

Research Article

The Year Publication Rate of Presentations from the Inaugural Medical Student Orthopaedic Society Research Symposium

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Introduction

Orthopaedic surgery is one of the most competitive residencies to match in medicine, the match rate has decreased to 63.1% in 2023.^{1,13} Aspects of the application that are most in the control of applicants are their personal and research experiences in the field and their choice of acting internships. The Medical Student Orthopaedic Society (MSOS) hosted the first national, and virtual orthopaedic research symposium for medical students. This study aimed to examine the short-term publication rate of the research presented at the 2022 MSOS Research Symposium.

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

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

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Methods

The titles of the articles and the names of the presenters from the MSOS program were used to search for publications via PubMed and Google Scholar search engines. If no matching result was found, the article was considered not published. If the presentation was published in a journal within our study period, the updated title, name and gender of the medical student and senior author, name of the journal, and date of publication were recorded. Demographic variables among presenters included gender, and current training status. These were determined via a Google search. Impact factors were extracted from the Web of Science (WoS) database for the year of 2023.

Results

For the 2022 MSOS Symposium, a total of 300 presentations were given. Nineteen publications had to be excluded. Of the 281 presentations included in this study, 129 were published in a peer-reviewed journal within 18-months after the symposium (45%). Presentations were published on average 165 days (~5.5 months) after the symposium. Of the journals that had an impact factor score, the average was 2.18. Categories with over 60% publication rate were Practice Management and Health Disparities, shoulder and elbow, and medical education. Among presenters whose projects were published, 74% identified as men and 26% as women. The papers' senior authors were 85% men and 15% women. Of those that participated and published in the 18-month period, 22% of individuals matched into orthopedics the following year, 9% matched into another residency, 38% were still medical students, 30% statuses were unknown or could not be determined. Of those schools represented, 20 schools (35 participants) did not have a home program at their institution, also known as orphan programs. The presenter was the first author in 53% (69) of the published works.

Discussion

The Medical Student Orthopaedic Society (MSOS) touted a publication rate of 45% which is comparable to the rates of publication in less time than numerous other meetings (~5.5 months). This may be due to medical students' finite amount of time to gain the experience necessary to apply, suggesting there is a higher motivation to get research out and published. However, further research into the participation levels of presenters would need to be studied directly to give a definitive understanding as to why first authorship was not provided to the presenter. Participants that published were majority male and attended allopathic schools. Most were still in medical school, while 21% have matched into an Orthopaedics program, 9% matched into another program and 30% could not be determined at this time.

Conclusion

As the goal for a medical student is to successfully match it is highly important that opportunities are not only accessible but allow for URiM and orphan medical schools to engage in a meaningful way.¹¹ The MSOS is hopeful that this virtual symposium can be beneficial in expanding exposure to orthopaedics through research opportunities and experiences.¹

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INTRODUCTION

Orthopaedic surgery is one of the most competitive residencies to match in medicine.

While there has been an increase in the number of programs in the last 20 years, the match rate has decreased to 63.1% in 2023 (Martinez et al. 2023; National Resident Matching Program 2023). As the United States Medical Licensing Examination (USMLE) Step 1 and Comprehensive Osteopathic Medical Licensing Examination of the United States (COMLEX) Level 1 exams have transitioned from numerical scores to pass/fail, it has been more difficult for programs to choose among qualified applicants (Su et al. 2022; Brotherton and Etzel 2021). Due to the loss of this once-established filter, programs have increased application focus on other indicators, such as USMLE Step 2, research experiences, sub-internships, preference signaling, and letters of recommendation (Quan et al. 2022; Su et al. 2022). Aspects of the application that are most in the control of applicants are their personal and research experiences in the field and their choice of acting internships. Research experiences may increase in importance as they provide exposure to mentors who may provide strong potential letters of recommendation, as well as an illustration of skills deemed important for prospective residents (Quan et al. 2022; Chandrakumar et al. 2021).

