

# Level of Evidence and Publication Rates of Abstracts Presented at the American Society for Surgery of the Hand Annual Meetings: Comparison Over 23 Years

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**Purpose** The primary aims of this study were to determine how level of evidence and publication rates of American Society for Surgery of the Hand (ASSH) abstracts presented at the national meeting have changed over the past 23 years.

**Methods** Abstracts presented at the ASSH annual meeting from 1992 to 2014 were reviewed. Level of evidence (LoE) and publication status for each abstract were recorded. We calculated annual and overall LoE, publication rates, average time to publication, and top journals of publication for abstracts presented from 1992 to 2014. The LoE was categorized into level 1 or 2 studies, levels 3 to 5 studies, or nonclinical study.

**Results** A total of 1,757 abstracts were presented at ASSH meetings from 1992 to 2014; 942 abstracts were published in peer-reviewed journals for an overall publication rate of 53.6%. There was a significant increase in the proportion of levels 1 to 2 LoE abstracts over time (18% in 2007–2014 vs 11% in 1999–2006 and 2% in 1992–1998). There was also a significantly higher percentage of abstracts published over time (62% in 2007–2014 vs 52% in 1999–2006 and 47% in 1992–1998). Levels 1 to 2 LoE studies were associated with higher publication rates than nonclinical or levels 3 to 5 LoE studies.

**Conclusions** This research provides historical trends on the LoE of abstracts presented at the ASSH annual meetings. Our study shows there are increasing numbers of levels 1 to 2 studies as well as higher publication rates of abstracts presented at more recent ASSH annual meetings. Levels 1 to 2 studies are more likely to be published than nonclinical or levels 3 to 5 studies.

**Clinical relevance** Although not all questions can be feasibly answered with level 1 or level 2 studies, authors should continue to search for ways to strengthen study designs, producing more valid and comparable results with increased likelihood of publication driving forward the quality of hand surgery research. Higher recent publication rates may be partially due to the increased number of available journals for publication. (*J Hand Surg Am.* 2020;45(10):988.e1-e6. Copyright © 2020 by the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Abstracts, level-of-evidence, publication.



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SCIENTIFIC STUDIES PRESENTED at the American Society for Surgery of the Hand (ASSH) annual meetings allow investigators to present their research findings in a forum of peers, facilitating the discussion of topics that may affect patient care or influence future research.

Previous studies have examined the publication rate of ASSH abstracts in peer-reviewed journals. Gavazza et al<sup>1</sup> examined publication rates from 1990 to 1992 and reported that 52% of abstracts were published in peer-reviewed journals. More recently, Abzug et al<sup>2</sup> and Theman et al<sup>3</sup> found that abstracts presented at ASSH meetings from 2000 to 2010 had similar publication rates of 47% to 49%. These articles, however, did not examine how level of evidence (LoE) of abstracts or subsequent publications have changed over time.

Within orthopedic surgery, there has been a movement to improve the quality of published surgical research as determined by LoE. In 2000, *The Journal of Bone and Joint Surgery* introduced an Evidence-Based Orthopaedics section and began including LoE ratings for its clinical studies in 2003.<sup>4,5</sup> Within hand surgery, the editors of the *Journal of Hand Surgery* published an editorial piece in 2005 describing efforts to improve the quality of hand surgery research.<sup>6</sup> Shortly thereafter, the *Journal of Hand Surgery* began publishing the LoE of clinical studies in November 2005. It was not until 2009, however, that the ASSH began publishing LoE for all accepted clinical abstracts. Whereas research has shown LoE has increased in the *Journal of Bone and Joint Surgery* and in abstracts presented at the American Academy of Orthopaedic Surgeons annual meetings since the publication of LoE ratings, there are little data on how hand surgery research has changed over the years.<sup>7–10</sup> Because there is typically a delay between abstract presentation and publication, it is possible that abstracts may reflect changes in the quality of hand surgery research earlier than do published articles. Previous studies have shown that abstracts are typically published between 2 and 3 years after being presented at the ASSH annual meeting.<sup>1,2</sup>

The aims of this study were to determine how level of evidence and publication rates of ASSH abstracts presented at the national meeting have changed over the past 23 years and to determine whether increased LoE is associated with higher rates of publication.

