Assessing Factors Attributing to Gender Disparity in Orthopedic Surgery

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Swipe in sign in walk in, scrubs on gloves on mask on, and focus to avoid the blue sterile field. This was the dance into the operating room that I performed twice a week during my time shadowing orthopedic surgical device sales representatives. Scrubs, gloves, mask, I watched and took note of the open and arthroscopic procedures by the surgeon, asking questions about why he chose one specific surgical route over another. It was always the same, and then one day, I followed my mentor into the operating room to see something different. For the first time, the orthopedic surgeon I saw leading the operating room was a woman. I am embarrassed to say I was slightly surprised. Throughout the two months working for my company, the dozens of orthopedic surgeons and residency fellows I has watched performing surgery or practicing surgical technique in the skills lab were men. Even the sales company I was interning with had an overwhelming male majority. Curious to determine if my findings were mere coincidence, I set out for an explanation.

Orthopedic surgery is defined as the branch of surgery concerning conditions of the musculoskeletal system. Physicians may use surgical and nonsurgical techniques to treat disorders such as trauma, spine disease, sports injuries, degenerative disease, tumors, infections, and congenital disorders ("Orthopedic Surgeons: 7 Things You Need to Know," 2019). All surgical specialties require a rigorous education process, but orthopedic surgery specifically requires fourteen years of formal education including four years of undergraduate school, four years of medical school, five years of orthopedic residency, and one or more years in a specialized fellowship (Throckmorton, 2022). A medical student will normally rotate through different surgical specialties and make their specialty preference during their third year of medical school (Murphy, 2020). Women make up the majority of medical students; the 2019-

2020 medical school application cycle was 53.5 % women, and the percentage of matriculating students was 53.7% women (Brendan Murphy, 2021). However, women continue to hold only a small representation in surgery and healthcare leadership ("Women in Health Care Leadership," 2022). Orthopedic surgery in particular has the lowest female representation of all surgical specialties; women make up a mere 5.3 % (Haskins, 2019).

To determine why women have low representation in orthopedics, I take a deep dive into the available information and research, synthesize the text into overarching themes, and determine what gaps in research are missing. My research focuses on both tangible and intangible concepts such that nonphysical actors can still be analyzed. Using this research, I discover what is yet to be investigated and implemented for aiding the inclusion of women in orthopedic surgery. Using my results, I argue that a lack of female representation in orthopedic surgery can be attributed to a lower number of female applicants into orthopedics and high attrition rates for women in surgical residency and practice. This is due to both cultural and structural problems of the surgical specialty.

For clarification, when I use the term woman, or female, in this thesis, I am taking on the definition of such terms as used by the researchers in cited resources.

Literature Review

Women play a necessary role in healthcare. When there is an increase in diversity of healthcare staff, including gender diversity, there are new approaches to problem solving and innovation which consider multiple perspectives and fit the needs of a multi-faceted population. Increased diversity also helps to create a hospital atmosphere which is inclusive and supportive to all patients (Kennedy, 2019).

The number of women in orthopedics has increased at a dismal rate while other male dominated specialties have made progress to improve female representation. Thoracic and neurological surgery are two other specialties which have been predominately male. In 2008, the AAMC, American Association of Medical Colleges, reported that only 3.6% of orthopedic surgeons were female, in comparison to 3.8% and 5.6% in thoracic and neurological surgery, respectively. By 2022, the percentages of women in thoracic and neurological surgery grew to 8.3% and 9.6%; orthopedics only increased to 5.9% ("2008 Physician Specialty Data," 2008; "Active Physicians by Sex and Specialty, 2017," n.d.). Orthopedic surgery has uniquely increased at the slowest rate and continues to have the smallest percentage of female representation compared to all surgical specialties.

Orthopedic surgery specifically could benefit with the induction of more women into surgical roles. Increased diversity would benefit inclusive patient care. Women have higher rates of incidence for orthopedic conditions, and patients often prefer to be treated by a physician of their same sex. So, for musculoskeletal disorders commonly presenting in women, female surgeons would provide comfort and support to patients with such preferences (Sobel, Cox, Ashinsky, Eberson, & Mulcahey, 2018). Research also shows that women who have orthopedic conditions are referred to elective procedures and consent to elective procedures at lower rates than men (Sobel et al., 2018). Increasing the number of female surgeons consulting with female patients may be a solution to this discrepancy in treatment opportunity and comfortability. Furthermore, research shows that there is a small but significant difference in the outcome of surgery dependent on the sex of the operating surgeon. There is a higher likelihood for female patients to have adverse postoperative outcomes when treated by a male surgeon; the reciprocal is not the same, and male patients have no significant difference in outcomes when treated by a