Research experience in the Electronic Residency Application Service (ERAS) application does not simply focus on publications, but includes activities such as participation in project synthesis, and presentation at conferences. Conferences are traditionally in-person, allowing students to present their research to a national audience and network with current leaders in the field. Unfortunately, attendance at conferences as a medical student is limited by finances and the time constraints of training schedules. Another consideration is the innate culture of the individual medical schools. Some institutions may encourage student participation in these kinds of activities by adjusting students' schedules or providing financial relief. Others may not, leading to further disparities in representation.

With the COVID-19 pandemic and the advent of technology, there has been an increased push for virtual meetings. Advantages of virtual conferences include the ability to reach a broader audience, a lowered financial burden in research-heavy specialties, and maintained benefits and opportunities seen with traditional in-person conferences (Quan et al. 2022; Chandrakumar et al. 2021; Veyg and Gurevich 2021).

On April 10, 2022, the Medical Student Orthopaedic Society (MSOS) hosted the first national, and virtual orthopaedic research symposium for medical students. This symposium had 300 medical student presentations, over 50 orthopaedic faculty/resident evaluators, and over 900 attendees. In addition to providing a means to present their research, the symposium was successful in increasing students' interest and knowledge of the field of orthopaedic surgery (Quan et al. 2022).

Unique to other national research conferences, the faculty/resident evaluators purpose was to provide feedback to

students on their presentation skills and encourage questions which could more clearly define details important for publication consideration. Although the conference has been shown to be efficacious in improving interest and knowledge of orthopaedic surgery, its impact on medical student publication rates in peer-reviewed journals is currently unknown. Therefore, this study aimed to examine the short-term publication rate of the research presented at the 2022 MSOS Research Symposium.

METHODS

The primary outcome of our study was to identify the 18-month publication rate of studies presented at the 2022 MSOS Research Symposium. The secondary outcome included an assessment of variables associated with having their research published.

Utilizing the downloaded program from the MSOS official website (<https://www.msosortho.com/>), all 300 abstract presentations with their presenting medical student author were identified. The titles of the articles and the names of the presenters were then used to search for publications via PubMed and Google Scholar search engines. The process of searching was undertaken in such a manner as to capture as many abstracts as possible. First, the full title presented in the MSOS Symposium program was entered into the search bar. If no results matched the author details generated, the title was then shortened to pertinent keywords to find a result from the archives. If a result was still not found, the individual presenter's name in combination with key words was entered into the search engine. If no matching result was found at this point, the article was considered not published. If the presentation was published in a journal within our study period, the updated title, name and gender of the medical student and senior author, name of the journal, and date of publication were recorded.

Each presenter's medical school was recorded into the database as well. They were then categorized by whether it was allopathic, osteopathic, or other. Those in the other category were Caribbean schools associated with the US Health Care system and international schools. The schools were then further stratified in whether they have an official home program recognized by the ACGME or private institution that takes them under their wing (Sasson et al. 2022). These were determined by matching schools to the ERAS database or looking on their website.

Demographic variables among presenters included gender, and current training status. These were determined via a Google search. There was a special focus on finding information via the presenter's social media accounts, such as LinkedIn, Instagram, Facebook, X etc. if they existed. Presenter gender was also determined by name. Participants' student status was recorded in an Excel spreadsheet. MSOS leadership verified all parameters regarding participants.

The quality of the journal was based on their impact factor. Impact factors were extracted from the Web of Science (WoS) database for the year of 2023.

DATA ANALYSIS

All data was collected by a single author and recorded in Microsoft Excel. After data collection, two separate authors validated the collected data to ensure accuracy. R Studio was used to clean the dataset and create the associated tables in this manuscript. R Studio is an open-source tool that allows for professional-level statistical analysis (RStudio Team 2020).

