

Research Article

The Majority of Orthopaedic Surgery Residency Faculty in the United States are Allopathic Males

Rachel Ranson, DO^{1a}, Tucker Peabody, DO^{2b}, Christopher Saker^{3c}, Anthony Lucido, DO^{4d}, Jia Bao Lin^e, Arianna Gianakos, DO^{5f}, Michaela Stamm^g, Mary K Mulcahey, MD^{3h}

¹ George Washington University, ² Doctors Hospital OhioHealth, ³ Tulane University, ⁴ Walter Reed National Military Medical Center, ⁵ Orthopaedic

a Rachel Ranson is a 2nd year orthopaedic surgical resident at The George Washington University. She was born and raised in Melbourne Beach, Florida. She attended Tulane University for undergrad, where she competed as a Division I swimmer. She also received her Master's degree at Tulane University in Neuroscience. Afterwards, she attended Campbell University School of Osteopathic Medicine for her medical training. Her orthopaedic interests include trauma and arthroplasty. She also have a passion for diversity, equality, and mentoring in orthopaedics.

[Conflicts of Interest Statement for Dr. Ranson](#)

b Tucker Peabody a second year orthopedic surgery resident training at Doctors Hospital OhioHealth in Columbus, OH

[Visit Dr. Peabody's Website](#)

[Conflicts of Interest Statement for Dr. Peabody](#)

c Christopher Saker is a 3rd year student at Tulane University School of Medicine. His undergraduate education was completed at the United States Naval Academy where he held leadership positions for roughly 2200 other Midshipmen and created community service opportunities to support the greater Washington D.C. area. He has continued his leadership and service at Tulane by leading student run electives, developing research/clubs to support underrepresented students, and volunteering in the local New Orleans community. Following medical school graduation, he hopes to serve in the United States Navy as an Orthopaedic Surgeon.

[Connect with Christopher Saker on LinkedIn](#)

[Conflicts of Interest Statement for Christopher Saker](#)

d Dr. Anthony Lucido is a second year Army Pediatric Resident at Walter Reed National Military Medical Center. He attended Campbell School of Osteopathic Medicine.

[Conflicts of Interest Statement for Dr. Lucido](#)

e [Conflicts of Interest Statement for Jin Lia](#)

[Visit the Open Payments Data Page for Jia Lin](#)

f Dr. Arianna Gianakos is an Attending Orthopaedic Surgeon and Assistant Professor at Yale Medicine, Orthopaedics and Rehabilitation. She completed her Foot and Ankle Orthopaedic Surgery fellowship at Harvard-Massachusetts General Hospital in Boston. Following her training, she became the first In-Office Needle Arthroscopy and Foot and Ankle Sports Medicine International Travel Fellow where she continued sport specific and in office arthroscopy training with world renowned surgeons in New York City, London, Amsterdam, Italy, and Greece. Dr. Gianakos has also been working towards completion of her Ph.D. at the University of Amsterdam with her area of focus on Gender Differences in Foot and Ankle Orthopaedic Surgery. Dr. Gianakos has over 50 peer-reviewed publications and 10 book chapters and has presented her work at numerous international and national platforms across the world. She is one of the founding members of #SpeakUpOrtho where she is leading a SpeakUp Coalition Call to Action Initiative with leaders in various medical specialties across the country aiming to improve the culture of residency training to effect policy change. She is a physician advocate in Physician Just Equity providing peer-support to physicians who experience workplace conflicts, through education, research, empowerment and advocacy while facilitating institutional culture change. She has recently been awarded Women in Medicine Summit #Trailblazer award and received the first ever 2021 Ruth Jackson Orthopaedic Society Courage award for her work. She serves as a leader in mentorship programs including the Ruth Jackson Orthopaedic Society Professional Development Committee, the AOFAS Humanitarian Committee and Women in Orthopaedics Worldwide group.

