2019, survey administration started in April. This program director survey underwent expedited review and approval by the Northwestern IRB.

Survey Content and Development

Residents

Residents were queried about the frequency with which they experienced specific behaviors consistent with gender/gender identity/sexual orientation discrimination (e.g., being mistaken for a non-physician), racial/ethnic/religious discrimination (e.g., being subject to racial slurs), and sexual harassment (e.g., inappropriate touching) within that academic year.[1,13,14] Items were developed and adapted based upon a comprehensive review of the literature and previously published instruments.[13-20] The Short-Negative Act Questionnaire (S-NAQ), a previously validated instrument, was used to assess bullying.[21] Burnout was assessed using a modified, abbreviated Maslach Burnout Inventory (aMBI).[22] Thoughts of attrition were queried with, "I have considered leaving my residency program in the last year (current academic year)."[23] Suicidal ideation was queried with, "During the past 12 months, have you had thoughts of taking your own life?"[6] The clarity and coherence of the complete survey was assessed using cognitive interviews with a national sample of general surgery residents. The survey then underwent multiple rounds of iterative revisions with extensive pilot-testing and feedback.

Program Directors

In 2019, PDs participating in the SECOND Trial were asked whether they agreed with a series of statements about burnout, attrition, suicidal ideation, bullying/abuse, gender/gender identity/sexual orientation discrimination, race/ethnicity/religion discrimination, sexual harassment, all phrased: "_____ is a problem at my program," with the response options strongly disagree, disagree, agree, strongly agree, don't know, and prefer not to answer. These question stems differ from those asked of the residents as a matter of practicality; a PD is unlikely to know how often each resident experiences being mistaken for a non-physician or being shown sexually inappropriate content (for example), but it is reasonable to expect they know if their residents experience discrimination or harassment, more broadly. Moreover, mistreatment and well-being are well-described concepts in the medical and surgical education literature, and, given the ACGME Common Core Requirements, we expect PDs are familiar with terminology such as "burnout" or "discrimination." PDs had an opportunity to input free text into the survey. The survey was pilot-tested and refined with a group of PDs on the SECOND Trial Faculty Advisory Committee.

Other Data Sources

The American Board of Surgery provides resident gender, as well as program type, size, and geographic region. Program director names were obtained from the ACGME, and their genders were ascertained upon review of publicly available biographies. Counts of active surgical faculty by gender and race for medical schools participating in Faculty Roster were provided by the Association of American Medical Colleges (AAMC).

Statistical Analysis

Exposures to specific mistreatment behaviors (e.g., inappropriate touching, being shown unwanted sexual imagery) were dichotomized into none versus any, then aggregated into mistreatment types (i.e., gender/gender identity/sexual orientation discrimination, racial/ethnic/religious discrimination, and bullying). Each mistreatment type was therefore a binary variable (any vs none). Burnout was defined as an at least weekly occurrence of any of the 6 emotional exhaustion or depersonalization items in the aMBI.[22] Resident survey responses were aggregated at program level such that the percentage of residents reporting each mistreatment type, burnout, thoughts of attrition, or suicidality was calculated for each program.

Overall concordance between these resident reports and PDs' perceptions was assessed using Spearman's correlations. Spearman's correlation assesses for a relationship, rather than an absolute difference, between two variables. A high correlation implies that PDs' perceptions increase as their residents' reports increase. A high correlation is possible between resident reports and PD perceptions, even if PD perceptions systematically underestimate resident reports, as long as they are monotonically related.

Alignment of each PD's perceptions with their residents' reports was defined as (1) a PD agreeing/strongly agreeing that an issue was a problem in their program and their program ranking in the worst quartile for that metric, or (2) a PD disagreeing or strongly disagreeing that an issue was a problem at their program and their program ranking in the best two quartiles for that metric. This definition was selected to conservatively bias

the results in favor of alignment (e.g., PDs are not penalized for not recognizing a problem, even when their program ranks in the next-to-worst quartile for that problem). Multivariable logistic regression models were constructed to identify programmatic factors (program size, location, type, gender and racial composition of faculty, gender and racial composition of residency, proportion of residents with children, gender of PD and chair) associated with alignment for each metric (mistreatment, burnout, thoughts of attrition, suicidality).

All analyses were performed with Stata version 16. Statistical significance was set at $p < 0.05$.

RESULTS

Of 6,126 residents training at SECOND Trial-enrolled programs, 5,240 (85.5%) responded to the ABSITE survey. All 212 PDs of programs enrolled in the SECOND Trial (100%) responded to the PD survey (Table 1), of whom 198 (93.4%) responded to at least 1 of the relevant items on perception. The PD population was 77.0% male and 23.0% female.

TABLE 1. Resident and Program Demographics

	n (%)
Resident Characteristics	n = 5,240
Gender	
Male	2,934 (57.5%)
Female	2,167 (42.5%)
Race/Ethnicity*	
White	3,108 (60.3%)
Black	226 (4.4%)
Asian	909 (17.6%)
Hispanic	390 (7.6%)
Other	264 (5.1%)
Prefer not to say	255 (5.0%)
Program Characteristics	n = 212
PD Gender†	154 (77.0%)
Male	46 (23.0%)
Female	
Chair Gender†	
Male	172 (89.1%)
Female	21 (10.9%)
Program Size	
<26 residents	62 (31.0%)
26-36 residents	57 (28.5%)
37-50 residents	47 (23.5%)
>50 residents	34 (17.0%)
Program Type	
Community	92 (46.0%)
Academic	105 (52.5%)
Military	3 (1.5%)
Region	
Northeast	62 (31.0%)
Southeast	37 (18.5%)
Midwest	51 (25.5%)
Southwest	23 (11.5%)
West	27 (13.5%)

*Percentages may sum to over 100% as respondents were able to choose more than one response.
†Total ns may vary due to missing data.

TABLE 2. Proportion of Residents Reporting and Proportion of PDs Perceiving Mistreatment or Poor Well-Being in SECOND Trial Programs

	% of Residents n = 5,240	% of PDs n = 212
Burnout	40.1	54.9
Attrition	12.1	15.2
Suicidality	4.5	11.3
Bullying	65.9	9.3
Racial/Ethnic Discrimination	24.4	5.0
Gender Discrimination	44.8	4.4
Sexual Harassment	31.1	7.8

Raw percentages of residents reporting mistreatment and PDs agreeing that mistreatment is a problem at their program are shown in Table 2. The proportion of PDs agreeing that burnout (54.9%), attrition (15.2%), and suicidality (11.3%) were problems in their program roughly approximated or overestimated the proportion of residents nationally who reported those issues (40.1%, 12.1%, 4.5%, respectively). However, for mistreatment, there were wide disparities between PD perceptions and residents' reports nationally: 65.9% of US residents reported experiencing bullying vs 9.3% of PDs reported that it was a problem in their program; 24.4% of residents reported racial and/or ethnic discrimination vs 5.0% of PDs reported it was a concern in their program; 44.8% of residents reported gender discrimination vs 4.4% of PDs reported it was a concern in their program; and 31.1% of residents reported sexual harassment vs 7.8% of PDs reported it was a concern in their program.

Spearman's correlations (Table 3) did not demonstrate concordance between PDs' perceptions and prevalence rates calculated from their residents' reports for gender discrimination ($r = -0.0194$ $p = 0.793$), bullying ($r = 0.100$, $p = 0.176$), or suicidality ($r = 0.019$, $p = 0.806$). Concordance was weak for racial/ethnic/religious discrimination ($r = 0.176$, $p = 0.019$), sexual harassment ($r = 0.180$, $p = 0.019$), burnout ($r = 0.198$, $p = 0.007$), and thoughts of attrition ($r = 0.193$, $p = 0.007$).

Multivariable regression models did not identify any program or program director characteristics that were consistently associated with improved resident-program director alignment (i.e, PDs noting a concern and residents reporting the same concern at a higher rate;

TABLE 3. Correlations between Resident-Reported Experiences and Program Director Perceptions of Mistreatment and Well-Being Issues

	All PDs	Female PDs	Male PDs
Burnout	0.20*	0.30*	0.15
Thoughts of Attrition	0.19†	0.13	0.22†
Suicidality	0.02	0.00	0.00
Bullying	0.10	0.22	0.07
Racial/Ethnic Discrimination	0.18*	0.31*	0.13
Gender Discrimination	-0.02	0.02	-0.03
Sexual Harassment	0.18*	0.22	0.16

A positive Spearman's correlation indicates that as resident reports of a problem increase at a program, their PD's perception of that problem also increases.

*$p < 0.05$

†$p < 0.01$

Table 4); occasional variables demonstrated statistically significant associations, but these were not consistent across mistreatment types. For example, PDs of middle-sized programs had higher alignment with their residents' reports of gender discrimination and sexual harassment, whereas PDs of larger programs had higher alignment with their residents' reports of racial/ethnic discrimination (Table 4).

