Recruitment of the Next Generation of Diverse Hand Surgeons

Claire A. Donnelley, MD, Andrea Halim, MD,
Lisa L. Lattanza, MD, FAOA, FAAOS*

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• Diversity recruitment • Hand surgery • Pipeline programs

KEY POINTS

- Hand surgery encompasses a diaspora of pathology and patients, yet the surgeons treating this population are not commensurately diverse.
- A physician population that more closely reflects the population it treats consistently leads to improved patient outcomes.
- Although there has been an increase in the diversity of surgeons entering into pipeline specialties such as General Surgery, Plastic Surgery, and Orthopaedic Surgery, the percentage of these trainees lags behind recruitment into other specialties and the overall makeup of practicing hand surgeons remains largely homogenous.
- Pipeline programs beginning as early as high school have been an effective tool to increase the number of surgical trainees entering historically White male dominanted specialties such as Hand Surgery.
- Emphasis on increasing diversity in leadership roles, actively seeking cultural change, and minimizing disincentives toward successful careers in surgical specialties is essential. Passive expectation of increased diversity and cultural change is not enough. Diversity recruitment must be an active process and iterated goal.

INTRODUCTION TO HAND SURGERY

The human hand is a remarkable structure, composed of dense, precise anatomy that works in concert for daily functionality. Comensurate to the diversity of structures within the hand is the spectrum of hand pathology. Hand surgeons restore function after traumatic damage; manage neurovascular compromise, degenerative changes, and inflammatory responses; provide relief from soft tissue contracture; and even perform gender affirmation surgery such as hand feminization.[1] As with the spectrum of pathology, the pathway to Hand Surgery is equally diasporic; hand surgeons come from a diversity of training backgrounds, including Orthopaedic Surgeons, Plastic Surgeons, and General Surgeons with hand fellowship training (Fig. 1). Although other specialties have made strides in becoming representative of the patient populations they treat, Hand Surgery lags behind, particularly with the recruitment of women and other historically excluded identities. Organizations such as the Perry Initiative seek to create pipelines to expose women and underrepresented in medicine (UIM) students to Orthopaedic Surgery and form important mentorship networks. Although there remains much work to be done, there are efforts to recruit and retain young women and UIM applicants with the hopes of having a more diverse next generation of hand surgeons.

Department of Orthopaedics and Rehabilitation, Yale University, PO Box 208071, New Haven, CT 06520-8071, USA
* Corresponding author.
E-mail address: lisa.lattanza@yale.edu

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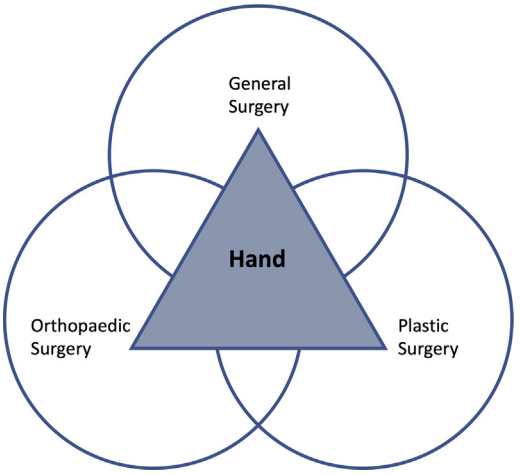

Fig. 1. Hand surgeons derive from multiple specialties: Orthopaedic Surgery, Plastic Surgery, and General Surgery may all develop future hand-specialty surgeons.

Why Does Diversity Among Hand Surgeons Matter?

It is important that the field of surgery be populated by a diverse group of people. Diversity encompasses gender identity, race, ethnicity, training, and lived experiences. There are many reasons why diversity is important. Heterogenous teams demonstrate greater creativity and innovation and consistently outperform homogenous teams when solving problems, performing tasks, and sourcing information.[2] When sourced collaboratively, different backgrounds and experiences lead to better solutions.