[Visit Dr. Gianakos's Website](#)

[Connect with Dr. Gianakos on LinkedIn](#)

[Visit the Open Payments Data Page for Dr. Gianakos](#)

[Conflicts of Interest Statement for Dr. Gianakos](#)

g [Conflicts of Interest Statement for Michaela Stamm](#)

h Dr. Mulcahey is a Board Certified orthopaedic surgeon specializing in shoulder and knee surgery and sports medicine. She is a New Hampshire native, who received her Bachelor of Arts in Biochemistry from Dartmouth College and her Doctor of Medicine from the University of Rochester School of Medicine. She completed her orthopaedic residency at Brown University, followed by a fellowship in Orthopaedic Trauma at the same institution. Dr. Mulcahey then went on to do a fellowship in sports medicine at San Diego Arthroscopy and Sports Medicine.

Dr. Mary Mulcahey joined the faculty in the Department of Orthopaedic Surgery at Tulane in April 2017, as the Director of Tulane's Women's Sports Medicine Program. In that role, Dr. Mulcahey has been instrumental in the design, development, and leadership of a comprehensive approach to the care of active women. Dr. Mulcahey is currently President of the Ruth Jackson Orthopaedic Society. Additionally, she is serving on the AANA Board of Directors, the AOSSM education committee, the AJSM Electronic Media Editorial Board, and she was selected for the AOSSM Traveling Fellowship to Europe in April 2022. Dr. Mulcahey is the team physician for

Surgery, Yale Medicine

Keywords: Orthopaedic residency, orthopaedic faculty, female surgeons, osteopathic surgeons

<https://doi.org/10.60118/001c.57673>

Journal of Orthopaedic Experience & Innovation

Vol. 4, Issue 1, 2023

Introduction

There is a paucity of information regarding the demographic characteristics of faculty at Accreditation Council for Graduate Medical Education (ACGME) orthopaedic surgery residency programs. The purpose of this study was to determine the demographics and education training of all current orthopaedic surgery residency program faculty members. We hypothesized that there would be a sex discrepancy among orthopaedic surgery faculty, and that there would be fewer DO (Doctor of Osteopathic Medicine) than MD (Medical Doctor) orthopaedic surgeons in academic medicine.

Methods

The Fellowship and Residency Electronic Interactive Database was used to identify all orthopaedic surgery residency programs in the United States. The following information was collected from each program website: faculty sex, degree, academic role, administrative title, and subspecialty. Faculty roles, titles, and subspecialties were compared across type of institution, degree earned, and sex using Chi squared and Analysis of Variance (ANOVA).

Results

Of the 4,325 faculty members identified, 3,893 were male (90%) and 4,033 were MDs (93%). The most common subspecialty was sports medicine (789, 18%). While traditional ACGME programs still had more MD faculty (3,728, 97.5%) ($p < 0.001$), the majority of faculty at traditional American Osteopathic Association (AOA) programs were also MDs (305, 61%). There were more male DOs than male MDs (95.6% vs. 89.3%, $p < 0.001$). More DOs practiced general orthopaedics (14.8% vs. 4.1%), whereas more MDs practiced upper extremity and orthopaedic oncology ($p < 0.001$). More male faculty practiced adult reconstruction (616, 15.8%), trauma (489, 12.6%), spine (471, 12.1%), and sports medicine (719, 18.5%), whereas more female faculty practiced pediatrics (135, 31.3%), upper extremity (100, 23.1%), and oncology (33, 7.6%). More male faculty held titles as chair of orthopaedic surgery (145, 3.7%) and fellowship director (111, 2.9%) than females (5, 1.2% and 5, 1.2%). Males were also listed as assistant professor (1057, 27.2% vs 188, 43.5%), associate professor (636, 16.3% vs 86, 19.9%), and professor (618, 15.9% vs 41, 9.5%) more commonly than females.

Conclusion

The current faculty of orthopaedic surgery residency programs is heavily male dominated, holding higher academic roles and administrative titles than women. There is also a high prevalence of MDs with higher academic roles and administrative titles than DOs.

Tulane's Women's Indoor and Beach Volleyball teams, the Big Easy Rollergirls, New Orleans Women's Rugby (the Halfmoons), as well as several local all girls' high schools.

