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Publication rates of abstracts presented across 6 major spine specialty conferences

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ABSTRACT

Background: Although scientific researchers aim to present their projects at academic conferences as a step toward publication, not all projects mature to become a peer-reviewed manuscript. The publication rate of meetings can be utilized to assess the quality of presented research. Our objective was to evaluate the contemporary publication rate of abstracts presented at spine conferences.

Methods: We reviewed annual meeting programs of North American Spine Society (NASS), Scoliosis Research Society (SRS), International Meeting on Advanced Spine Techniques (IMAST), Spine Global Spine Congress (GSC), Lumbar Spine Research Society (LSRS), and Cervical Spine Research Society (CSRS) from 2017 to 2019. Abstracts were identified as published from PubMed and Google search. From published manuscripts, journal name and open access status was collected. Journal impact factors were collected from the 2021 Journal Citation Reports.

Results: A total of 3,091/5,722 (54%) abstracts were published, ranging from 44.5% to 66.3%. Publication rate of posters and podiums ranged from 39.8% to 64.8% and 51.6% to 67.2%, respectively. Podium presentations were more likely to be published than posters (59.6% vs. 47.2%, p<.001). Only NASS (61.4% vs. 61.8%) and LSRS (64.6% vs. 67.2%) demonstrated similar publication rates for posters and podiums. Award nominated abstracts had a significantly higher publication rate (68.0% vs. 53.4%, p<.001). Among journals with an impact factor, the median overall impact factor was 3.27 and was similar between all conferences except GSC, which was slightly lower (2.72 vs. 3.27, p<.001).

Conclusions: Fifty-four percent of abstracts were published with 3 societies (NASS, LSRS, and SRS) having rates of over 60%. Moreover, NASS and LSRS demonstrated high publication rates regardless of presentation type. These numbers are significantly higher than previous reports suggesting that these conferences allow attendees to review high quality evidence that is likely to achieve peer-reviewed publication while obtaining an early look at original research.

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Introduction

Scientific meetings provide an important forum for the advancement of scientific knowledge between colleagues both by disseminating research findings and by inviting critical discussion of results. The findings of these studies, whether level I randomized clinical trials or level IV observational experiences, have the potential to impact the clinical judgment of attendees. While the goal of most research teams is publication in a peer-reviewed journal, these conferences serve as an important step in the research process on the path to eventual publication.

Abstract quality is of high importance to the scientific community, as a prior review demonstrated that almost 50% of textbook chapters will cite conference proceedings [1]. However, while respected scientific meetings have rigorous abstract review, the quality of accepted abstracts for presentation are often limited by numerous factors including high submission volume and a limited word count. Across all biomedical research, a systematic review conducted in 2016 found that only 37% of 307,028 abstracts reached full publication as a peer-reviewed manuscript [2].

While several studies have evaluated the publication rate of various spine conferences before 2012 [3–7], these have all evaluated single conferences over different periods of time, limiting conclusions that can be drawn regarding whether certain conferences are more likely to yield a peer-reviewed manuscript or whether presentation at a specific society meeting is more likely to result in publication in a high-impact journal. While previous reports demonstrate individual conferences have publication rates ranging from 32.2% to 55.1% [3–8], it is unclear if this has shifted in more recent years as there has been an increase in overall publication volume and open access publications, rise in research funding, and improved global collaborative networks [9–13]. The purpose of this study was to evaluate the impact of abstracts presented among 6 major spine conferences by analyzing their contemporary publication rates.