Diversity among surgeons is also essential in addressing health disparities.[3,4] Medical treatment may be avoided or delayed due to mistrust of the medical community, remnants of historically exclusionary and unethical practices, underrepresentation, or fear of discrimination.[5,6] Patients who do not share key identities with their treating providers have been shown to receive worse care[3,7] and are less satisfied with their treatment.[8] In addition to representation (or lack thereof) within the medical community, quality and type of health care is modified by factors such as sex assigned at birth, race or ethnicity,[9] socioeconomic status,[10] insurance status, and language proficiency.[5] For example, in one 2016 analysis of more than 13,000 patients, African-Americans and uninsured individuals were significantly less likely to undergo replantation of a traumatic digit amputation than their White, insured counterparts.[11] In cases of upper extremity trauma, uninsured patients are also more likely to be transferred than their insured counterparts, often delaying access to time-sensitive, limb salvage procedures such as revascularization or reimplantation.[12] These disparities continue in nonemergency Hand Surgery. In a 2021 review of carpal tunnel release, older patients and patients with private or workers compensation insurance were more likely to receive surgical intervention, whereas women; patients with Medicare and Medicaid; and patients of Asian, African American, and Hispanic descent were less likely to undergo surgical management.[7] UIM physicians mitegate these inequalities as they facilitate representative of the patients they treat, are more likely to treat uninsured patients, and are more likely to work within underserved communities.[13–16]

Principles of Recruiting Students and Trainees to Hand Surgery

In 1958, there were 10 women board-certified orthopaedic surgeons in the United States.[17] By 2021, with only 1,100[17] women of the nearly 23,000 orthopaedic surgeons in practice, women in Orthopaedic Surgery remain well below the "30% threshold" critical mass to achieve and maintain an ongoing diverse workforce.[17] An even smaller proportion of orthopaedic surgeons identify as a racial or ethnic minority. Only 3% of practicing orthopaedic surgeons identify as Black,[18] and 0.6% of orthopaedic surgeons identify as Black women. Within the field of Hand Surgery, a 2021 review found that of the 614 surgical faculty associated with hand fellowship programs, about 15% are women.[19] Although the percentage of racial, ethnic, and other minorities including Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual, Allies, and more (LGBTQIA+) hand surgeons are not readily available, open members of these minority communities are rare. Clearly, although strides have been made since 1958, there is still significant work to be done to increase diversity in Hand Surgery.

Currently, the pipeline of women in medical school is equal to that of men, with women representing 56% of undergraduate students and 51% of medical students.[19] Early college performance indicators demonstrate that female high school students are as qualified or more qualified than their male counterparts to pursue science, technology, engineering, and mathematics (STEM) fields such as engineering and Orthopaedics, but this is not seen in practice.[17] This representation seems to break down in the transition from medical school into residency. A 2021 report generated from 15 years of Graduate Medical Education Track data demonstrated that women medical students matching into Orthopaedics lagged behind all other surgical specialties.[20] As of 2012, women

represented just less than 20% of Hand Surgery trainees, 17% trainees of Asian descent, 3% trainees of African American descent, and 5% trainees of Hispanic descent.[4] Within the trainee pipeline to Hand Surgery, at 36% and 28%, General Surgery and Plastic Surgery, respectively, have the most women surgical trainees, with Orthopaedic Surgery lagging behind at 14%. Orthopaedic Surgery, in addition, has less ethnic diversity, with 78% Caucasian orthopaedic trainees, compared with 69% Caucasian trainees in Hand Surgery, 72% in Plastic Surgery, and 63% in General Surgery.

To improve diversity in Hand Surgery, more effort must be made to recruit women and UIM into surgical residencies. These recruitment efforts must be made at every step of the training pipeline from high school and beyond, including addressing the recruitment gap of UIM candidates into medical school. As the obstacles to recruiting diasporic individuals into the Hand Surgery pipeline differ at every step of the process, so too must the solutions be tailored to each stage of training.

Pipeline Programs

Lack of early exposure to Orthopaedic Surgery is one of the biggest obstacles to recruitment. Pipeline programs are organizations designed with the goal of increasing diversity by educating and mentoring young people from underrepresented groups. Without such programs, those groups are often at a disadvantage in pursuing fields such as Hand Surgery. For example, men are significantly more likely than women to have exposure to Orthopaedics before medical school.[17] Early intervention (eg, high school) programs seek to mentor young women and UIM students in order to minimize this exposure gap. The long-term goal of pipeline programs is to surpass critical mass diversity thresholds.

