

A Systematic Review of the State of Preclinical Mentorship Programs in Plastic and Reconstructive Surgery

Bryce Dzubara, BS*
 Nojan Bajestani, BS*
 Stephanie Paras, BS*
 Eric Min, BA*
 Shuchi Sharma, BS*
 Juhi Katta, BS, BBA*
 Cristiane Ueno, MD†

Background: Plastic and reconstructive surgery is consistently one of the most competitive medical specialties in the match. The recent United States Medical Licensing Examination score reporting switch to pass-fail led to a change in metrics by which applicants are evaluated by plastic surgery programs. Applicant research productivity and the demand for plastic surgery mentorship will continue to rise. Given the competitive nature of the residency match and shift in metrics emphasis after the change in STEP 1 scoring, early exposure to plastic surgery and mentoring relationships are paramount to applicant success. However, most medical students are not exposed to plastic surgery until they begin clinical rotations.

Methods: A literature review of plastic surgery mentorship programs available during preclinical years was conducted to identify preclinical mentorship opportunities in plastic surgery. Sixty-eight references were identified, but only two studies met the inclusion criteria of addressing mentorship programs in preclinical years.

Results: Examination of the included studies indicated that preclinical medical students achieve self-identified goals and generate longitudinal benefits in plastic surgery by participating in early and focused mentorship programs.

Conclusions: The limited number of studies in this review highlights a lack of available, studied preclinical mentorship programs in plastic surgery and reveals a knowledge gap concerning the creation of successful preclinical mentorship programs. Early exposure to plastic surgery, combined with the development of structured preclinical mentorship programs, can potentially replicate successful outcomes seen in other surgical subspecialties' mentorship programs while addressing the lack of formalized mentorship opportunities for preclinical students in plastic surgery. (*Plast Reconstr Surg Glob Open* 2023; 11:e5322; doi: 10.1097/GOX.0000000000005322; Published online 9 October 2023.)

INTRODUCTION

Plastic and reconstructive surgery is consistently one of the most competitive medical specialties in the match.^{1,2} After January 2022, United States Medical Licensing Examination STEP 1 scores transitioned from numeric to pass-fail reporting, leading to increased emphasis on other plastic surgery applicant metrics.³ Powell et al⁴ predicted an increase in the importance of United States Medical

Licensing Examination STEP 2 scores and more holistic metrics, such as letters of recommendation, research, and personal knowledge of the applicant.⁵ In this setting, applicant research productivity continues to rise, whereas plastic surgery match rates are among the lowest of all medical subspecialties.^{1,2} This change will likely increase the importance of mentorship via improved letters of recommendation, personal knowledge of applicants, and research opportunities.^{5,6}

Education and mentorship-based initiatives can nurture medical student interest and engagement within surgical specialties.⁷⁻⁹ However, despite ample literature on the benefits of mentorship programs in internal medicine and surgical subspecialties, medical students lack early exposure and access to mentors within the field of plastic surgery during the preclinical years.¹⁰ A 2013 study found that medical students tend to associate plastic surgery with aesthetic surgery and reconstruction but not with hand,

From *The Ohio State University College of Medicine, Columbus, Ohio and †Department of Plastic and Reconstructive Surgery, The Ohio State University, Columbus, Ohio.

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peripheral nerve, or wound surgery.¹⁰ Similar results were found in a 2021 study where medical students did not associate plastic surgery with hand surgery and peripheral neuropathies.¹¹ Evidence supporting this hypothesis was published in a 2017 study that found television portrayals significantly influenced medical students' understanding of plastic surgery.¹² All these disparities may be linked to a lack of early exposure in medical school and increased reliance on societal stereotypes in forming perceptions of plastic surgery.¹⁰⁻¹²

Research suggests that longitudinal mentorship programs can bridge this knowledge gap, leading to a greater percentage of students applying to and matching into surgical subspecialties. A 2019 study conducted at the University of Michigan found that a surgical interest group can successfully build interest in surgical subspecialties; their data demonstrated a nearly 10% increase in the number of applicants applying to surgery in the four years following the foundation of a surgical interest group.⁸ Furthermore, mentored students can build clinical skills, increase the number of publications, thrive in leadership roles, and obtain stronger letters of recommendation and sponsorship, which are all significant factors in successful residency selection, especially with the pass-fail scoring policy of STEP 1.^{13,14}

