

# Stronger Together in Lab: Multi-Center and Laboratory Spine Studies Are Closer to Publication than Single-Center and Clinical Spine Studies: Snapshot of Annual Meetings of the Spine Society of Europe

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**Study Design:** This is a cross-sectional study of literature databases.

**Purpose:** The purpose of this study is to analyze the predictive factors for the publication rates of spine studies.

**Overview of Literature:** Spine research has garnered worldwide interest due to the increased number of spinal disorders in aging population.

**Methods:** We evaluated the abstracts presented at the annual meetings of the Spine Society of Europe between 2009 and 2012. Additionally, we recorded presentation categories, study designs, research types, random assignments of the subjects, single- or multi-center-based methodologies, and significance of the results.

**Results:** We evaluated 965 abstracts, 53.5% of which were published in peer-reviewed journals. Publication rates were significantly higher for oral presentations (62.9%) and prospective studies (61.3%) as compared to the poster presentations (46.7%) and retrospective studies (44.2%), respectively ( $p < 0.001$ ). Clinical studies contributed to about 86.1% of the published abstracts. However, publication rates were significantly higher for laboratory studies as compared to clinical studies (70.1% vs. 50.8%,  $p < 0.001$ ). Multi-center studies were closer to publication than single-center studies (67.1% vs. 52.2%,  $p = 0.009$ ). Our study demonstrated that multi-center studies (odds ratio, 1.81;  $p = 0.016$ ) and laboratory studies (odds ratio, 2.60;  $p < 0.001$ ) are more likely to be published.

**Conclusions:** Multi-center collaborations dedicated to experimental studies in spine research are highly ranked and more likely to be published in peer-reviewed journals.

**Keywords:** Congress; Abstract; Presentation; Publications; Journal

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## Introduction

Scientific studies are inspired by the questions pertaining to the areas of interest. Studies are designed to answer these questions by developing methodologies, carrying out experiments, obtaining the results, and drawing the conclusions [1]. There is a continuous emergence of new questions as soon as the previous questions are answered.

Conferences and journals are the major ways of sharing new studies with other researchers. Key messages/findings of the new studies are usually presented at conferences, whereas detailed methodologies, results, discussions, and conclusions of these studies can be accessed through peer-reviewed journal publications. New studies either can be directly submitted to the journals or can be submitted after being exposed to preliminary peer-review process, including with queries aroused during presentations. This preliminary peer-review process could be useful for the editorial board of the journals. Because studies published in peer-reviewed and internationally indexed journals are more valuable, identifying the publication rates of the presented abstracts at scientific conferences and predictive factors for the publication of an abstract would be beneficial for researchers.

The purpose of this paper is to analyze the predictive factors for the publication rates of spine studies. For this purpose, we evaluated the abstracts presented at the annual meetings of the Spine Society of Europe.

## Materials and Methods

It has been observed that abstracts presented at the scientific meetings were generally published within 4 years after the corresponding meetings [2]. We evaluated the abstracts presented at the annual meetings of the Spine Society of Europe between 2009 and 2012. We recorded presentation categories (oral presentation, poster presentation), study designs (prospective, retrospective, others), research types (clinical or laboratory), random assignments of the study subjects, single- or multi-center-based methodologies, and significance of the results. Thereafter, we used the PubMed/Medline and Google Scholar databases for checking whether the abstracts were published until the end of 2017. For the published abstracts, we also recorded the time of publication and changes in content. Aim of the study, methodology, sample size, and results were evaluated for similarity and changes in content. If an

abstract had been published before it was presented at the meeting, then it should have been exactly similar in content. Otherwise, it was not accepted as published.

We used IBM SPSS ver. 20.0 (IBM Corp., Armonk, NY, USA) for statistical analysis. Chi-square test and independent samples *t*-test were used for analyzing dichotomous and continuous variables, respectively. Predictive factors for the publication rates were analyzed by using the binary logistic regression model. A *p*-value of less than 0.05 was accepted as statistically significant.

## Results

We evaluated 965 abstracts (oral presentations, 404 [41.9%]; posters, 561 [58.1%]), presented at 2009–2012 annual meetings of the Spine Society of Europe, 516 (53.5%) of which have been published in peer-reviewed journals. Of the 516 accepted articles, 89.5% (462) had been published in the journals indexed in Science Citation Index (SCI, including the extended version, SCIE).

