



# Levels of Influence in Orthopaedic Surgery Journals Vary by Specialty

Meghan L. Morley, MD  
Sara Weintraub, BA  
Jaimo Ahn, MD, PhD  
Joseph Bernstein, MD

Department of Orthopaedic Surgery  
University of Pennsylvania Philadelphia, PA

## Introduction

In recognition that conflicts of interest cannot be fully eliminated, but at best managed, the International Committee of Medical Journal Editors (ICMJE) developed a system of disclosure under which authors are required to disclose “all financial and personal relationships that might bias or be seen to bias their work.”<sup>1</sup> With the ICMJE data available for all authors, it now becomes possible to categorize manuscripts based on Bernstein and colleagues’<sup>2</sup> “Level of Influence” classification system. According to this system, manuscripts can be assigned to one of four categories: Level A, where there is neither external funding for the study nor any industry relationships; Level B, where there is external funding from governmental or not-for-profit entities, but no relationships with industry; Level C, where one or more authors has a relationship with industry, but the study was not funded by industry; and Level D, studies funded directly by industry. The Level A and B studies can be collectively denoted as having no industry relationships, contrasted with Level C and D studies which do.

In their report, Bernstein et al<sup>2</sup> found that 68% of Journal of Bone and Joint Surgery (JBJS) manuscripts reported industry relationships (Level of Influence C or D). It is unknown whether the high Level of Influence as seen in JBJS papers is representative of the field of orthopedic surgery. To that end, a sample of papers from the journals Clinical Orthopedics and Related Research (CORR), The Journal of Arthroplasty (JOR), The American Journal of Sports Medicine (AJSM), and The Spine Journal (Spine J) were evaluated according to the Level of Influence system.

A second question posed is whether there is a loss of information when the Level of Influence status is aggregated for all authors. In particular, journals may employ a phrase such as “one or more of the authors received payments or services...one or more of the authors has had a financial relationship...that could be perceived to influence or have the potential to influence what is written in this work.” This phrase would apply even if the first or last (and presumably most important) authors did not have a financial relationship, though a middle (and presumably less important) author did. Accordingly, the

sample of 400 papers was scrutinized to determine how often papers use the term “one or more authors... [has an industry relationship]” when both the first and the last author did not report conflicts.

## Methods

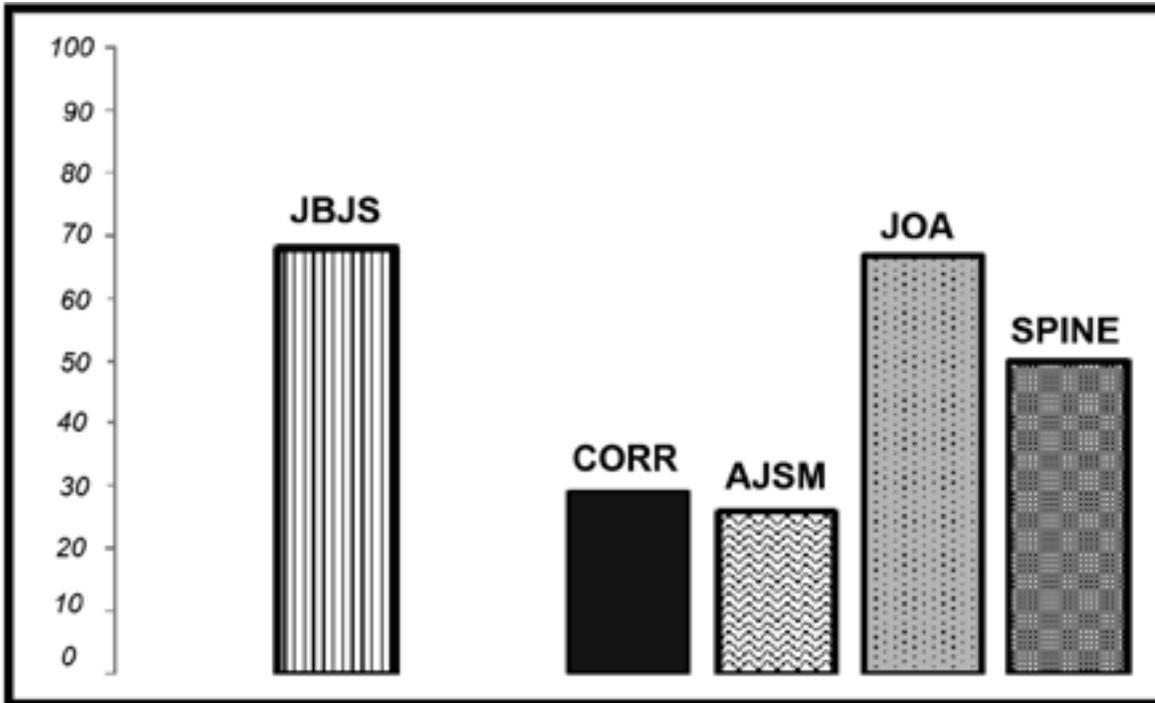
A sample of 100 scientific manuscripts was selected from CORR, JOR, AJSM, and Spine J. The first 10 papers appearing in 10 consecutive issues beginning with January 2014 were identified and categorized according to Bernstein’s Levels of Influence classification system as described in Figure 1. The manuscripts were also categorized according to a simplified classification: “type I”, which had no industry involvement, namely the combination of studies categorized above as A and B; and “type II” which had some industry involvement, the category C and D studies combined. The set of scientific manuscripts were classified by two independent readers; there were 4 discrepancies in classification that were resolved by the senior author. Studies that reported to have received only incidental contributions from industry (testing materials or medications, for example) were not considered to be “industry supported.” For those studies which did report an industry relationship for “one or more authors,” the conflict of interest documents were scrutinized to determine which of the authors triggered that clause, noting specifically whether it was a first, last, or middle author.