Recent literature reviewing the 2021 and 2022 plastic surgery match data indicate that not only are the number of applicants rising disproportionately to available positions, but also that great value is placed on letters of recommendation and research productivity.^{5,15} These factors, along with STEP 2 Clinical Knowledge cutoffs and Alpha Omega Alpha membership, are ranked as significant predictors of matching into plastic surgery.¹⁶ By increasing early exposure during preclinical years and facilitating relationships with faculty, mentorship programs can elevate applicant competitiveness and provide them opportunities for success. Additionally, the benefits of such programs are mutual, as faculty and resident mentors can increase their academic productivity and career satisfaction.¹⁷

The importance of plastic surgery mentorship to career success is widely recognized, and the need for plastic surgery mentorship exists at all levels of training, including during surgical training. Akiki and Borrelli emphasize the importance of connecting medical students to physician mentors in plastic surgery and endorse national mentorship programs.¹⁸ A 2012 review on mentorship in surgical training highlighted the relatively scarce literature and insufficient adoption of mentorship in surgical training, despite clear beliefs in the importance of mentorship.¹⁹ Similar patterns are noted once residency training has been completed. Janes et al noted the centrality of mentorship in the careers of academic plastic surgery leaders, advocating for the development of professional relationships and more national mentorship programs in plastic surgery.²⁰

Despite a widespread support for mentorship and expressed need for mentorship programs at all levels of plastic surgery, it is unclear what type of, if any, formal mentorship opportunities exist for preclinical students

Takeaways

Question: Do preclinical medical students interested in plastic and reconstructive surgery have access to plastic surgery mentorship programs, and if so, what do those programs look like, are they successful, and why?

Findings: There is a scarcity of documented plastic surgery mentorship programs for preclinical medical students; however, available programs seem successful, if heterogeneous, in their design.

Meaning: Preclinical medical students interested in plastic surgery do not routinely have access to successful mentorship programs in plastic surgery; this could become an important area of growth for medical schools aiming to develop competitive plastic surgery applicants.

interested in plastic surgery. Our main objective is to better characterize these opportunities—specifically, the types of preclinical mentorship opportunities available. Our secondary objective is to define what components of these preclinical mentorship opportunities are most valuable to preclinical medical students interested in plastic surgery.

MATERIALS AND METHODS

Using PRISMA methodology, a systematic review was conducted with the objective of identifying all previously published scientific research related to mentorship programs for preclinical medical students interested in plastic and reconstructive surgery. We constructed search inputs for both PubMed and Embase with the assistance of a research and education librarian used by our institution's health sciences library. Relevant medical subject headings (MeSH) were used as appropriate. The search inputs are listed below.

Embase—56 Results

("Plastic surgery"/exp OR "plastic reconstructive surgery" OR "plastic surgery" OR "surgery, plastic") AND ("mentorship program" OR "mentor"/exp OR "mentor" OR "mentors" OR "mentorship" OR mentee) AND ("medical student"/exp OR "medical student" OR "medical students" OR "student, medical" OR "students, medical") AND [2012-2022]/py

PubMed—43 Results

((("Surgery, Plastic"[Mesh] OR "Surgery, Plastic" OR "Plastic and Reconstructive Surgery" OR "Reconstructive Surgery" OR "Surgery, Plastic" OR "Plastic Surgery") AND ("Mentors"[Mesh] OR "Mentors" OR "Mentorships" OR "Mentorship" OR "Mentee" OR "Mentorship Program")) AND ("Students, Medical"[Mesh] OR "Student, Medical" OR "Students, Medical" OR "Medical Students" OR "Medical Student"))

A total of 99 articles were retrieved from the databases: 56 articles were retrieved from Embase, and 43 articles were retrieved from PubMed. Of the 99 retrieved articles, 31 were duplicates. A total of 68 nonduplicate articles were first screened by one reviewer via title and abstract