Several pipeline programs exist specifically to engage and inspire young people from underrepresented groups to consider specialties in Orthopaedic Surgery. It is important to note that the challenges of attaining diversity are not the same for all groups. Although the number of women has reached and surpassed the number of men in medical school, there is a persistent lack of women choosing surgical specialties, particularly Orthopaedic Surgery. Additionally, there remains adeficit in medical school matriculates of color, men and women. This pipeline problem leads to an even bigger gap with regard to improving diversity in Orthopaedic Surgery and becomes progressively more challenging with the further subspecialized field of Hand Surgery. Depending on where the pipeline to Hand Surgery narrows, different strategies are required.

The Perry Initiative

The Perry Initiative represents one of the most direct and successful methods of creating a pipeline for women to pursue Orthopaedics—and eventually to consider Hand Surgery as a career. This Initiative is named after Dr Jacquelin Perry, who was among the first women certified by the American Board of Orthopaedic Surgery. In 2009 the Perry Initiative, a 501c3 nonprofit organization, was founded by Dr Lisa Lattanza (Orthopaedic Surgeon) and Dr Jenni Buckley (Engineer) with the purpose of recruiting and inspiring high school–aged women to pursue the traditionally male-dominated fields of Orthopaedic Surgery and engineering.[17] The Perry Initiative is composed of several key programs: the Perry Outreach Program (POP) targeted toward high school–aged women, the Medical Student Outreach Program (MSOP) targeted toward women in medical school, and Orthopaedics in Action (OIA) with curriculum for STEM students in middle and high school. As of 2022, more than 14,000 women, graduates of 341 high schools, and 141 medical schools have completed POP and MSOP.[17]

The POP is a hands-on full day course that exposes young women to engineering principles taught through the lens of Orthopaedic Surgery. Activities include simulated saw bone surgeries, suturing, lectures from prominent women orthopaedic surgeons and engineers, and a mentoring program. Approximately 1600 students attend more than 50 programs nationwide annually. The annual career progress of POP alumnae has been tracked with follow-up surveys since 2014. Of 1115 responses (12% response rate), approximately 90% of Perry Initiative Program (POP) alumnae matriculate into STEM majors and 55% note an intention to pursue medicine, with 52.4% noting continued interest in Orthopaedic Surgery.[17] POP programming was cited nearly universally as the impetus for initial and continued interest in Orthopaedic Surgery.

In 2012 MSOP was started for female-identifying or nonbinary first to third year enrolled MD or DO students, now with more than 70 programs annually. MSOP consists of programming that emphasizes hands-on Saw Bones surgical simulations, lectures on careers in Orthopaedic Surgery, work-life balance question/answer sessions, and opportunities for enduring mentorship. Within MSOP participants, the annual match rate into Orthopaedics is 22%. Since its inception,

20% of the women who participated in an MSOP program have gone on to match into an Orthopaedic Surgery residency, compared with 1% of women medical students overall who match into Orthopaedic Surgery. For example, with an overall match rate into Orthopaedic Surgery of 68% in 2021 (1470 applicants with 875 spots), there was a 20% match rate within Perry Initiative graduates, higher than the current percentage of female residents in Orthopaedics.[21] Although the Perry initiative does not specifically recruit women into Hand Surgery, creating a pipeline to directly increase women in Orthopaedics allows for a more diverse pool of future Hand Surgery fellowship applicants.

In 2016, the Perry Initiative created OIA in order to have even a wider reach, which are STEM compliant kits that can be purchased for use in junior high and high school science classes. These kits have now been requested by more than 200 classrooms within the United States.[17] Since 2020, the Perry Virtual Experience and Virtual Medical School Outreach Experience have also been developed and have now reached more than 1800 women in high school, college, and medical school.[17]

