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Education

The Need for Higher Levels of Evidence in Plastic Surgery

Jennifer Wang, BS*
Charles Schafer, DO*
Thomas Steele, BS*
Jeffrey E. Janis, MD†
Albert Losken, MD*

Background: Evidence-based medicine in plastic surgery is essential to provide optimal care to individual patients. Level of evidence (LOE) and number of citations are metrics used to gauge quality of research and impact within a field, respectively. The objective of this study was to determine an association between LOE and number of citations within recently published articles in *Plastic and Reconstructive Surgery* (PRS).

Methods: A review of original research articles published in PRS from January 2018 to June 2022 was performed. LOE was identified through the PRS website, and the number of citations identified via PubMed. Articles were further divided into sections of their corresponding topic.

Results: A total of 965 articles were reviewed, of which 21 (2.2%) were articles assigned level I evidence. There were 147 (15.2%) level II articles, 360 (37.3%) level III articles, 377 (39.1%) level IV articles, and 60 (6.2%) level V articles. The average number of citations per article was 2.72, and the average LOE of all included articles was 3.31. Level I articles had an average of 4.95 citations, whereas level II, III, IV, and V articles had averages of 2.95, 2.54, 2.64, and 2.71, respectively. Breast articles were cited on average 3.85 times each, more than any other type of article.

Conclusions: Our data show that articles assigned level I evidence in PRS trend toward higher numbers of citations compared with articles assigned lower LOEs. These findings should encourage investigators to publish high-quality research to advance the field of plastic surgery. *(Plast Reconstr Surg Glob Open 2024; 12:e6263; doi: 10.1097/GOX.0000000000006263; Published online 5 November 2024.)*

INTRODUCTION

Evidence-based medicine ensures that patients are receiving care guided by high-quality research and evidence. With the constantly evolving nature of research and innovation in the plastic surgery field, there should be a greater emphasis on clinical decision-making based on well-designed and executed studies, when applicable.[1,2] Since 2011, *Plastic and Reconstructive Surgery* (PRS) has included a level of evidence (LOE) grading on applicable articles to emphasize the importance of higher-quality research and to help readers quickly evaluate an article.[3] LOE, a criterion to evaluate the quality and reliability of research, offers a hierarchical ranking from I through V. Level I evidence is considered the highest LOE, including adequately powered randomized controlled trials (RCTs), whereas level V evidence comprises case reports and clinical examples. Although high-quality observational studies, case reports, and expert opinions (LOE III–V) are still important for evaluating certain patient populations that may not be included in RCTs, certain clinical decisions can only be answered through data from higher levels of evidence.[1] The long-term goal of this initiative was to promote articles with increasingly higher LOEs.[4] Readers have subsequently been encouraged to place greater value on articles with higher LOEs when resolving clinical dilemmas.

Currently, there is no definitive way to measure an article's clinical or research impact. Although limited in its application, the number of times an article has been cited in subsequent publications can be a measure of an article's influence in the field.[5] With the increased role of social media in plastic surgery, Altmetrics (alternative metrics), such as the amount of reshares an article receives on platforms like X (formerly known as Twitter), can be an indicator of an article's impact within the general population.[6–8] With the emphasis on higher-quality research studies, it is hypothesized that higher LOE articles would have

*From the *Division of Plastic and Reconstructive Surgery, Emory University School of Medicine, Atlanta, Ga.; and †Department of Plastic and Reconstructive Surgery, The Ohio State University Wexner Medical Center, Columbus, Ohio.*

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a greater impact in the plastic surgery field. The objective of this study was to determine whether there is an association between LOE and number of citations within recent articles published in PRS.

METHODS

A review of original research articles published in PRS over a period of 54 months (from January 2018 to June 2022) was performed to determine the relationship of LOE to the number of citations. This timespan was chosen to account for several factors, including being at least 2 years since publication to allow for adequate time to be cited and shared, but recent enough to analyze current trends. Articles in breast, cosmetic, experimental, hand/peripheral nerve, pediatric/craniofacial, and reconstructive were included if the LOE rating was included in the abstract of the article on the PRS website. Our data were limited to what was available publicly online. X, specifically, has been shown to be primarily used for professional purposes based on accounts of academic leaders.[9] For this reason, metrics such as the number of tweeters who shared the research article, geographical breakdown/number of countries in which the article was tweeted, and demographic breakdown of people who tweeted the article [members of the public, practitioners (doctors and other healthcare professionals), scientists, and science communicators (journalists, bloggers, and editors)] were collected from Altmetrics data of the article. The number of citations for each article was identified via PubMed. Excluded articles were animal studies, cadaver studies, basic science studies, review articles, discussion articles, instructional course lectures, continuing medical education articles, editorials, and correspondence articles.