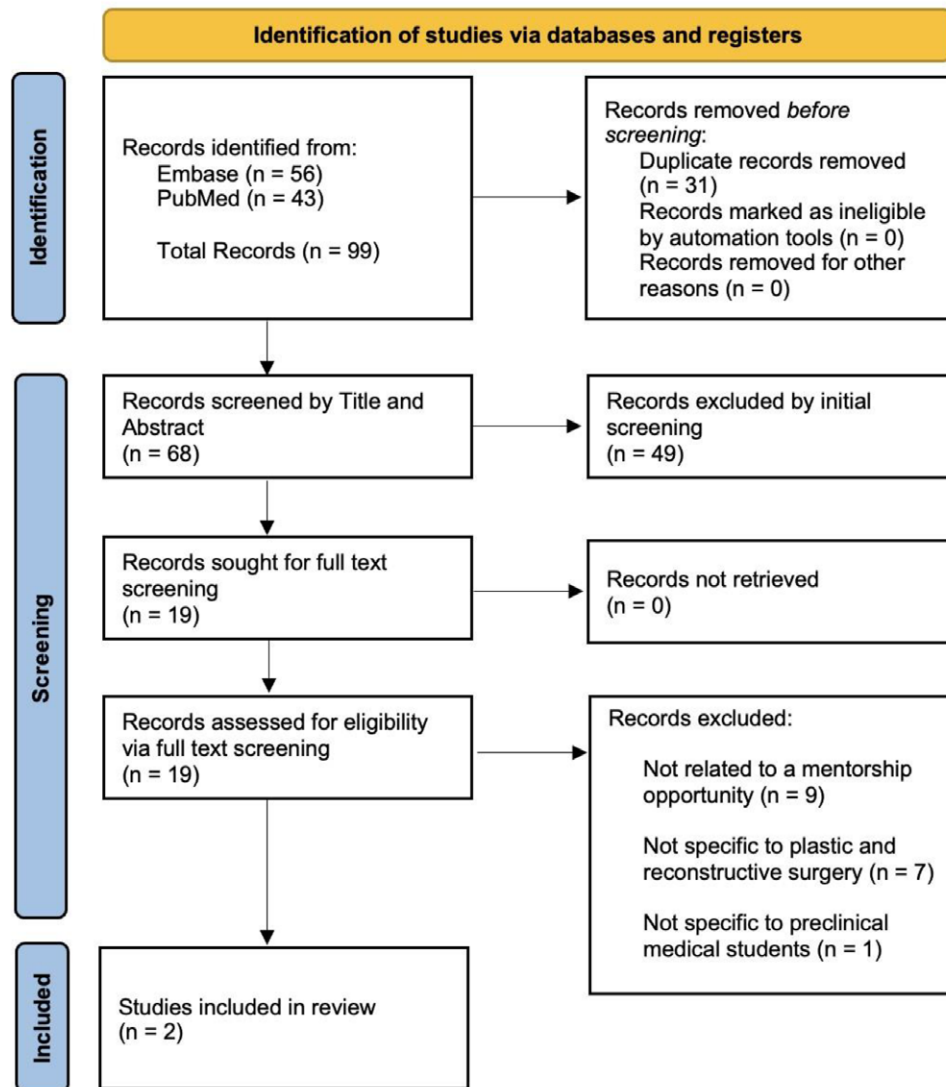


Fig. 1. A visual depiction of the literature review screening process, including duplicate removal and step-wise study exclusion, per PRISMA guidelines.

for relevance to our research topic. A total of 49 articles were excluded by initial screening. The remaining 19 articles were successfully retrieved and underwent full-text screening, performed by the same reviewer. Articles were included if they were published and met the following inclusion criteria:

1. Intervention: providing a personal, extracurricular opportunity for mentorship
2. Setting: specific to plastic and reconstructive surgery
3. Population: specific to preclinical medical students

A total of two articles that met all the listed criteria were included in this literature review. A total of 17 articles were excluded after full-text review, with nine excluded for failing to meet the “intervention” inclusion criteria, seven excluded for failing to meet the “setting” inclusion criteria, and one excluded for failing to meet the “population” inclusion criteria (Fig. 1).

