

## Comparison of altmetrics with conventional bibliometrics in the surgical literature

Shashank R Thyarala<sup>1,2</sup>, Gerard T Flaherty<sup>2</sup>

**Keywords:** *Altmetrics; Bibliometrics; Surgical Research; Citations; Social Media; Citations*

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### Abstract

**Background:** The impact of a research publication has traditionally been quantified by its citation count. Newer bibliometric indices such as Altmetric Attention Score (AAS) and article page views are emerging as supplementary measures to quantify the academic influence of research.

**Objective:** The aim of the current study was to interrogate the relationship between novel and traditional bibliometric indices for research published in a leading surgical journal and evaluate the role of these newer indices in measuring the impact of surgical research.

**Methods:** All articles published in JAMA Surgery between 1 January 2019 and 1 September 2021 were examined. The literature database PubMed was used to identify all articles published within the specified time period. Cumulative citation count (Web of Science), AAS and article page views were retrieved from the journal website. Statistical analysis using the Spearman rank correlation coefficient (r) was performed on Minitab 19.

**Results:** A total of 1,071 articles were retrieved for further analysis. The correlation (95% CI) between ranks for all articles was 0.635 (0.594-0.673) for AAS and citation scores, 0.680 (0.642-0.714) for citations and article page views, and 0.813 (0.788-0.835) for AAS and article page views.

**Conclusions:** We demonstrated a strong correlation between citations and AAS for articles published in

a leading surgical journal. The inter-year correlation between 2019 and 2021 was similar, suggesting that AAS could be predictive of future citations. AAS may be useful in evaluating the wider societal impact of the surgical literature and could serve to promote greater public engagement in surgical research.

### Introduction

Social media platforms have assumed an increasingly prominent role in the dissemination of research output to the public. The impact of a research publication has traditionally been quantified by its citation count. Altmetric Attention Score (AAS) and article page views have emerged as surrogate indices of the popularity of published articles. Previous studies have demonstrated varying degrees of positive correlation between AAS and citation scores in the most cited surgical literature<sup>1,2,3</sup> and in other disciplines, including travel medicine<sup>4</sup> and pediatrics.<sup>5</sup> The aim of the current study was to determine the correlation between novel and traditional bibliometric indices for research published in a leading surgical journal.

### Methods

All articles published in JAMA Surgery between 1 January 2019 and 1 September 2021 were examined. Data were extracted in September 2021. All categories of article were included in our analysis. The literature database PubMed was used to identify all articles published in JAMA Surgery within the specified time period. The cumulative citation count (<http://cel.webofknowledge.com>), AAS (<https://www.altmetric.com>) and article page views were retrieved from the journal website. Web of Science/Web of Knowledge was used in preference to Google Scholar as the latter is subject to inflated citation counts due to the

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<sup>1</sup> Department of Surgery, Bon Secours University Hospital, Galway, Ireland

<sup>2</sup> School of Medicine, National University of Ireland Galway, Galway, Ireland

#### Address for Correspondence:

Gerard Flaherty, School of Medicine, National University of Ireland Galway, Galway, Ireland.  
Email: [gerard.flaherty@nuigalway.ie](mailto:gerard.flaherty@nuigalway.ie) Tel.: 00353-91-495469