RESULTS

A total of 965 published articles were reviewed, of which 21 (2.2%) were articles assigned level I evidence; 147 (15.2%), level II articles; 360 (37.3%), level III articles; 377 (39.1%), level IV articles; and 60 (6.2%), level V articles. Of the 965 articles, the average number of citations per article was 2.71 (range 0–55, SD 4.13), and the average LOE of all included articles was 3.32 (range 1–5, SD 0.99). The highest annual average of LOE was in 2019 (3.43), and LOE average has been down trending since (Fig. 1). For all included articles, each article had an average of 30.17 references (range 3–93, SD 13.81), 11.95 total tweets (range 0–105, SD 13.34), and reached 3.42 countries (range 0–55, SD 3.21).

There were 243 breast articles, 213 reconstructive articles, 194 pediatric/craniofacial articles, 179 cosmetic articles, 114 hand/peripheral nerve, and 22 experimental articles. Breast articles were cited on average 3.85 times each, which is more than any other type of article (Fig. 2). The multiple linear regression model used to determine whether article type had an effect on the number of citations yielded negative coefficients, indicating little effect of article type on the number of citations. These findings were consistent even when controlling for article publication year. Experimental articles had the largest average

Takeaways

Question: Is there an association between the level of evidence (LOE) assigned to an article and its impact on the field of plastic surgery?

Findings: A total of 965 articles published in *Plastic and Reconstructive Surgery* were reviewed. Data collected included LOE and number of citations received per article. Level I articles had a higher average number of citations compared with the average number of citations for level II, III, IV, and V articles, individually.

Meaning: Investigators should publish level I evidence research to have the greatest impact on the field of plastic surgery.

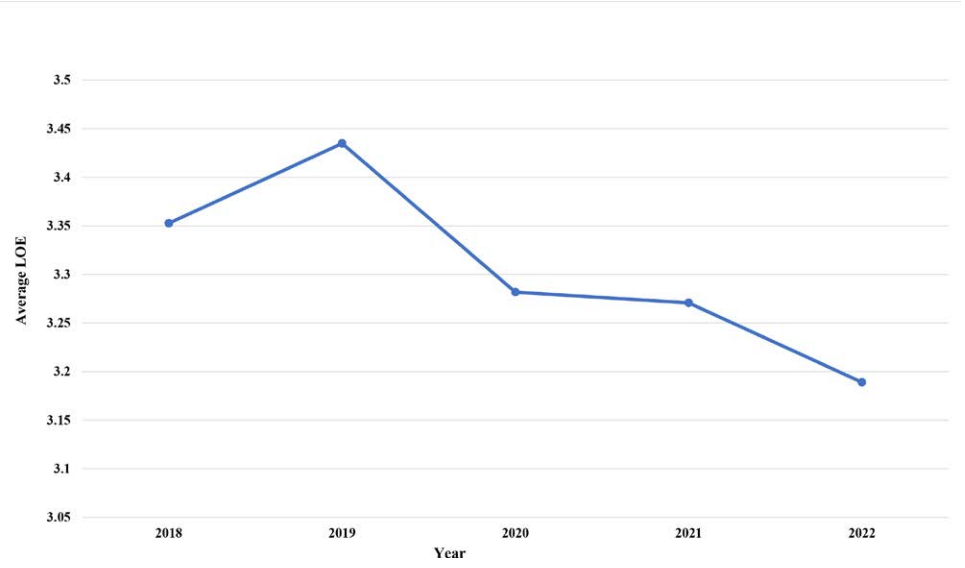

Fig. 1. The average LOE of PRS articles published between January 2018 to June 2022.