RESULTS

A total of two articles met all inclusion criteria and were included in this literature review. Reghunathan et al²¹ created a Plastic Surgery Diversity, Equity, and Inclusion Mentorship Program and Workshop. The program was offered both virtually and in-person. Students in their first, second, and third years—as well as research years—were eligible for inclusion in the program if they were either underrepresented in medicine, LGBTQ, first-generation low-income, or from a medical school without a home plastic surgery residency program. Students were paired with a resident mentor. The workshop portion of the program included various activities, including but not limited to didactic lectures, a suturing laboratory, a resident panel, and dissections. Additionally, participants were expected to meet with their mentor quarterly and generate research within the plastic surgery department. A total of 24 students participated in the program. Program

participants rated the workshop a 9.36 of 10 and reported a significant increase in plastic surgery exposure, knowledge, technical skills, and resources. Moreover, participants overwhelmingly described the program as achieving student-identified goals for the program, such as gaining didactic knowledge (96%), networking (92%), strengthening a mentor relationship (96%), and gaining technical skills in plastic surgery (92%).²¹

Alfonso et al²² described their single-institution experience developing a plastic surgery summer research program from 2013 to 2020, where first-year students received mentorship from research fellows and department faculty. The program evolved over time, but it centered on an 8-week research curriculum designed to help students hone research skills and gain mentorship. Program participants would attend grand rounds, and eventually presented their research. Weekly journal clubs and surgical skills sessions were added over time. Approximately six students participated annually. When examining program outcomes from 2013 to 2019 longitudinally, 28% of participants continued conducting research in plastic surgery, and 29% of participants engaged in a period of dedicated extracurricular plastic surgery research. By graduation, participants averaged a total of 6.9 ± 4.0 publications overall and 5.0 ± 4.2 publications related to plastic surgery. When analyzing outcomes in the residency match, 95.5% of the participants matched: 62% into a surgical residency and 54% into an integrated plastic surgery residency.²²

DISCUSSION

Mentoring relationships often happen naturally. Mentees organically identify mentors and vice versa, and mentors share information, experiences, and insights with the mentee. However, we claim that when we establish formal mentorship programs, we add structure, consistency, and planning to increase efficiency and ultimately improve outcomes.²³

In this review, our objective was to characterize the extent of mentorship opportunities available to preclinical students interested in plastic surgery, including the types of mentorship available. Two articles met inclusion criteria. This suggests that there are very few examples of mentorship programs for preclinical medical students that have undergone formal evaluation, revealing a knowledge gap concerning the creation of successful preclinical mentorship programs in plastic surgery. Moreover, based on the two articles that did satisfy our inclusion criteria, preclinical mentorship programs are valuable opportunities for medical students. The two preclinical mentorship programs differed in focus, with one aiming to address the lack of diversity in plastic surgery²¹ and the other aiming to create interest in the field through a formal research curriculum.²² However, both programs seemed to offer opportunities for one-on-one mentor-mentee communication and facilitated exposure to the field of plastic surgery for preclinical students. These characteristics align with previously reported preferences of mentees in plastic surgery.²⁴ Additionally, both programs can be considered longitudinal, with durations of

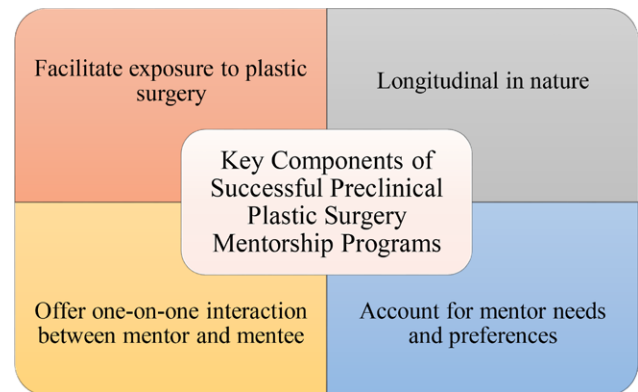


Fig. 2. A visual representation of key components to high-quality preclinical mentorship programs in plastic surgery. Successful preclinical mentorship programs facilitate exposure to plastic surgery, are longitudinal in nature, offer one-on-one interaction between mentor and mentee, and account for mentor needs and preferences.