Nth Dimensions

The Nth Dimensions Program was founded by Dr Bonnie S. Mason in 2004 as a pipeline program to encourage women and UIM medical students to pursue Orthopaedics. Since its inception, Nth Dimensions has expanded to include recruitment of UIM individuals into many specialties, not just Orthopaedics. The program consists of an 8-week clinical research program between the first and second years of medical school. During this time, students participate in musculoskeletal lectures, practice-based workshops, and research projects and presentations. Mentorship and professional development opportunities derived during this summer continue throughout the remainder of medical school. Between 2005 to 2012, 118 students completed the 8-week clinical and research Nth Dimensions/American Academy of Orthopaedic Surgeons (AAOS) Summer Internship Program.[18] From tracked data, women who completed the internship had increased odds of applying into Orthopaedic Surgery compared with national controls (35% vs 1%, respectively).[18] UIM also had increased odds of applying into Orthopaedic Surgery compared with national controls (31% vs 3%, respectively). Across the 8 years of Orthopaedic summer intern cohorts, the overall match rate of applicants into Orthopaedic Surgery was 76%, which was significantly higher than national controls.[18]

Support/Networking Groups

Many groups and societies exist with the function and purpose of bringing together women and UIM to support and encourage professional success and growth. These groups function as excellent sources of academic support but can also be a place to find advocates against discrimination. Many of these groups also offer pipeline support as part of their programs and initiatives.

The Ruth Jackson Orthopaedic Society

Founded in 1983, the Ruth Jackson Orthopaedic Society (RJOS) serves as a networking and support group for orthopaedic women of all training levels, from high school through established careers. Dr Ruth Jackson was the first practicing female orthopaedic surgeon in the United States. The group offers diverse mentorship opportunities. Workshops are developed and catered to trainees at all levels. For example, during the COVID-19 pandemic, mock virtual interview practice sessions were made available for female medical students applying into Orthopaedics.

The J. Robert Gladden Orthopaedic Society

The J. Robert Gladden Orthopaedic Society (JRGOS) was founded in 1998, named after the first Black orthopaedic surgeon, with a mission to increase diversity within the orthopaedic profession and promote the highest-quality musculoskeletal care for all people. This society offers membership to many training levels, including medical students interested in Orthopaedic Surgery, and to residents, fellows, and physicians already in Orthopaedics. Opportunities for students include mentoring, mock orals, and notifications of grants and scholarship opportunities.

The American Association of Latino Orthopaedic Surgeons

Founded in 2012 by Dr Ramon Jimenez, the American Association of Latino Orthopaedic Surgeons offers mentorship opportunities as early as premedical students. Mentorship may then continue into medical school, residency, and beyond. The organization offers test prep seminars on examinations such as the MCAT and USMLE step 1 and 2 examinations. There are also scholarships and opportunities made available to members targeted toward increasing the number of Latinx individuals within Orthopaedic Surgery.

The International Orthopaedic Diversity Alliance

Founded in 2019, the International Orthopaedic Diversity Alliance (IODA) is a global organization with the 2022–2024 strategic plan including American

Association of Latino Orthopaedic Surgeons with 3 goals: (1) expanding the reach of global diversity efforts; (2) equipping IODA members with knowledge and tools to create and sustain a diverse, inclusive, and equitable environment; and (3) develop a sustainable organization. The organization has free and open membership, providing access to other members in North America, South America, Africa, the Middle East, Europe, Australia, and Asia Pacific.

Black Women Orthopaedic Surgeons

Founded in 2020, the group Black Women Orthopaedic Surgeons (BWOS) has a described mission statement to support and empower Black women orthopaedic surgeons. It targets current orthopaedic residents and beyond with monthly check-ins, big sister/little sister programs, and mentorship opportunities.

Pride Ortho

Founded in 2020 via a virtual happy hour, Pride Ortho promotes mentorship and a sense of belonging for Lesbian, Gay, Bisexual, Transgender, Queer (LGBTQ) orthopaedic surgeons, allies, and patients, with professional development opportunities available throughout all stages of an Orthopaedic Surgery career. The community welcomes all orthopaedic surgeons (gay, straight, trans, or cis) who are committed to increasing LGBTQ representation and community within the field of Orthopaedics.