male or female physician (Wallis, Jerath, & Coburn, 2021). In orthopedics, where women have higher rates of incidence, the impact of increasing the number of practicing female surgeons could lead to better overall outcomes. Increased gender diversity also aids patient care through increased sex-specific reporting. Sex-specific outcomes are significantly more likely to be reported in journal articles if a woman is the first or last author. Performing sex-specific reporting is necessary to identifying differences in prevalence, risk factors, and presentation of orthopedic disorders (Stumpff, Hadley, Corn, & Templeton, 2021). When the differences in musculoskeletal disorders between sexes are identified, surgeons have better resources for patient specific treatment. All of the potential benefits previously listed emphasize the importance of orthopedic surgery inducting more women into the profession(Errani et al., n.d.).

To better understand why there is high gender disparity in orthopedic surgery, and argue the specialty is antagonistic towards women, I gather data from a variety of sources: scientific journals, surveys in orthopedic surgery and the orthopedic field, previously completed data analysis, and reported interviews. I then analyze the data with a thematic analysis approach; I create a framework which takes in resources, and then identifies, analyzes, and reports repeated patterns which have had a negative influence on women in orthopedics. These patterns highlight themes in orthopedic surgery, both tangible and non-tangible, which are unique from other specialties and support my thesis. My framework utilizes the fact that orthopedic surgery gender disparity is an established problem. Therefore, I can review changes and patterns over a longer period of time. I uncover what challenges weigh most on the ability of women to enter the orthopedic field, what previous research has been done to combat the problem, and furthermore, how this research has succeeded or failed to be implemented.

Methods

I collect evidence for my argument using both primary and secondary sources. The primary sources are mostly surveys of orthopedic surgeons, and interviews previously given by women in orthopedics. My secondary sources consist of case studies, datasets, and journal reviews discussing problems with orthopedic surgery training, application, and practice. Most of this information is found in medical research agency websites and orthopedic journals such Society of Women in Orthopedics, PubMed, National Institute of Health, American Journal of Medicine, and other databases. I primarily focus on work done in the United States and Canadian healthcare systems in the past fifteen years, but include information from earlier in time if the reviewed characteristic of orthopedic surgery has created a legacy continuing into present day practice.

The resulting information is analyzed using content thematic analysis. I see how women in medical school have responded to reoccurring themes in hospitals and medical school facilities, and decipher which factors are playing the largest role in the lack of female representation in the orthopedic surgical specialty. This method allows me to isolate specific events, attributes, and characteristics of orthopedic training and practice. Next, I analyze how repeatedly occurring problems have changed the number of women in the field. Contrarily, I determine what elements create positive impressions of orthopedic surgery for women and how they are presented or diminished in the profession.

Results

If an orthopedic rotation were to become mandatory, schools might see a large increase in female applicants back to their orthopedic programs. Many medical schools place little emphasis

on orthopedic rotation or do not make the specialty rotation required. Third year rotation is reported as the primary influence for choosing a medical specialty in orthopedic and non-orthopedic students. However, female medical students indicate being more commonly influenced by clinical rotations (85%) than male medical students (56%) (Johnson et al., 2012; Van Heest, 2020). This influence was further proven in a twelve-year study period at the Icahn School of Medicine at Mount Sinai. An introduction of a required orthopedic rotation for two weeks during the third year, caused an 81% increase in proportion of female applicants into orthopedic surgery, 17% before the new curriculum and 30% after the new curriculum. This contrasted with the national average of a 14% to 15% increase from 2002 to 2012 (London et al., n.d.).

The orthopedic residency application process is another hurdle for women. A Johns Hopkins Clinical Orthopedics and Related Research Study polled orthopedic residency program directors about the highest weighted application factors. The most important considerations were grades in orthopedic electives and clerkship, and scores on the National Board of Medical Examiners, both part I and II. This is despite the fact there is no proven correlation between such scores and clinical performance. Research has shown significant gender differences in performance on the National Board of Medical Examiners Part I, with women scoring lower (*African Americans and Women in Orthopaedic Residency: The Johns Hopkins Experience*, n.d.). The heavy weight placed on this test score is a flaw to recruitment design which creates a barrier to women's applications.

The interview process also negatively influences acceptance chances and interest in recruitment for women. In a study of five residency program specialties, including orthopedics, women were statistically more likely to be asked potentially illegal interview questions

surrounding gender, age, marital status, and family planning. Such questions caused women to rank a program lower, specifically in general surgery and orthopedics (Hern, Alter, Wills, Snoey, & Simon, 2013). This evidence suggests that application and interview processes actually pose higher barriers to women than men and create a loss in interest from female applicants.

