RESEARCH ARTICLE

The impact of the open-access status on journal indices: a review of medical journals [version 1; referees: awaiting peer review]

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Abstract

Background: Over the past few decades, there has been an increase in the number of open access (OA) journals in almost all disciplines. This increase in OA journals was accompanied by an increase in funding to support such movements. Medical fields are among the highest funded fields, which further promoted its journals to move toward OA publishing. Here, we aim to compare OA and non-OA journals in terms of citation metrics and other indices.

Methods: We collected data on the included journals from Scopus Source List on 1st November 2018. We filtered the list for medical journals only. For each journal, we extracted data regarding citation metrics, scholarly output, and whether the journal is OA or non-OA.

Results: On the 2017 Scopus list of journals, there was 5835 medical journals. Upon analyzing the difference between medical OA and non-OA journals, we found that OA journals had a significantly higher CiteScore (p < 0.001), percent cited (p < 0.001), and source normalized impact per paper (SNIP) (p < 0.001), whereas non-OA journals had higher scholarly output (p < 0.001). Among the five largest journal publishers, Springer Nature published the highest frequency of OA articles (31.5%), while Wiley-Blackwell had the lowest frequency among its medical journals (4.4%).

Conclusion: Among medical journals, although non-OA journals still have higher output in terms of articles per year, OA journals have higher citation metrics.

Keywords

Open access, Journal, Medicine, Bibliometrics, Citation

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**Introduction**

Open access (OA) journals allow free (access to/availability of) academic articles, they enable any user to read, search, download, share, use them for indexing, print the full texts, or utilize them as data for software without being charged. Over the past 20 years, there has been an increase in the number of OA medical journals. According to Web of Science, published OA articles as a proportion of total publications increased from 9.5% to 24% from 1998 to 2018. These OA journals provide an easily accessible source of information, a source that is accessible even for developing and low income countries.

Bibliometric analysis are methods or applications used to measure the influence of authors or scientific papers, of which, citation analysis is the most commonly used methods. Now several citation databases have become available, with the three largest being Web of Science, Scopus and PubMed. These databases record the number of times that a journal article has been cited by other papers. The use of bibliometric analysis is becoming more popular to assess the performance of different aspects of the scholarly and scientific fields. Analysis can be at the level of the researchers themselves, journals, departments, universities, national organizations, and even entire nations. There are several databases that can be used to perform the bibliometric analysis, with each database having its own characteristics; these include Google Scholar, Pubmed (Only biomedical citations), Scopus, and Web of Science. According to the number, coverage, and quality of citations covered by the databases, Scopus has wide coverage of high quality journals, compared to high number of citations at the expense of quality for Google Scholar, and high quality at the expense of number of citations for Web of Science.

It is claimed that the emergence of OA journals has led to better dissemination of knowledge with the additional benefit of more citations for the authors, although this is still a matter of debate. In this study, we aim to study the OA status of medical journals and the impact of the open-access status on journal indices using the Scopus database.

**Methods**

**Data collection**

We collected data on the included journals from Scopus Source List on 1st November 2018 (see Underlying data). We filtered the list for medical journals (which include all specialties in medicine, as per Scopus categorization).

**Variables**

For each journal, we extracted the following citation metrics: Citation count, Percent Cited, CiteScore, CiteScore Percentile, SCImago Journal Rank, Source Normalized Impact per Paper (SNIP), and SCImago Quartiles. Details about these metrics and how they are calculated can be found on Scopus website. Moreover, scholarly output is defined as sum of documents published in the serial title (e.g. 2017) in the 3 years prior to the year of the metric (e.g. 2014 – 16). Open access Journals covered by Scopus are indicated as Open Access if the journal is listed in the Directory of Open Access Journals (DOAJ) and/or the Directory of Open Access Scholarly Resources (ROAD).

**Statistical analysis**

We used SPSS version 22.0 (Chicago, USA) in our analysis. We used means (± standard deviation) to describe continuous variables (i.e. journal indices). We used counts (frequency) to describe other nominal variables (i.e. publishers and OA journals). We performed Mann-Whitney tests to analyze the difference between measurements and OA status, and we presented data as medians (25% to 75% quartiles). To analyze open access journals between radiology and medicine, we used the weighting cases function in SPSS and a Chi-square test. All underlying assumptions were met, unless otherwise indicated. A p value of 0.05 was considered as significant.

**Results**

In the 2017 Scopus list of journals, there was 5835 medical journals. Regarding the 5 most common publishers, 890 (15.3%) journals were from Elsevier, 653 (11.2%) Springer Nature, 196 (6.8%) Taylor & Francis, 360 (6.2%) Wiley-Blackwell, and 304 (5.2%) Wolters Kluwer. 1293 (22.2%) journals were OA journals. Table 1 indicates the minimum, maximum, mean, and standard deviation of medical journal indices.

Upon analyzing the difference between medical OA and non-OA journals, we found significant differences in the following indices:

- **CiteScore** ($p<0.001$): with a median of 1.19 (25–75%: 0.53–2.21) for OA journals, and a median of 1.06 (25–75%: 0.26–2.18) for non-OA journals.
- **Scholarly output** ($p<0.001$): with a median of 157 (25–75%: 76–319.5) for OA, and a median of 205 (25–75%: 107–423) for non-OA journals.
- **Percent cited** ($p<0.001$): with a median of 52% (25–75%: 32%–70%) for OA, and a median of 48% (25–75%: 19%–68%) for non-OA journals.
- **SNIP** ($p<0.001$): with a median of 0.706 (25–75%: 0.370–1.023) for OA, and a median of 0.617 (25–75%: 0.176–1.013) for non-OA journals.