at least one semester. Longitudinal programs may provide more opportunities to mitigate barriers related to mentor availability—such as by increasing time to schedule mentorship—and offer more time for mentees to build relationships with their mentors, potentially increasing the benefit of the program and improving outcomes (Fig. 2).

Although there is a dearth of research studies specifically examining plastic surgery mentorship opportunities for preclinical medical students, we acknowledge that mentorship opportunities exist that do not have accompanying scientific literature evaluating them. The Plastic Surgery Research Council (PSRC) has a virtual mentorship program for medical students, residents, fellows, or faculty who are PSRC members that espouses one-on-one mentorship with resident mentors, webinars with mentorship panels, and real-time interaction with faculty mentors.²⁵ The Garnes Society aims to connect and grow underrepresented medical students, residents, and physicians interested in plastic surgery, hosting an annual meeting and sponsoring students to participate in other mentorship programs.²⁶ Women of Color in Plastic and Reconstructive Surgery (WOCPRS) offers virtual mentorship opportunities for medical students, residents, and physicians with in-person meetings at national plastic surgery events.²⁷ The Plastic Surgery Research, Education, and Preparation Promoting Equity and Diversity (PREPPED) course, founded in 2022, is a two-day event for third year or leave of absence underrepresented medical students designed to prepare candidates for subinternships and residency applications.²⁸ The PSRC program is similar to those included in our review, seeming to offer one-on-one opportunities in a longitudinal format. It is difficult to compare the mentorship opportunities offered by WOCPRS or the Garnes Society, as no formal mentorship program is defined. PREPPED seems to serve a different, although important, function in its mentorship, as it is not longitudinal and focuses on preparing students for upcoming subinternship roles.

Although all these programs serve a function in the mentorship model for plastic surgery, they do not seem

to directly target preclinical medical students. PREPPED specifically targets students in their third year, generally a clinical year for medical students. Organizations like PRSC, the Gurnes Society, and WOCPRS, describe targeting all medical students, trainees, and physicians; however, as these programs are national and lack a specific campus presence, it is reasonable to assume that students may learn about these programs from preexisting mentors in plastic surgery at their respective institutions. Thus, although these programs are valuable, they may be more valuable to students who have already established mentoring relationships, likely excluding a significant portion of preclinical medical students from accessing these opportunities. Additionally, PREPPED takes place in a singular location but takes applications nationwide; although organizations like the Gurnes Society sponsor students, the financial and logistical burden of attending are barriers to participation. Despite this, for medical students from institutions that do not have an established plastic surgery presence, these programs do serve the function of introducing students to plastic surgery through their mentorship initiatives.

Plastic surgery interest groups are another potential source of mentorship opportunities not present in scientific literature that can provide potential mentorship opportunities for preclinical medical students. Moreover, they are widespread across most medical schools, creating plastic surgery exposure for many preclinical medical students. A brief search of plastic surgery interest groups demonstrates great variability in the opportunities provided by some of these groups. We found that the University of California San Diego School of Medicine has a Plastic Surgery Mentorship Program open to medical students.²⁹ Not all interest groups seem to offer formalized mentorship opportunities. The University of Pennsylvania Perelman School of Medicine Plastic Surgery Interest Group seems to host speakers who guide lecture-based discussions, with no mention of specific structured preclinical mentorship opportunities.³⁰ Similarly, the Indiana University School of Medicine's Plastic Surgery Interest Group seems to host speaker events but does not advertise specific preclinical mentorship opportunities.³¹ The University of Michigan Plastic Surgery Interest Group hosts monthly talks to supplement learning, arranges facilitated exposure to plastic surgery, and assists students in building a competitive application; however, no preclinical mentorship opportunities are mentioned.³² Interest groups seem well-suited to engage with preclinical medical students, given their widespread presence across medical campuses. Additionally, the relatively low-commitment opportunities available in such programs—such as lectures and workshops—are likely suitable entry-level opportunities for students to develop interest in plastic surgery. However, these programs are heterogenous in nature and perform varying functions; preclinical medical student mentorship programs are not available everywhere, and thus, preclinical medical students can lose out on the benefits of structured mentorship.