There is a lack of incentive for women to join orthopedic surgery because the benefits of the profession are unequally split. After the passage of the Sunshine Act, medical device and pharmaceutical companies must publicly report any industry payments to physicians and teaching hospitals. In a study from 2016 to 2017, Tufts University, Harvard University and Hospital for Special Surgery researchers reviewed such disclosed payment information and found that 98% of the orthopedic surgeons which received industry payments were men, and that the average male orthopedic surgeon received five times the number of payments then any female orthopedic surgeon ("A Check-Up on Gender Disparities in the Field of Orthopedic Surgery," 2020). Such information shows a positive feedback cycle where men receive the most financial incentive from such industries, and the male perspective is what goes into the industries' creations of orthopedic devices and techniques. Women may also be deterred from orthopedics because the chances of acceptance and promotion are low. A survey of female residents showed that women had only a slightly lower preference for surgery, but statistically lower rates of choosing surgery because of the belief that it was too "difficult in getting a residency,"(Walker & Hubbard, 1993). Also reported was that 83% of women felt that promotion in orthopedics for a woman was more difficult (O'Connor, 2016). In fact, 25% of female orthopedic surgeons would not recommend their residency program to women applicants (Walker & Hubbard, 1993). If orthopedic programs hope to make their staff gender inclusive, they need to ensure that the rewards of the job are equally shared.

Women may be dismayed to join orthopedic surgery because of stereotypes regarding the strength and demeanor required for the specialty. Surgeons reported that orthopedic surgery specifically gave off an impression of being male dominated and physically demanding (Ahmed & Hamilton, 2021). Subliminal ideas such as the needed physical strength or the personality of orthopedic surgeons is often cited as reasons which discourage women from choosing orthopedics (de Costa, Chen-Xu, Bentounsi, & Vervoort, 2018). Some counter arguments claim that these subliminal thoughts are true, that it is a fact that orthopedic surgery requires more strength and stamina then women can handle. Orthopedics is claimed to be a very physically demanding specialty, requiring holding heavy patients steady and using large instruments such as mallets and saws (Finch, 2017). The strain of such procedures leads some physicians to recommended hand surgery as a subspecialty for women, as it is better suited for "petite figures," (Schierhorn, 2013). This is not a reasonable excuse to dismiss women from the field. The advancement of medical technology such as medical tools which fit different body measurements, altered surgical approaches, and new ergonomic positioning of patients, allows such "petite figures" to practice orthopedic surgery with no significant statistical difference in surgical outcomes or adverse effects (Errani et al., n.d.).

Sexual harassment and discrimination perpetuate the concerns which women may have of not fitting the orthopedic persona or stereotype. In a survey of female orthopedic residents, 46% reported sexual harassment, 65% reported sex discrimination, and 68% reported less encouragement than male colleagues in training (Walker & Hubbard, 1993). Harassment is a problem seen across the medical field but is prominent in orthopedics specifically. If women feel that orthopedics is an unfit specialty based on stereotypes, leadership needs to place increased

emphasis on workplace harassment prevention and promotion of mentorships and support groups.

A mentorship or support system can be a useful tool to combat an environment with high reporting rates of harassment and discrimination, but many female orthopedic surgeons are unable to find this in their workplace. The problem starts with the current lack of women in orthopedics. According to ACGME's accredited programs from the GME national database in 2020, 45 of 179 orthopedic residency programs had no female residents. Woman are more likely to enter programs with other women faculty because it creates a more inclusive environment (McFarling, 2021; Van Heest, 2020). Not only is there a lack of women overall to form a support system, but many candidates feel that there is a specific lack of women in orthopedic leadership and mentorship roles (Ahmed & Hamilton, 2021). Departmental leaders who wish to incentivize women to join their program may consider hiring more women in faculty, leadership, and research positions. Orthopedic programs with these implementations have greater percentages of female residents and are proven to enhance female recruitment and interest (Sobel et al., 2018). People may argue that a support system can be found outside of the hospital. In fact, one may point to a study by Walker and Hubbard, which concluded from a survey of female orthopedists, that women who have a support system at home, marriage or a long term partner, are less likely to leave orthopedic residency (Walker & Hubbard, 1993). However, this study is single faceted, assuming causation rather than correlation. A more recent systematic survey found that older research identified female surgeons as wishing to start families earlier or wishing to have a more flexible schedule for their personal life. In contrast, recent studies were reframed to show the desire of women to maintain work life balance (Singh, Loseth, & Shoqirat, 2021). In fact, research shows that while women do not express partnership or children as a burden in

residency, it is a source of negative emotions in contrast to men who report feeling happier and supported by partnership and children (Chen, Yeo, Roman, Bell, & Sosa, 2013). The idea that women can find support by a partnership or family, is a mere excuse for not providing resources for women in the profession.