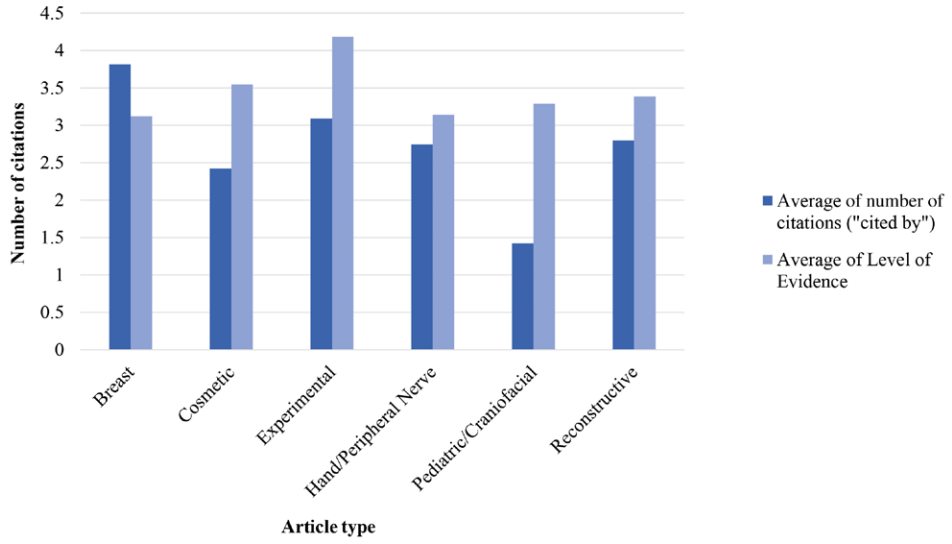

Fig. 2. The average number of citations received and average LOE assigned by article type.

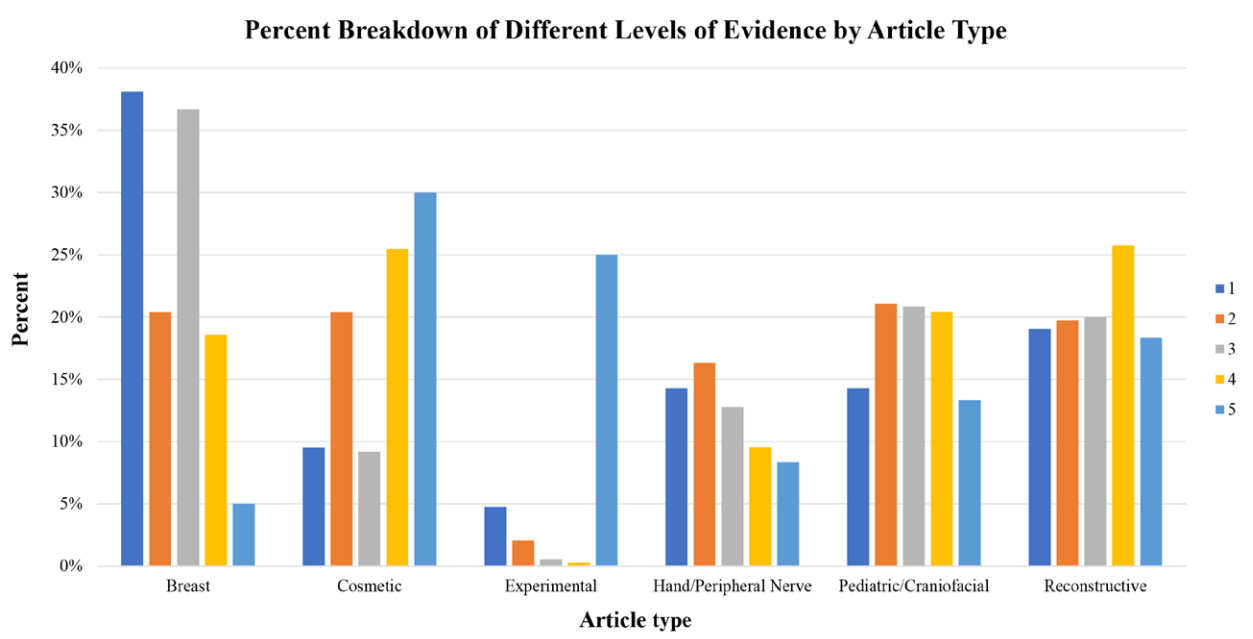

Fig. 3. Percentage breakdown of LOEs I–V by article type.