[Visit Dr. Mulcahey's Website](#)

[Visit the Open Payments Data Page for Dr. Mulcahey](#)

[Conflicts of Interest Statement for Dr. Mulcahey](#)

iovera[®]

©2022 Pacira Pharmaceuticals, Inc., a wholly owned subsidiary of Pacira BioSciences, Inc. All rights reserved. Iovera[®] is a registered trademark of Pacira Cryotech, Inc., a wholly owned subsidiary of Pacira BioSciences, Inc. PP-ID-US-0762 05/22

***Advertisement**

[Click here to learn more about Iovera](#)

INTRODUCTION

Orthopaedic surgery is one of the least diverse fields in medicine. While Van Heest et al. showed that there was an increase in the number of female orthopaedic surgery residents throughout a 15-year period in the United States (Van Heest, Agel, and Samora 2021), orthopaedic surgery still lags behind other historically male dominated fields with regards to percentage increases in female presence (Chambers et al. 2018). Currently, the majority of the research involves orthopaedic surgical residents, and there is a paucity of literature investigating the demographics of current orthopaedic surgery faculty members in the United States. Additionally, there is a sparsity of literature regarding degrees held by the orthopaedic surgery faculty.

The Accreditation Council for Graduate Medical Education (ACGME)- American Osteopathic Association (AOA) merger was first introduced in 2015 with the idea that all accredited residency programs would now be under the jurisdiction of one accrediting system instead of two. This merger allows for a uniform framework for training and quality care in the United States. Cumming et al (Cumming 2021). demonstrated that almost one quarter of surgical specialty AOA-accredited programs did not become ACGME certified, resulting in a loss of over 40 programs, including some orthopaedic residency programs. With this merger now complete, there is an increase in residency program faculty as well as a potential increase in faculty diversity.

The purpose of this study was to determine the demographics and education training of all current orthopaedic surgery residency program faculty members. We hypothesized that there would be a sex discrepancy among orthopaedic surgery faculty, with fewer females than males, and that there would be fewer DO (Doctor of Osteopathic Medicine) than MD (Medical Doctor) orthopaedic surgeons in academic medicine.

METHODS

In January 2021, all ACGME accredited orthopaedic surgery residency programs were reviewed using the Fellowship and Residency Electronic Interactive Database (FREIDA). The publicly accessible websites of the accredited programs were individually searched to obtain information about the programs' faculty from January to April 2021. Faculty information gathered included medical degrees earned, sex, subspecialty, academic role, and administrative titles held. The following specific academic and/or administrative roles were evaluated: "Chair", "Vice Chair", "Medical Director",

"Residency Program Director", "Assistant Program Director", "Director/Chief of Subspecialty", "Fellowship Director", "Professor", "Professor Emeritus", "Assistant Professor", "Adjunct Professor", "Associate Professor", and "Instructor". Photographs of faculty members provided on program websites as well as pronouns (when listed) were used to categorize faculty sex. If photographs were not provided, an external online search of faculty names was performed to evaluate sex.

During this same time frame, additional internet searches were occasionally conducted to determine the faculty's residency if not provided on the program's website or in case of broken Uniform Resource Locator (URL) links. Residency programs were assigned a region based on the Agricultural Research Service's classification of regions in the United States, with an added sixth region to include international residency training. The 5 regions included are as follows: 1 – Northeast, 2 – Southeast, 3 – Midwest, 4 – Plains, 5 – Pacific West. Each faculty's employment residency program was compared to the residency program where they trained to determine if they remained in the same institution, same state, and/or same region.

Results were categorized into 3 comparative groups: allopathic and osteopathic residency programs, surgeons with an MD or DO degree, and male versus female orthopaedic surgeons. Groups were further broken down into categorical specialty training, geographic location, academic role held, and any associated administrative titles carried by the orthopaedic surgeon affiliated with the residency program. The surgical specialties that were evaluated were adult reconstruction, trauma, sports medicine, spine, pediatrics, hand/upper extremity, oncology, foot and ankle, general, and faculty that were trained in more than one subspecialty. The collected data was analyzed using Microsoft Excel (2013/2016) and SPSS software, version 25. Chi squared analysis was used for dichotomous variables and analysis of variance (ANOVA) was utilized for continuous variables. P-values less than 0.05 were deemed statistically significant.