Methods

Programs for the annual meetings of 6 spine conferences were reviewed for all podium presentations and poster/e-poster abstracts from 2017 to 2019, allowing for at least 3 years from presentation to publication, as most studies are published within this timeframe [6,14–16]. The included conferences were the annual meetings of the North American Spine Society (NASS), Global Spine Congress (GSC), Cervical Spine Research Society (CSRS), Lumbar Spine Research Society (LSRS), Scoliosis Research Society (SRS), and International Meeting on Advanced Spine Techniques (IMAST). These spine conferences were identified because they represent highly regarded spine meetings across different anatomic areas and pathologies targeting both United States and international audiences. NASS, LSRS, and CSRS were classified as North American conferences while GSC, IMAST, and SRS were classified as international conferences. This distinction was made based on the geographic location of annual meetings. Abstract title, authors, presentation type, and award nomination status was recorded from conference programs.

Two reviewers independently reviewed the abstracts via a PubMed search tailed to December 1, 2022, for abstract title or keywords from title. If an exact match was not found, manuscripts were matched to authors and content to confirm that the article represented the correct abstract. If an abstract could not be identified on PubMed, a subsequent Google search sought to identify manuscripts not indexed on PubMed. The publication date, publishing journal, and whether or not the manuscript was published open access were recorded. The impact factor of publishing journals was collected from the 2021 Web of Science Journal Citation Reports [17]. Open access journals were defined as those that are completely open access without subscription articles. Articles published as open access are those either published in an open access journal or in another journal without requiring subscription or licenses to access.

Descriptive statistics were reported as mean and standard deviation for continuous variables and mean and percent for categorical variables. Pearson chi-square tests and Fisher exact tests, in the case of small counts, were conducted for bivariate comparisons of all categorical variables. Journal impact factor was assessed for normality via Shapiro-Wilk testing and analyzed with Mann-Whitney U tests. All statistical tests were conducted using Stata SE, Release 17 (Stata Statistical Software). P values less than 0.05 were considered statistically significant.

Results

Overall, 5,722 abstracts were identified over the 3 years of annual meetings, and 54% (N=3,091) were published in a peer-reviewed journal. The publication rate of abstracts ranged from 44.5% to 66.3%. GSC demonstrated the lowest publication rate at 44.5%, while SRS, NASS, and LSRS all had publication rates of at least 60%. The publication rate of podium presentations ranged from 51.6% to 67.2%, and poster presentations from 39.8% to 64.6%. Across every abstract category, LSRS had the highest publication rate (Table 1).

Abstracts selected as podium presentations were significantly more likely to be published than poster presentations (59.6% vs. 47.2%, p<.001). Similarly, award nominated abstracts had a significantly higher publication rate (68.0% vs. 53.4%, p<.001). International conferences generally had a lower overall publication rate (49.7% vs. 61.7%, p<.001). Publication of abstracts over time, while significantly different, did not follow a longitudinal trend (2017: 54.1% vs. 2018: 56.8% vs. 2019: 51.6%) (Table 2).

Abstracts were published in 306 total unique journals. The most common journals of publication were *Spine* (N=469, 15.2%), *The Spine Journal* (N=255, 8.25%), *Global Spine Journal* (N=229, 7.41%), *Spine Deformity* (N=210, 6.79%), and *European Spine Journal* (N=196, 6.34%) (Table 3). Most (80.1%) abstracts were published in journals with a registered impact factor as of the 2021 Journal Citation Reports. Published CSRS abstracts were least likely to be submitted to a journal without impact factor (8.3%), while SRS, IMAST, and GSC abstracts were more likely to be published in a nonimpact factor journal (32.0%, 21.4%, and 20.2%, respectively). It is important to note that *Spine Deformity, International Journal of Spine Surgery*, and *Asian Spine Journal*, 3 journals that frequently published manuscripts from these conferences, do not have an impact factor as they are housed under the Emerging Sources Citation Index. Among journals that do have an impact factor, the median overall impact factor was 3.27 [IQR: 2.23; 4.00] and was similar between all conferences except GSC, which was slightly lower (2.72 vs. 3.27, p<.001). Thirty-three percent of abstracts were published in an open access journal, most commonly from GSC (N=499, 44.6%) which was significantly greater than SRS (N=82, 18.0%) (Table 4).