Publication rates were significantly higher for oral presentations than those for poster presentations (62.9% versus 46.7%, respectively;  $p < 0.001$ ). Clinical studies contributed 86.1% of the published abstracts. However, publication rates were significantly higher for laboratory studies as compared to clinical studies (70.1% versus 50.8%, respectively;  $p < 0.001$ ). Most of the presented and published abstracts had significant results (91.2% and 91.5%). However, abstracts with significant results and those with insignificant results showed no statistically significant differences in the publication rates (53.6% versus 51.8%, respectively;  $p = 0.741$ ). We observed that 49.8% of the abstracts had a prospective study design, whereas 37.2% of the abstracts had a retrospective study design. Publication rates were significantly higher for prospective studies than those for retrospective ones (61.3% versus 44.2%, respectively;  $p < 0.001$ ). Of the prospective studies, 21.7% were randomized. Randomized and non-randomized prospective studies were not significantly different in terms of publication rates (62.6% versus 61%, respectively;  $p = 0.773$ ). Multi-center studies were closer to publication than single-center studies (67.1% versus 52.2%, respectively;  $p = 0.009$ ).

The mean time to publication was  $1.75 \pm 1.66$  years after the presentation at the meeting (range, -4 to 7 years according to the year of presentation). Of the accepted abstracts for publication, 22 had been published before

presentation at the annual meetings of the Spine Society of Europe (4 years, 1 paper; 3 years, 2 papers; 2 years, 8 papers; and 1 year, 11 papers). Oral presentations took a relatively shorter time to be published than the poster presentations. However, the difference was not statistically significant (1.68 versus 1.82 years, respectively;  $p=0.329$ ). We realized that 42.4% of the published abstracts differed from their presented forms in terms of methodology and/or scientific content.

The five leading peer-reviewed journals in which most of the accepted abstracts had been published were as follows: *European Spine Journal* (25.9%, 134 abstracts), *Spine (Phila Pa 1976)* (18.4%, 95 abstracts), *The Spine Journal* (5.8%, 30 abstracts), *Clinical Spine Surgery* (5.2%, 27 abstracts), and *Journal of Neurosurgery: Spine* (5.2%, 27 abstracts).

After analyzing significant independent variables by using the binary logistic regression model, we showed that multi-center studies (odds ratio [OR], 1.81; 95% confidence interval [CI], 1.11–2.95;  $p=0.016$ ), laboratory studies (OR, 2.60; 95% CI, 1.72–3.93;  $p<0.001$ ), and oral presentations (OR, 0.49; 95% CI, 0.37–0.64;  $p<0.001$ ) achieved more publication success in the peer-reviewed journals.

## Discussion

The purpose of this paper is to analyze the predictive factors for the publication rates of spine studies. For this purpose, we evaluated the abstracts presented at the annual meetings of the Spine Society of Europe.

In the field of science, there are some steps to be followed for answering a question in a proper way: asking the question, presenting the hypothesis, developing the experimental methodology, conducting the research, acquiring the data, and drawing the conclusion(s). Scientific meetings and peer-reviewed journals are the two most common mediums to disseminate the conclusions to their audience. As compared to presenting the facts at a scientific meeting, publishing them in a scientific journal is more valuable because journal articles harbor full content of the studies and are circulated among the audience in an uninterrupted way. However, not all scientific journals are published with the same quality. The quality of scientific journals is valued depending on which international indexes they have been indexed, one of which is SCI or SCIE. Of the accepted abstracts in this study, approxi-

mately 90% had been published in SCI or SCIE indexed journals, which could be considered as a high rate of success.

We analyzed all the significant independent variables that could predict the publication rates of presented spine abstracts by using a binary logistic regression model. We found that laboratory studies had 2.6 times and multi-center studies had 1.8 times higher probability of being published. We suggest that multi-center collaborations dedicated to experimental spine studies are more readily published.

Multi-center studies are more valuable than single-center studies because multi-center studies have larger sample sizes and more rigid study protocols. Single-center studies could not be conducted with larger sample sizes. Multiple collaborators via uniform data collection and standardized well-designed procedures control data input and data analysis. In multi-center studies, primary and secondary outcome measures are more precisely determined by using more common, consistent, and relevant measures. Study results are evaluated by using pre-planned analyses and subanalyses. Thus, fishing expedition is avoided and results could be generalized. In multi-center studies, regular interim data analysis with quality controls is conducted in a standardized time and manner to avoid data pollution [3-6]. Single-center studies are not strong enough to provide groundbreaking conclusions in clinical practice because they have less internal rigidity and external validity of the acquired data as compared with the multi-center studies [7,8]. Even though multi-center studies are superior to single-center studies, multi-center studies require extensive time and investment [3,4]. Single-center studies could provide preliminary results for multi-center studies [8]. These preliminary results could be strengthened by further multi-center studies, and conclusions of these multi-center studies could be used in daily clinical practice, as expected by the peer-reviewed journals [7]. Our study also showed that peer-review journals preferred publishing the multi-center studies.

