Equal means equal: Cardiothoracic surgery in its second century

Marc R. Moon, MD

ABSTRACT

Objective: As the specialty of cardiothoracic surgery turns the corner into its second century of existence, there has been an uptick in the number of women and underrepresented minorities entering the field, but we have a long way to go before race and gender equity prevails.

Methods: In this report, specific barriers to diversity without exclusion and mechanisms to breakdown these barriers will be explored.

Results: Barriers to inclusion include a long-standing deficiency in exposure, encouragement, mentorship, and sponsorship to actively attract underrepresented groups to the specialty. Diversity will not occur passively. It will take a concerted effort best employed through a top-down approach at the local and national level, and it has to seem normal.

Conclusions: Cardiothoracic surgery is an outstanding field for anyone and everyone who seeks a challenging, rewarding career, regardless of their gender, race, or ethnic background. It is the responsibility of leadership to dispel the tradition that certain individuals are not welcome. (J Thorac Cardiovasc Surg 2021;161:1381-9)

Diversity in cardiothoracic surgery will not occur passively. It takes a concerted effort.

CENTRAL MESSAGE

In the last decade, there has been an uptick in the number of women and underrepresented minorities in cardiothoracic surgery, but we have a long way to go before race and gender equity prevails.

PERSPECTIVE

As cardiothoracic surgery turns the corner on its second century, barriers to inclusion remain for women and underrepresented minorities to enter the specialty. Diversity will not occur passively. It will take a concerted effort. Through a top-down approach at the local and national level, specific barriers can be addressed through increased exposure, encouragement, mentorship, and sponsorship.

I was in a European country last year for a conference, and my host was the daughter of the Chief of Cardiothoracic Surgery. She told me how much cardiothoracic surgery excited her when she was young but that she ultimately chose to become a cardiologist. "Why not a cardiothoracic surgeon?" I asked. She replied, "Because that is man's work." Fifty years ago, such a response would not have raised any eyebrows, and unfortunately for this trainee, it did not raise any eyebrows among her peers or mentors when she was making a career decision that would last the rest of her life. Cardiothoracic surgery is one of the least-diverse specialties in medicine, and it is the responsibility of leadership to dispel the tradition that certain individuals are not welcome.

WOMEN IN CARDIOTHORACIC SURGERY

Gender inequality is nothing new. It has been around at least since the Neolithic Period more than 8000 years ago.

From the Division of Cardiothoracic Surgery, Washington University School of Medicine, St Louis, Mo.

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Address for reprints: Marc R. Moon, MD, Washington University School of Medicine, 660 S Euclid Ave, Campus Box 8234, St Louis, MO 63110 (E-mail: moonm@wustl.edu).

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Abbreviations and Acronyms
AATS = American Association for Thoracic Surgery
ABTS = American Board of Thoracic Surgery
STS = Society of Thoracic Surgeons
URM = underrepresented minority

A study in the European *Journal of Archeology* reported overrepresentation of men in cave art and biased burial patterns in prehistoric Spain.[1] Formal burial sites were far more common for men than women and while men were buried with arrowheads, tools, and precious metals, women were buried with ceramics. These findings suggest that gender inequality was not determined by biologic differences; instead, it was cultural.

Dr Mary Edwards Walker was the first female surgeon.[2] After graduating from medical school in 1855, she went into private practice in Upstate New York. During the Civil War, she tried to enlist in the Union Army, but they would only commission her as a nurse. She eventually served as a civilian War Department surgeon with the Ohio 52nd Infantry. Unfortunately, it took another 100 years before there would be a female cardiothoracic surgeon. Three women were certified by the American Board of Thoracic Surgery (ABTS) in 1961, including Dr Ann McKiel, Dr Nermin Tutunju, and Dr Nina Starr Braunwald. Dr Braunwald performed the first successful mitral valve replacement in 1960 and was also the first woman to become a member of the American Association for Thoracic Surgery (AATS) in 1967.[3,4] These female firsts in the 1960s were not the beginning of a revolution. Progress remained slow. By 1980, only 10 women had received ABTS certification and the number did not exceed 250 until 2014.[5] So, where are we today? Recent data from the Association of American Medical Colleges list thoracic surgery as one of the least gender-diverse specialties, with women accounting for only 6% of the active workforce.[6]