## MATERIALS AND METHODS

Abstracts presented at the annual meeting from 1992 to 2014 were downloaded from the ASSH Website.

Abstract title, presenter name, first author name, last author name, and number of authors were recorded for all abstracts from 1992 to 2014. The LoE was recorded directly from the published abstracts from 2009 to 2014 because LoE was included in abstract books for those years. We excluded abstracts from 2015 to -2018 to allow a full 3 years for publication.

To determine LoE of abstracts from 1992 to 2008, abstracts were reviewed by 4 separate reviewers (J.G.S., J.D.L., D.T.F., D.A.O.) and categorized as LoE 1, LoE 2, LoE 3, LoE 4, LoE 5, or nonclinical based on the *Journal of Hand Surgery* instructions to authors LoE guidelines.<sup>11</sup> Full criteria for designation of LoE can be found at: [https://www.elsevier.com/\\_data/promis\\_images/jhsachart.gif](https://www.elsevier.com/_data/promis_images/jhsachart.gif). All other studies that did not meet ASSH LoE criteria were classified as nonclinical studies. This included animal, cadaver and biomechanical studies, surveys, and literature reviews. These nonclinical studies were not included in LoE analysis.

To determine whether abstracts were published in peer-reviewed journals, abstract titles were entered in Google Scholar and PubMed. Published titles identical to that of their corresponding abstracts with similar authors were marked as published. Published articles with nonidentical titles but similar authors and key words to a corresponding abstract were reviewed. If a published paper matched an ASSH abstract, they were marked as published. For each published abstract, the authors, author order, title of the journal, and publication date were recorded.

Descriptive statistics were performed to determine annual and overall LoE and publication rates, average time to publication, and top journals of publication for abstracts presented from 1992 to 2014. Abstracts often provide limited information regarding methods; as such, the decision was made to group LoE to increase the accuracy of our ratings. The LoE was categorized into levels 1 or 2 studies, levels 3 to 5 studies, or nonclinical study. When it was difficult to discern between 2 levels, a best estimate was provided by the reviewer.

The 23-year period of study was divided into thirds (1992–1998, 1999–2006, and 2007–2014). A chi-square analysis was performed to determine whether an association existed between LoE and publication rate. It was also used to determine whether the proportion of levels 1 to 2 LoE abstracts and publication rates differed among the 3 time periods. We created a logistic regression model to determine whether the proportion of levels 1 to 2 and levels 3 to 5 studies have changed over the years. The dependent variable in the model was

**TABLE 1. Articles Published by Abstract Year and LoE**

	Abstract Published?		Total
	Yes	No	
Abstract Year			
1992–1998	269 (47%)	309 (53%)	578
1999–2006	289 (52%)	263 (48%)	552
2007–2014	384 (61%)	243 (39%)	627
		<i>P</i> < .05	
LoE			
LoE: levels 1–2	120 (66%)	63 (34%)	183
LoE: levels 3–5	526 (50%)	529 (50%)	1055
Nonclinical	296 (57%)	223 (43%)	519
		<i>P</i> < .05	
Total	942 (54%)	815 (46%)	1,757

levels 1 to 2 versus levels 3 to 5 abstracts, and the independent variable was abstract year. Only clinical abstracts were included in the model.