Performing orthopedic surgery comes with risk of physical injury to female orthopedic surgeons. As previously mentioned, almost all medical device consulting fees go to male surgeons. Therefore, it is no surprise that such instruments are designed with ergonomics and dimensions which fit the average male body type. Such designs manifest in female orthopedic surgeons experiencing higher rates of discomfort or symptoms while using equipment. The reports of discomfort did not vary with level of training or hand dominance, but slightly differed with years of practice (Fram, Bishop, Beredjiklian, & Seigerman, 2021). The variance with experience might create the argument that equipment is not the problem, but that newer female orthopedic surgeons are using the tools incorrectly. However, this side overlooks the role of mentorship. Female orthopedic surgeons report less discomfort with experience because of their ability to adapt to ill-sized equipment with mentorship and guidance of other female surgeons (Bridget Balch, 2022). Another health risk is the amount of radiation in the operating room. Women are placed at a higher risk because the radiation-blocking gowns which are worn to protect operating room staff are often sized in such a way that the upper quarter of breast tissue, near the armpits, is exposed. Female orthopedic surgeons have higher rates of breast cancer than the general United States population (Bridget Balch, 2022). Such gowns also often do not fit during the later stages of pregnancy. Resizing of equipment would physically benefit female surgeons in all surgical specialties and would take away large physical risks of performing orthopedic surgery.

Conclusion

My analysis shows that there is a plethora of research available proposing what factors cause a low volume of female applicants and continuing surgeons in orthopedic surgery. Therefore, it is important to consider what reasons orthopedic surgical leadership and healthcare executives may have for a lack of change in comparison to other specialties. It may be that the sheer mass of information scattered across the internet and medical journals has made it difficult to find common themes. There may be issues with creating regulation which is able to both fit into the hierarchical hospital structure, and also handle intangible causes of female underrepresentation, such as stereotyping of orthopedic surgeons. Possibly leadership has a lack of urgency or importance placed on increasing gender diversity. In addition, it could be a fault of the current orthopedic surgical leadership and staffing being majority male and potentially less attentive to needs which do not directly affect them. If orthopedic surgery is going to become more inclusive to women, there needs to be a conscious and intentional shift in effort. My argument suggests changes such as making orthopedics a required medical school rotation, stricter regulation of application interview questions, introduction of more women into orthopedic leadership roles, increased rigidity of harassment regulation, creation of support and mentorship groups, and increasing female perspective in consulting.

This research could be read by healthcare executives, surgical staffing professionals, hospital recruiting leadership, medical schoolteachers and curriculum creators, and hopefully other current orthopedic surgeons. By reading this thesis, people who have a say in the medical school curriculum and staffing of orthopedic units might see ways in which they can make their work environment supportive and appealing to female candidates. Current orthopedic surgeons

could reflect on their current practices and become better allies to gender diversity in their hospitals and teaching facilities.

Future researchers could build off this information to determine the most effective and beneficial ways to change orthopedics structure and culture. Case studies of different policy implementation in orthopedic programs could be performed to determine what changes work best with different hospital structures. For example, if hospitals have smaller staff sizes or fewer resources, how are they able to compensate for an inability to hire more women in leadership or create financial and program incentives? Related research could look further into how gender disparity across different surgical disciplines unequally impacts the treatment of patients. There could be a further investigation for why increasing gender diversity creates increased treatment and patient care outcomes. Research in the orthopedic field could also extend to investigating the causes of racial disparity in orthopedics. From this paper we understand reasons behind a low female population, but based on data from the US Census Bureau, the Accreditation Council for Graduate Medical Education, and the American Academy of Orthopaedic Surgeons, orthopedic surgery is also the least racially diverse surgical specialty (Ramirez & Franklin, 2019).

With the information outlined in my argument, the world of medicine could change to become more inclusive for future physicians and surgeons. Women could move forward and follow a passion for orthopedics. They could push further into roles of leadership and mentorship to improve healthcare gender accessibility even more. Increasing the diversity of perspective in orthopedic surgery, teaching, consulting, and design might drive innovation forward, increase patient specific care, and improve the sometimes “dreaded” hospital experience for patients in need.

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