DISCUSSION

In this study, we attempt to quantify the association between program directors' perceptions of resident experiences and resident reports. As resident educators and advocates, program directors are uniquely positioned to help address mistreatment and/or poor well-being; however, our results show that they do not always know how pervasive it is. Although at the national level, the proportion of PDs who express concern about burnout, thoughts of attrition, and suicidality among their residents roughly approximates, and at times overestimates, the proportion of residents reporting these issues, concordance between PDs' perceptions and reports of their own residents is weak at best. For mistreatment, PD and resident views are even more disparate, with a far smaller proportion of PDs perceiving mistreatment than the proportion of residents reporting it. Moreover, there is weak concordance about mistreatment at the program-level. These inconsistencies have implications. Accurate perceptions are a prerequisite for generating meaningful change; it is difficult to fix problems of which one is unaware.

The gap between PDs' perceptions and their residents' experiences is perhaps unsurprising, as there are multiple barriers to resident disclosure or reporting. In medicine, mental health issues are stigmatized.[24,25] At many institutions, help-seeking may result in negative career-long consequences (e.g., having to report a fitness for duty evaluation on future boards and/or credentialing applications, loss of licensure).[8,11] Toughness and grit are rewarded in surgery, and have even been suggested as a screening criterion,[26] creating a culture that discourages any admissions of vulnerability, whether about mistreatment or well-being, that may be misconstrued as weakness. Additionally, in order for reporting of mistreatment to result in meaningful action, substantial detail is often required, which may compromise reporter confidentiality. Given their place in the training hierarchy, residents may be uniquely vulnerable to retaliation, including loss of career opportunities and/or social ostracization, should they be identified.[16,27] Finally, because such investigations are often confidential and their resolutions not transparent, residents have little evidence that reporting will lead to meaningful change, and moreover, may only see that it instigates an onerous bureaucratic investigation.[27,28]

In our study, there were no PD or program factors consistently associated with resident-PD alignment. Although we hypothesized that PDs of smaller programs would be more attuned to resident experiences, or that female PDs would be more aware of gender discrimination or sexual harassment, no such associations were clearly observed. Additionally, while our gender-stratified Spearman rho's analysis demonstrated a few moderate correlations (female PDs with burnout and racial and/or ethnic discrimination, male PDs with thoughts of attrition), gender was not associated with any resident-reported outcome on multivariable analysis. In total, our findings indicate that accuracy in perception is challenging and not mitigated by any particular identity or program attribute; as such, programs must continue to endeavor to create the mechanisms and environment to encourage resident disclosure to arm their PDs with the information needed to intervene and help.

These data should be interpreted in context of several limitations. First, survey item question stems differed, which may explain differences between residents and PDs in reporting mistreatment. These differences in question stems were necessary due to the differences in audience (i.e., PDs cannot be expected to know their residents' experience with the same level of granularity as the residents themselves): for example, PDs were asked about "sexual harassment" generally, and residents were asked about specific behaviors that comprise sexual harassment such as "inappropriate touching"). Given the attention to mistreatment and well-being in the medical and surgical education literature and by the ACGME Common Core Requirements, we expect that PDs are

TABLE 4. PD and Program Characteristics Associated with Resident-PD Alignment on Mistreatment and Well-Being

	Burnout OR (95% CI)	Attrition OR (95% CI)	Suicidality OR (95% CI)	Bullying OR (95% CI)	Racial/Ethnic Discrimination OR (95% CI)	Gender Discrimination OR (95% CI)	Sexual Harassment OR (95% CI)
Program Size							
1-25	-	-	-	-	-	-	-
26-36	0.60 (0.26-1.27)	1.18 (0.54-2.60)	1.29 (0.60-2.78)	1.89 (0.87-4.15)	2.10 (0.95-4.61)	2.13 (0.97-4.68)	2.70* (1.15-6.35)
37-50	0.75 (0.29-1.85)	0.76 (0.30-1.96)	1.82 (0.72-4.62)	2.85* (1.08-7.53)	0.93 (0.36-2.37)	2.63 (0.92-6.92)	4.37* (1.48-12.89)
51+	0.47 (0.15-1.39)	1.35 (0.44-4.21)	1.93 (0.66-5.66)	2.74 (0.89-8.48)	3.50* (1.14-10.63)	2.86 (0.92-8.84)	2.97 (0.92-9.61)
Location							
Northeast	-	-	-	-	-	-	-
Southeast	0.54 (0.25-1.25)	0.67 (0.31-1.47)	1.17 (0.55-2.51)	1.17 (0.54-2.53)	1.75 (0.80-3.86)	0.83 (0.38-1.81)	0.48 (0.21-1.08)
Midwest	0.98 (0.45-2.04)	1.29 (0.59-2.85)	1.94 (0.91-4.15)	1.53 (0.70-3.31)	3.13 (1.39-6.84)	1.04 (0.48-2.24)	1.88 (0.82-4.28)
Southwest	0.82 (0.31-2.17)	1.57 (0.53-4.63)	1.49 (0.57-3.92)	3.82* (1.23-11.81)	1.44 (0.54-3.86)	2.26 (0.76-6.69)	2.40 (0.80-7.20)
West	1.13 (0.48-3.09)	0.68 (0.27-1.69)	2.35 (0.92-6.01)	1.57 (0.61-4.04)	1.55 (0.61-3.93)	0.52 (0.21-1.33)	1.09 (0.42-2.82)
Program Type							
University	-	-	-	-	-	-	-
Community/Military	0.84 (0.39-1.79)	0.84 (0.39-1.82)	1.51 (0.71-3.21)	1.40 (0.64-3.09)	1.91(0.88-4.13)	1.40 (0.63-3.07)	2.84* (1.20-6.74)
Chair Gender							
Male	-	-	-	-	-	-	-
Female	1.70 (0.65-4.43)	0.89 (0.33-2.36)	0.97 (0.37-2.52)	0.94 (0.35-2.53)	1.06 (0.40-2.76)	2.21 (0.78-6.32)	1.37 (0.50-3.75)
PD Gender							
Male	-	-	-	-	-	-	-
Female	0.64 (0.32-1.27)	0.51 (0.26-1.01)	0.82 (0.42-1.60)	1.63 (0.81-3.29)	0.57 (0.28-1.13)	0.79 (0.40-1.56)	1.27 (0.62-2.59)
% Non-White Faculty	1.00 (0.98-1.02)	1.01 (0.99-1.03)	1.01 (0.99-1.03)	1.00 (0.98-1.02)	1.00 (0.98-1.02)	1.00 (0.98-1.02)	1.03 (1.00-1.05)
% Non-White Residents	1.00 (0.98-1.02)	0.99 (0.97-1.00)	0.99 (0.98-1.01)	1.00 (0.98-1.02)	1.00 (0.98-1.02)	1.00 (0.98-1.01)	0.98 (0.96-1.00)
% Female Residents	1.01 (0.98-1.04)	1.02 (0.99-1.06)	1.00 (0.98-1.02)	0.99 (0.97-1.04)	1.01 (0.98-1.03)	1.02 (0.99-1.04)	1.00 (0.98-1.03)
% Female Faculty	1.01 (0.98-1.04)	1.02 (0.96-1.02)	1.01 (0.99-1.05)	1.00 (0.97-1.04)	1.01 (0.98-1.04)	0.99 (0.97-1.03)	0.95* (0.92-0.99)
% Residents with Children	1.00 (0.96-1.03)	0.99 (0.95-6.84)	1.00 (0.96-1.03)	1.00 (0.97-1.04)	0.97 (0.94-1.00)	1.00 (0.97-1.03)	1.01 (0.98-1.05)

Alignment was defined as:
(1) a PD agreeing/strongly agreeing that an issue was a problem in their program and their program ranking in the worst quartile for that metric
(2) a PD disagreeing/strongly disagreeing that an issue was a problem at their program and their program ranking in the best 2 quartiles for that metric
*indicates $p < 0.05$

familiar with concepts such as "burnout," "suicidality," "discrimination," or "sexual harassment," even without the specific examples provided to residents. Additionally, our definition of concordance allowed for absolute discrepancies between PD perceptions and resident reports: (1) A high Spearman's correlation is possible even with large absolute differences if the variables are monotonically related; nevertheless, our analysis determined no or weak relationships, and (2) We defined "alignment" generously to bias in favor of PD perceptiveness: the third quartile of resident data was excluded from the alignment analysis in order to be conservative (i.e., we did not expect program directors to recognize that their programs were only slightly above average on any measure). Second, the response rates were incomplete (ABSITE survey 85.6%, PD survey 93.4%), thus raising concerns for potential non-response bias. However, these response rates are quite high for a physician survey.[29] Moreover, non-response would be expected to bias our estimates in the conservative direction (i.e., more engaged PDs would be more likely to be aligned with their residents' experiences and also more likely to respond to the survey).[29] Third, the ABSITE and PD surveys were not administered contemporaneously; however, burnout, suicidality, and well-being are largely stable concepts that are not sensitive to transient situational changes.[30-35] Fourth, all survey studies are subject to recall bias. The survey is administered after a long and potentially stressful examination. However, while prior analysis of our data did demonstrate an association between examination performance and emotion expressed during the survey, there was no association between examination performance and reports of mistreatment, burnout, thoughts of attrition, and suicidality. Moreover, the association between mistreatment and poor well-being persisted after controlling for both examination performance and emotion.[36]