RESULTS

The FREIDA search identified 199 accredited orthopaedic surgery residency programs. Of the 199 programs, 153 (76.8%) were traditionally allopathic, 38 (19.1%) osteopathic, and 8 military (4%). Military programs were excluded from analysis due to the lack of publicly available faculty data. Of the remaining 191 programs, websites for 2 programs did not provide faculty information. The remain-

**BE A PART OF BETTER ORTHOPAEDIC CARE.
CLICK HERE TO LEARN HOW.**

THE ORTHOPAEDIC IMPLANT COMPANY



*Advertisement

[Click here to learn more about The Orthopaedic Implant Company](#)

ing 189 programs' websites provided information for 4,325 faculty members.

3,893 (90%) faculty members were male and 432 (10%) were female. 4,033 (93.3%) held Medical Doctor (MD) degrees and 291 (6.7%) held Doctor of Osteopathy (DO) degrees ([Table 1](#)). Subspecialties, academic roles, administrative titles held, geographic location of the institution, and residencies attended are detailed further in [Table 1](#).

Traditional allopathic orthopaedic residency programs (TAPs) and traditional osteopathic accredited residency programs (TOPs) were compared ([Table 2](#)). There were more MDs (3,728, 97.5%) in both allopathic and osteopathic programs than DOs (305, 61%) ($p < 0.001$). There were more male faculty (3,415, 89.3% MD and 478, 95.6% DO) and general orthopaedic surgeons (142, 3.7% MD and 66, 13.2% DO) in TOPs than TAPs ($p < 0.001$ and $p < 0.001$, respectively). TAPs had more pediatric orthopaedic surgeons (530, 13.9%), $p = 0.009$, and hand and upper extremity surgeons (702, 18.4% vs 60, 12.0%) ($p < 0.001$). Univariate analysis revealed no difference in program region or faculty's residency region between traditional allopathic and osteopathic residency programs ($p = 0.545$ and $p = 0.198$, respectively). Not enough information was provided by TOPs to determine significance between academic roles held across program type. Only 8% (3/38) of academic roles were reported for TOPs, whereas 71.5% (109/153) of TAPs had information regarding academic role on the programs' websites ($p < 0.001$).

When comparing MD orthopaedic surgeons and DO orthopaedic surgeons ([Table 3](#)), we found that there were more male and general orthopaedic DOs than MDs (95.6% vs 89.3%, $p < 0.001$, and 14.8% vs 4.1%, $p < 0.001$, respectively), and more hand and upper extremity and oncology MDs than DOs (18.2% vs. 10%, $p < 0.001$, and 4.6% and 0.7%, $p = 0.001$, respectively). More DOs were listed as only "faculty" on the websites (81.8% vs 75.3%, $p = 0.013$); however, DOs also comprised a larger percentage of assistant program directors and program directors (4.1% vs 2.0%, $p = 0.018$ and 7.9% vs 3.9%, $p = 0.001$, respectively). More MDs were listed as Director/Chief of their respective divisions and as Chair of Orthopaedics (12.3% vs 5.5%, $p < 0.001$ and 3.6% vs 0.7%, $p = 0.008$, respectively) than DO faculty. Univariate analysis revealed no difference in program region or faculty's residency region between MDs and DOs ($p = 0.886$, $p = 0.227$, respectively). Not enough information was provided about DOs to determine significance between academic roles held across program type. Only 19.6% (7) of aca-

dem roles were reported for DOs, whereas 67.3% (112) of MDs had information regarding academic role on the programs' websites ($p < 0.001$). It needs to be taken into account that information provided on academic program websites may be outdated or inaccurate.