Discussion

Although the goal of scientific investigators is publication in a peer-reviewed journal, not all projects reach the stage of an accepted peer-reviewed manuscript. By submitting abstracts to respected academic conferences, researchers access a peer-review process both by program conference reviewers and fellow attendees. Therefore, scientific meetings serve an important role as a checkpoint in vetting research presentations before presentation and determining which studies appear to be of solid methodology and academic importance. Analyzing the publication rate is a common method to assessing the quality of abstracts presented at annual meetings in order to determine which studies withstand the rigors of a full peer-review process. Moreover, a high publication rate may indicate that a conference committee is more stringent in selecting clinically important and scientifically valid abstracts for presentation. In our analysis, we identified that the overall publication rate of abstracts presented at 6 major conferences was 54.0%.

We found a significantly greater publication rate among award-nominated abstracts and among podium presentations compared with

Table 1
Publication rate of abstracts across all conferences.

	Overall		Podium presentations		Poster presentations	
	Not published	Published	Not published	Published	Not published	Published
Overall (N=5,722)	2,631 (46.0%)	3,091 (54.0%)	1,261 (40.4%)	1,864 (59.6%)	1,370 (52.8%)	1,227 (47.2%)
CSRS (N=429)	176 (41.0%)	253 (59.0%)	100 (36.7%)	175 (63.6%)	76 (49.4%)	78 (50.6%)
GSC (N=2,510)	1,392 (55.5%)	1,118 (44.5%)	492 (48.4%)	524 (51.6%)	900 (60.2%)	594 (39.8%)
LSRS (N=282)	95 (33.7%)	187 (66.3%)	61 (32.8%)	125 (67.2%)	34 (35.4%)	62 (64.6%)
NASS (N=1,338)	513 (38.3%)	825 (61.7%)	338 (38.2%)	547 (61.8%)	175 (38.6%)	278 (61.4%)
IMAST (N=427)	175 (41.0%)	252 (59.0%)	113 (37.2%)	191 (62.8%)	62 (50.4%)	61 (49.6%)
SRS (N=736)	280 (38.0%)	456 (62.0%)	157 (34.2%)	302 (65.8%)	123 (45.8%)	154 (55.6%)

CSRS, Cervical Spine Research Society; GSC, Global Spine Congress; LSRS, Lumbar Spine Research Society; NASS, North American Spine Society; IMAST, International Meeting on Advanced Spine Techniques; SRS, Scoliosis Research Society.

Table 2
Abstract characteristics associated with publication.

	Not published	Published	p value
Abstract type			<.001*
Poster	1,370 (52.8%)	1,227 (47.2%)	
Podium	1,262 (40.4%)	1,863 (59.6%)	
Abstract presentation year			.005*
2017	854 (45.9%)	1,006 (54.1%)	
2018	769 (43.2%)	1,012 (56.8%)	
2019	1,008 (48.4%)	1,073 (51.6%)	
Award nominee			<.001*
Not nominated	2,551 (46.6%)	2,918 (53.4%)	
Nominated	81 (32.0%)	172 (68.0%)	
Conference audience			<.001*
North America	785 (38.3%)	1,264 (61.7%)	
International	1,847 (50.3%)	1,826 (49.7%)	

* Indicates statistical significance at p<.05.

Table 3
Journals with the highest publication volume of spine abstracts.