To evaluate the reliability between reviewers, all 4 reviewers rated 127 abstracts chosen at random. Each reviewer was blinded to the other reviewers' ratings. The intraclass correlation coefficient (ICC) using a 2-way mixed-effect model of absolute agreement on single ratings was determined between groups of LoE (levels 1–2 vs levels 3–5 vs nonclinical). The ICC values less than 0.5 are indicative of poor reliability, 0.5 to 0.75 moderate reliability, 0.75 to 0.9 good reliability, and greater than 0.90 excellent reliability.<sup>12</sup>

## RESULTS

A total of 1,757 abstracts were presented at ASSH annual meetings from 1992 to 2014. Of these, 942 abstracts were published in peer-reviewed journals for an overall publication rate of 53.6%. The median time to publication was 2.0 years (range, 0–14 years). Fifteen percent of abstracts were published after 4 or more years and 5% after 6 or more years. The top 5 journals of publication were *Journal of Hand Surgery, American Volume (JHS)*, 50%; *Journal of Bone and Joint Surgery (JBJS)*, 10.5%; *JHS European Volume*, 3.8%; *Plastic and Reconstructive Surgery*, 3.3%, and *Hand (New York)*, 2.7%. The ASSH abstracts were published in a total of 105 distinct peer-reviewed journals. They were published in 33 different peer-reviewed journals between 1992 and 1998, 51 different peer-reviewed journals between 1999 and 2006, and 66 different peer-reviewed journals between 2007 and 2014.

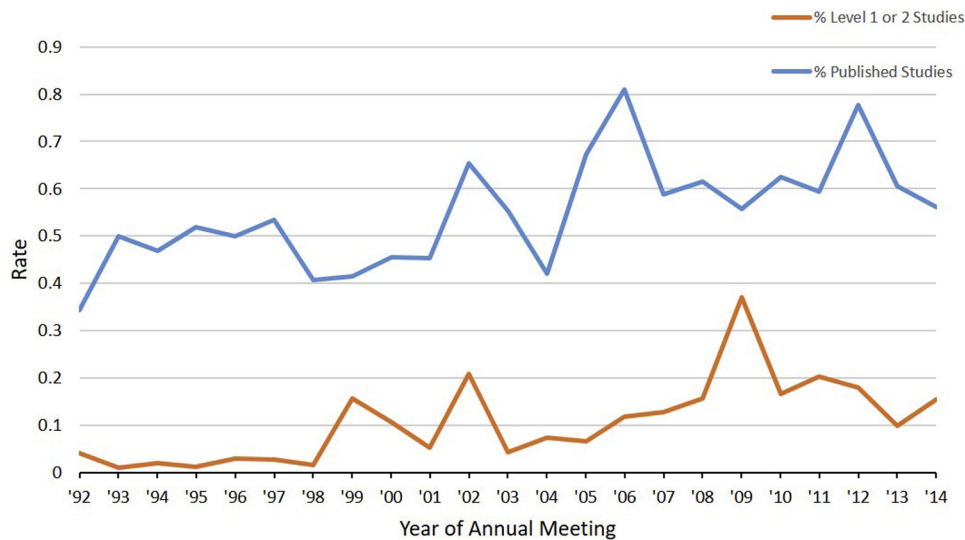
The percentage of abstracts published between 2007 and 2014 (61%) was significantly greater than prior years (52% in 1999–2006 and 47% in 1992–1998) (Table 1). For the entire study period, studies with levels 1 to 2 LoE (66% publication rate) were significantly more likely to be published than nonclinical (57%) or levels 3 to 5 LoE (50% publication rate) (Table 1).

The percentage of levels 1 to 2 LoE abstracts as well as the percent of abstracts published over the study period are presented in Figure 1. The percent of levels 1 to 2 LoE abstracts between 2007 and 2014 was 18%; this was significantly greater than previous years (11% in 1999–2006 and 2% in 1992–1998) (Table 2 and Fig. 2). The logistic regression model showed that, from 1992 to 2014, there has been an increase in levels 1 to 2 LoE abstracts versus levels 3 to 5 LoE abstracts ( $B = -0.09$ ; 95% confidence interval,  $-0.12$  to  $-0.07$ ).