[Table 4](#) summarizes findings between male and female orthopaedic surgeons. More male faculty subspecialized in adult reconstruction (616, 15.8%, $p < 0.001$), trauma (489, 12.6%, $p = 0.033$), sports medicine (719, 18.5%, $p = 0.007$), and spine (471, 12.1%, $p < 0.001$). A higher relative percentage of female faculty subspecialized in pediatrics ($p < 0.001$), hand and upper extremity ($p = 0.001$), and oncology ($p < 0.001$). No difference was found between sexes and subspecializing in foot and ankle. More female faculty were listed as "only faculty" (79.9% vs. 75.3%, $p = 0.034$) and more males were listed as Chair of Orthopaedics and as Fellowship Directors (3.7% vs. 1.2%, $p = 0.006$ and 2.9% vs. 1.2%, $p = 0.039$, respectively). More female faculty were listed as assistant professors than males (43.5% vs 27.2%, $p < 0.001$) and more male faculty were listed as professors than females (15.9% vs 9.5%, $p < 0.001$). Male faculty remained in the same state and same region as their residency training more than female faculty, but no difference existed regarding remaining in the same institution between sexes ($p = 0.011$, $p = 0.026$, and $p = 0.205$, respectively). Finally, there was no difference between sexes with regards to orthopaedic residency training regions.

DISCUSSION

To our knowledge, this is the first study to evaluate academic orthopaedic faculty by degree. We found that there are very few DO orthopaedic faculty compared to their MD counterparts (4,033 MDs vs. 291 DOs). Additionally, there are more MD faculty in American Osteopathic Association (AOA) accredited programs than DOs. Additionally, MDs have a higher tendency to be subspecialized, and while most DOs are also subspecialized, they appear to be more inclined to pursue general orthopaedics compared to their MD counterparts. One possible explanation is that many DO residency training programs are not affiliated with academic institutions and are in more rural environments; therefore, the exposure to and need for general orthopedists is higher. Additionally, we found a paucity of female orthopaedic surgeons in leadership roles.

One specific trend that was noted in this study is the limited academic role listing in AOA programs compared

Table 1. Demographic Information for Orthopaedic Residency Faculty.

	Demographic	N	Percentage
Sex			
	Male	3893	90.0%
	Female	432	10.0 %
Degree			
	MD	4033	93.2%
	DO	291	6.8%
Subspecialty*			
	Sports Medicine	789	18.2%
	Hand and Upper Extremity	772	17.8%
	Adult Reconstruction	653	15.1%
	Pediatrics	582	13.5%
	Trauma	534	12.3%
	Spine	495	11.4%
	Foot and Ankle	305	7.0%
	General Orthopaedics	212	4.9%
	Oncology	192	4.4%
	Not Listed	62	1.4%
Academic Role			
	Not Listed	1552	35.8%
	Instructor	106	2.5%
	Adjunct Professor	21	0.5%
	Assistant Professor	1245	28.7%
	Associate Professor	722	16.8%
	Professor	659	15.2%
	Professor Emeritus	20	0.5%
Administrative Title*			
	Only listed as "Faculty"	3319	76.7%
	Assistant Residency Program Director	98	2.3%
	Residency Program Director	188	4.3%
	Director/Chief of Subspecialty	518	12.0%
	Vice Chair of Orthopaedics	61	1.4%
	Chair of Orthopaedics	152	3.5%
	Medical Director	51	1.2%
	Fellowship Director	116	2.7%
	Other Title	97	2.2%
Institution Region			
	Northeast	1354	31.3
	Southeast	763	17.6
	Midwest	1293	30.0
	Plains	399	9.2
	Pacific West	516	11.9
Residency Region			
	Northeast	1612	37.3
	Southeast	536	12.4
	Midwest	1254	29.0

	Demographic	N	Percentage
	Plains	281	6.5
	Pacific West	376	8.7
	International Residency	201	4.6

*Denotes the cumulative percentage is higher than 100% secondary to faculty being trained in more than one subspecialty and holding more than one administrative title.

Table 2. Comparative Analysis of Traditional Allopathic and Traditional Osteopathic Orthopaedic Residency Programs.