Despite the recent focus, there is evidence that resident well-being is declining.[37] We believe that significant investment in the development and implementation of methods to reduce mistreatment, burnout, attrition, and suicidality is warranted. In order to effectively intervene, we must first accurately diagnose these issues. To encourage reporting, PDs may consider the overwhelming stigma that prevents residents from help-seeking for either mistreatment or poor well-being; in the face of this powerful disincentive, continual reiteration of their desire to help residents with mistreatment and poor well-being and public acknowledgments of help-seeking as an adaptive behavior may be necessary. Finally, PDs play an integral but not the only role; the entire system must work to reduce mistreatment. The department and institution must recognize the need for developing policies and procedures for transparently investigating and meaningfully resolving reports of mistreatment. Processes for help-seeking and/or reporting mistreatment that do not involve program leadership or others in evaluative positions may be beneficial. For example, institutional ombudspersons may be trained to provide impartial support and guidance for those considering reporting mistreatment. Some surgical departments have developed professionalism committees to internally review and address reports of mistreatment.

The SECOND Trial Learning Environment and Resident Well-Being Report provides intervention arm programs with their comparative performance on various metrics, including resident mistreatment, burnout, thoughts of attrition, and suicidality. The SECOND Trial Wellness Toolkit collates solutions implemented at programs around the country. In so doing, we seek to fill the awareness gap indicated by the present data and assist surgical educators, program leadership, departments, and institutions in developing the processes and cultures that encourage disclosure and help-seeking.

CONCLUSIONS

Resident and PD perceptions were generally disparate regarding mistreatment, burnout, thoughts of attrition, and suicidality. Reconciling this discrepancy is critical to enacting meaningful change to improve the learning environment and resident well-being. Detailed, benchmarked data on residents' experiences may help improve PDs' recognition and ability to intervene on these important components of the resident training experience.

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Muffins and Meditation: Combatting Burnout in Surgical Residents

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OBJECTIVE: To quantify the prevalence of burnout in our surgical residency program and to assess the impact of a weekly wellness program for surgical residents through validated tools measuring mindfulness, self-compassion, flourishing, and burnout. Our hypothesis was that participants with more frequent attendance would: (1) be more mindful and self-compassionate and (2) experience less burnout and more flourishing.

DESIGN: An optional one-hour weekly breakfast conference was facilitated by a senior surgical faculty member with the time protected from all clinical duties. Following a guided meditation, participants were given time for reflection and dialogue about their training experiences or led in a wellness exercise. TRANCE (tolerance, respect, anonymity, nonretaliation, compassion, egalitarianism) principles were utilized to create a safe and open environment. Residents were surveyed at the end of the study period, which was from March 2017 through June 2018.

SETTING: The conference and data analysis was conducted at Denver Health Medical Center, affiliated with the University of Colorado School of Medicine.

PARTICIPANTS: This study analyzed survey responses from 85 surgical residents.

RESULTS: Following the wellness program, when answering the 2-question Maslach Burnout Inventory, 35.7% of residents reported feeling burned out by their work once a week or more, and 29.7% reported feeling more callous toward people once a week or more. After multivariate analysis, the only independent predictors of increased burnout were "not being married or in a committed relationship," lower positive affect, and higher negative affect. Written feedback was overwhelmingly positive, and residents expressed gratitude for the conference, the opportunity for self-reflection, and open dialogue with attendings and colleagues.

CONCLUSIONS: The prevalence of burnout is high among surgical residents. Allowing time to practice a mindfulness meditation while providing space for residents to share their experiences may be protective, and efforts should be made to reduce barriers to participation. (J Surg Ed 000:1−9. © 2022 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: general surgery, burnout, graduate medical education, quality of life, resident education

COMPETENCIES: Professionalism, Interpersonal and Communication Skills, Systems-Based Practice

INTRODUCTION

Burnout is a work-related syndrome characterized by emotional exhaustion, depersonalization, and a sense of ineffectiveness.[1] In the last decade, the prevalence of burnout among U.S. physicians has remained at or near 50%.[2] Specifically, burnout is more common in physicians than in other working U.S. adults, with those in "front-line" care specialties at the highest risk.[3]

Burnout is recognized as a public health crisis owing to its deleterious effects not only on individual physicians but also on healthcare systems and therefore on patients.[1] A 2019 meta-analysis found an association between physician burnout and lower-quality care, and the estimated economic cost of physician burnout exceeds $4 billion annually.[4,5] Recent national surveys

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of US general surgery residents report burnout rates between 38.5% and 69%, with higher burnout rates among women than men.[6,7] A 2019 nationwide survey of residents at 301 US general surgery residency programs identified a burnout rate of 43.0%, and found independent associations between burnout and workplace environment factors such as workload, social support, mistreatment, and meaning in work.[8] Another survey showed that 85% of surgery residents were satisfied with their job, but 15.3% had considered leaving their program within the previous year.[9] At a single institution, a survey using a validated burnout inventory found a 93% rate of burnout, with the highest rates of burnout in senior residents.[10] However, burnout seems to start as early as the first year of training, as demonstrated by a survey which showed that 28% of interns experienced emotional exhaustion and depersonalization, both of which are signs of burnout.[11]

Given the high prevalence of burnout, especially among surgical trainees, exploring factors that mitigate burnout is an academic imperative. Burnout is complex and has multifactorial causes, including workplace environment, other life stressors, and personal predisposition.[12] Institutional factors including unwieldy electronic health record systems, increasing time spent on clerical tasks, and administrative burdens each have proven associations with burnout.[13-15] A study assessing the effect of the 80-hour work-week restrictions on surgery residents did not find significant differences in measures of burnout, including emotional exhaustion and depersonalization, despite a work week that was 18 hours shorter, on average, than before the hours restriction.[16]

Various approaches to mitigating burnout in surgical residents are currently underway, many of which focus on mindfulness and wellness. In a 2017 study, dispositional mindfulness was significantly associated with lower risk of burnout, stress, anxiety, suicidal ideation, and depression.[17] Formal analysis of the attitudes and habits of surgeons at a large academic center suggests that beyond protecting against burnout, active mindfulness and self-reflection may help surgeons provide more humanistic care and overcome challenges.[18] Given its nuanced nature, factors that mitigate burnout are likely different for each individual and include improvements in practice setting by enhancing hospital system effectiveness and staff relationships, increased physical and mental wellness activities, mentoring, and support outside of work.[19,20]

Finally, the value of teaching non-traditional and wellness-oriented topics to surgical residents is well-documented.[21,22] Prior to this study, our institution did not have a dedicated environment for "safe-space" conversations or time set aside to focus on resident wellbeing.

This study was designed to assess the effect of a weekly mindfulness practice and wellness conference on residents in an academic general surgery program through validated tools measuring mindfulness, self-compassion, flourishing, and burnout. Our hypotheses were that participants with more frequent attendance at the conference (1) will be more mindful and self-compassionate and (2) would experience less burnout and more flourishing compared to participants with lower attendance rates.

MATERIAL AND METHODS

In a general surgery program with 10 categorical residents per year, a one-hour weekly breakfast conference was developed and facilitated by a senior surgical faculty mentor who was trained in meditation and mindfulness skills. The conference was optional, open to all surgical residents, and the time was protected from clinical duties. Residents were encouraged to attend via regular departmental communications and by an announcement at a required morning report which immediately preceded the conference. Attending faculty were educated on the conference and agreed that residents would not have conflicting clinical duties. The site for the study conference also had weekly Morbidity and Mortality conferences, a daily Morning Report, and a weekly hour of didactics at the university teaching hospital. The study conference was added to a day when no other didactics or conferences were scheduled, and the time selected for weekly conferences was based on operative schedules to allow for the least conflict between the conference and cases. The conference took place from March 2017 through June 2018. All conferences were in-person and were offered at a single site. A safe environment was created at the beginning of each conference through a review of guiding principles: Tolerance of opinion/belief, Respect, Anonymity, Non-retaliation, Compassion, and Egalitarianism with respect to station and position (TRANCE).

The sessions began with mindfulness instruction, followed by a 10-minute silent meditation. Subsequently, there was a facilitated discussion of a professional development topic, a guest speaker, or participation in a predefined wellness exercise (Fig. 1). Facilitated discussion topics included those regarding professional development (negotiating contracts, medical staff structure, peer review, credentialing, and practice settings), in addition to those explicitly focused on personal and professional wellness, including burnout, adverse outcomes, substance abuse, and depression/suicide. The topics were decided upon by consensus with administrative chief residents at the time of conference inception.