LOE (4.18) followed by cosmetic articles (3.55) (Fig. 2). The breast section had the greatest percentage of level I articles (38.1%) compared with other sections, whereas cosmetic had the greatest percentage of level V articles (30.0) (Fig. 3).

In terms of social media engagement, X users retweeted or shared the greatest number of articles published in 2018 (Fig. 4). Between January 2018 to June 2022, the breast section had the greatest number of overall tweets per article (14.6), with the majority of articles being shared by members of the public (8.4). Practitioners retweeted cosmetic articles more than other types of articles, with each cosmetic article having on average 4.4 tweets by practitioners. Experimental articles were shared, on average, to the greatest number of countries (5.0) followed by cosmetic (4.1), reconstructive (3.7), breast (3.5), hand/peripheral nerve (2.8), and pediatric/craniofacial (2.4) (Table 1). Linear regression used to analyze the number of tweets and article type resulted in a negative coefficient, showing a minimal effect between the two.

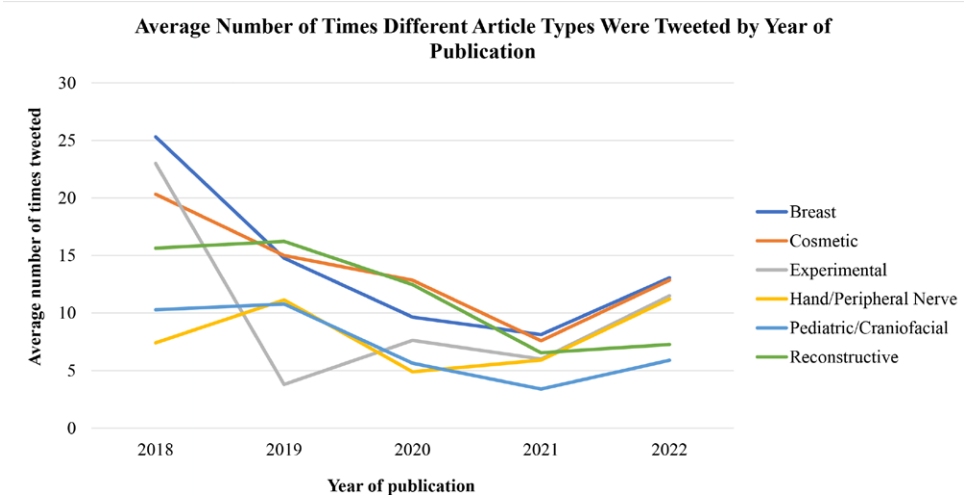

Fig. 4. Average number of tweets received by article type from January 2018 to June 2022.

Table 1. Average LOE, Number of Citations, and X (Formerly Twitter) Engagement by Article Type

Article Type	Average LOE	Average of No. Citations ("Cited by")	Average of No. Tweeters	Average of No. Countries	Average of No. Member of Public Tweeting	Average of No. Practitioners Tweeting	Average of No. Scientists Tweeting	Average of No. Science Communicators Tweeting
Breast	3.1	3.8	14.6	3.5	8.4	3.9	1.4	0.9
Cosmetic	3.5	2.4	14.3	4.1	7.7	4.4	1.2	1.0
Experimental	4.2	3.1	10.7	5.0	5.9	3.1	1.2	0.5
Hand/peripheral nerve	3.1	2.7	7.8	2.8	3.9	2.5	0.8	0.7
Pediatric/craniofacial	3.3	1.4	7.3	2.4	3.8	2.3	0.6	0.6
Reconstructive	3.4	2.8	12.0	3.7	7.1	3.2	0.9	0.9