Characteristic	Traditional Allopathic Program	Traditional Osteopathic Program	P-Value
MDs	3728 (97.5%)	305 (61%)	<0.001
Males	3415 (89.3%)	478 (95.6%)	<0.001
General Orthopaedics	142 (3.7%)	66 (13.2%)	<0.001
Adult Reconstruction	582 (15.2%)	65 (13.0%)	0.191
Trauma	459 (12.0%)	69 (13.8%)	0.248
Sports Medicine	680 (17.8%)	96 (19.2%)	0.436
Spine	431 (11.3%)	57 (11.4%)	0.930
Pediatrics	530 (13.9%)	48 (9.6%)	0.009
Hand and Upper Extremity	702 (18.4%)	60 (12.0%)	<0.001
Oncology	174 (4.5%)	15 (3.0%)	0.111
Foot and Ankle	266 (7.0%)	30 (6.0%)	0.427
More than 1 Subspecialty	180 (4.7%)	24 (5.0%)	0.783
More than 1 Title	198 (5.2%)	8 (1.6%)	<0.001
Instructors	106 (2.8%)	0 (0%)	<0.001
Adjunct Professors	21 (0.5%)	0 (0%)	0.097
Assistant Professors	1211 (31.7%)	34 (6.8%)	<0.001
Associate Professors	720 (18.8%)	2 (0.4%)	<0.001
Professors	655 (17.1%)	4 (0.8%)	<0.001
Professor Emeriti	20 (0.5%)	0 (0%)	0.085

*Bolded rows denote statistical significance

to ACGME-accredited programs. Fewer DO orthopaedic surgeons were listed as assistant, associate, and full professors, indicating a less prevalent role in academic medicine. This may be in part because DO orthopaedic surgeons and residency programs have more affiliations with community-based hospitals than academic institutions.

Additionally, there were more MD orthopaedic surgeons listed as “Chair” or “Directors”; whereas more DOs held positions such as Assistant Program Director and Program Director. We found that there was a profound lack of accurate role description for the traditional osteopathic programs. TOPs, when academic roles were included on their program information, tended to record positions including Program Director or Assistant Program Director. Further research could focus on determining whether this is due to a lack of complete information or because there is a true discrepancy of academic roles between DO and MD orthopaedic surgeons affiliated with ACGME accredited orthopaedic residency programs.

Shah et al. demonstrated an increase in female orthopaedic faculty from 8.5% to 17.9% from 1997 to 2017 in traditional allopathic programs (Shah et al. 2020). Our study showed only 10% of orthopaedic faculty to be female, which is consistent with Nguyen et al. demonstrating only 9% of residency faculty being female in 2007 (Nguyen et al. 2010). Shah et al. also demonstrated that in 2017, 11.7% of senior orthopaedic faculty were women and 19.8% were junior faculty including: 9% professors, 14.5% associate professors, and 39.7% instructors (Shah et al. 2020). Our study demonstrated that female orthopaedic surgeons comprised 15.1% of all assistant professors. Out of all female faculty positions, assistant professor was the most common (43.5%). We also found that females comprised 11.9% of all associate professors and only 6.2% of all professors. When it came to sex comparisons in orthopaedic faculty administrative titles, there were more males in the positions of “Fellowship Director” (111, 2.9%) and “Chair” (145, 3.7% compared to female faculty (5, 1.2% both categories, respectively).

Table 3. Comparative Analysis of MD and DO Orthopaedic Residency Faculty.