Statistical significance for differences between journals and the JBJS historical control was assessed using the Chi-square test at the  $p < 0.05$  level.

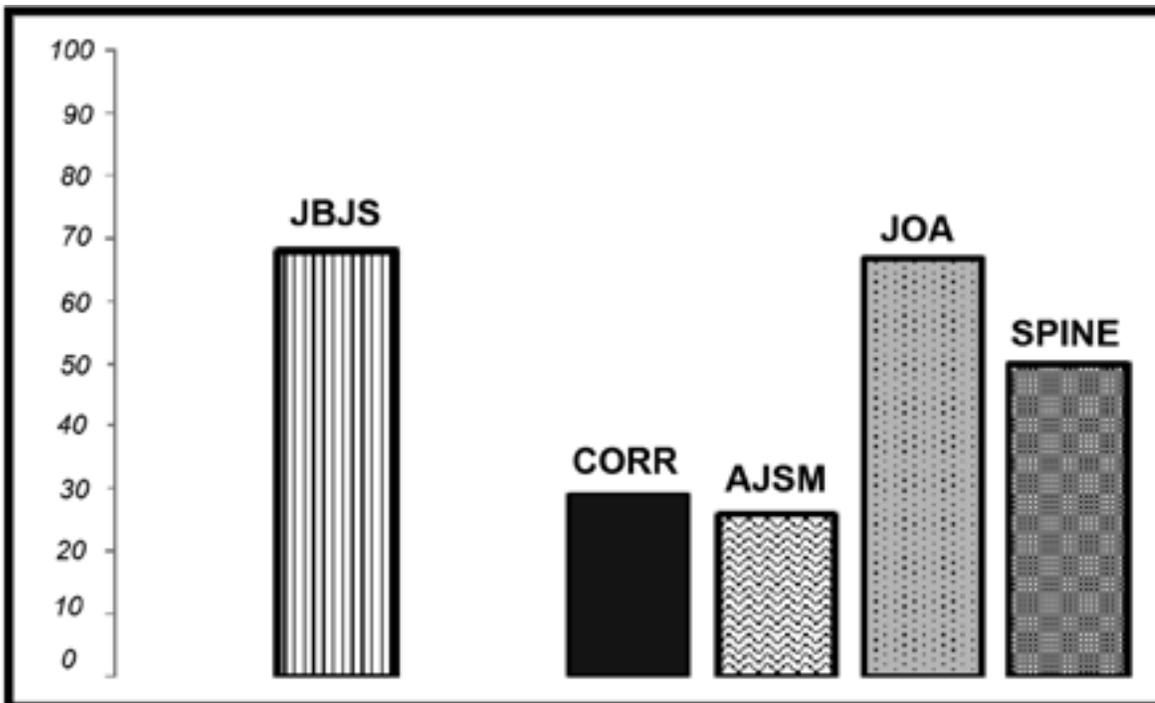
## Results

Of the 100 scientific papers from CORR, 45 were designated as Level A, 26 were Level B, 20 were Level C, and 9 were Level D. AJSM had 47 Level A, 27 Level B, 16 Level C, and 10 Level D manuscripts. In JOA, there were 29 manuscripts designated as Level A, 4 as Level B, 67 as Level C, and 0 as Level D. Spine J had 28 Level A, 22 Level B, 45 Level C, and 5 Level D papers.

Applying the simplified classification, 29 manuscripts from CORR and 26 from AJSM reported industry relationships. JOA and Spine



**Figure 1.** Flow chart diagramming the classification of papers according to their Level of Influence (NFP: Not for profit).



**Figure 2.** Comparison of the four journals to the JBJS, which was seen to have 68 of 100 papers reporting an industry relationship. As shown, the JBJS rate was nearly matched by JOA, though CORR and AJSM reported far fewer such studies.

J had 67 and 50 such studies, respectively. Using the rate of industry relationships previously reported in JBJS (68 out of 100)<sup>2</sup>, the differences in rates between JBJS and CORR, ASJM, and Spine J were statistically significant ( $p < 0.01$ ); the difference between JBJS and JOA was not (Figure 2).

In all four journals combined, there were 154 Level C papers with a total of 802 authors. Of these 802 authors, 299 (37%) declared a potential conflict of interest. In 23 (15%) of the 154 Level C papers, neither the first nor the last author declared a potential conflict (Table 1).

### Discussion

In our study, we have shown that the high rate of industry-related authors in JBJS as reported in a prior review is indeed not pervasive in orthopedics. As noted, CORR and AJSM had rates of 29% and 26%, respectively. As such, it would be incorrect to infer from the original study that the field of orthopaedic surgery is characterized by papers written by industry-related authors. Rather, certain journals have a high prevalence, whereas other leading journals do not. Further, the relatively high Levels of Influence typically seen

