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Social networks and traditional metrics of impact in pulmonary medicine journals: a correlation study

Abstract

Introduction: The Scimago Journal Rank (SJR) impact factor is extensively used. However, as the Internet has become widely available, new metrics are coming into play. Our research aims to determine whether a correlation between the SJR impact factor and metrics reflecting social media activity does exist.

Materials and methods: We have used pulmonary medicine journals indexed in the SJR. Variables of social network usage have been extracted from verified accounts. Bivariate analyses have been performed with the Mann-Whitney U tests, the correlation between social media-derived variables and the SJR impact factor have been assessed with the Spearman correlation coefficient. Results are presented before and after adjustment for the years since the creation of the accounts.

Results: From 130 journals, 38 had at least one social network account, Twitter being the most commonly used (22.85 %). The H index was higher in journals with social network accounts (median 60 *vs* 17; $p < 0.01$). The global correlation between the SJR and the number of followers on Twitter revealed moderate agreement ($r = 0.46$; $p < 0.01$), which was excellent in open access journals ($r_s = 0.90$; $p < 0.05$).

Conclusions: The use of social networks is directly correlated with traditional indicators of scientific impact. The joint use of alternative and traditional metrics may be useful for journals in order to generate strategies aiming to increase their audience, as well as for researchers when deciding about the best option of disseminating their articles.

Key words: online social networking, social media, journal impact factor, pulmonology

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Introduction

Any researcher would want their research to reach wide audiences, which means that finding a way to measure the impact of journals is necessary. Over time, the term "impact factor" has become a joint measure of the author and journal impact, based on the number of citations [1]. The SCImago Journal Rank (SJR) is a widely accepted way to define the impact factor, covering a wide range of journals [2]. It gives more weight to citations from top rank journals compared to those from medium- and low-rank journals and assigns less weight to self-citations [3]. The latter is an interesting and useful approach. Nonetheless, the metrics for defining the impact of journals are continuously changing over time.

As the Internet has become a reality available and useful tool, social media mentions have gradually become useful for assessing journal's impact. These are immediately available after on-line publication, even before pre-prints become formally accessible. This has led to the concept of alternative metrics, which include tweets, Facebook wall postsand mainstream media mentions, among others [4]. Furthermore, traditional metrics assess only those who write and cite, but not those who read without generating scientific

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literature (2/3 of the scientific community). These subjects may use social media as a means to share contents published in medical journals [4, 5]. Thus, alternative metrics seem to be an accurate complementary approach towards defining the impact factor of publications.

Some studies have previously assessed the association between traditional metrics and alternative metrics finding adequate correlation. However, these studies have been criticized due to the nature of the covered journals (elite, longstanding, favoring internet research) [4]. Furthermore, alternative metrics reveal the impact of individual research items, rather than journals as a whole [6]. To the best of our knowledge, the comparison between the activity of social network accounts and the academic impact of pulmonary medicine journals has not been previously assessed. Thus, through this research, we aim to describe the correlation between the SJR impact factor and the use of social media as a measure of journal impact.

Material and methods

This is a correlation study aiming to assess the relationship between the SJR and alternative metrics. In the study, we included all pulmonary medicine journals indexed in the Scimago Journal Rank (SJR) [7]. The Ethics and Research Committee of our institution approved the study protocol.

The search for information started by categorizing the journals of interest through the data displayed on the Scimago Journal & Country Rank website [7]. This page allows searching journals according to subject areas, subject categories, regions/countries, type and year of publication. For the purposes of this study, we included all journals covered in the subject area "Medicine" and subject category "Pulmonary and respiratory medicine". Once the journals of interest were defined, we extracted the following variables: the SJR impact factor and SJR quartile, which were taken as proxies of scientific quality. Also, we documented the H index, total number of documents published in the previous 3-year period and whether the journal had open access. The regions were registered according to the country where the editorial office was located in the following categories: Latin America, North America, Europe, Asia, Oceania and Africa.