7:00—7:05	Create a safe and confidential environment with TRANCE principles	**T**olerance – of differences in beliefs or opinions **R**espect – for the lived experiences of others **A**nonymity – for the persons and conversations involved **N**on-retaliation – zero tolerance principle **C**ompassion – caring and a desire to help **E**galitarianism – with respect to station and position
7:05—7:15	Mindful meditation	Residents were guided in **10 minutes of silent meditation**. They practiced drawing attention to a single focus, **recognizing distractions, and returning to that focus.**
7:15—7:30	Topic or speaker presentation	Faculty-led Topics: • Personal and professional goal setting • Marriage, relationships, children • Self-care – hobbies, health, mindfulness • Substance abuse, depression, and suicide • Post traumatic event care, adverse outcomes • First jobs, contracts, malpractice, litigation Resident-driven Topics: • Political climate and current affairs • Dealing with ideological differences at work • Difficult conversations with patients and families Outside Speakers: • Family members • Patients • Palliative care team members • Community surgeons • Surgical sub-specialists • Primary care / referring physicians
7:30—8:00	Roundtable discussion	Time was allotted for discussion related to the conference topic. Senior faculty facilitated discussion by using structured questions while allowing space for residents to bring up other issues they wished to address.

FIGURE 1. Conference schedule, TRANCE principles, and curriculum.

Given the potential for such topics to cause distress among residents, the facilitator was prepared to debrief with individuals following the conference, and to make referrals for additional support or counseling if indicated. A small number of residents were referred to the program director and to resident counseling. Residents were surveyed through REDCap at the end of the study period, using the following validated tools: 2-question Maslach Burnout Inventory (MBI), Cognitive and Affective Mindfulness Scale (CAMS-R), Positive and Negative Affect Scale (PANAS), and Self-Compassion Scale (SCS-SF).

Respondents were categorized as burned out or not burned out, depending on their responses to the 2-question MBI.[23] Burnout was defined as a response of 4, 5, or 6 in either question of the MBI, which corresponds to feelings of burnout or callousness once a week or more frequently. Flourishing ratio measures the ratio of positive to negative affect scores (positive-PANAS/negative-PANAS). For analysis, flourishing ratio was dichotomized into categories of >2.9 and ≤ 2.9 based on the critical positivity ratio, where subjects in the ≤ 2.9 range were considered "languishing," while those above 2.9 were considered "flourishing."[24] The CAMS-R Scale measures attention, present-focus, awareness, and acceptance, and the SCS-SF scale measures self-kindness vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over-identification.[25, 26] The mean CAMS-R score was 34.11 among studied participants in the development of the tool.[25] The SCS-SF is primarily used for comparison within groups, though its developers have put forth a tentative rubric classifying self-compassion scores of 1.0 to 2.49 as low, 2.50 to 3.50 as moderate, and 3.51 to 5.0 as high.[26]

Categorical variables were compared using Chi-square or Fisher Exact tests as appropriate, while numerical variables were analyzed by linear regression. Trends were assessed by the Chi-square test for trends. Multiple linear regression was used to adjust numerical variables for confounders, with the model fit assessed by r-square. Correlations were assessed using the Spearman Rho test. Multivariate logistic regression or generalized linear models were used to adjust categorical outcomes for

confounders. Effect size was expressed as odds ratios (OR) with 95% confidence intervals. Variables with $p < 0.20$ in univariate were included in the models and stepwise selection was used to define significant predictors. Model discrimination was assessed using the area under the receiver-operating-characteristics curves (ROC) with 95% confidence intervals whereas the calibration was assessed via Hosmer-Lemeshow statistics, for which higher p-values indicate better fit. All tests were two-tailed with significance declared at $p < 0.05$.

RESULTS

Demographics

Overall, 77% of general surgery residents responded to the survey (N = 85). Most respondents were categorical residents (75.0%), male (61.2%), White non-Latino (72.9%), 26-35 years old (90.6%), married or in a committed relationship (58.8%) and did not have children (76.5%). Demographic data of survey respondents can be seen in Table 1.

Of the survey respondents, 71 (83.5%) reported having attended at least one conference, and 56 (65.9%) had attended a conference in the six months prior to taking the survey (Table 2).

Incidence of Burnout

When answering the two-question MBI, 35.7% of residents reported feeling burned out by their work once a week or more, and 29.7% reported feeling more callous toward people once a week or more. Increased time since last session attended was correlated with increased callousness (Spearman Rho = 0.23907; p = 0.0285). PGY level, when analyzed as a continuous variable, was negatively correlated with burnout (Spearman Rho = −0.266667, p = 0.0142).

On univariate analysis, there were marginally significant trends toward lower burnout incidence with more sessions attended (p = 0.09) and older age (p = 0.07). Participants who were married/in a committed relationship (p = 0.003), had children (p = 0.03) and had more years of training (p = 0.03) also had a significantly lower likelihood of presenting with burnout. There were no associations between burnout and gender, racial/ethnic minority status, position type (categorical vs. preliminary), or recency of last attended conference (Fig. 2). After multivariate analysis, the only independent predictors of increased burnout were "not being married or in a committed relationship" (OR: 5.35; 95%CI: 1.73-16.52), lower positive-PANAS (OR 0.88; 95% CI:0.82-0.94) and higher negative-PANAS (OR 1.10; 95%CI: 1.004-1.20). The model had good calibration (Hosmer-

TABLE 1. Demographic Data of Survey Respondents (N = 85)

Variable	N (%)
Position type*	
Categorical	63 (74.1)
Preliminary	21 (24.7)
Gender	
Male	52 (61.2)
Female	32 (37.6)
Prefer not to answer	1 (1.2)
Race/Ethnicity	
White non-Latinx	62 (72.9)
Asian	9 (10.6)
Latinx	5 (5.9)
Black/African American non-Latinx	4 (4.7)
Pacific Islander	1 (1.2)
Other	1 (1.2)
Prefer not to answer	3 (3.5)
Age Range (years)	
20-25	1 (1.2)
26-30	37 (43.5)
31-35	40 (47.1)
36-40	6 (7.1)
>41	1 (1.2)
PGY Level	
1	22 (25.9)
2	17 (20.0)
3	14 (16.5)
4	14 (16.5)
5	9 (10.6)
6	3 (3.5)
7	6 (7.1)
Relationship Status	
Single, never married	33 (38.8)
Single, divorced	2 (2.4)
Currently married or in a committed relationship	50 (58.8)
Parental Status	
No current children	65 (76.5)
Current children	20 (23.5)

*One respondent did not answer this question
PGY: postgraduate year

TABLE 2. Session Attendance (N = 85)

Variable	N (%)
Time since last session attended	
<1 month	14 (16.5)
1-2 months	17 (20.0)
3-4 months	16 (18.8)
5-6 months	9 (10.6)
>6 months	21 (24.7)
Never attended	8 (9.4)
Number of sessions attended in past 12 months	
0	14 (16.5)
1-3	19 (22.4)
4-6	20 (23.5)
7-9	16 (18.8)
>9	16 (18.8)

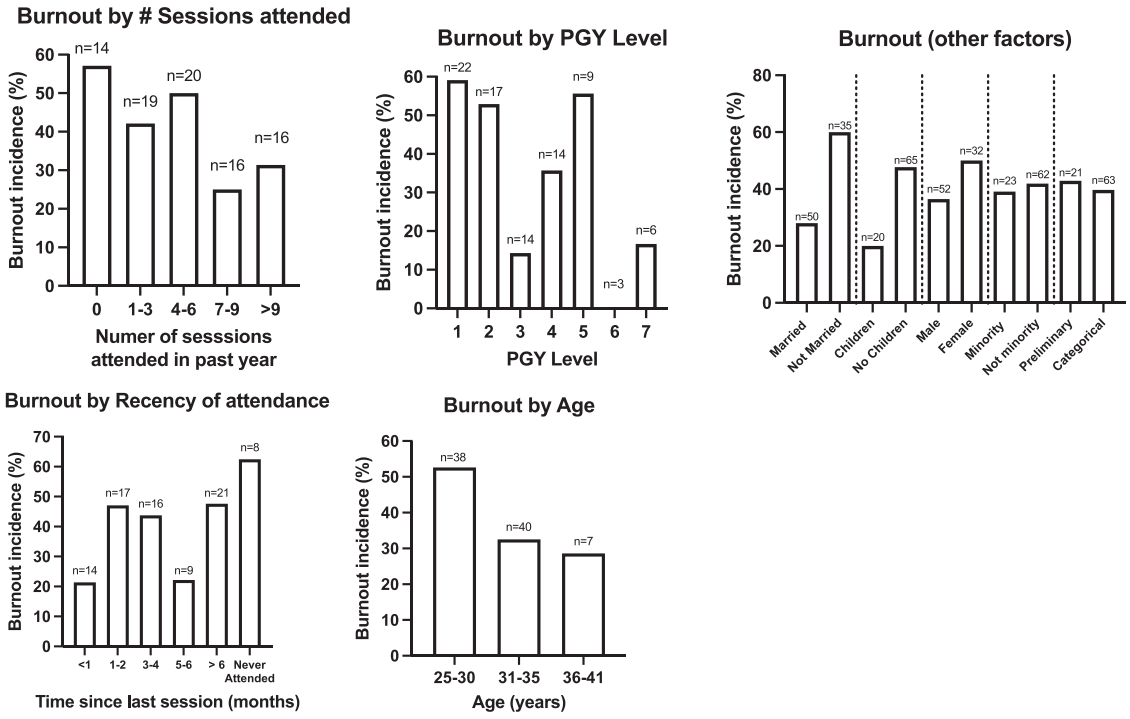

FIGURE 2. Burnout, defined as score of 4, 5 or 6 on either of the two MBI questions.