RESULTS

For the 2022 MSOS Symposium, a total of 300 presentations were given. Two presentations were excluded as there was a lack of clarity on authors' status in medical school, as the symposium was meant to target medical students. An additional filter to identify presentations published before October 1, 2021, was performed to exclude studies published before the call for abstracts for the symposium. This led to an additional 19 presentations being excluded, resulting in 281 presentations being included in our analysis. Of the 281 presentations included in this study, 129 (45%) were published in a peer-reviewed journal within 18-months after the symposium. Presentations were published on average 165 days (~5.5 months) after the symposium. There was a total of 67 journals represented. The presenter was the first author in 53% (69) of the published works. The top three journals were Foot and Ankle Orthopaedics, The Journal of Bone and Joint Surgery (JBJS) Open Access, and the Orthopaedic Journal of Sports Medicine. The average impact factor of the journals was 2.18. The top three categories of presentations by number were Hip and Knee Reconstruction (59), Foot and Ankle (30), and Spine (30). Categories with over 60% publication rate were Practice Management and Health Disparities, shoulder and elbow, and medical education.

Among presenters whose projects were published, 74% identified as men and 26% as women. The papers' senior authors were 85% men and 15% women. Ninety-four percent of the cohort attended allopathic schools, 3% were osteopathic schools, and 3% were international or some other designation. There were 120 schools represented at the symposium, 104 allopathic schools, twelve osteopathic schools, and four international schools. There were 20 schools represented who would be considered "orphan" medical schools, i.e. without an orthopaedic residency. Of these 20 schools, fourteen were allopathic and seven were osteopathic. There were 21 publications from these individuals from orphan medical schools.

Of those that participated and published in the 18-month period, 22% of individuals matched into orthopaedics the following year, 9% matched into another residency, 38% were still medical students, 30% statuses were unknown or could not be determined.

DISCUSSION

The Medical Student Orthopaedic Society (MSOS) hosted the first, national virtual orthopaedic research symposium

for medical students. The MSOS Symposium aims to provide students an opportunity to present their research, learn more about orthopaedics via panels, and encourage students to connect by reducing the barriers associated with in-person conferences, such as travel and conference fees. The inaugural virtual symposium resulted in the publication of 129 articles (45%) by medical students interested in orthopaedic surgery.

Participants in the symposium were in various stages of their training in medical school. We investigated their training statuses because we wanted to verify that they were medical students at the time of participation and understand the inaugural symposium presenter's profile. Of those that participated and published in the 18-month period, 22% of individuals matched into orthopaedics the following year, 9% matched into another residency, 38% were still medical students, 30% statuses were unknown or could not be determined. As the MSOS symposium continues the goal is to continue seeing the rising number of individuals who participate match into residency.

Loeffelholz et. al. gathered the publication rates of nine of the largest meetings in orthopaedics in 2018, the Orthopaedic Trauma Association (73% for 2008-2012), American Orthopaedic Foot & Ankle Society (62% for 2008-12), Mid-America Orthopaedic Association (59% for 2012-2016), Pediatric Orthopaedic Society of North America (51% for 2002-2006), Arthroscopy Association of North America (49% for 2008-12), the American Academy of Orthopaedic Surgeons (49% for 2001), American Society for Surgery of the Hand (46% for 2000-2005), American Orthopaedic Society for Sports Medicine (45% for 2011-2015) (Loeffelholz, Piening, and Cannada 2018). The American Academy of Orthopaedic Surgeons, one of the largest conferences, had a comparable publication rate with MSOS symposium. Although most of the percentages are like that of the virtual symposium, the average time to publication in the literature varied.

This important factor showcases how quickly MSOS presentations are being published. For example, Wang et. al. noted an average publication rate of over four years for meetings held by North American Spine Society (NASS), Scoliosis Research Society (SRS), and International Society for the Study of the Lumbar Spine (ISSLS). Their publication rates were 40%, 47%, and 45% respectively (Wang, Yoo, and Delamarter 1999). Of note, the average time to publication tends to be significantly longer than what this study has demonstrated with MSOS (5.5 months) (Loeffelholz, Piening, and Cannada 2018). There are numerous reasons why that can be, Rushing et al. suggested that works don't always get published because it is a low priority, they don't have enough time, methodologic limitations, and inadequate institutional support (Rushing et al. 2020). Many of these larger conferences involve residents in-training and attendings, not just medical students. Understandably, the other responsibilities these professionals have outweigh that of publishing research. Another reason the MSOS symposium may have this higher publication rate in less time after presentation participation is because of the necessity associated with having publications to suc-

cessfully match into orthopaedics. Medical students have a finite amount of time to gain the experience necessary to apply, suggesting there is a higher motivation to get research out and published.