Women in Orthopaedics Worldwide

Founded in 2021, the Women in Orthopaedics Worldwide (WOW) is a global organization targeted toward the empowerment of women orthopaedic surgeons through the recognition of intersectionality and barriers in the inclusion of women in Orthopaedic Surgery. WOW offers webinars and symposiums, orthopaedic chapters in Africa, Asia, North America, South America, and Europe, analytics such as a "women in Orthopaedics" heatmap, and showcases of women in Orthopaedics such as a compilation timeline beginning in 1919 with Dr Anna Frumina of Ukraine, the first woman orthopaedic surgeon. Membership in WOW is open to everyone.

Orthopaedic Diversity Leadership Consortium

Founded in 2022, the ODLC is a membership organization offering professional development opportunities to improve the effectiveness and sustainability of diversity efforts in health care. They focus on diversity strategy–oriented speaking engagements, personalized coaching, and leadership development workshops. Membership is available to medical students, residents, industry members, human resource and administrative personnel, and practicing physicians.

In addition to the aforementioned organizations, a variety of other initiatives, such as the B.O.N.E.S Initiative,[22] have been developed. Such programs typically use short-term curriculum and mentorship opportunities that emphasize exposure and access to Orthopaedics during medical school. Funding for such initiatives is often addressed via corporate investment and donations (such as from orthopaedic institutions), personal investments, foundation support, and other partnerships such as Project Lead The Way (PLTW).

Deterrents to Entering the Hand Surgery Pipeline

At every education level, involvement of mentors from the next step in training is invaluable[23] to the trainee experience, particularly mentors who may share some of the lived experiences of identity background.[24] Preresidency, mentors provide insight and guidance into the process of becoming a physician. Many students, particularly if they are from socially disadvantaged backgrounds, may have had minimal exposure to or understanding of the process of becoming a doctor and little or no awareness of the different types of medical or surgical practices available. During residency, faculty-to-resident mentorship may include getting residents involved in research, professional societies, support, guidance, and active demonstration of what leadership and the meaningful practice of medicine looks like. Oftentimes existing as the sole individual of a certain identity within a training program, UIM residents may have the lived experience of feeling apart or othered from their residency program or institution, while simultaneously filling hypervisible roles as ambassadors of their race and/or gender.[24]

Mentorship from women and minority mentors at the faculty level is limited for medical students wishing to enter into surgical subspecialties. For UIM medical students finding *any* mentor may be challenging and even more difficult to find a mentor who shares key components of their identity, such as ethnicity or gender identity. One study showed that as few as 35% of medical students identifying as women were able to find a mentor during a surgical rotation, and of those with a mentor, 90% were men.[23] Even if a mentor may be identified, significant discrimination and negative experiences may occur within the training process. A 2018 systematic review of 120 studies examining medical student rationale for surgical specialty selection or selection to not enter into surgery revealed that 68% to 96% of female

medical students experience gender discrimination during their surgical experiences.[23] In contrast, male medical students reported significantly less harassment than female medical students, which correlated with greater interest in surgical careers.[23] Further, perceptions developed over time of surgical subspecialties may be additional deterrents. A 2016 survey of female members of the Ruth Jackson Orthopaedic Society found that perceptions of Orthopaedics included the belief that Orthopaedics was too physically strenuous and that along with a "jock fraternity" culture, there was also a lack of appropriate mentorship.[21] These perceptions were included as disincentives to joining the field. Inappropriate mentorship runs the risk of further deterring trainees. A classic example would be having a mentor who, under the guise of helpfulness or caring, suggests that women may wish to pursue less strenuous professions in order to start a family.

Beyond residency, mentorship remains important. Opportunities for advancement for women and UIM continue to lag throughout the career of an orthopaedic surgeon. For example, of 187 orthopaedic surgery residency programs in the United States, only 6 have appointed women chairs, with 4/6 having been appointed within the last 2 years. Diversity in leadership is correlated with diverse recruitment of trainees, and surgical residency programs that lack diversity are less appealing to women and minority medical students,[23] leading to data demonstrating that Orthopaedic Surgery programs train women residents at unequal rates. Although some programs consistently recruit and train women orthopaedic surgeons, others consistently train none and may wish to improve their recruitment.[20] Promoting diverse candidates to program leadership, fellowship leadership, and involvement in societies such as at the American Society for Surgery of the Hand (ASSH) are important steps to providing the continued, ongoing support that surgeons need after successfully navigating the pipeline—by women and minority surgeons continuing to become leaders in the field, the path for future hand surgeons is made clear.