Lemeshow statistics p = 0.37, for which higher p-values indicate better model fit) and discrimination (AUROC = 0.85, 95% CI 0.76-0.93).

Flourishing Ratio (FR)

Of the 84 respondents (one resident did not answer this question), only 19 (22.6%) had a flourishing ratio of >2.9 (High-FR). When increased time since last conference attendance was analyzed as a continuous variable, it was negatively associated with FR (Spearman Rho = −0.24379, p = 0.0254). There was no significant trend of High-FR and weeks since last session attended (Chi-square for trend, p = 0.39) nor with number of sessions attended (Chi-square for trend, p = 0.21). Male gender was significantly associated with a higher flourishing ratio (2.3 score for male respondents vs. 2.0 score for female respondents, p = 0.03). In the dichotomized analysis, 28.8% of male residents reported that they were flourishing, whereas only 12.9% of female residents reported flourishing (p = 0.0945). Percentage of respondents flourishing also increased with age (p = 0.0487; Fig. 3).

There were no associations between flourishing ratio and minority status, PGY level, position type, relationship status, or having children.

Self-Compassion Score (SCS)

There were no significant differences in mean SCS in the following categories: minority status, relationship status, children, or type of position. Male gender was

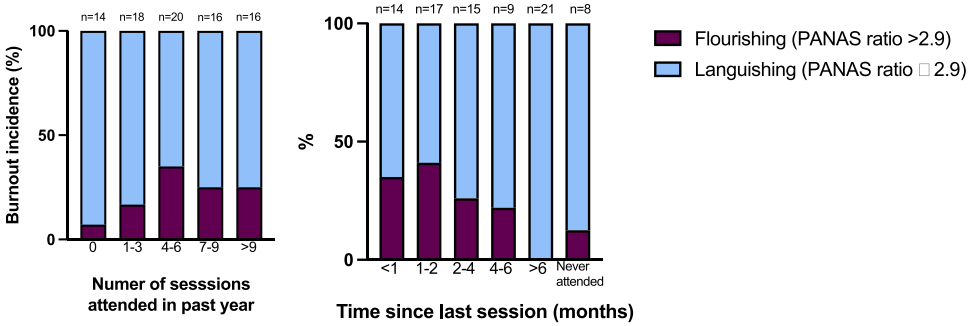

FIGURE 3. Flourishing.

- "… Very useful to discuss topics that are generally thought to be 'not enough time to discuss' ... Creates a good relationship and *open dialogue with attending*… Shows a real desire and care that our program is committed to our well-being and development. Is a good stress management tool."
- "… Calming and energizing experience. Discussing motivation/intent *humanizes what we are doing*- think it also builds camaraderie with colleagues. Reflecting and taking moment to think about what we are doing *helps build resilience*."
- "This conference provides a time for mental relaxation and strengthening … *the effect it has had on my mental well-being is already obvious*."
- "I find this conference to be a breath of fresh air... It gives us a *chance to self-reflect*, to deal with the graveyard of skeletons and to grow in both a professional/personal level."
- "… these conferences are an important deliberate act toward our wellness, and *I wish there was more time for them*."
- "I look forward to this meeting every week... *I've become more aware of my surroundings and my actions*. Especially the result of my actions."
- "The meditation time did make me feel less stressed during the day. It was a *good way to reset* after hectic morning rounding prior to starting an operation."
- "Meeting is the only time we have to academically discuss the big picture stuff that either affects actual patient care or our ability to provide it. Plenty of discussion of the physiology of this or the operative repair of that, but no discussion of *how it makes us feel to be doing what we do."*

FIGURE 4. Feedback from resident survey.

significantly associated with higher self-compassion. Mean SCS for male residents was 3.3 compared to 3.0 for females ($p = 0.03$). There was no significant change in mean SCS with session attendance (≥1 session vs. no sessions), and there was no correlation between the number of sessions attended or time since attendance and SCS.

Cognitive and Affective Mindfulness Scale - Revised (CAMS-R)

Higher PGY level was correlated with an increased CAMS-R score (Spearman Rho = 0.23306, $p = 0.0329$). There was no association between number of sessions attended or time since last session and CAMS-R. There were no significant associations of the CAMS-R score with the following variables: gender, age, relationship status, having children, PGY status, or being a categorical/preliminary resident (all $p > 0.15$).

Feedback from Resident Survey

Feedback obtained from the comment field on the resident survey was overwhelmingly positive (Fig. 4). Common themes emerged, including gratitude for the conference, the opportunity for self-reflection, and open dialogue with attendings and colleagues.

DISCUSSION

The primary aim of this study was to analyze the effect of an optional weekly mindfulness practice and wellness conference on residents in an academic general surgery program through validated tools measuring mindfulness, self-compassion, flourishing, and burnout. In the year prior to filling out the survey, 83.5% of residents attended at least one conference. This proportion of residents who elected to attend, taken together with the positive resident feedback, indicates that limited attendance may be the result of logistical obstacles rather than lack of enthusiasm for the conference.

When time since last attended was analyzed as a continuous variable, we identified a significant negative correlation with flourishing ratio and a significant positive correlation with the MBI callousness score. This suggests that the longer it has been since a resident has had a formal, protected "safe-space" for discussion, the more callous they become and the less likely they are to be flourishing. Our study did not identify significant differences in burnout based on gender, which is not consistent with prior studies which show higher rates of burnout among women, though female residents in this study did have lower flourishing and SCS scores compared to males.[6,7] These correlations did not persist on multivariate analysis, and we also did not identify an

independent association between number of conferences attended or recency of last attended conference and SCS or CAMS-R score. Though not statistically significant, residents who never attended any of the conferences had the highest rates of burnout and the worst flourishing scores, which suggests that any conference attendance, albeit limited, may improve wellbeing. Further study is required to determine if there is an optimal number of attended conferences to achieve maximum benefit, as our findings indicate that there may be a point of diminishing returns after 4 to 6 sessions (Fig. 3).

Studies have shown that more frequent participation in mindfulness-based stress reduction (MBSR) improves measures such as mindfulness and self-compassion.[27] Requiring attendance is one approach to increasing resident participation, however, we believe that the voluntary nature of this conference was essential and that adding mandatory wellness programs to the already busy schedules of residents is likely counterproductive. Modification of the program to include mindfulness skills which are meant to be practiced outside of the conference setting may also increase indices of flourishing and mindfulness and decrease prevalence of burnout.

Higher PGY level was associated with lower burnout rates on Chi-square univariate analysis, as well as lower burnout rates and higher CAMS-R score on Spearman correlation analysis. This finding suggests that wellness initiatives such as ours aimed at lower PGY level residents may be more impactful. We propose that at our institution, the lower rates of burnout in senior residents may be due to fewer non-operative call responsibilities and more time to adjust to the demands of residency while refining coping skills. The lower rates of burnout observed in PGY3 residents may be partly attributable to the higher proportion of PGY3 residents who are in the research years of their residency. Our conference was available to clinical and research residents alike, and not all residents complete their research years on the same schedule, which is why we did not segregate out specific PGY level respondents.

On multivariate analysis, the sole independent predictor of burnout was not being married or in a committed relationship. This is also consistent with other studies showing that residents who are single are most likely to experience burnout. A better understanding of the factors involved in the protective nature of a committed relationship may allow for additional curriculum content directed to providing support specific to those who are not in such a relationship.

We would like to emphasize that our survey results provided observational evidence of the value this conference holds for residents. Nearly all the comments indicate that residents appreciated having protected time for reflection and discussion, and that they viewed the conference as evidence that their program leadership cared about their well-being.

We suggest several reasons why we did not detect more robust associations between conference attendance and the outcome measures. There are inherent limitations to quantifying outcomes based on survey results. As answers were self-reported, recall bias may have influenced responses. It is possible that the conference could have had an impact on other nuanced factors, such as interpersonal relationships with peers and faculty or success within the residency program, but the validated tools selected for outcome measurement do not capture such results. Our study design could not account for self-selection toward burnout tendencies — those who may be more predisposed to burnout may have attended more conferences, or vice versa. Additionally, it is possible that choosing to attend a conference more regularly is a marker of individuals who already prioritize their own wellbeing. The retrospective study design also limits the ability to compare our data with resident wellbeing prior to the intervention.