Formal mentorship programs allow for a structured program that can maximize effective use of time and be most beneficial to the mentor–mentee relationship.

Moreover, formal commitments encourage mentors to dedicate specific time to their mentees. In this setting, defining objectives to mentees, setting an agenda with expectations and goals, and constructing a professional and personal career development pathway is paramount to better outcomes.³³ Although there is a scarcity of studied, formal preclinical mentorship programs in plastic surgery, successful and replicable mentorship programs exist in other surgical subspecialties. A 2019 study found that a longitudinal program aimed at improving student–faculty engagement in surgical specialties led to a greater percentage of students applying into surgical specialties when compared with the national average.⁸ Similarly, a 2022 study found that students who participated in a year-long mentorship program in general surgery matched into categorical residency programs at higher rates than the national average.⁹ Furthermore, a formal and low-cost mentorship program was developed in urology that had 15 of 16 participants (94%) match into urology and showed potential replicability in other surgical subspecialties.³⁴ Mentorship programs in other specialties have also been associated with promoting greater diversity and student access to surgery. A recent study found that women and underrepresented minorities in orthopedic surgery highly valued mentorship because it attracted them to the field, especially when their mentors had similar cultural identities.³⁵ Therefore, we propose that the development of formal preclinical mentorship programs introduced early in medical schools will enable earlier exposure to plastic surgery and improve applicant success in the plastic surgery match. This may prove useful especially for students who face institutional or cultural barriers, and for those unable to navigate the financial constraints created by a gap year for research.

A mentorship program can develop a meaningful relationship between future plastic surgery applicants and mentors, creating opportunities for mentees to strengthen their residency applications by obtaining stronger letters of recommendation. Letters of recommendation are consistently ranked among the most important residency application metrics. These letters of recommendation have two key characteristics: the author of the letter and the content of the letter, showing an applicant's work ethic, character, and potential.¹³ Furthermore, the 2022 match trends have noted an increased proportion of applicants matching at home institutions and in their home region.³⁶ This further demonstrates the significance of developing strong relationships between mentors and applicants at their home program, which can be accomplished with the creation of preclinical mentorship programs.

Future steps could include further attempts to identify unstudied formal preclinical mentorship programs or address the perspective of mentors. A 2016 study showed that mentors generally preferred group activities more than one-on-one meetings and preferred to meet less frequently, with time constraints being a frequently cited barrier.³⁷ Therefore, the development of future mentorship programs must take mentor perspectives into account to increase long-term sustainability and the investment of plastic surgery mentors in their mentees. Additionally,

once attempts have been made to create and study formal mentorship programs for preclinical students in plastic surgery, additional research could quantify their impact and determine the components of successful programs.

CONCLUSIONS

Despite the established value of mentorship-based initiatives for medical students interested in surgical subspecialties and the known competitiveness of applying to surgical specialties, the study of preclinical mentorship programs in plastic and reconstructive surgery is scant, and the overall existence of formal preclinical mentorship opportunities is ambiguous. Only two preclinical mentorship programs were described in plastic surgery literature, and both have benefitted medical students in gaining exposure, increasing understanding of the field, fostering interest, and preparing them to be competitive candidates for integrated plastic surgery residency programs. Therefore, the development of structured preclinical mentorship programs and constant, thorough evaluation, evolution, and improvement of these programs is necessary to increase engagement in plastic surgery and maximize the success of future applicants.

Bryce Dzubara, BS

The Ohio State University College of Medicine
Columbus, OH

E-mail: bryce.dzubara@osumc.edu

DISCLOSURE

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

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