Despite the high publication rate, there is evidence of lower than expected first-authorship. The presenter was the first author in 53% (69) of the published works. This lack of first authorship suggests that the medical students were not the main researcher on the presented projects. However, further research into the participation levels of presenters would need to be studied directly to give a definitive understanding as to why first authorship was not provided to the presenter.

As the goal for a medical student is to successfully match it is highly important that opportunities are not only accessible but allow for URiM and orphan medical schools to engage in a meaningful way. The American Academy of Orthopaedic Surgeons (AAOS) has deemed the diversification of the orthopaedics workforce a priority as they continue to lag many other fields of medicine, despite the concerted efforts and discussion surrounding this issue (Lamanna et al. 2022). another concern is the individuals that go to schools that do not have an orthopaedic residency program attached to their training institutions. Without opportunities to interact these students must find and take advantage of any opportunities that they can participate in to make connections and get involved in the field (Sasson et al. 2022). By adding to the opportunities provided by groups, such as the J Robert Gladden Orthopaedic Society, Nth Dimensions, Perry Initiative, Pride Ortho, the Ruth Jackson Orthopaedic Society, and #SpeakUpOrtho, the MSOS may also help in diminishing potential barriers for URiMs in orthopaedics (Czerwinka, Russo, and Cannada 2023; Quan et al. 2022; Mason, Ross, and Bradford 2022).

There are limitations to our study. We are evaluating publication rates through a small window of time, eighteen months post symposium. A passage of time would give a more definitive and robust conclusion on the effectiveness of MSOS on the goal of its symposium. This first look at publication rate provides hope that we will continue to see an upward trend. It may be possible that a study was published, and we missed it in our search, as the titles are often working titles, not the final ones. There also may have been human error despite the strictly followed protocol for searching for the publications.

It may also prove useful to collect other variables moving forward, such as participation in research experience before participation in the MSOS Symposium, if the participant participated in the symposium before, if they attend conventions/networking events, the buy-in of sponsors and established medical professionals, and if they have a personal vested interest in continuing research.

CONCLUSION

As the MSOS virtual symposium continues, it is hopeful that this virtual platform can be beneficial in expanding exposure to orthopaedics through research opportunities and experiences (Martinez et al. 2023).

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TABLE 1. Overall Publication Rate of Presentations Presented at the Annual Medical Student Orthopaedic Society Symposium

Publication Status	Frequency		
No	152		
Yes	129		
Presenter Credit on Publication	Male	Female	Total
Published + presenter is first author	50	19	69
published + presenter is not first author	45	15	60
Category	Freq of all	Frequency of Published	% Published
PMHD	16	10	63%
shoulder and elbow	29	18	62%
medical education	15	9	60%
spine	30	16	53%
sports medicine	29	14	48%
foot and ankle	30	14	47%
hand and wrist	15	7	47%
trauma/oncology	16	7	44%
pediatrics	15	6	40%
trauma	29	9	31%
hip and knee reconstruction	59	16	27%
basic science	15	3	20%

TABLE 2. Distribution of Journals Publishing Presentations Presented From the 2022 Annual Medical Student Orthopaedic Society Symposium