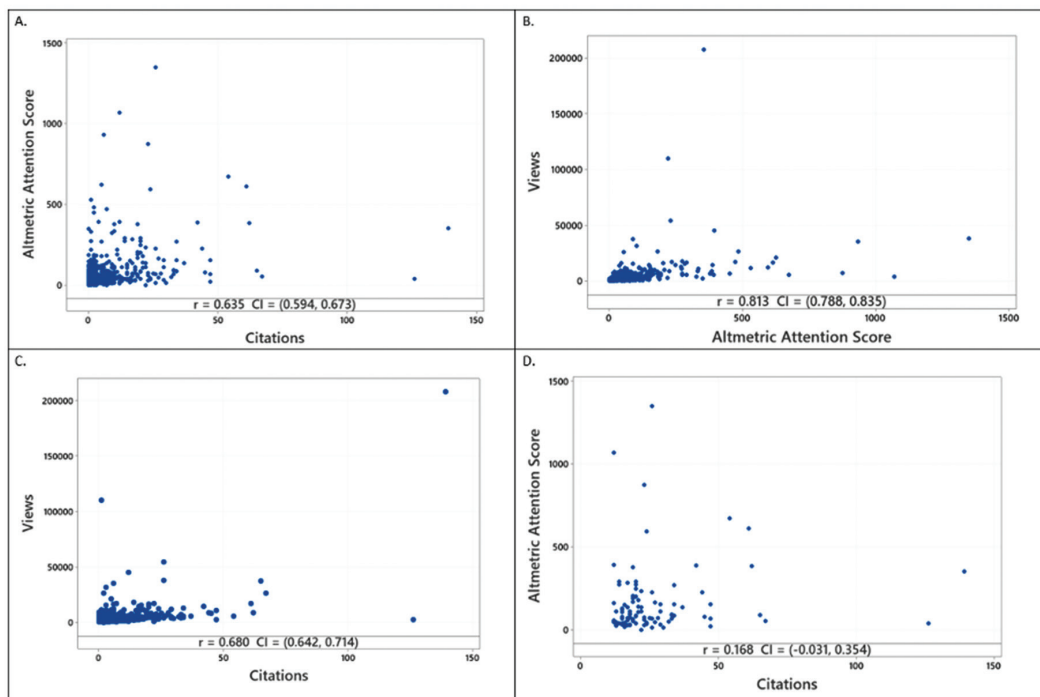
inclusion of multiple less scholarly literature sources such as promotional pages, tables of contents, and course readings lists. Data were entered in a Microsoft Excel 2019 database. Statistical analysis using the Spearman rank correlation coefficient ( $r$ ) for non-parametric ordinal data was performed on Minitab 19. Correlation values were reported as  $r$  (95% confidence interval). Correlations between variables were interpreted as small ( $r < \pm 0.29$ ), medium ( $r = \pm 0.30 - 0.49$ ), strong ( $r = \pm 0.5 - 0.99$ ), or perfect ( $r = \text{near } \pm 1$ ) according to standard statistical practice. This analysis was repeated for the top 100 cited articles. Content analysis was performed to identify articles which were COVID-related.

**Results**

A total of 1,071 articles were retrieved for further analysis. The Special Communication article category had the highest mean citation score (38.9), AAS (111.1), and article views (35,173). The correlation (95% CI) between ranks for all articles was 0.635

(0.594-0.673) for AAS and citation scores, 0.680 (0.642-0.714) for citations and article page views, and 0.813 (0.788-0.835) for AAS and article page views (Figures 1A-1C). The correlation between ranks (95% CI) for citations and AAS was 0.686 (0.622-0.741) for articles published in 2019, 0.680 (0.618-0.733) for articles published in 2020, and 0.549 (0.454-0.632) for articles published in 2021. Figure I illustrates the correlation between AAS and citations for the top 100 most cited articles. Content analysis revealed that a minority ( $n=24$ ) of articles were COVID-related. The correlation between AAS and citation count for COVID-related articles was stronger ( $r=0.765$ , 95% CI 0.480-0.904). The article with both the highest AAS (1,348) and page views (37,976) was an original investigation relating to the professional behaviour of surgeons. The article which received the highest number of citations (139) reported guidelines for perioperative care in cardiac surgery.

**Discussion**



**Figure I**

**Panel A:** Altmetric attention scores vs citation counts for all articles ( $n=1,071$ ). **Panel B:** Altmetric attention scores vs views for all articles ( $n = 1,071$ ). **Panel C:** Citations vs views for all articles ( $n = 1,071$ ). **Panel D:** Altmetric attention scores and citations for top 100 cited articles.

We demonstrated a strong correlation of 0.635 between citations and AAS for articles published in a leading surgical journal. Previous research showed a medium correlation of 0.462 for the general surgery literature,<sup>1</sup> and small positive correlations of 0.33 for plastic surgery and 0.12-0.21 for specialised burns research journals, respectively.<sup>6,7</sup> We found that AAS peaked earlier than citation count for articles published between 2019 and 2021. The inter-year correlation between 2019 and 2021 was similar, suggesting that AAS could be predictive of future citations. Our analysis showed there was no significant correlation between AAS and citation count for the top 100 cited articles. This is likely attributed to the fact that citation count reflects academic influence of research while AAS reflects online reach and popularity. Social media has facilitated the more rapid dissemination of journal article content.<sup>8-11</sup> AAS may be useful in evaluating the wider societal impact of the surgical literature and could serve to promote public engagement in surgical research. This may yield benefits in terms of securing sustainable funding for patient-centered surgical research.

Our study reveals a high level of correlation between

AAS and citation count in surgical research and provides insights into the potential role of AAS as a metric in this field. We restricted our analysis to a single journal with a high impact factor and we did not perform separate analyses for individual article categories since in general the majority of citations stem from original research articles and review articles. We recommend that further research should extend the analysis to multiple surgical journals. In conclusion, we have identified a strong positive correlation between citations and Altmetric scores for articles published in a leading surgery journal. AAS may prove to be predictive of future citations and it may have a role in evaluating the wider societal impact of surgery publications and thus promote greater public engagement in surgical research.

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**Conflicts of interest:** None declared.

**Data availability:** The raw journal data underlying this study are in the public domain from the sources specified in the methods. All data are also available upon request from the corresponding author.

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