Journal	Impact factor	Number	Percentage of total
Spine	3.269	469	15.2%
The Spine Journal	4.297	255	8.25%
Global Spine Journal	2.230	229	7.41%
Spine Deformity	N/A	210	6.79%
European Spine Journal	2.721	196	6.34%
Journal of Neurosurgery: Spine	3.467	185	5.95%
World Neurosurgery	2.210	167	5.40%
Clinical Spine Surgery	1.723	143	4.63%
International Journal of Spine Surgery	N/A	87	2.81%
Asian Spine Journal	N/A	68	2.20%
Neurosurgery	5.315	60	1.94%
Journal of Spine Surgery	N/A	54	1.75%
Journal of Bone and Joint Surgery	6.558	51	1.65%
Journal of Clinical Neuroscience	2.116	37	1.20%
Journal of Pediatric Orthopaedics	2.537	28	0.91%
Neurospine	3.374	28	0.91%
Neurosurgical Focus	4.332	28	0.91%
BMC Musculoskeletal Disorders	2.562	23	0.74%
Operative Neurosurgery	2.817	22	0.71%
PLoS One	3.752	21	0.68%
Journal of the Craniovertebral Junction & Spine	N/A	21	0.68%
Journal of Clinical Medicine	4.964	17	0.55%
Bone & Joint Journal	5.385	16	0.52%
Clinical Neurology & Neurosurgery	1.885	16	0.52%

poster presentation, which was expected. The scientific committees and abstract reviewers at each respective conference frequently assign the highest quality abstracts for these designations. Interestingly, the only 2 conferences with poster presentation publication rates similar to those of podium presentations were NASS (61.4% vs. 61.8%) and LSRS (64.6% vs. 67.2%). This may suggest an exceptionally high quality of abstracts selected by the program selection committee for all abstract types. *Spine*, as a journal, published the highest proportion of all abstracts reaching full publication, comprising 15.2% of all published manuscripts, followed closely by *The Spine Journal* and *Global Spine Journal*. These journals may serve as a strong targets for many seeking to publish their research all 3 demonstrate journals with significant reach and high-impact factor, consistently publishing papers among the most influential in cervical spine, lumbar spine, adult spinal deformity, and several other topics pertinent to spinal surgery [18–24].

Several studies have previously evaluated publication rates of abstracts at spine conferences [4–6,25]. In our study, there was a higher rate of publication among abstracts presented at conferences focusing

Table 4
Characteristics of published abstracts.

	Journal impact factor	Journals without impact factor (%)	Open access journals (%)	Open access article (%)
Overall (N=3,091)	3.27 [2.23; 4.00]	616 (19.9%)	1,010 (32.7%)	1,418 (45.9%)
CSRS (N=253)	3.27 [2.23; 4.00]	21 (8.3%)	68 (26.9%)	97 (38.3%)
GSC (N=1,118)	2.72 [2.23; 3.48]	226 (20.2%)	499 (44.6%)	646 (57.8%)
LSRS (N=187)	3.27 [2.21; 4.19]	31 (16.6%)	50 (26.7%)	70 (37.4%)
NASS (N=825)	3.27 [2.23; 4.30]	138 (16.7%)	253 (30.7%)	349 (42.5%)
IMAST (N=252)	3.27 [2.54; 3.47]	54 (21.4%)	58 (23.0%)	130 (51.6%)
SRS (N=456)	3.27 [2.72; 3.47]	146 (32.0%)	82 (18.0%)	126 (27.6%)
p value	<.001*	<.001*	<.001*	<.001*

* Indicates statistical significance at p<.05.CSRS, Cervical Spine Research Society; GSC, Global Spine Congress; LSRS, Lumbar Spine Research Society; NASS, North American Spine Society; IMAST, International Meeting on Advanced Spine Techniques; SRS, Scoliosis Research Society.

on North American audiences compared with international audiences. Two previous analyses with similar methodologies of podium presentations at CSRS European and American section meetings found that 62% of abstracts presented at the American section were published as manuscripts compared with only 49% of those at the European section over a similar period of time [6,15]. And when we compare our study's rates of publication to previous publications, we find that most prior publications found a significantly lower publication rates among the same conferences. One study found that among abstracts presented at LSRS between 2008 and 2012, just 55.1% were published within a 4-year interval, which is far lower than the 66.3% we found in our study [5]. Even NASS, the largest North American conference, demonstrated a 61.7% overall publication rate from 2017 to 2019 compared with only 40% from 1990 to 1992 and 43.8% from 2010 to 2012 [4,8].