Additionally, the limited sample size and the challenges to repeated conference attendance raise the possibility of a Type II error. Even residents with the highest attendance rates attended only about 13% of the total number of conferences. Thus, it is possible that with higher attendance, the conference could have been effective in reducing burnout and improving flourishing ratio, but the rates of attendance in this study were too low to achieve significant benefit. Individual variations in attendance frequency and time between conferences can be attributed, at least in part, to the single-site, in-person nature of the conference. Only about 25% of the residents in the program rotated at the conference site at any given time, and rotations were 28 days long. Many residents attended regularly while rotating at the conference site and stopped attending when they switched to another clinical site. The number of residents who were on-site changed with each conference day because residents rotate on and off service at different times depending on their PGY level, limiting the ability to accurately report the proportion of on-site attendance. This study is also limited by a lack of data on specific barriers to conference attendance that residents may have faced.

These data were collected prior to the COVID-19 pandemic, which has ushered in expanded virtual and remote communications. Creating a virtual conference option could improve attendance for residents who are rotating off-site, though this must be balanced against the loss of shared in-person experience.

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Hardship and Humanity: A Closer Qualitative Look at Surgical Training and Its Effects on Trainees From the Perspectives of Loved Ones

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Objective: The aim of this study was to obtain novel perspectives regarding the effects that surgical training has on the well-being of trainees.

Summary Background Data: Improving trainee well-being is a national concern given high rates of burnout, depression, and suicide among physicians. Supporters of surgical trainees may offer new perspectives regarding the effects of surgical training and point to strategies to optimize trainee wellness.

Methods: This qualitative study employs semi-structured interviews of 32 support persons of trainees at a single tertiary care center with multiple surgical training programs. Interviews focused on perspectives related to supporting a surgical trainee. Interview transcripts underwent qualitative analysis with semantic and conceptual coding. Themes related to effects of training on trainee wellness are reported.

Results: Four themes were identified: Who Can Endure the Most Hardship?—trainee attributes and programmatic factors contribute to trainees feeling the need to constantly endure the most hardship; Consequences of Hardship—constantly enduring hardships has significant negative effects on wellness; Trainees are Humans—trainees are people with basic human needs, especially the need for worth; Research Time as Refuge—dedicated research time is treated as an oasis away from clinical hardships.

Conclusions: Perspectives from support persons can offer valuable insight into the wellness needs of surgical trainees. According to support persons, surgical training profoundly negatively impacts trainee wellness. Unlike during clinical training, dedicated research time is a period during which wellness can be prioritized. Programs should provide greater attention to mitigating the negative ramifications of surgical training and promoting wellness in a longitudinal fashion throughout training.

Keywords: loved ones, surgical training, well-being, wellness

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Throughout the United States, there are alarming rates of burnout among trainee physicians, including surgical trainees. Approximately, 40% to 69% of surgical residents meet criteria for burnout on at least 1 subscale of the Maslach Burnout Inventory with particularly high levels of emotional exhaustion and symptoms of depersonalization.[1–6] In 1 study, almost half of surgical residents also met criteria for poor psychiatric well-being.[6] These troubling findings have sparked interest in assessing work-hour restrictions and alternative duty-hour structures as a way to improve trainee well-being without compromising patient care.[7,8] A growing awareness of this issue has also prompted other studies to evaluate strategies for optimizing trainee wellness.[9–11]

Unfortunately, trainee well-being remains a complex, poorly understood topic. Competing forces can make it difficult for trainees to be honest regarding concerns surrounding their wellness, thereby hindering the understanding of how surgical training affects their well-being. For example, honest reporting of duty-hour violations may be dampened due to fear of potential repercussions, including those from the Accreditation Council for Graduate Medical Education.[12] Similarly, others have found that residents are more likely to be deceptive if they anticipate ridicule or embarrassment from attendings.[13] A resident's willingness to report adverse events has also been shown to be predicted by the perceived level of psychological safety, the belief that one can speak up without fear of punishment or judgment.[14,15] These forces may alter how trainees self-report on measures of wellness, especially when real concerns exist. Therefore, obtaining perspectives on trainee well-being from individuals who are free of such forces, such as the loved ones of those who support trainees (eg, parents, spouses, and so on), may provide new insight into trainee well-being and offer potential strategies for improving wellness and life satisfaction.

In this study, we sought to better understand the effects of surgical training on trainee wellness from the perspectives of those who primarily support them. To our knowledge, there are no studies which have reported on surgical trainee wellness through the lens of this group. By employing a qualitative approach, we believed that these perspectives would complement existing conceptual frameworks on clinician wellness and enrich our understanding around the external and internal factors that affect trainee well-being.[16]

METHODS

Study Design

This exploratory qualitative study was designed to obtain the perspectives of support persons of surgical trainees. The techniques used in this study have also been previously described in detail.[17] This study was conducted between March and May 2020 at a tertiary midwestern allopathic academic medical center with Institutional Review Board (HUM# 00174983) approval.

Interview Participants

A convenience sample of support persons was identified.[18] Surgical trainees from nine surgical programs (general surgery, neurosurgery, oral maxillofacial surgery, otolaryngology, pediatric surgery, plastic surgery, thoracic surgery, transplant surgery, and urology) were first emailed details of the study regarding the purpose, interview process, transcription process, and analysis. If comfortable with the study, trainees provided contact information of someone they considered a ''support person'' who might be interested in participating. The definition of a ''support person'' or someone whom the trainee significantly relied upon was left to the interpretation of the trainee. Identified individuals were then contacted to discuss the study and scheduled an interview if interested. All participating support persons received a $25 gift card following the interview.

Interview Procedures

A semi-structured interview was first developed by M.K. a general surgery resident, and G.S. an expert qualitative researcher. The initial guide was then reviewed by a group of qualitative experts. A finalized guide, which has been previously published, was then created using feedback from this group and is provided in Supplemental Table 1, http://links.lww.com/SLA/D463.[17] After obtaining consent, 1 expert qualitative researcher (J.E.) conducted one-on-one in-person or telephone 60-minute interviews with participants at times and locations convenient for them.[17] Importantly, J.E. is a qualitative researcher who has limited interactions with residents, no supervisory or assessment role, and no association with any of the participants. In line with qualitative techniques, iterative alterations to the interview guide were made to explore themes most important to participants. Later-stage interviews were conducted via telephone due to COVID-19 restrictions. All interviews were audio-recorded, transcribed verbatim, and de-identified. Some participants shared additional thoughts and information via email post-interview, which were included in the final analysis. All participants completed a Qualtrics (Provo, Utah) pre-interview survey to obtain participant demographics (sex, age, ethnicity/race, and relationship to trainee) and details about the associated trainee (surgical program, post-graduate level, and parental status).[17]

Precautionary measures were taken to ensure external and internal confidentiality given the sensitive nature of the collected information. Measures included the provision of pseudonyms and quality assessment to confirm accuracy and de-identification. Member-checking was also performed by allowing participants to review and approve use of pseudonyms and discrete data used. As an added layer of confidentiality, participants who provided approval for discrete data were also asked if they would be comfortable obtaining approval from the associated trainee. Only representative data that has been approved by both participant and the associated trainee were included in this article.[17,19]

Qualitative Analysis

Data management and structuring were conducted in NVivo12 (QSR Software, Burlington, MA).[20] Thematic analysis was the qualitative methodological approach used to capture the experiential and interpretative realities of the participants.[21,22] The analysis was conducted by 3 members of the research team, a behavioral researcher (J.E.), a general surgery resident (M.K.), and a surgical education faculty member (G.S.). Transcripts were initially coded for semantic and conceptual data by 1 of 2 researchers (J.E. and M.K.).[23] Principles of reflexivity were used by the research team to guard against methodological error and the influence of personal perceptions.[24] The codebook was finalized by consensus with divergent codes discussed until agreement was reached (J.E. and M.K.). Inductive reasoning was used by the research team (J.E., M.K., and G.S.) to sort codes and identify patterns, clustering codes into themes and subthemes. Themes specific to participant perspectives on trainee experiences were separated from those describing direct experiences of support persons. Themes specific to trainees' experiences were incorporated into this manuscript. Transcripts were then reviewed again post development of codes, themes, and subthemes to confirm that the results were supported by the data (J.E. and M.K.).