The ICC among the 4 different reviewers on the 127 randomly selected abstracts was 0.52, indicating moderate agreement among the reviewers. In the abstracts with disagreement, the most commonly selected LoE among the reviewers was assigned to the abstract. Only 8 of 127 (6%) of the abstracts reviewed by all 4 reviewers had more than 1 reviewer discrepancy. In these cases, the LoE was decided by the first author (J.G.S.).

## DISCUSSION

Over the last decade, a greater emphasis has been placed on the quality of research in both orthopedic and hand surgery literature. To draw attention to the importance of research methodology, orthopedic



**FIGURE 1:** Annual rate of published studies and the annual proportion of levels 1 and 2 studies presented at the ASSH annual meeting from 1992 to 2014.

**TABLE 2.** Numbers of Abstracts of Each LoE by Abstract Year

Abstract Year	LoE			Total
	Levels 1–2	Levels 3–5	Nonclinical	
1992–1998	13 (2%)	395 (68%)	170 (29%)	578
1999–2006	59 (11%)	316 (57%)	177 (32%)	552
2007–2014	111 (18%)	344 (55%)	172 (27%)	627

$P < .05^*$

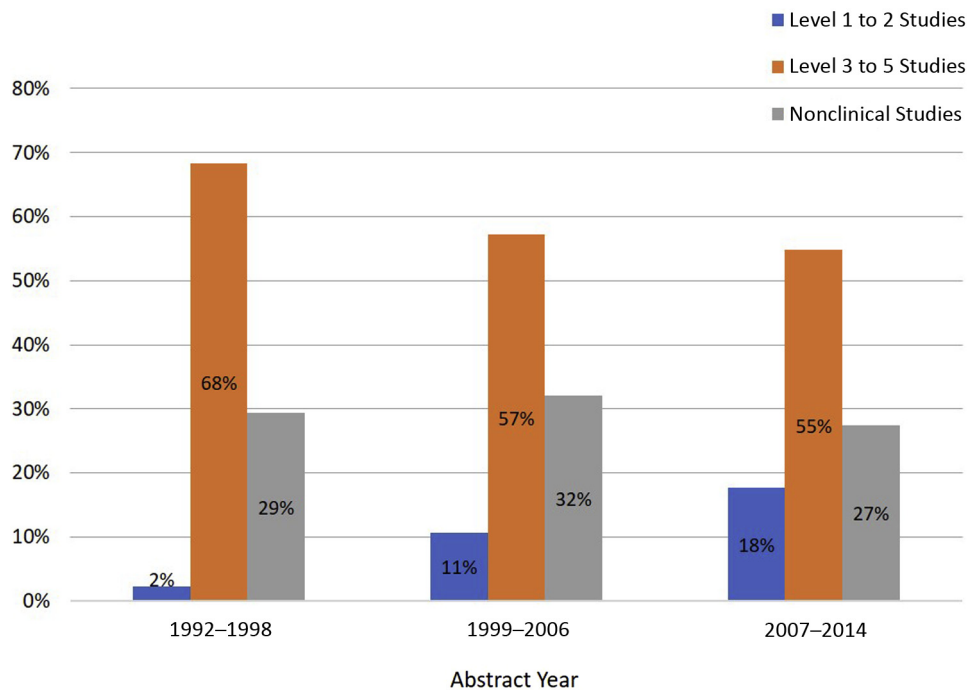
\**Post hoc* analysis showed LoE were significantly different with all between-group comparisons of abstract year grouping ( $P < .05$ ).

journals began publishing the LoE of clinical research in the mid-2000s. Since that time, orthopedic journals with the highest impact factors have been publishing more studies with higher LoE.<sup>7</sup> It is unknown whether this trend has been reflected in the hand literature or how level of evidence affects publication rates. Our study examined the LoE of published ASSH annual meeting abstracts spanning 23 years (1992–2014); the proportion of levels 1 to 2 LoE abstracts presented at ASSH annual meetings has increased over time and level 1 to 2 LoE of abstracts were associated with higher publication rates.

