Tweeting Authors: Impact on Research Publicity and Downstream Citations

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INTRODUCTION

The increasing ubiquity of social media has revolutionized medical and scientific communication, with considerable emerging interest in the use of Twitter for research dissemination (1, 2). Over the past decade, the field of Pulmonary and Critical Care Medicine has innovatively applied this technology to build international research communities and promote knowledge translation (3). Previous studies have determined that highly tweeted articles are well-cited (4), and consequently some journals have begun requiring peer-reviewed journal-issued tweets to accompany publications (5). While researchers have a clear incentive to promote their work, their individual potential to impact its dissemination via Twitter is unclear and the impact of direct author tweeting on citations has not been previously studied. We therefore sought to determine if articles published in Pulmonary and Critical Care Medicine journals tweeted by their authors received greater downstream tweets and citations compared with non-author-tweeted articles.

METHODS

Eighty-four Pulmonary and Critical Care Medicine journals and their 2017 Journal Impact Factor (IF) rankings were identified using the InCites Journal Citation Reports tool (Clarivate Analytics, 2018). From June 6, 2011, to January 1, 2017, 15,078 articles from these 84 journals that were referenced by at least one Twitter post (“tweet”) within the first year of publication were identified using [Altmetric.com](https://www.altmetric.com). Article author names were matched to Twitter users to determine whether each article was mentioned by a tweet issued by at least one author. The Web of Science database (Clarivate Analytics, 2018) was cross-referenced to identify articles’

downstream citations. The total number of tweets at one year after publication, number of citations at one year, and total citation count (number of citations by the end of the study follow-up period on December 5, 2018) were calculated for each article. An alpha of 0.05 was pre-specified as the threshold for statistical significance; bootstrapping was used to generate 95% confidence intervals (95% CI) and *p* values for comparisons between author-tweeted and non-author-tweeted articles. Journals were stratified by IF into IF < 2 (low-IF), IF ≥ 2 and < 5 (moderate-IF), and IF ≥ 5 (high-IF) categories. Anaconda Python 3.6 (Anaconda, Inc., Austin, TX) was used for data management and statistical analysis.

RESULTS

We identified 15,078 articles published in 84 pulmonary and critical care journals which had complete tweet and citation data (Table 1). Overall, author-tweeted articles achieved a 3.08-fold (95% CI, 2.69–3.51; *p* < 0.001) increase in downstream tweets compared with non-author-tweeted articles (Table 1). This corresponded to a 1.41-fold (95% CI, 1.25–1.58; *p* < 0.001) increase in citations at one year and a 1.51-fold (95% CI, 1.32–1.72; *p* = 0.001) increase in total citations. Statistically significant increases in tweets at one year were observed across IF categories among author-tweeted compared with non-author-tweeted articles (*p* values < 0.001); however, only articles in high-IF journals attained significant increases in citations (Table 1).

DISCUSSION

Our study demonstrates that articles tweeted by at least one of their authors achieved a threefold increase in tweets at one year compared with non-author-tweeted articles and that such articles went on to obtain a 50% greater number of total downstream citations. In sub-group analyses, while significant increases in tweet volumes were observed across all IF categories, this “author boost” only translated into increased downstream citations for articles in high-IF journals. The mechanism underlying these findings is unclear; one possibility is that authors on social media participate in networks of individuals with similar interests, thereby allowing greater penetration of their tweets within such networks compared

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Table 1 Author's Twitter Impact on Research Dissemination, Overall and Stratified by Impact Factor Group

2017 Impact Factor (IF)*	Number of journals (number of articles)	Mean tweets at one year			Mean citations in the first calendar year			Mean total citations as of December 2018		
		Non-author tweeted	Author tweeted	Fold change	p value	Non-author tweeted	Author tweeted	Fold change	p value	Fold change
Overall	84 journals (15,078)	5.42 (5.26–5.59)	16.71 (14.67–18.97)	3.08 (2.69–3.51)	< 0.001	2.17 (2.12–2.22)	3.05 (2.72–3.40)	1.41 (1.25–1.58)	< 0.001	1.51 (1.32–1.72)
≥ 5 (high)	12 journals (6607)	8.10 (7.77–8.45)	21.94 (18.84–25.35)	2.71 (2.32–3.14)	< 0.001	2.84 (2.74–2.95)	3.79 (3.31–4.33)	1.34 (1.16–1.53)	< 0.001	1.37 (1.17–1.59)
≥ 2 and < 5 (moderate)	49 journals (7052)	3.61 (3.50–3.72)	7.96 (6.65–9.41)	2.21 (1.83–2.62)	< 0.001	1.77 (1.72–1.81)	1.87 (1.61–2.16)	1.06 (0.91–1.22)	0.5	1.00 (0.88–1.13)
< 2 (low)	23 journals (1419)	2.39 (2.20–2.59)	7.93 (4.57–13.17)	3.33 (1.87–5.45)	< 0.001	1.15 (1.07–1.23)	1.43 (1.00–1.90)	1.25 (0.87–1.67)	0.4	1.15 (0.78–1.59)

Journals are categorized by 2017 Impact Factor using the InCites Journal Citation Reports tool (Clarivate Analytics, 2018) and stratified into high (≥ 5), moderate (≥ 2 and < 5), and low (< 2) impact factor categories. Error margins represent bootstrapped 95% confidence intervals

with tweets originating outside. Further study is required to precisely delineate the nature of this interaction.

While this is the first study, to our knowledge, to demonstrate significant association between author tweeting and frequency of article citations, this work has several limitations. The retrospective nature of our analyses on this prospectively collected, observational data precludes assertion of a direct causative link between author tweets and downstream citations. Some authors may not identify themselves on Twitter, potentially introducing information bias. It was not possible to differentiate between author-driven as opposed to journal-mandated tweet issuance.

Overall, this study highlights Twitter's role in the online sharing of scientific literature, suggesting its use may represent an opportunity for researchers to significantly impact the dissemination and citation of their work. Journal editors may thus consider encouraging their authors to engage with social media to maximize the distribution of new publications and potentially promote their integration into future research articles as citations.

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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