RESULTS

This study included interviews of 32 support persons (1 trainee per participant). Participant characteristics are provided in Table 1, and several participants were part of dual-trainee households.[17] Codes captured participant perceptions of surgical training and the impact it has on trainee wellness. Although participants overall reported a positive sentiment toward surgical training in relation to professional growth, participants frequently emphasized a negative sentiment regarding the effect it has on trainee wellness. From the analysis, 4 overarching themes were identified, which are represented in Supplemental Table 2, http://links.lww.com/SLA/D463 with exemplary quotes:

TABLE 1. Participant Characteristics*

Trainee Support Person Characteristics	N. of Participants	% of Total (N=32)
Age		
24–30	16	50%
31–35	9	28%
36–40	3	10%
>40	4	12%
Race		
African American/Black	2	6.25%
East Asian/South Asian	2	6.25%
Latinx	2	6.25%
Middle Eastern/North African	2	6.25%
Caucasian/White	24	75%
Sex		
Female	19	59%
Male	13	41%
Relationship to resident		
Fiancée/fiancé	3	9%
Parent	2	6%
Sibling	1	3%
Significant other	5	16%
Spouse	21	66%
Associated surgical trainee characteristics		
Trainee surgical specialty		
General	15	47%
Neurosurgery	1	3%
Oral maxillofacial	1	3%
Otolaryngology	2	6.25%
Pediatric	1	3%
Plastic	5	16%
Thoracic	3	9.5%
Transplant	1	3%
Urology	3	9.5%
Trainee post-graduate level		
PGY1	5	16%
PGY2	4	13%
PGY3	8	25%
PGY4	7	23%
≥PGY5	7	23%
Trainee parental status		
With children	13	41%
Without children	19	59%

*Previously published in.[17]

1. **Who Can Endure the Most Hardship?**—trainee attributes and programmatic factors contribute to trainees feeling the need to constantly endure the most hardship.
2. **Consequences of Hardship**—constantly enduring these hardships has significant negative effects on wellness.
3. **Trainees Are Human**—trainees are human beings with basic human needs, especially the need for worth.
4. **Research Time as Refuge**—dedicated research time is treated as an oasis away from clinical hardships.

Please note, all names linked with the following illustrative quotes are pseudonyms used to protect the identity of our study participants and the trainees they support.

Who Can Endure the Most Hardship?

Participants highlighted how several factors contribute to an environment in which individuals take pride in and are measured by the amount of hardship they are willing to suffer to care for patients. Support persons described the inherent nature of surgical trainees that contribute to this environment. Trainees were described as ambitious, determined, and diligent, painting a picture of an extremely dedicated group of individuals with no limits as to what they are willing to endure. For example, 1 participant detailed how his spouse would go above and beyond what was asked of her:

> ''I think she is one of those, 'I will stay there all night if I have to' kind of deal. I wish there was more managing of those residents who tend to overachieve and want to go over and beyond and do not realize sometimes that they could be hurting themselves doing that. Helping residents to get out of their own way. . .would be nice. And then to train others to recognize that, especially those in leadership roles. That is the only thing that I could say. I wish there was somebody just telling her to go home. That is–she got upset last month because one of the fellows had not scheduled her for a specific surgery. And the fellow had told her, 'Just go home. Go rest.' She said, 'I do not want to rest. I do not need to sleep right now.''' — Jared, trainee spouse

Support persons also emphasized how the high stress and high programmatic expectations of surgical training compound the trainees' need to endure such hardships. In fact, trainees were described as measuring their success as surgeons by how much they were willing to give of themselves toward their duties. Some cited how this created competition, resulting in a constant drive to excel and improve. One participant described how his partner felt compelled to continuously impress others:

> ''She doesn't want to let people down or she wants to do extra work and she wants to impress people and all of that sort of thing. I'm telling her to do less and do only what she's paid to do–just to maintain sanity and that's manageable.'' — Adrian, trainee partner

Participants described that the program's culture can prompt trainees to always give more and put clinical duties above everything else. For example, 1 partner described the following:

> ''But a lot of times when he is at home, he is not fully present. The pager is always there. I once found a note; it fell out of his backpack. And it just became a running joke. . .It says, 'pager.' And then there is a line, and it says, 'above everything else.' And that is kind of the running joke is, yes, the pager comes above everything else.'' — Rosa, trainee spouse

As a result of the constant pressure to impress others and to meet these high expectations of attendings and the program, participants provided clear examples of how trainees' lives become consumed by their professional and clinical duties. For example, one participant offered the following:

> ''There's never a day when he's like, 'Oh, you know what? I can relax today.' You know what I mean? I have one day to relax. There's no such thing as that. So, I do worry eventually that something–that there's not enough of a balance.'' — Marianne, trainee spouse

Support persons effectively describe how the attributes of trainees and the demands of their programmatic duties interplay with each other to result in a need to endure constant hardship.

Consequences of Hardship

Participants described how constantly enduring hardship has numerous negative effects on trainee wellness including the neglect of physical or mental health, subsequent exhaustion and fatigue, and the inability to partake in activities of enjoyment. Trainees were described as rarely prioritizing their own health, and several support persons expressed frustration that program commitments make it logistically impossible for trainees to make health appointments. For example, 1 participant offered the following:

> ''It is interesting and ironic that he is a doctor and he cannot go see a doctor.'' — Eva, trainee partner

This difficulty in prioritizing their own health also extended into access to mental health care. Participants also lamented on the potential negative stigma associated with seeking mental health care:

> ''He seems to have a perception that if you are a doctor, you cannot go to therapy, and you cannot be on medication for mood because if other people find out, they will perceive you negatively.'' — Halley, trainee partner

Given the constant pressure to excel, several participants described the tremendous physical and emotional fatigue that results from this lifestyle. One participant described the effects of this fatigue with the following:

> ''I think the majority of the way that people change. . .is fatigue. You get really tired, so it's hard to be in the moment and awake and alert for what people are saying or making it to certain events. . .And I think with everyone, the more tired you get, the less engaged you are. And I think that was the biggest correlation for him was a loss of engagement because of fatigue.'' Rani, trainee partner

The chronic exhaustion can prevent trainees from being able to fully participate in activities which bring enjoyment and promote wellness. For example, 1 support person provided the following:

> ''I just wish they would give more thought to. . . the scheduling of their people to let them be home and rest and actually partake in some fun things, hobbies. . .and she can't even do hobbies because she has no time or is too tired.'' — Wayne, trainee partner

Overall, support persons inform on how the chronic enduring of hardship during surgical training leaves trainees in a depleted state of self-neglect.

Trainees Are Human

Support persons highlighted that trainees are human beings with the same basic needs as everyone else, including the need for a sense of worth. Several aspects of training which either contribute to

or detract from this sense of worth were detailed. For example, feeling appreciated was described as critical. When asked what good days for trainees are like, 1 participant described the impact that feeling valued has on her associated trainee:

> ''Probably when he gets appreciation for doing certain things, like when he gets a hug from a patient or a patient's family that he helps save or something like that. I think those are the things that like really make it all worth it, even though that does happen very infrequently.'' — Eva, trainee partner

In contrast, a lack of appreciation was described as damaging to one's sense of worth. When describing the bad days of surgical training, 1 participant offered the following:

> ''I think it is just not feeling like she is appreciated or accepted or trusted to do what she is doing. I think that a lot of that is driven by those above, via attendings in the operating room or just somebody being more dismissive.'' — Brett, trainee partner

Participants also highlighted that trainees want to be valued as people. For example, one provided this insight:

> ''If I could sit down with [leadership], I would probably say something concerning the area of seeing the residents as people and getting to know them. . .I understand it is a huge program, and there is a huge hospital. . .But I just think that if he was recognized more as a person. . .if people were considered more, if residents were considered more as people and not just employees or not just a number.'' — Quinn, trainee spouse

Similarly, in relation to maintaining this sense of worth, support persons also emphasized the importance that trainees be able to focus on what they are training to do, to tend to oneself, and to have more control over their schedule. However, support persons described how energy directed toward less meaningful tasks can reduce this sense of worth. For example, another participant described a bad day during training with the following:

> ''A bad day would be a day where she is dealing with the EMR. . .and its chaos. . .people like to work in their wheelhouse and to feel like they're doing things they're meant to do and signed up to do. Bad days are when you're asked to do all of these other things that you didn't necessarily think should be your problem. Or she's on call at three different hospitals and she's scrambling around, and things keep piling up–you have a consult five or ten minutes before you hand the pager to somebody else. . .Or if she has to come back and has a paper due at the end of the week–when the outside things start to interrupt what she should be doing–that's a bad day. . .It's not that much different than anybody else. It's like, you want to be doing what your primary role is.'' — Adrian, trainee partner

As part of perspectives related to this theme, it is worth specifically highlighting the particular disadvantages experienced by non-male and racial/ethnic minority trainees, as described by their support persons. Since these trainees are part of a less represented group, we have reframed from providing specific quotes here as this may result in potentially identifiable context and harm. Participants reported how such trainees encounter discrimination based on their sex and race requiring daily vigilance, which is mentally exhausting and degrading for trainees. For example, participants discussed female trainees feeling the need to compensate for being a woman in surgery by being more assertive. Importantly, these issues and associated microaggressions were more often described within the context of patient interactions. Supporters requested that leadership work diligently with all colleagues to ensure these forms of discrimination are not tolerated and that biases are corrected. Additionally, participants highlighted the value of trainees' ability to connect with individuals of similar backgrounds.