Some speculate it is a pipeline issue.[7] You certainly could have substantiated that conclusion in 1980 when only 30% of medical school applicants were women, but not in 2020. Since 2003, the number of women applicants has been similar to men, and the number of female graduates now approaches 50%.[8] It is not a pipeline issue, rather it is during medical school that women determine not to pursue cardiothoracic surgery. Fields such as obstetrics and gynecology, pediatrics, and dermatology lead the list of residency programs selected most often by women.[9] Orthopedic surgery, neurosurgery, and thoracic surgery rank at the bottom. The number of female cardiothoracic surgical trainees has increased from 8.9% in 2007 to 23.8% in 2017, but cardiothoracic surgery still lags far behind other surgical subspecialties.[6]

A 2010 study from Dr Carolyn Reed and coauthors queried 2153 general surgery residents (67% men, 33% women) to identify perceived shortcomings for various surgical subspecialties.[10] The overwhelming shortcoming most often expressed by both men and women in regards to cardiothoracic surgery were job market and job security concerns, reported 3 to 14 times greater than for all the other surgical subspecialties (Figure 1). Job security concerns first came to light in 2002 when Dr Richard Lee, then President of the Thoracic Surgery Residents Association, published the findings of a survey of graduating cardiothoracic surgery residents.[11] Residents reported that prospects for employment were bleak, and the training experience was antiquated. These sobering findings stimulated Dr Mark Orringer to publicly proclaim, "The word is out" at the Society of Thoracic Surgeons (STS) Annual Meeting in 2004.[12] Applications to thoracic surgery residency programs fell dramatically from 200 in 1995 to less than 100 in 2007.[13] For the first time, the number of positions available exceed the number of applicants, and it stayed that way for nearly a decade.

In response, the ABTS, Thoracic Surgery Residency Review Committee, and individual thoracic surgery programs made sweeping changes to address perceived deficiencies.[14-19] In 2009, Grover and coinvestigators[20] predicted the demand for cardiothoracic surgeons was going to increase 46% by 2025 while the supply would fall 21%. As a consequence, they predicted a major shortage by the year 2020, but when preclinical medical students were surveyed in 2010, only 14% of women were aware of the impending shortage compared with 51% of men.[21] The AATS took a deliberate approach to spread the word at the 96th Annual Meeting in Baltimore in 2016. The prime position on the program was given to Dr Susan Moffatt-Bruce to present an even more compelling argument with her paper, "Providing Cardiothoracic Services in 2035: Signs of Trouble Ahead."[22] Dr Moffatt-Bruce's message finally struck home, and each year since 2016, there have been 20% to 30% more applicants than positions available for the traditional programs and, most recently, there were 120 applicants for 38 integrated-6 residency positions.[23,24] Women account for a greater percentage of integrated-6 (29%) than traditional (23%) positions. Some might suggest that this is because the quality of the applicants has diminished, but that is not true. Figure 2 demonstrates cardiothoracic integrated-6 residents had United States Medical Licensing Examination Step 1 scores just below orthopedics and neurosurgery and Step 2 scores that excelled.[25]

Looking specifically for differences between male and female medical students, Foote and colleagues[21] surveyed 470 medical students including preclinical men, preclinical women, and clinical women. Specialty interests varied by gender and medical school stage; 50% of preclinical men

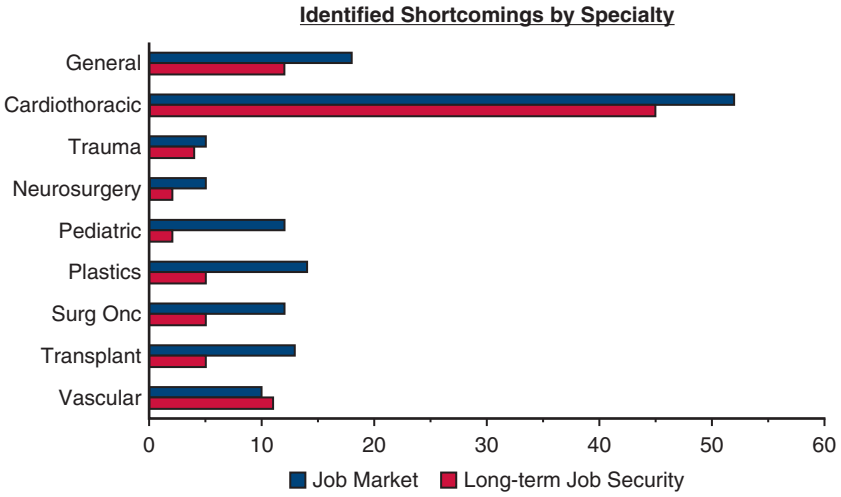

FIGURE 1. Reported shortcomings perceived by surgery residents for common surgical subspecialties overwhelmingly included job market (*blue*) and long-term job security (*red*) for cardiothoracic surgery. Based on data from Reed and colleagues.[10]