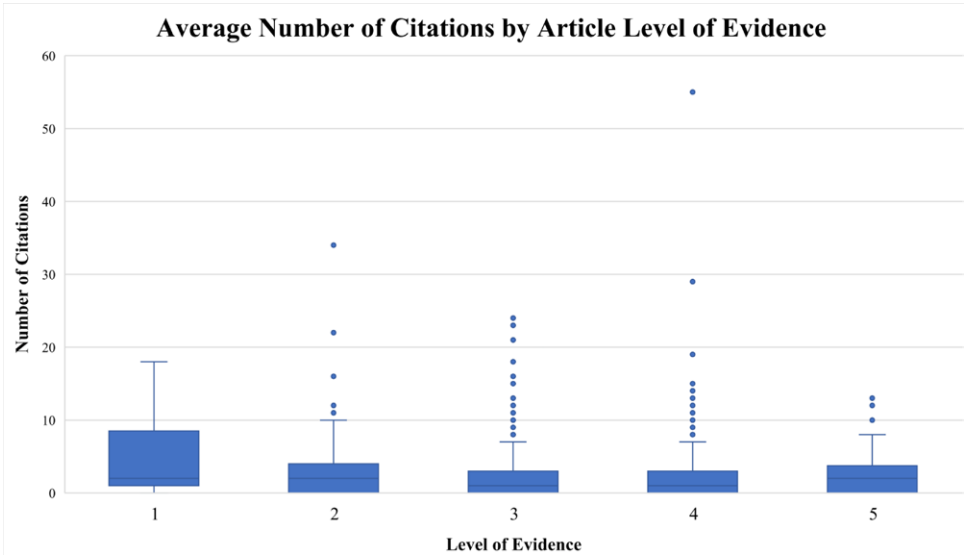

Fig. 5. Boxplot of average number of citations received by articles from LOEs I–V.

Overall, level I articles had an average of 4.95 citations, whereas level II, III, IV, and V articles had averages of 2.95, 2.54, 2.64, and 2.71, respectively. Level I articles were tweeted on average 13.15 times, whereas level II, III, IV, and V articles received on average 12.35, 11.50, 11.44, and 11.40 tweets, respectively. One-way analysis of variance tests controlling for the amount of time since an article was published yielded no significant differences between an article's LOE and the number of citations or number of tweets it received ($P = 0.118$ and $P = 0.204$, respectively) (Figs. 5, 6).

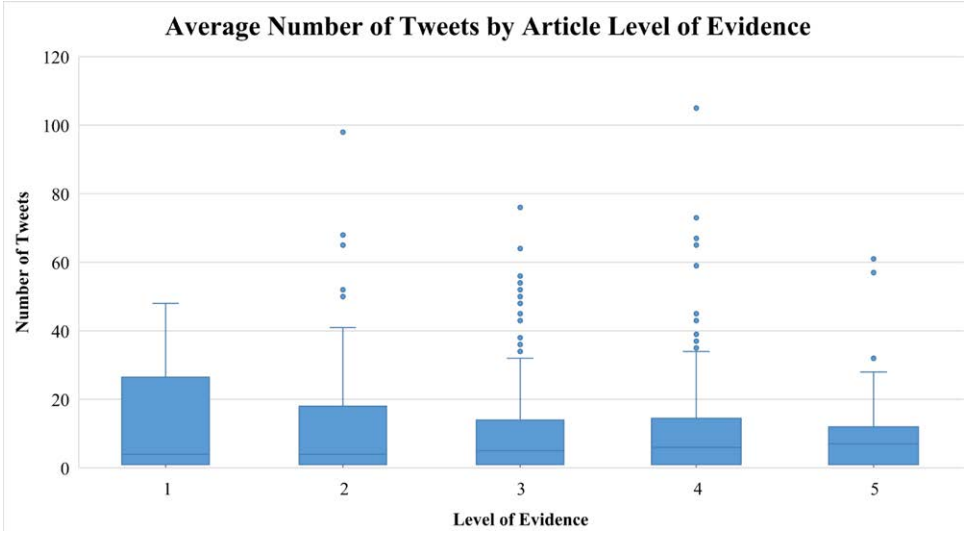

Fig. 6. Boxplot of average number of tweets received by articles from LOEs I–V.

DISCUSSION

The purpose of this study was to examine whether articles showing greater scientific rigor are the more cited and shared in the field of plastic surgery. Our study takes away the confounding variable of journal impact factor, as all included articles were published in PRS, and incorporates number of tweets as an additional measure of article impact. Additionally, there have been no studies examining the association between LOE and impact of PRS articles within the last 5 years. Generally, the number of citations a publication receives is accepted to echo its relevance on the subject and impact on the specialty, just as the number of tweets for an article is a direct measure of the article's popularity and publicity.[10] Our data show that LOE I articles received, on average, more citations and tweets than LOE II, III, IV, and V articles, individually. This finding is consistent with the findings of a study done by Leal et al[11] that examined articles published in 2011 from four main international plastic surgery journals and compared the number of citations in articles considered high LOE (systematic reviews, RCT >1000 patients, and RCT <1000 patients) to those considered low LOE (cohort studies, case-controlled studies, case series, and case reports).[12] LOE I articles are the most cited, and thus, are poised to have significant impact in advancing the field of plastic surgery.