The SJR is a measure of the average number of weighted citations in the selected year divided by the total number of documents published within the previous 3-year period. The SJR quartile (Q) categorizes journals in four groups, with the higher impact arising from journals rated as Q1. The H index indicates the number of articles (h) in the journal, which have been cited at least (h) times. All documents were registered as citable and non-citable documents published by the journal in the previous 3-year period. Open access was registered as reported on the Scimago Journal and Country Rank website [7].

Four social networks were assessed: Facebook, Twitter, Instagram and YouTube. We started by evaluating which journals had active accounts on social media. Journals without exclusive social network accounts (i.e. shared social network accounts, linked to scientific societies or editorial offices) were not included in the analysis. For Facebook, the number of followers was taken from the "Community" section and the dates of creation of each account were extracted from the "Information" section. For Twitter, we registered the number of followers, number of tweets and the date of creation of the account from the main page. In Instagram, we recorded the number of followers, number of posts and the date of creation of the account from data registered in the account's main page. Finally, in YouTube, the number of subscribers was drawn from the main page, the number of videos was taken from the "Videos" section, and the number of views (a total and most frequently seen videos) was drawn from each video, and the date of creation of the account was taken from the "Information" section.

The search took place the third week of February 2019. We aimed to perform the complete search in the shortest time possible in order to decrease the risk of length-time bias, due to the changing nature of alternative metrics.

As for the statistical analysis, initially, we explored extreme values and assessed data using a Shapiro-Wilk test, revealing non-normal distribution. Also, the sample of journals with social media was small. Thus non-parametric statistics were employed for analysis. Bivariate analyses were performed using the Mann-Whitney U tests as required by the nature of data. Then the correlation among social media-derived variables and the SJR impact factor was assessed with the Spearman correlation coefficient (r_s), these results are presented both before and after adjustment for the years since creation of the accounts. Finally, subgroup analyses were performed for social networks with adequate sample sizes in order to account for confounding factors. Statistical significance was set at $\alpha = 0.05$. The statistical software STATA 14 was used for analysis.

Table 1. Sample description according to social network status

	Journals with social network accounts (n = 39)	Journals without social network accounts (n = 101)	P-value
SJR, Median (IQR)*	1.07 (0.45–1.68)	0.46 (0.17–0.81)	0.279
H Index, Median (IQR)*	60 (26–97)	17 (7–44)	< 0.001
Quartile, n (%)			
Q1	18 (46.15)	17 (16.83)	0.001
Q2	9 (23.08)	26 (25.74)	
Q3	9 (23.08)	26 (25.74)	
Q4	3 (7.69)	32 (31.68)	
Region, n (%)			
Europe	21 (53.85)	57 (56.44)	0.001
North America	17 (43.59)	15 (14.85)	
Asia	0 (0)	22 (21.78)	
Latin America	1 (2.56)	2 (1.98)	
Africa	0 (0)	3 (2.97)	
Oceania	0 (0)	2 (1.98)	
Open access, n (%)	6 (15.38)	31 (30.68)	0.066
The number of documents published within the previous 3-year period, n (%)			
< 250	13 (33.33)	63 (62.38)	< 0.001
250–500	7 (17.95)	24 (23.76)	
> 500	19 (48.72)	14(13.86)	

*Compared using non-parametric statistics, with the Mann-Whitney U test; IQR — interquartile range

Table 2. Journals' indicators of activity on social networks

Journals with Twitter accounts, n (%)	**33 (22.8)**
Followers on Twitter, n (%)	
< 1000	13 (39.4)
1000–2000	10 (30.3)
> 2000	10 (30.3)
Twitter followers/years, median (IQR)*	262 (60–632)
Number of tweets, n (%)	
< 1000	17 (51.5)
1000–2000	10 (30.3)
>2000	6 (18.2)
Journals with Facebook accounts, n (%)	17 (12.1)
Followers on Facebook, n (%)	
< 1000	7 (41.2)
> 1000	10 (58.8)
Facebook followers/year, median (IQR)*	230 (143–413)