**Table 1: Fraction of Level C studies in which neither the first nor the last author declared a conflict.**

	CORR	AJSM	JOA	Spine	Total
Level C manuscripts	26	16	67	45	154
Level C manuscripts in which neither the first nor the last author declared a conflict	2	4	9	8	23

in JOA and Spine J may suggest that the degree of influence is a feature of subspecialty: arthroplasty and spine typically use expensive implants and thus there is mutual appeal for industry-surgeon collaboration. It would be interesting in future work to examine the rates of industry relationships in other sub-specialties in orthopaedic surgery.

The study also confirmed that using a single phrase such as “one or more authors...” may not adequately represent the status of the paper. It was shown that in 15% of Level C papers, the “one or more authors...” clause was triggered by a

middle (neither first nor last) author whose contribution, it may be inferred, was relatively minor.

## Conclusion

The field of orthopedic surgery cannot be broadly characterized as having a high rate of industry-related authors. The use of a single phrase to encapsulate the potential conflicts of all authors may be imprecise (and overstate the degree of industry influence). Reporting Levels of Influence in the abstract and designating authors' individual Levels of Influence with a superscript next to their names would present this information more clearly to readers and maximize their ability to correctly infer what the study shows.

## References:

1. **ICMJE.** Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals. Available at: <http://www.icmje.org/recommendations/>. Accessed September 11, 2018.
2. **Bernstein JR, Maliha G, Ahn J, et al.** Levels of Influence: Habituation and the Prevalence of Declared Conflicts of Interest. *JBJS*. 2016 Nov 16;98(22):e99.