After analyzing 6 months of journal articles in 2003, Obremsky et al<sup>8</sup> found that *JHS* had the third lowest number of levels 1 to 2 studies among 9 of the top orthopedic journals. Since that time, hand surgery researchers have pushed to improve the LoE and quality of research methodology, following the trend set by the *JBJS* and the orthopedic

research community at large.<sup>4–6</sup> This study shows an improvement in the number of levels 1 to 2 LoE abstracts presented at the ASSH annual meeting over time, particularly in the last 8 years. A dramatic increase in LoE was seen in 2009, which was also the first year the ASSH annual meeting began publishing LoE data within their abstracts.

In association with this improvement in the quality of research, there has been an increase in ASSH abstract publication rates over time. The overall publication rate from abstracts presented at the annual ASSH meeting was 54% in our study, consistent with previous studies showing publication rates ranging from 46% to 52% with similar average times of publication ranging from 1.5 to 3 years.<sup>1–3</sup> We also show that ASSH abstract publication rates into peer-reviewed journals have significantly improved over the last 8 years. The reason for higher publication rates is likely multifactorial. One factor may be the increasing number of available journals for



**FIGURE 2:** ASSH abstract level evidence over the years. There was a statistically significant higher proportion of levels 1 to 2 studies in 2007 to 2014 than in the years 1992 to 1998 and 1999 to 2006. There was also a significantly higher proportion of levels 1 to 2 studies in 1999 to 2006 than in 1992 to 1998.

publication. We found that from 1992 to 1998 ASSH abstracts were published in 33 different journals, whereas in 1999 to 2006 and 2007 to 2014, ASSH abstracts were published in 51 and 66 different peer-reviewed journals, respectively.

Despite the improvement seen over time in the quality of abstracts at the ASSH annual meetings, the average LoE and percentage of levels 1 to 2 studies are still below those of other specialties. Kay et al<sup>9</sup> analyzed abstracts from the Arthroscopy Association of North America annual meeting. From 2006 to 2015, 31% of abstracts were levels 1 to 2 LoE studies compared with 18% at the ASSH annual meetings from 2007 to 2014 as noted in the current study. This same gap was noted by Voleti et al<sup>10</sup> at the 2010 American Academy of Orthopaedic Surgeons annual meeting; level 1 and level 2 studies represented 31%, increased from 14% in 2001.

There were a few limitations to our study. Before 2009, the LoE was not explicitly listed for each ASSH abstract. Because abstracts often contain limited information owing to word limits, this may have led to inaccuracies extracting LoE from certain abstracts with limited information regarding methodology. We attempted to increase accuracy of ratings by grouping levels 1 to 2 and 3 to 5 into 2 groups. Each reviewer did not assess all articles

owing to the large number of abstracts and the time-consuming nature of this task. Our interrater reliability regarding assessment of LoE was moderate among reviewers. Also, despite our rigorous method of searching for published abstracts on 2 separate search databases, it is possible we missed abstracts published in peer-reviewed journals. Similarly, more recent abstracts may still be published in the future. Both of these limitations likely led to underreporting of publication rates in recent years. Our study, however, still showed increasing publication rates and similar overall rates of publication to multiple previous studies.<sup>1-3</sup>

Although LoE rating is 1 marker for higher-quality research methodology, we must be cautious with putting too much emphasis on these ratings. Poorly designed randomized controlled studies and prospective cohort studies may still produce misleading results. Despite this, LoE provides a means to objectively compare research methodology with higher levels generally producing more valid results. Our study shows that hand surgery research presented at the ASSH annual meetings continues to improve with regards to LoE. Over time, there have also been higher publication rates in peer-reviewed journals, especially in studies with levels 1 to 2 LoE ratings. Higher publication rates, however, may be due to

increasing number and availability of peer-reviewed journals. Although not all questions can be feasibly answered with level 1 or level 2 studies, investigators should continue (when possible) to search for ways to strengthen their study designs.

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