*Compared using non-parametric statistics, with the Mann-Whitney U test; IQR — interquartile range

Results

140 pulmonary medicine journals were included, of these, 39 (27.86%) had at least one social network account, 14 (10.76%) had accounts in two social networks, and none had accounts in more than two. Differences between journals with and without social network accounts are presented in Table 1. The H index was significantly higher in journals with social network accounts (60 *vs* 17; $p < 0.01$). A bigger proportion of quartile 1 journals was identified among journals with social network accounts. However, the SJR was not significantly different between both groups ($p = 0.279$). Most of the pulmonary medicine journals were being published in Europe and had released less than 250 documents within the previous 3-year period in both groups ($p < 0.01$).

Twitter (22.8%) and Facebook (12.1%) were the most frequently used social networks. Regarding Twitter, 39.4% of the accounts had less than 1000 followers, while most Facebook accounts had more than 1000 followers (58.8%). The indicators of activity in social network accounts are presented in Table 2. Only one journal had a YouTube account. This journal was "Respirology" and its account had 112 subscribers, 74 videos, 14.887 views (2748 of which corresponded to the most often seen video), and it was created 5 years ago. None of the journals had an Instagram account.

Due to the sample size, correlation analyses were only performed for the social network "Twitter". The investigation of the SJR and the number of followers on Twitter revealed a moderate correlation ($r_s = 0.46$; $p < 0.05$). A better correlation was observed for Quartile 1 journals, and those with more than 500 published documents. Similar findings were observed for the number of followers adjusted for time since creation of the account. A low correlation was found between the SJR and the number of tweets ($r_s = 0.27$). However, it was excellent in open access journals ($r_s = 0.90$; $p < 0.05$). Quartile 1 journals displayed a better correlation with the SJR than Quartile 2 through 4 journals. Correlations between the SJR and metrics of activity on social network accounts are presented in Table 3.

Discussion

Our results revealed that the use of social media is still rather uncommon among pulmonary medicine journals — only about 30 % of them use these means of communcation. The SJR

Table 3. Correlation between the impact factor (SJR) and alternative measures of activity on Twitter (n = 33)

	Number of followers	follow-ers/year	Number of tweets
Global correlation	0.462*	0.463*	0.270
Open access, n = 5	0.600	0.600	0.900*
Non open access, 28	0.445	0.483*	0.246
Q1, n = 15	0.375	0.296	0.386
Q2 a Q4, n = 18	–0.061	-0.001	-0.059
Europe, n = 17	0.414	0.336	0.272
North America, n = 15	0.493	0.600*	0.100
< 500 documents**, n = 17	0.074	-0.022	-0.081
> 500 documents**, n = 16	0.353	0.426	0.309

*Statistically significant at a level of 0.05; **The number of documents published in the previous 3-year period

median did not differ in a statistically significant manner between journals with and without social network accounts. However, when stratifying the analysis by individual social networks (Twitter and Facebook), the difference in the SJR within subgroups did become apparent. The global correlation between the SJR and metrics of activity on Twitter was moderate. The latter suggests that both traditional and alternative metrics may be useful and mutually complementary.

Most of the journals that had social networks, either had Facebook or Twitter accounts. It is not surprising, since these social networks group an important number of active users each month according to the information from the years 2018 and 2019 [8, 9].

The global correlation between the SJR and the number of followers, as well as between the SJR in open access journals and the number of followers was moderate, suggesting that the number of followers on Twitter does accurately reflect the scientific impact of journals. A better correlation was found between the SJR in Quartile 1 and North American Journals, indicating a wider use of social media for diffusion of scientific contents as compared to other regions, and reinforcing the idea that the number of followers could reflect popularity of journals.