reported surgery or surgical subspecialties as their first career choice. Preclinical women had broad interests including 21% who favored surgery, but by the time women had progressed to the clinical years, interest in primary care specialties predominated and interest in surgery fell by half. Intellectual interest and lifestyle were important in both men and women, but while prestige and salary were more important for men, the ability to address health disparities played a greater role in women (Figure 3). Importantly, while 30% of women reported interest in cardiothoracic surgery at baseline, when asked again about their interests if they were assured that the specialty could incorporate their specific career goals of a balanced lifestyle and the ability to address health disparities, interest in cardiothoracic surgery among preclinical women exceeded 80%. In addition, although 77% of preclinical women expressed interest in shadowing a cardiothoracic surgeon, only 12% attempted to do so.

Early exposure, whether through medical student interest groups, shadowing, or mentorship can prompt students to select a rotation in cardiothoracic surgery as an elective in their clinical years. It then becomes incumbent upon the faculty and residents to ensure the rotation is a positive experience. McKinley and colleagues[26] identified 3 key

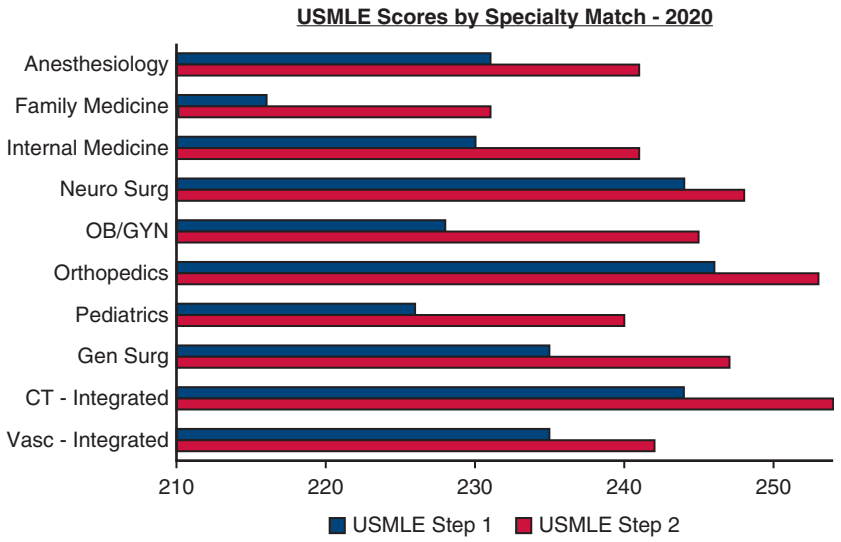

FIGURE 2. United States Medical Licensing Examination (*USMLE*) Step 1 (*blue*) and Step 2 (*red*) scores for medical students matching into common specialties. *OB*, Obstetrics; *GYN*, cgynecology; *CT*, cardiothoracic. Based on data from the Association of American Medical Colleges 2019 Report on Residents.[25]