The time taken to finally publish a study was 1.75 years on an average, which could be one of the reasons that might discourage the authors to prepare a full manuscript of their study. There were 22 manuscripts that had been published before their presentations at the annual meetings of the Spine Society of Europe. Most of the annual scientific meetings of different medical specialties prohibit the submission of abstracts that had already been

published in the peer-reviewed journals, some might have been overlooked and this entity has already been presented in the literature [9]. The scientific meetings aim to transfer the knowledge to the appropriate audience in a short and practical way. Besides, scientific meetings provide the medium at which study projects could be evaluated based on the new questions and ideas aroused from the audience [10]. It is beneficial to present a study at a dedicated scientific meeting just before its submission to a peer-reviewed journal. However, some authors would like to submit their manuscripts before their presentation for some reasons, for example, authors would not like to share a novel finding that might be the first of its kind in the literature before it is published. They would like to be prepared for any criticism from the audience because of prior criticisms from the reviewers of scientific journals. The simplicity of preparing a presentation from an already published manuscript could also lead the authors to present their published studies [11].

Laboratory studies are more likely to be published than the clinical ones [2]. The reason behind this fact could be the prospective design of laboratory studies. Laboratory studies could be more novel than clinical studies, since they answer the most interesting and unstudied questions, which could not be studied directly on human subjects. Laboratory studies are more likely to be published, since they require more time, resources, and efforts relative to the clinical ones. The complexity in the materials and methods of a study might yield a greater attention. Productivity in publication is expected from basic scientists as a part of their job. However, clinicians are overwhelmed by daily clinical activities and might spend less time than that is required for conducting a clinical study. In a survey conducted by Sprague et al. [12], three main reasons for failure in publishing a research were limited time (mostly), ongoing research activities, and conflicts between the authors in conducting the study forward [13].

Oral presentations had witnessed more publications than poster presentations (62.9% versus 46.7%). Only the abstracts with a high impact are chosen for oral presentations due to limited slots in the scientific meetings. It could be assumed that the higher publication rates of oral presentations are due to this rigorous evaluation process, both in the meeting and publication processes [1]. Prospective studies had a higher likelihood of acceptance by scientific journals as compared to retrospective ones (61.3% versus 44.2%). Of the prospective studies, 21.7%

was randomized, which is far less than the expected rate. Retrospective studies with a good study design might deserve publication as much as the prospective ones. So, there could be a prejudice of reviewers about the study design before the evaluation of submitted manuscripts. To make further comments on this topic, reviewers' opinion could be assessed after their evaluation of the manuscripts.

Approximately one-fourth of every accepted abstract had been published in *European Spine Journal* (25.9%), the official journal of the Spine Society of Europe. The reasons behind this are out of scope of this paper and should be thoroughly analyzed in a separate study.

We are aware of our limitations. We reviewed the meeting abstracts through PubMed/Medline and Google Scholar. Even though most of the publications are indexed by these major databases, some publications still may have been missed. Sprague et al. [12] reported a survey about the fate of unpublished abstracts. Authors of 199 out of 306 unpublished abstracts presented at the 1996 Annual Meeting of American Academy of Orthopaedic Surgeons responded to their survey. Approximately 40% of the 199 abstracts had actually been accepted and published [12,13]. We reviewed the abstracts by using the same methodology of similar publications within a 2-year period. Both authors of this study double-checked the abstracts to minimize the number of missed publications. Another limitation of our study is that we used the abstracts presented only at the annual meetings of the Spine Society of Europe; therefore, the results could not be generalized to all the spinal meetings around the world.

## Conclusions

Single-center clinical studies are easier to conduct by scientists and clinicians in the field of spine research, since clinicians have limited time and resources for both multi-center and laboratory studies. However, the publication probability is higher for multi-center and laboratory studies. Multi-center studies provide generalizable statements due to larger sample sizes and laboratory studies answer questions, which could not be studied on human beings. Further multi-center and laboratory studies are needed, since spine research needs generalizable statements and new answers.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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