Altmetrics are a growing tendency, which seems useful for the assessment of individual publications. However, they do not allow to assess the specific impact of a journal [4], which is relevant for authors when choosing where to submit their research. Our data suggests that journal mentions in social network accounts could be a good indicator of the interest of not only the general public, but also fellow researchers regarding a specific research article. As such, concordance was found despite the fact that social media may be manipulated, for instance through fake followers. Thus, the latter reinforces the hypothesis that both types of metrics should be employed in a complementary fashion, instead of replacing one with another [10]. The joint use of alternative and traditional metrics may be useful for journals in order to generate strategies aiming to increase their audience, as well as for researchers when deciding about the best option of submitting their manuscripts.

The correlation between the journal impact and social media mentions has been previously analyzed in other areas. For instance, a 2016 article has reported on the creation of the Twitter impact factor for the assessment of Urology journals, having found that 21% of the analyzed journals had a Twitter account, which is close to our finding of 22.8%. This article also discovered a positive association between social media mentions and the journal's impact factor based on the journals listed in Journal Citation Reports [11].

YouTube accounts were found only for one journal. In this particular case, the number of subscribers was 112, suggesting that YouTube has less potential to be of significant impact to share information in pulmonary medicine journals. The approach of pulmonary medicine patients often includes a wide variety of visual information, such as findings on physical examination, chest X-rays, tomography and bronchoscopy images among others. Thus, it would be expected for there to be a higher presence of social media accounts in networks such as Instagram. However, surprisingly enough, no Instagram accounts were retrieved.

To the best of our knowledge, this is the first article to assess the correlation between the SJR impact factor and journal level social media metrics in pulmonology. A strength of the study is that we collected data in a relatively short period of time, which is important considering the changing nature of social media mentions along time. Furthermore, previous authors have stated that due to the increasing use of social networks, publishers should find a mechanism to compensate older articles for lower alternative metrics scores due to the lower social media use at the

time of publication [4]. Thus, we have created a variable reflecting followers adjusted for time since the creation of the account.

We also have several limitations to disclose. The main limitation is that even when we have demonstrated that both kinds of metrics are correlated, the design of the study has not allowed us to define whether causality exists or to determine its direction. This means that two explanations are possible: having an account on social networks can increase the interest of other researchers, thus increasing citations, or instead, journals with higher impact factors can have greater resources and funding aiming to increase activity on social networks, through social media -designated specialists for instance. Furthermore, there are other potentially significant factors that could not be considered in our analysis. For example, some of the existing accounts might not be actively used, or some journals may use previously created accounts with existing followers at baseline. Regretfully, detecting these possible confounders is unlikely. However, we believe these are not common practices. Thus, this should not significantly impact our results. Finally, we did not analyze the characteristics of original content in social media (such as infographics, videos, press notes, selection of key articles) and its impact on social media followers. The latter may significantly affect the performance of social media accounts. Future studies are required in order to assess the best mechanisms to present information on social media.

Additionally, some of the journals that have been traditionally considered to be of high quality were not included in the analysis in cases where a social media account was shared by multiple journals or was created for use by the scientific society that managed the account. However, it was necessary to avoid measuring the impact of professional societies or editorial houses, rather than the journal's activity. Otherwise, the individual weight of each journal as a measure of impact on social media could not have been determined. Finally, the sample size was not large enough to accurately calculate correlation for all networks, it only allowed to draw valid inferences for one social network: Twitter. Future research is necessary to evaluate the correlation between metrics based on citations and Facebook in other medical fields.

Conclusions

Social networks are increasingly becoming more popular for the diffusion of scientific knowledge. Pulmonary/respiratory medicine journals with social network accounts (Twitter and Facebook) have higher impact as defined by the SJR impact factor. Furthermore, there is a moderate to substantial correlation between the SJR impact factor and indicators of activity on Twitter. The latter suggests that the use of social networks may be a valid indicator of scientific impact and may thus be useful alongside traditional metrics when choosing the best journal to submit research in the pulmonary/respiratory medicine field.

Conflicts of interest

None to disclose.

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