Journal Name	Freq.	Impact Factor
Foot and Ankle Orthopaedics	6	NI
JBJS Open Access	6	NI
Orthopaedic Journal of Sports Medicine	6	2.6
Cureus Journal of Medical Science	4	1.2
Journal of Shoulder and Elbow Surgery	5	3
The Spine Journal	5	4.5
Foot and Ankle Specialist	4	NI
Journal of the American Academy of Orthopaedic Surgeons	4	3.2
The American Journal of Sports Medicine	4	4.8
European Journal of Orthopaedic Surgery & Traumatology	3	1.7
Arthroscopy, Sports Medicine, and Rehabilitation	3	NI
Hand	3	NI
JAAOS Global Research & Reviews	3	1.5
Archives of Orthopaedic and Trauma Surgery	2	2.3
InSeminars in Arthroplasty: JSES	2	NI
Journal of Hand Surgery Global Online	2	NI
Journal of Orthopaedic Experience & Innovation	2	NI
Journal of orthopaedic trauma	2	2.3
Journal of Orthopaedics	2	1.5
Journal of the American College of Surgeons	2	5.2
JSES Reviews, Reports, and Techniques	2	NI
North American Spine Society Journal	2	NI
Osteoarthritis and Cartilage	2	7
OTA International	2	NI
Spine	2	3
sports health	2	3.3
The Iowa Orthopaedic Journal	2	NI
The Knee	2	1.9
The Physician and Sports Medicine	2	2.3
World Neurosurgery	2	2
Archives of Bone and Joint Surgery	1	1.3
Asian Spine Journal	1	2.3
BMC Surgery	1	1.9
British Journal of Surgery	1	9.6
Clinical Anatomy	1	2.4
Clinical Orthopaedics and Related Research	1	4.2
Foot and Ankle Surgery: Techniques, Reports and Cases	1	NI
Global Surgical Education- Journal of the Association for Surgical Education	1	NI
HAPS Educator	1	NI
Injury	1	2.5
InSeminars in Arthroplasty: JSES	1	NI
International Journal of Orthopaedics	1	NI
International Journal of Spine Surgery	1	1.6
International Journal of Surgery	1	15.3

Journal of Children's Orthopaedics	1	1.4
Journal of Clinical Medicine	1	3.9
Journal of Clinical Orthopaedics and Trauma	1	NI
Journal of Experimental Orthopaedics	1	1.8
Journal of Foot and Ankle Surgery	1	1.3
Journal of Hand and Microsurgery	1	0.4
Journal of ISAKOS	1	1.6
journal of neurosurgery	1	4.1
Journal of Orthopaedic Research	1	2.8
Journal of orthopaedic Surgery and Research	1	2.6
Journal of Pediatric Orthopaedics	1	1.7
Journal of Pediatric Orthopaedics Part B	1	1.1
Journal of Surgical Education	1	2.9
Journal of the American Academy of Orthopaedic Surgeons	1	3.2
Journal of Trauma and Acute Care Surgery	1	3.4
Knee Surgery, Sports Traumatology, Arthroscopy	1	3.8
Regenerative Medicine	1	2.7
Revista Brasileira de Ortopedia	1	NI
Southern Medical Journal	1	1.1
The Journal of arthroplasty	1	3.5
The Journal of Arthroscopic & Related Surgery	1	4.7
The Journal of Knee Surgery	1	1.7
World Journal of Orthopaedics	1	1.9

TABLE 3. Characteristics of Presenters of the 2022 Annual Medical Student Orthopaedic Society Symposium

Medical School Representation	Frequency in publications	Frequency in Orphaned medical school publications
Allopathic	69	18
Osteopathic	5	3
Other	3	NA

Med school Representation published	Men	Women
Allopathic	87	33
Osteopathic	6	1
Other	2	0

orphaned schools published	Male	female	total
allopathic	10	4	14
osteopathic	6	1	7
			21

	All Participants	Published	Senior Author
Men	217	95	110
Women	76	34	19
Unknown	3	--	--

TABLE 4. Summary of Publication Rates of Other Orthopaedic Surgery Subspecialty Meetings

Current Status	Frequency	%
Orthopaedic Residency	28	22%
Other Residency	12	9%
Medical Student	50	39%
Other	9	7%
NA	30	23%



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