There are numerous reasons that may help explain this resultant rise in publication rate. An analysis of National Institutes of Health (NIH) funding from 2005 to 2014 found a growth in total funding by 24% to just over 54 million United States dollars across 44 orthopedic surgery departments [26]. This growth may have contributed to a greater rise in prospective trials that are of higher methodological rigor and are more likely to achieve publication. In arthroplasty research, increased NIH funding has been associated with a higher senior investigator publication rate and Hirsh-index (h-index) [27]. In our study, we also identified 2 trends in the abstracts published as well including the higher number of open access publications and manuscripts which may have increased the publication rates compared with earlier analyses. The number of open access journals has grown significantly in recent years [9,28]. Across indexed journals, the number of open access journals increased by 18% annually and open access publications by 30% compared with a general increase of 3.5% for journal publications broadly from 2000 to 2009 [9]. This has resulted in a greater increase in publication of original research in open access journals among spine surgeons. An analysis of members of Orthopaedic Research Society (ORS) Spine Section and the International Society for the Study of the Lumbar Spine (ISSLS) found that only 1 open access journal was ranked among the most common destination for publication among society members from 2007 to 2011 [29]. However, from 2012 to 2016, 3 and 4 of the top 10 journals publishing research of ORS and ISSLS members, respectively, were open access publications [29]. While these have allowed for a greater dissemination of research, it is unclear whether this may have any effect on increasing visibility or citation rate [28,30].

We also witnessed a large number of abstracts published as open access manuscripts at journals that are not considered open-access journals. Open access publications, which frequently require a fee, may be mandated by grant-funding institutions or may reflect a willingness to pay to publish manuscripts that have a greater clinical or academic impact. An analysis of spine publications at journals that published at least 10% of papers both as open access or nonopen access (ie, hybrid journals that allow for open access publications) found that open access publication was associated with significantly greater attention score [31]. These open access publications may be especially important for global initiatives, allowing an equitable distribution of scientific knowledge internationally to many surgeons and institutions unable to afford article fees [32]. Moreover, the increased open access publication rate among Global Spine Congress may reflect significant efforts to increase global dissemination of spine surgery related original research.

While our study is strengthened by its review of several spine conferences with a standard methodology, there are limitations that should be considered. First, our primary article search was on PubMed followed by a Google search. It is possible that there were articles published in journals that are not PubMed-indexed which may not be readily identified via Google search. However, Whitehouse et al. previously demonstrated that PubMed and Google Scholar identified more manuscripts in a review of hip surgery related abstracts at national meetings than other databases, such as Embase [33]. Additionally, considerations regarding impact factor and open access journal status should be carefully considered given that respected journals including *Spine Deformity* and *Global Spine Journal* also fall into these categories, respectively. Moreover, we only allowed for a minimum of 3 years between abstract presentation to publication. It is possible that there may be abstracts in the early stages of larger projects that will take longer to be submitted or that a delay in publication may occur from initial rejections from multiple journals. However, no set time frame for an appropriate time to publication exists, and our choice of 3 years is consistent with other literature. Finally, the article search process may be influenced by subjectivity, limiting comparison to prior studies. However, our study utilized the same reviewers across all 6 conferences, which may serve as a relative strength.

Conclusions

Overall, 54% of abstracts went onto publication, and 3 conferences (LSRS, NASS, and SRS) had abstract publication rates above 60%, demonstrating a substantial increase in publication rate compared with prior reports of spine academic meetings. The publication of presented abstracts in peer-reviewed journals allows for validation of work and a more thorough analysis of project data. A higher publication rate was identified for podium presentations, award-nominated abstracts, and those presented at North American spine meetings. The high publication rate of abstract presentations may allow conference attendees to believe in the quality of the presented studies and that the implications of the original research should be considered before future publication.

Declaration of Competing Interest

One or more of the authors declare financial or professional relationships on ICMJE-NASSJ disclosure forms.

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