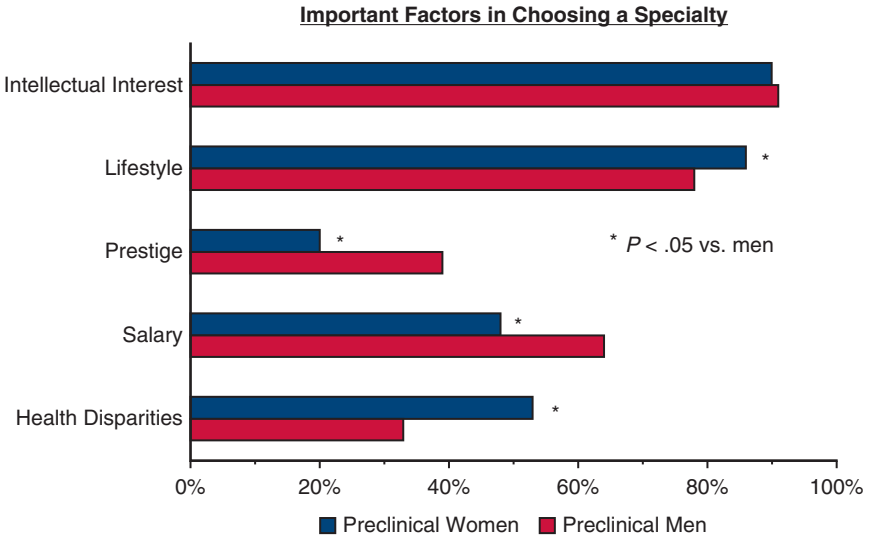

FIGURE 3. Important factors considered by preclinical women (*blue*) and preclinical men (*red*) when selecting a specialty. Based on data from Foote and colleagues.[21]

factors during a surgical clerkship: (1) one-on-one resident mentoring; (2) experiencing a meaningful relationship with a patient; and (3) making an incision and assisting in dissection. Surgical clerkships can also combat students' misconceptions. Students surveyed preclerkship and postclerkship reported a substantial improvement in perception that surgeons are compassionate physicians (49% pre-, 77% post-), respect medical students (20% pre-, 51% post-), and are good teachers (36% pre-, 57% post-). After the types of procedures performed, residents who ultimately chose cardiothoracic surgery considered a positive experience during a cardiothoracic rotation and identifying a mentor in the field as the most inspirational factors (Figure 4).[27] Only 34% of women believe it is easy to find a cardiothoracic surgeon mentor but note that access to mentors who represent their respective cultural and identifying backgrounds would nearly double their interest in the field.[21,28]

Mentorship is key, but we must do it right.[29] A recent survey in The American Surgeon reported recommendations from faculty mentors to female trainees.[30] The specialty that ranked at the very bottom, ie, recommended the least

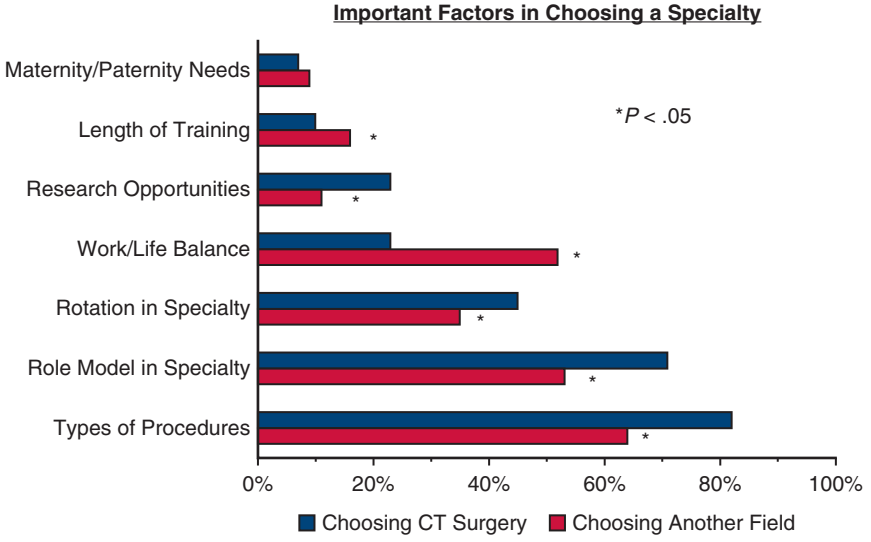

FIGURE 4. Important factors considered when selecting a surgical subspecialty in residents who chose cardiothoracic surgery (*blue*) compared with those who chose a different field (*red*). *CT*, Cardiothoracic. Based on data from Vaporciyan and colleagues.[27]

to women mentees, was cardiothoracic surgery, recommended less than even neurosurgery or orthopedics. The specialties viewed most receptive for women were breast surgery, obstetrics and gynecology, and plastics. Is it possible that surgical mentors are perpetuating stereotypes when advising women trainees? These data certainly raise concern.[31] The most disturbing finding though was the negative recommendations from cardiothoracic surgeons against women entering the field. Although only 20% of urologists advised only men to pursue urology, the specialty group that most often advised only men to pursue cardiothoracic surgery were cardiothoracic surgeons at 57%.[30] To quote Walt Kelly's famous comic strip character Pogo, "We have met the enemy and he is us."[32]

In 2015 at the University of Minnesota, the Department of Surgery initiated an undergraduate surgery interest group.[33] The undergraduate group comprised 75% women compared with their medical student surgical interest group, which comprised only 41% women. The program was economical, costing only $2500 per year for workshops, and the 40 faculty and resident proctors each had only a 2-hour time commitment. The 3 most popular future surgical subspecialties identified by the undergraduates included neurosurgery (28%), trauma (18%), and cardiothoracic surgery (8%). In contrast to medical students who viewed resident lifestyle and social obligations of a surgical career to be negative influences on their decision to pursue the field, undergraduates conversely identified these factors as positive influences to pursuing a surgical career. We need to strike while the iron is hot.