Characteristic	Medical Doctor Degree	Doctor of Osteopathy Degree	P-Value
Male	3415 (89.3%)	478 (95.6%)	<0.001
Subspecialty			
General Orthopaedics	165 (4.1%)	43 (14.8%)	<0.001
Adult Reconstruction	610 (15.1%)	37 (12.7%)	0.266
Trauma	487 (12.1%)	41 (14.1%)	0.311
Sports Medicine	721 (17.9%)	55 (18.9%)	0.661
Spine	458 (11.4%)	30 (10.3%)	0.586
Pediatrics	549 (13.6%)	28 (9.6%)	0.053
Hand and Upper Extremity	732 (18.2%)	29 (10.0%)	<0.001
Oncology	187 (4.6%)	2 (0.7%)	0.001
Foot and Ankle	278 (6.9%)	18 (6.2%)	0.644
More than 1 Subspecialty	191 (4.7%)	12 (4.4%)	0.776
Administrative Titles			
Only listed as "Faculty"	3037 (75.3%)	238 (81.8%)	0.013
Assistant Residency Program Director	82 (2.0%)	12 (4.1%)	0.018
Residency Program Director	158 (3.9%)	23 (7.9%)	0.001
Director/Chief of Subspecialty	498 (12.3%)	16 (5.5%)	<0.001
Vice Chair of Orthopaedics	58 (1.4%)	2 (0.7%)	0.290
Chair of Orthopaedics	147 (3.6%)	2 (0.7%)	0.008
Medical Director	51 (1.3%)	0 (0.0%)	0.054
Fellowship Director	110 (2.7%)	6 (2.1%)	0.497
Other Title	91 (2.3%)	5 (1.7%)	0.547
More than 1 Title	196 (4.9%)	10 (3.4%)	0.271
Academic Role			
Instructor	101 (2.5%)	5 (1.7%)	0.402
Adjunct Professor	21 (0.5%)	0 (0%)	0.217
Assistant Professor	1210 (30%)	35 (12%)	<0.001
Associate Professor	713 (17.7%)	9 (3.1%)	<0.001
Professor	650 (16.1%)	8 (2.7%)	<0.001
Professor Emeritus	20 (0.5%)	0 (0.0%)	0.229
Geographic Location			
Same Institution (Residency)	1153 (28.9%)	71 (26%)	0.303
Same State	1823 (45.7%)	162 (59.3%)	<0.001
Same Region	2487 (62.4%)	186 (68.1%)	0.058

*Bolded rows denote statistical significance

In 2020, Chen et al. demonstrated that 5.4% of shoulder and elbow fellowship program faculty were women (Chen et al. 2020). Our study revealed a much higher percentage of female faculty in upper extremity. This could be confounded by the fact that we included not only shoulder and elbow surgeons, but also hand surgeons in our upper extremity category. This was mainly because there was a discrepancy in fellowship categorization across faculty information. In contrast to Shah et al. and our own study, Chen et al. demonstrated no significant effect of sex on attainment of professor rank or leadership roles (Chen et al. 2020).

Lastly, the AOA-ACGME merger has now been in full effect and will hopefully instill a larger emphasis on academic values across all accredited residency programs, thus allowing DO orthopaedic surgeons to pursue higher academic roles and administrative titles, if desired.

Cummings et al. demonstrated that 26% of surgical specialty osteopathic accredited programs either withdrew or voluntarily withdrew from potential ACGME merging (Cummings 2021). This resulted in a loss of 41 surgical programs during a time of rapid growth for osteopathic medical schools. This study also anticipated a slowed progres-

Table 4. Comparative Analysis of Male and Female Orthopaedic Residency Faculty.

Characteristic	Male	Female	P-Value
<u>Subspecialty</u>			
Pediatrics	443 (11.4%)	135 (31.3%)	<0.001
Hand and Upper Extremity	662 (17.0%)	100 (23.1%)	0.001
Sports Medicine	719 (18.5%)	57 (13.2%)	0.007
Adult Reconstruction	616 (15.8%)	31 (7.2%)	<0.001
Spine	471 (12.1%)	17 (3.9%)	<0.001
Trauma	489 (12.6%)	39 (9.0%)	0.033
Oncology	156 (4.0%)	33 (7.6%)	<0.001
Foot and Ankle	269 (6.9%)	27 (6.3%)	0.606
General Orthopaedics	195 (5.0%)	13 (3.0%)	0.065
More than 1 Subspecialty	180 (4.6%)	24 (5.6%)	0.392
<u>Administrative Title</u>			
Only listed as "Faculty"	2930 (75.3%)	345 (79.9%)	0.034
Assistant Residency Program Director	80 (2.1%)	14 (3.2%)	0.109
Residency Program Director	164 (4.2%)	17 (3.9%)	0.785
Director/Chief of Subspecialty	468 (12.0%)	46 (10.6%)	0.403
Vice Chair of Orthopaedics	56 (1.4%)	4 (0.9%)	0.388
Chair of Orthopaedics	145 (3.7%)	5 (1.2%)	0.006
Medical Director	47 (1.2%)	4 (0.9%)	0.607
Fellowship Director	111 (2.9%)	5 (1.2%)	0.039
Other Title	83 (2.1%)	13 (3.0%)	0.240
More than 1 Title	189 (4.9%)	17 (3.9%)	0.394
<u>Academic Role</u>			
Instructor	94 (2.4%)	12 (2.8%)	0.643
Adjunct Professor	21 (0.5%)	0 (0.0%)	0.126
Assistant Professor	1057 (27.2%)	188 (43.5%)	<0.001
Associate Professor	636 (16.3%)	86 (19.9%)	0.059
Professor	618 (15.9%)	41 (9.5%)	<0.001
Professor Emeritus	20 (0.5%)	0 (0.0%)	0.135
<u>Geographic Location</u>			
Same Institution (Residency)	1112 (29%)	112 (26.1%)	0.205
Same State	1810 (47.2%)	175 (40.8%)	0.011
Same Region	2425 (63.3%)	248 (57.8%)	0.026