Upon comparing open access journals between the 5 most common publishers, we found a significant difference ($p<0.001$). Post-hoc analysis showed that Wiley-Blackwell has significantly lower number of open access journals 16 (4.4%) open access journals compared to others. Table 2 shows the open access status for the most common publishers.

**Discussion**

Our study found that OA medical journals had significantly higher CiteScores, Percent cited and SNIP; which is consistent with a number of previous studies made across a variety of disciplines including philosophy, political science, engineering, mathematics, physics, computer science and agriculture; all...
of which concluded that open access publications have a greater research impact (higher citation rate) than non-open access publications\textsuperscript{12,14-16}. On the other hand, in a randomized controlled trial conducted on 11 biological and medical journals, it was found that only 2 of these journals showed positive and significant OA effects. In addition, it was found that OA advantage is declining by about 7% per year, from 32% in 2004 to 11% in 2007\textsuperscript{17}. Chua et al. found that there was significantly more citations in OA articles than in non-OA articles within almost identical journals’ impact factor\textsuperscript{18}. Moreover, comparing citations in OA and non-OA articles in the same journal showed significant citation privilege for OA publications in several studies. For example, for the Journal of Postgraduate Medicine a comparison of citations per 100 articles per year before and after the journal became open access showed an increase between 3 and 4.5 times in citations\textsuperscript{19}. In a longitudinal study of a cohort of OA and non-OA articles, it was shown that OA articles are cited earlier, and almost 2 times more frequently than non-OA articles in the first 4–16 months after publication in the same journal\textsuperscript{20}. Regardless of all the aforementioned findings, our study found that non-OA medical journals have significantly higher Scholarly Output which can be strongly linked to the fact that most non-OA medical journals have been established years before OA journals, which have only recently emerged\textsuperscript{21}.

### Table 1. Descriptive statistics for medical journals.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CiteScore</td>
<td>5835</td>
<td>0</td>
<td>130</td>
<td>1.58</td>
<td>2.588</td>
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<tr>
<td>Percentile</td>
<td>5835</td>
<td>0</td>
<td>99</td>
<td>48.03</td>
<td>28.666</td>
</tr>
<tr>
<td>Citation count</td>
<td>5835</td>
<td>0</td>
<td>77809</td>
<td>761.87</td>
<td>2221.841</td>
</tr>
<tr>
<td>Scholarly output</td>
<td>5835</td>
<td>1</td>
<td>11270</td>
<td>346.14</td>
<td>505.062</td>
</tr>
<tr>
<td>Percent cited</td>
<td>5835</td>
<td>0</td>
<td>100</td>
<td>45.67</td>
<td>26.800</td>
</tr>
<tr>
<td>SNIP</td>
<td>5835</td>
<td>0.000</td>
<td>88.164</td>
<td>0.75260</td>
<td>1.450990</td>
</tr>
<tr>
<td>SJR</td>
<td>5835</td>
<td>0.000</td>
<td>61.786</td>
<td>0.82674</td>
<td>1.572423</td>
</tr>
<tr>
<td>Rank</td>
<td>5835</td>
<td>1.00</td>
<td>785.00</td>
<td>162.7102</td>
<td>167.95247</td>
</tr>
</tbody>
</table>


### Table 2. A comparison in the percentage of open access (OA) journals between the top five publishers of medical journals.

<table>
<thead>
<tr>
<th></th>
<th>Open access</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>publishers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elsevier</td>
<td>756</td>
<td>134</td>
</tr>
<tr>
<td>Springer Nature</td>
<td>447</td>
<td>206</td>
</tr>
<tr>
<td>Taylor &amp; Francis</td>
<td>324</td>
<td>72</td>
</tr>
<tr>
<td>Wiley-Blackwell</td>
<td>344</td>
<td>16</td>
</tr>
<tr>
<td>Wolters Kluwer Health</td>
<td>229</td>
<td>75</td>
</tr>
<tr>
<td>Others</td>
<td>2442</td>
<td>790</td>
</tr>
<tr>
<td>Total</td>
<td>4542</td>
<td>1293</td>
</tr>
</tbody>
</table>

77.8% 22.2% 100.0%
We found that the number of OA journals varied among publishers, with Whiteley-Blackwell having the least, with only 16 journals (4.4%), and the most with Springer Nature (206, 31.5%). In a previous study that analyzed OA articles published by different publishers, regardless of the discipline, they found that Elsevier had the highest number of OA articles, followed by Springer Nature and Whiteley-Blackwell. A longitudinal study comparing hybrid open access articles between publishers found great variation depending on the discipline. For instance, medicine is the discipline which most frequently publishes in hybrid OA.

Our study has potential limitations. In this study, we didn’t account for the effect of publishing OA articles in non-OA journals (hybrid journals), as “Gold” OA publishing (i.e. fully OA journals) relates to publication of articles that are freely available to view and these may occur in OA or hybrid journals. Moreover, future studies should consider analyzing specialties within medicine (e.g. oncology), where we believe there will be variations in the effect of OA publishing within these specialties.

Data availability

Underlying data

Harvard Dataverse: Medical journals. https://doi.org/10.7910/DVN/YYUTGG

This project contains the following underlying data:

- Medical journals 2017 dataset.tab (Scopus search results from the 1st November 2018)

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).

Grant information

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References


Page 5 of 6
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