UNDERREPRESENTED MINORITIES (URMs) IN CARDIOTHORACIC SURGERY

Dr Daniel Hale Williams was a Black surgeon from Chicago who, in 1893, performed an operation that brought him international fame.[34] It was the lay press that first reported his heroic efforts. A newspaper article in the *Daily Inter Ocean* detailed how Dr Williams was one of the first in the world to suture repair a pericardial laceration. Dr Williams was the only Black surgeon admitted to the American College of Surgeons at the time of its formation in 1913. So, where are we today?

The US population includes 60% White, 19% Hispanic, 13% Black, and 2% Native American or Hawaiian.[35] Cardiothoracic surgery residencies comprise 66% White, 8% Hispanic, 4% Black, and 0% Native American or Hawaiian.[36] Unlike the earlier assessment of the female deficiency in cardiothoracic surgery, the deficiency of URMs resembles more of a pipeline phenomenon. The loss of women to other specialties occurs most substantially at the decision point between medical school and residency. Women constitute 46% of all residents, 43% of general surgery residents, but just over 20% of cardiothoracic residents.[36,37] In contrast, URMs account for 14% of residents, 14% of general surgery residents, and 12% of cardiothoracic residents. The loss of URMs from the potential surgical workforce occurs much earlier in the educational process. In the United States, while 39% of high school students are URMs, URMs account for only 33% of undergraduate students. Based on the US Bureau of Labor Statistics, there are 3.2 million high school seniors, of which 25% are Hispanic and 14% are Black.[38] If this same ratio were assumed among the 2.1 million who enroll in college, this would yield 819,000 URMs in college. The actual percentage of 33% yields approximately 693,000 URMs in college, a leak of 126,000 URMs in the transition from secondary to tertiary-level education.

Numerous interventions to inculcate secondary students and undergraduates to pursue a surgical career have been initiated during the last decade. To spark interest among high school students, Camp Cardiac was founded by Dr Richard Lee in 2010 as a 1-week summer day camp including hands-on workshops, basic knowledge lectures, and an introduction to various careers in cardiac-related health care fields.[39] Local programs are run by medical students in more than 30 cities nationwide. Partial and full scholarships are available to those with socioeconomic constraints. The Society of Black Academic Surgeons has taken early exposure to an even greater level.[40] At their annual meeting, the Society hosts mentorship sessions for eighth- and ninth-grade students to introduce them to the excitement of pursing an academic surgical career.

Probably the most disturbing loss of URMs in the educational pipeline occurs during the medical school admissions process and medical school itself.[41] Of those applying to medical school, only 14% are URMs, a leak of 8634 from college. Of those admitted, only 13% are URMs, a leak of 276 during the admissions process. Of those graduating from medical school, only 11% are URMs, a loss of 364 during medical school. Here is where interventions to address unconscious bias may play its most important role.[42]

With conscious or explicit bias, behaviors are conducted with intent. The actions are voluntary, conveyed directly and the individual is aware of the bias. In contrast, unconscious or implicit bias occurs outside the individual's awareness. Bias is involuntary, conveyed indirectly, and spontaneous. Implicit bias can be addressed through transformative learning theory in which a disorienting experience leads to critical refection which promotes skill acquisition and role modeling of the learned behavior, but this process is slow and requires a dedicated curriculum.[43]

As a more direct approach, Dr Quinn Capers, an interventional cardiologist at the Ohio State University School of Medicine, has developed 4 distinct strategies to actively confront implicit bias[44-46]:

- *Common Identity Formation.* Probe until you find a common shared interest with the individual. Maybe you both like football, or symphony music, or you are both middle children.
- *Perspective Taking.* Use empathy to understand where the individual came from, the background and previous influences that shaped their being.
- *Consider the Opposite.* Force yourself to look for data to support the contrary. Use a holistic assessment beyond numerical test scores. Strong leadership skills may predict future success more so than an organic chemistry grade obtained during sophomore year.
- *Actively Counter Stereotypes.* Connect with individuals outside your circle to better understand different communities and what they have to offer society as a whole.