*Bolted rows denote statistical significance

sion of transition of DO's integration into already previous ACGME established residency programs.

There are several limitations to this study. Current information available on program websites may be outdated or inaccurate, leading to skewed results. Additionally, there may be data missing, including academic roles and administrative titles, which was frequently absent on websites for AOA-accredited programs. Finally, military programs were excluded from the study due to lack of publicly available program data, which may affect the generalizability of this study's results to all programs. Given that this was a cross-sectional analysis, we are only able to report on currently available information without trends.

CONCLUSION

The current faculty of orthopaedic surgery residency programs is heavily male dominated, holding higher academic roles and administrative titles than women. There is also a high prevalence of MDs with higher academic roles and administrative titles than DOs. As we anticipated there were a larger number of males and MD's holding academic and leadership roles in academic orthopaedic surgery residency programs.

Submitted: September 18, 2022 EDT, Accepted: December 16, 2022 EDT



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-NC-ND-4.0). View this license's legal deed at <https://creativecommons.org/licenses/by-nc-nd/4.0> and legal code at <https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode> for more information.

REFERENCES

- Chambers, Caitlin C., Stephanie B. Ihnow, Emily J. Monroe, and Linda I. Suleiman. 2018. "Women in Orthopaedic Surgery: Population Trends in Trainees and Practicing Surgeons." *Journal of Bone and Joint Surgery* 100 (17): e116. <https://doi.org/10.2106/jbjs.17.01291>.
- Chen, Raymond E., Benjamin D. Kuhns, Shannon Kaupp, Ilya Voloshin, and Sandeep Mannava. 2020. "Diversity among Academic Orthopedic Shoulder and Elbow Surgery Faculty in the United States." *Journal of Shoulder and Elbow Surgery* 29 (4): 655–59. <https://doi.org/10.1016/j.jse.2019.11.035>.
- Cummings, Mark. 2021. "The Impact of the ACGME/ AOA Single Accreditation System on Osteopathic Surgical Specialties, Residents, and DO Students." *Journal of Surgical Education* 78 (5): 1469–75. <https://doi.org/10.1016/j.jsurg.2021.02.006>.
- Nguyen, Lam, Nirav H. Amin, Thomas P. Vail, Ricardo Pietrobon, and Anand Shah. 2010. "Editorial: A Paucity of Women among Residents, Faculty, and Chairpersons in Orthopaedic Surgery." *Clinical Orthopaedics & Related Research* 468 (7): 1746–48. <https://doi.org/10.1007/s11999-009-1125-y>.
- Shah, Kalpit N., Jack H. Ruddell, Brandon Scott, Daniel B.C. Reid, Andrew D. Sobel, Julia A. Katarincic, and Edward Akelman. 2020. "Orthopaedic Surgery Faculty: An Evaluation of Sex and Racial Diversity Compared with Other Specialties." *JBJS Open Access* 5 (3): e20.00009–e20.00009. <https://doi.org/10.2106/jbjs.oa.20.00009>.
- Van Heest, Ann E., Julie Agel, and Julie Balch Samora. 2021. "A 15-Year Report on the Uneven Distribution of Women in Orthopaedic Surgery Residency Training Programs in the United States." *JBJS Open Access* 6 (2): e2000157. <https://doi.org/10.2106/jbjs.oa.20.00157>.