Research Time as Refuge

Several participants highlighted how dedicated research time presents an opportunity to seek refuge from the hardships of clinical training. Trainees were described as having better work-life integration and greater ability to prioritize their own needs during this time. Discussions regarding research time focused on the anticipation of entering research years, how one can better care for oneself, and how trainees can enjoy and participate more in family life.

Participants described how trainees were eager to have more flexibility and control over their schedules. For example, a spouse summarized the impact of the reprieve provided by research time:

> ''We talked about a point in time, obviously transitioning into research was very transformative for her in so many ways and just a reprieve from the constant beat down of residency in many ways.'' — Bodie, trainee spouse

In relation to the better self-care that trainees realize during this non-clinical period, participants cited the following: greater frequency of exercise, improved nutrition, and more sleep (see Supplemental Table 2, http://links.lww.com/SLA/D463).

DISCUSSION

In this study, we present trainee support person perspectives regarding the effects that surgical training has on trainee wellness. We show that engaging with support persons can provide training programs with unique insight into the wellness needs of their own trainee populations. Although some positive sentiments were provided in this study, the overwhelming negative sentiment expressed by participants aligns well with some of the prior evidence suggesting the negative ramifications of surgical and medical training on well-being. For example, high rates of post-traumatic stress disorder have been identified among trainees and this has also been linked to burnout.[25–27] Perhaps, most importantly, the perspectives offered from those closest to trainees mandate reflection on our existing surgical training paradigms and that we as a profession consider how to train future surgeons without requiring one's humanity and well-being to be marginalized in the process. This warrants an ongoing national discussion.

Notably, the insight obtained from this study also aligns well with previous conceptual models that depict the multiple external and internal factors that impact clinician wellness, although such insight warrants increased emphasis in future frameworks.[16] This insight further demonstrates that promoting the wellness of trainees is a complex process and requires multimodal strategies that target these various factors. Already, others seeking to improve wellness have implemented programs with reported positive results on several measures of physical health and mental well-being.[2,5,28,29] Some programs have included educational sessions on several topics, including the following: emotional intelligence, resilience, team building, communication, work-life integration, goal setting, empathy, strategic diet and exercise, operative posture and ergonomics, stress reduction techniques, and mindfulness.[2,5] Others have used strategies such as weekly lectures on exercise, diet, alcohol avoidance, and mental health as well as team-based weekly exercise sessions with aid from physical trainers.[29]

Although the above strategies are valuable interventions, this study also provides some other important considerations for training programs seeking to improve trainee wellness, which are laid in

TABLE 2. Support Person Perspectives on How to Improve Well-Being of Trainees

Intervention	Description
Deemphasizing the endurance of hardship as a measure of success	With the full awareness that surgical training is rigorous, programs should emphasize that hardship is not a milestone of success. Rather, it is possible to train as a surgeon without having to constantly endure hardship. This includes de-emphasizing competition amongst residents and eliminating any associated unwritten norms, rules, or expectations.
Role Modeling and Providing Permission to Prioritize Oneself	Senior members are encouraged to be intentional about attending to their own health and well-being as role models to others—demonstrating that attention to one's health and patient care are simultaneously possible. Additionally, implementing sustainable cultural change can be assisted by senior members providing explicit permission to more junior members to prioritize health needs and protect time outside of the hospital. In doing so, groups should strongly emphasize the importance of healthy nutrition, exercise, and adequate sleep as necessities for the clinically competent surgeon.
Gratitude and Appreciation	Programs and their associated members may find that being intentional about demonstrating gratitude and appreciation for trainees enhances wellness. This includes emphasizing that their work is valued and that they are seen as individuals with worth and potential.
Reductionist Versus Additive Approach	The answer to well-being challenges should not always be the addition of a new program or intervention. Rather, reducing the amount of non-educational activities or protecting trainees from onerous administrative activities should also be considered beneficial.
Creating Specific Programming for URM* Trainees	URM trainees should be provided additional outreach programs and the training program should facilitate opportunities for mentorship and connectedness.
Programmatic and Institutional Anti-Discrimination Policies and Allyship Training	The program and institution at large should adopt and enact explicit anti-discrimination policies and create specific programming and training around allyship and anti-discrimination practices. These changes should also address and consider situations in which trainees and members of the health care team experience discrimination directly from patients.
Raising Programmatic and National Awareness of Discrimination Experienced by URM Trainees	URM trainees can experience discrimination from others. This discrimination, which can take many forms, is degrading for trainees and requires daily vigilance; therefore, subsequent mental and emotional exhaustion and injury can also result. National groups and programs should continue to develop targeted strategies focused on experiences and consequences of such discrimination.
Promotion of Wellness Longitudinally Throughout Training	Personal well-being should be emphasized throughout training so that dedicated research time does not have to be seen primarily as a refuge away from hardships of clinical training.
Incorporating Scheduling Flexibility	Integrating flexibility into programming and residency structure would enhance the ability to adjust trainee schedules. The ability to access this flexibility provides trainees with routine avenues for attending to well-being.

*Underrepresented in Medicine.

Table 2. It illustrates how surgical trainees' positive attributes and desire to excel can directly contribute to the neglect of self-care. This study, therefore, suggests that training programs should consider behavior economics when promoting trainee wellness. In other words, since these training programs often comprise highly determined, high-achieving, and very altruistic individuals, programs need to prevent the decision to tend to or neglect oneself from being completely reliant on individual choice. Furthermore, surgical culture needs to shift away from only celebrating endurance of hardship. Instead, we need to prioritize strategies that alleviate hardship and emphasize the promotion of individual worth. This would include but is not limited to increased demonstrations of gratitude and appreciation, transparent role-modeling by faculty and senior-level trainees in relation to wellness, and protection from having one's time and energy be consumed by administrative paperwork activities.[30,31] Adopting a reductionist rather than additive approach when possible may also help to minimize burden and to ensure trainee time is most often spent on high yield educational activities. In other words, improving well-being does not always mandate the addition of a ''wellness program'' to solve a particular issue. Sometimes, the appropriate strategy is simply to reduce or restructure one's workload so that the activities which bring a sense of value and worth can be prioritized. Of note, participants in this study also suggest a critical need for programs to specifically support underrepresented trainees by explicitly combating discrimination and the accompanied emotional and mental consequences experienced by trainees, addressing systematic biases, and fostering opportunities for outreach and connectedness. This critical need suggested by participants in this study is supported by the recently published findings on the discrimination and sexual harassment experienced by trainees throughout the United States.[32,33] Undoubtedly, ongoing and increased awareness and discussion at the national level around the discrimination experienced by underrepresented trainees is a necessary first step to creating systematic strategies to address these issues. We suspect that these ambitious changes would augment the positive effects of previously reported programs.

In this study, dedicated research time was described as a period of refuge away from the hardships of clinical training. This finding aligns with results from a recently published study that found personal rejuvenation to be a key reason that trainees pursue such nonclinical opportunities.[34] However, promoting wellness should not be isolated to periods of nonclinical activities. Therefore, wellness strategies may also consider how to longitudinally promote and integrate the elements that make this period ideal for wellness throughout one's training. These include, but are not limited to greater trainee empowerment, scheduling flexibility, greater emphasis on self-care (eg, nutrition, sleep, exercise, health), and encouraging trainees to take time away

from clinical duties for activities of enjoyment.[35] These principles should be applied across several training paradigms regardless of whether or not dedicated time away from clinical duties already exists.

There are limitations to this study. These findings are based on the perspectives of 1 sample of trainee-identified support persons and are not the direct perspectives of trainees. Given that this was performed at a single academic center, these findings may lack transferability to other institutions and other fields outside of surgery. Regardless, this study offers new perspectives and demonstrates the importance of engaging with support persons. Another limitation is that self-selection bias and/or confirmation bias could also be present in this study. Also, the findings we present in this paper are not exhaustive and are amenable to reevaluation using other theoretical frameworks. Finally, although this study provides critical new insight, it alone is insufficient to create a standalone conceptual framework. We recommend ongoing evaluation of support person perspectives to further our understanding of trainee wellness. This future conceptual framework will also benefit from assessing the support persons of fully trained surgeons, who likely have important perspectives worth considering as well.

In conclusion, this study demonstrates how the surgical training paradigm can negatively impact residents and their well-being. As programs seek to improve trainee wellness, they should engage with support persons. Additionally, surgical-training culture needs to shift away from enduring hardship and to better recognize trainees as individuals with human needs, including the need for self-care and sense of worth. Although dedicated time away from clinical duties can allow trainees to prioritize themselves, programs should work to make it so that such opportunities to promote one's well-being are integrated throughout training.

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