Medical schools around the country are espousing these principles to foster diversity among the student body with promising results, and such an approach can foster diversity in cardiothoracic surgery moving forward.

And it has to seem normal. Diversity in cardiothoracic surgery will not occur passively. It will require a concerted effort, at least for the foreseeable future.[47] In 2017, Dr Alec Patterson summarized the secret to increasing diversity during an interview for the AATS Centennial commemorative text In the Words of the Presidents, "We have to make it possible for women to have a successful marriage and a successful family life while successfully training them to do what we do, and it has to seem normal."[48] But when you think about it, what do we ever do as cardiothoracic surgeons that is normal?

Female cardiothoracic surgeons are less often married and less often have children than their male counterparts.[49,50] Women more often delay pregnancy because of their career (98% vs 50%), necessitating assisted reproductive technology 2.5-fold greater than the national average.[51] Both genders felt their career would be adversely affected by having children, 60% of men and 82% of women.[51] Yeo and coauthors[52] reported lower American Board of Surgery examination pass rates for examinees who were married with children than those who were single or married without children, regardless of gender. Luc and associates[53] identified a confidence gap for women cardiothoracic surgical graduates because they self-report less adequate preparation for board examinations than men, but, importantly, the confidence gap did not translate to actual gaps in ABTS examination pass rates. Policies to support childbearing during training and early career must be initiated.[29,54] Formal leave policies, career sharing, flexible call schedules, and subsidized "on-call" childcare coverage for minor illnesses should all be considered. Collegial support of work–life integration efforts is one of the most important factors associated with career satisfaction and is particularly impactful for women.[55]

In a recent editorial, Babchenko and Gast[56] suggested that we should train female and male residents slightly different, professing, "In coaching women, there is more of a need for 'ego-boosting'." With men, ""it is more 'ego-busting'." I was pleased to read the conclusion of the letter to the editor that followed from Dr Jessica Luc (female cardiothoracic resident) and Dr Mara Antonoff (female cardiothoracic faculty).[57] "To suggest that female surgical trainees ought to be trained or treated differently by faculty members than their male colleagues may arguable perpetuate bias." They suggest advancement through merit (ability plus effort), which, as described previously, should be assessed using a holistic approach. Cardiothoracic leaders must express empathy, self-awareness, and emotional intelligence, whether innate (uncommon) or learned through targeted education in the Accreditation Council for Graduate Medical Education core competences of interpersonal communication skills and professionalism.[58-61]

Raising awareness to the barriers that encumber diversity in cardiothoracic surgery is essential, most effectively in a top-down fashion. In 2018, the AATS focused the AATS Leadership Academy entirely on female surgeons.[62] In 2019, under AATS President Dr David Adams' leadership, merit-based recruitment through targeted sponsorship of women resulted in a 30% increase in female AATS members, and at the 2020 AATS Annual Meeting, the lead plenary paper was, "Unconscious Bias in Leadership at National and Regional Cardiothoracic Surgery Organizational Annual Meetings," presented by Dr Elizabeth David.[63] The following day yielded a historic event. Dr Yolonda Colson was nominated to become the first women who will ultimately serve as president of the AATS when the AATS Nominating Committee appointed her Vice President of the Association.[64] The AATS and STS have both formed committees focused on advancing diversity in cardiothoracic surgery,[65,66] and the theme of the 2021 AATS 101st Annual Meeting is "Diversity Without Exclusion in a Culture of Safety."