Another impact variable we examined was social media engagement of the articles published in PRS. Social media use in academic plastic surgery is growing exponentially on all platforms, ranging from Facebook, Instagram, X (formerly known as Twitter), and TikTok.[13,14] Additionally, X use by academic journals has been found to increase a journal's impact factor.[15] We found that LOE I articles trend a greater number of citations. Furthermore, we found that articles published in 2018 received the greatest number of tweets, on average. Although the decline in the average number of tweets per articles published more recently (from 2018 to 2022) is consistent with the fact that there has been less time for the article to be discovered and tweeted, there was an increase in average number of tweets for all types of articles published in 2022 (Fig. 4). This phenomenon may be explained by the increase in X as a platform to market residency programs during the COVID-19 pandemic. During this time, plastic surgery residency programs incorporated social media for recruitment purposes, with X containing more research related material compared with other social medial platforms.[16] With the rise of social media use in plastic surgery, we can likely expect to see increased tweets on average per article published in PRS.

In terms of article type and number of citations, we found that breast articles are cited and tweeted more than other types of articles and have a relatively lower average LOE (Table 1). This supports the notion that articles with higher-quality research (lower LOE) have a greater impact on the field (greater number of citations). Breast articles and hand/peripheral nerve articles have the same average LOE; however, the latter have fewer citations. This difference potentially reflects the general interest of plastic surgery authors in these topics and may be explained by the fact that there are more journals that breast articles could be cited in compared with hand/peripheral nerve articles. In regards to social media engagement, it is important to recognize that the number of tweets may be a confounding variable to number of citations, as increased spread and attention to an article increases the chance that it is cited. The majority of tweets were from the public as opposed to practitioners or scientists. Practitioners tweeted the most about cosmetic articles, which aligns with the fact that many private practice plastic surgeons use social media as a way to engage followers and garner attention in the community, especially in aesthetic surgery.

Across medicine, it is important to use the highest quality evidence possible to support clinical decision-making. However, we also need to recognize that there is a paucity of such evidence, and therefore, strategies to address this deficiency are paramount to address

this. The inherent difficulties of conducting high-quality research such as RCTs in plastic surgery are often attributed to the reliance on patient-reported outcomes rather than objective metrics, complicating RCT analysis.[17,18] Similarly, Sinno et al[19] argued that standardization of surgical methodology in RCTs goes against the flexible and creative nature of the field of plastic surgery and may negatively impact patient-specific outcomes. Many have vouched for the idea that lower evidence articles such as high-quality observational studies can provide valuable data for patient populations that would be otherwise excluded from RCTs.[1,20–22] Others believe the methodologic nature of RCTs improves scientific quality of research in plastic surgery by providing a standardized way to evaluate the literature.[23] Although the applicability of different LOE articles in plastic surgery articles is controversial, there is a consensus that awareness of the quality of data in the literature can help practitioners make better decisions, improve quality of care, and enhance patient safety and outcomes based on the latest evidence.

Limitations of this study include only including articles published in PRS, as the impact factor of a journal may impact the number of citations and social media attention an article may generate regardless of the LOE of the article. Various other confounding factors, such as topic relevance, study design intricacies, and authorship prestige, may influence both evidence level and citation rates independently. Additionally, our data are limited to what is reported online on the PRS journal website. There are limitations to understanding how X retweets reflect the X user's intent. For example, retweets may be for marketing purposes rather than research purposes. Future research endeavors should delve into these nuances to disentangle how they may affect the impact of an article on the field of plastic surgery.

CONCLUSIONS

We have shown that articles assigned level I evidence in plastic surgery trend toward higher numbers of citations and tweets compared with articles assigned lower LOEs. These findings should encourage investigators to publish high-quality research to advance the field of plastic surgery.

Jennifer Wang, BS
Emory University School of Medicine
100 Woodruff Circle, Atlanta, GA 30322
E-mail: jennifer.wang@emory.edu

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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