Section Six: The Application Process

Pipeline projects and initiatives are crucial to inspiring and encouraging women and UIM students to apply to medical school and then to surgical specialties. In order for these programs to be successful, the process of applying to medical school, residency, and fellowship must be examined for sources of bias that may preclude successful applications. With data from medicine and outside medicine, gender discrimination in hiring decisions has been well documented via randomized controlled trials, demonstrating that men are more likely than women to be hired despite matched qualifications, men are more likely than women to receive recommendation for advancement, and men are offered higher salaries.[25] Although hiring processes in medicine are typically left up to institutions, groups such as the support and networking groups mentioned earlier as well as national medical societies have the power and ability to affect these processes, minimize bias, and support the future of a more diverse group of surgeons.

Many potential sources of bias exist in application interviews and selection processes. For medical school, residency, and fellowship, many programs rely heavily on letters of recommendation. However, studies have demonstrated that significant differences exist in how applicants are described. A recent study showed that women are more frequently described as being "pleasant" and "flexible," whereas men were more frequently described using their research and initiative.[26] Even in Plastic Surgery where standardized letters of recommendation have become more common, studies show that gender and minority status tend to predict poorer letters.[27] Similar data also exist for applicants to General Surgery residency.[28] To combat this problem, it may be important for schools and programs to consider letters of recommendation as potential sources of bias and not to weight them as heavily as the more unbiased elements of the application, such as transcripts and publications. However, medical school transcripts have been shown to be biased against ethnic minorities,[29] and publications are subject to the ability to identify and access a research mentor, which can vary based on the institution and other factors. Personal statements may also be weighted more strongly when deemed appropriate. Although even these elements of the application may to some extent reflect unequal opportunities or experiences, they give the applicant a chance to represent themselves.

Several strategies exist that can help to limit bias in application processes, including the following:

- Blinding applications to photograph, gender, sex, school of origin, or other potential sources of bias.
- Including secondary reviewers for applications from UIM or female candidates to ensure these candidates receive serious consideration.
- Placing less weight on letters of recommendation, which themselves have been shown to be sources of bias.[26]

- Placing greater weight on factors that have been shown to predict success including female gender, advanced age, military service, and participation in college athletics.
- Ensuring that each applicant interviews with the same faculty in order to decrease subjective variability.
- Asking all interviewers to participate in bias training before application reviews and interviews.[30]

Ultimately, one of the most important considerations for residency, fellowship directors, and department chairs is that increasing diversity among residents, fellows, and attending surgeons must be actively sought if it is to be successful. It cannot be a passive process.

SUMMARY

The importance of taking an active role in furthering the diversity of our field cannot be understated. Diversity does not happen without proactively seeking it out and valuing it. And when diversity is in place, cultural change follows. It is clear that women and minority surgeons still lack opportunities to speak on the national level and are behind their counterparts in opportunities for academic and career advancement. For example, less than 3% of speakers at the Hip and Knee Society over the last 10 years have been women orthopaedic surgeons.[31] Across the board, specialty societies report fewer women in leadership and attaining monetary awards.[32] In order to change culture, create an inclusive society and give women and underrepresented groups a voice; the decision must be made to prioritize diversity.

It is clear that one of the strongest tools we as surgeons have to create a future generation of diverse surgeons is to get involved within the pipeline to our specialty. A multipronged approach to changing the pipeline could include participating in and building opportunities for exposure to surgical specialties, identifying and addressing gaps in education, participating in meaningful mentorship, making use of societies that value and support diverse students and trainees, and shaping institutional cultures that are supportive of women and minority physicians.[18] If we want to have an ASSH meeting full of surgeons from all backgrounds, it is our responsibility to join a committee, volunteer for the Perry Initiative, reach out to a medical student, participate in the residency application process, and advocate for leadership that represents all of us. Meaningful change will only happen when everyone understands the importance of diversity and steps up to be part of the solution.

DISCLOSURE

Drs C.A. Donnelley and Halim have nothing to disclose. Dr L.L. Lattanza is a founding member of and currently serves on the board of directors for the Perry Initiative.

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