Not only is it important to convince women and URMs to enter the field, it is incumbent upon leadership to ensure the opportunity to achieve professional fulfilment and maximize retention. Donington and coauthors noted that

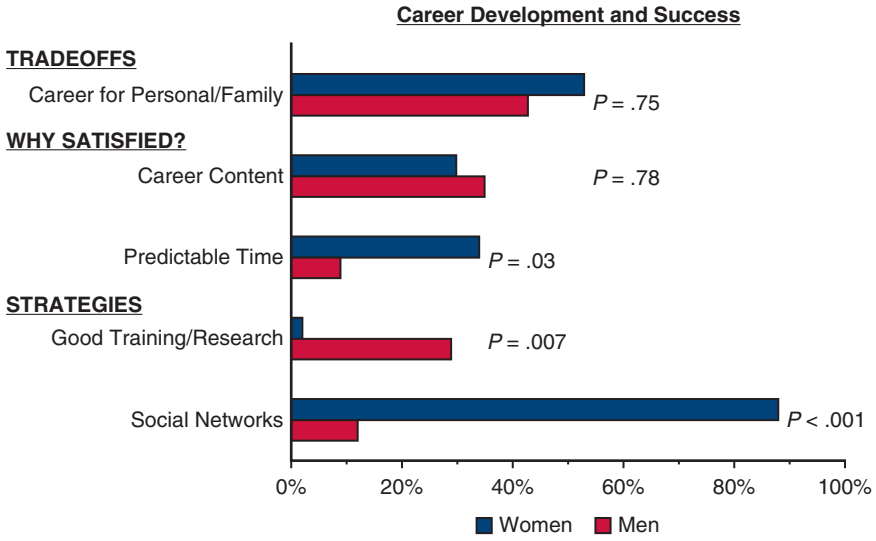

FIGURE 5. Tradeoffs, reasons for satisfaction, and strategies to accomplish career satisfaction as identified by mid-career "satisfied" surgeons (women *blue*, men *red*). Based on data from Ahmadiyeh and colleagues.[71]

while 51% of women are in academic practice compared with 34% of all cardiothoracic surgeons, the percentage of female faculty that hold the rank of associate or full professor lags far behind men.[3,6,67,68] When asked to identify the source of greatest professional dissatisfaction, other than demands on time, senior female cardiothoracic surgeons (10 years beyond ABTS certification) identified inadequate reimbursement; younger surgeons identified inadequate resources and support.[3] A recent survey of Black academic surgeons yielded a similar perception of salary inequities, more so in women than men, which is consistent with previous gender gap reimbursement reports.[19,69] These areas of dissatisfaction must be addressed at both the local and national level to ensure equal pay and equal promotion for equal work, again using a holistic approach to evaluate contributions, with sufficient support for junior surgeons to facilitate successful career development.

Time commitment, stress, and inadequate advancement are common reasons reported by academic surgeons considering a change to private practice, but women are 3-fold more likely to identify inadequate mentoring and a sense of isolation as the most important factor.[70] A study focusing on "satisfied" midcareer surgeons reported strategies used to accomplish career satisfaction.[71] Both men and women identified career content as an important factor but women were much more likely to identify predictable time requirements and social networks as strategies that led to satisfaction (Figure 5). While local same-sex networks may be challenging to develop for women in cardiothoracic surgery, efforts to increase national and international networks have flourished. Luc, Stamp and others have championed social media as a tool to rewrite the narrative and decrease isolation for women and URMs in cardiothoracic surgery.[72-76] Social media can facilitate role modeling, networking, mentorship, and sponsorship and unite female and URM surgeons in a virtual network of colleagues. In cardiothoracic surgery, more so than in other surgical specialties, women report a greater level of importance for the opportunity to engage a same-sex mentor (80% vs 55%); however, 59% of female cardiothoracic surgeons lack access to same-sex mentorship at their home institution compared with only 36% of other surgical specialties and 25% of medical specialties.[72,73] Social media enabled same-sex networking for 93% of female cardiothoracic surgeons compared with 68% of other surgical specialties and only 13% of medical specialties.

WHO IS ULTIMATELY RESPONSIBLE FOR INITIATING CHANGE IN CARDIOTHORACIC SURGERY?

Ultimately, the responsibility falls on each of us. Ceppa and coauthors[77] recently reported a disturbingly high incidence of sexual harassment in cardiothoracic surgery. More than 80% of women and remarkably also 44% of men reported experiencing sexual harassment during their careers. The problem is systemic, and we all need to change.[78] Institutional responsibility with a top-down approach through national and international organizations can initiate progressive change,[64,79] but ultimately, as Dr Robert Guyton professed in poetic form during his 2004

STS Presidential Address[80]:

I cannot, I will not
Accept this state…
But I know there's no one else,
I must begin with me.

In cardiothoracic surgery, it must begin with "me," and it must begin with "us." Through awareness and action, we can all begin to make a change.

Conflict of Interest Statement

Dr Moon is a consultant/advisory board member for Medtronic.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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