

The anatomy of a publication programme as seen through article-level and alternative metrics

Poster #
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Abstract

Objective: Traditional journal and article metrics are either static or only available after a significant lag period, and measure only limited aspects of an article's success. Using article-level and alternative metrics, a more detailed picture of the 'impact', 'influence', 'interest' in and 'reach' of an article emerges. The aim of this case study was to assess the utility of various novel metrics with respect to publication planning.

Research methods: Journal articles and congress abstracts published in the past 4 years and relating to three different drugs with the same indication were identified and categorized according to type (primary data, subanalyses, meta-analyses, health economics/outcomes analyses, reviews, editorials or case studies). Article-level and alternative metrics (including article page views, Mendeley activity and Twitter activity) were obtained and compared to citation counts and journal impact factors.

Results: This case study presents a quantitative overview of publications (131, 254 and 110 articles for drugs A, B and C, respectively) and congress activity (18, 45 and 12 abstracts for drugs A, B and C, respectively) over a 4-year period, alongside an analysis of the publications using article-level and alternative metrics. Preliminary results from this dataset identified a strong correlation between article views and citation counts and a moderate correlation between citation counts and Twitter or Mendeley activity. Further analysis of a larger dataset is underway to investigate these relationships. Issues regarding the utility and interpretation of alternative metrics for assessment of impact, interest, influence and reach, and in informing publication planning, are investigated and discussed.

Conclusion: Article-level and alternative metrics are potentially a rich source of information that can enhance aspects of publication planning, provided caution is exercised when interpreting the data.

Objective

- This case study was intended to explore the utility of alternative and article level metrics for comparing publication activity, and for informing publication planning.

Methods

- A search was performed to retrieve all articles published between June 2010 and May 2014 inclusive that related to any of three anticoagulant agents (Drug A, Drug B and Drug C) in the indication of treating venous thromboembolism (VTE). Abstracts presented at key congresses over the period were also identified using the same criteria.
- Articles with PubMed IDs were manually categorized according to publication type and as negative in tone or findings with respect to the agent in question or positive/neutral following review of the abstract/content.
- Article-related social media activity retrieved using Altmetric.com included Bloggers, Twitter activity (unique accounts), Google+ authors, F1000 reviews, News outlets, Facebook walls, Peer review sites, Mendeley readers, Weibo, Pinterest and CiteULike readers.
 - Citation counts were obtained from Google Scholar and Scopus; PubMed commons activity was checked for each publication.
 - Journal impact factors and article level metrics (Abstract views, Page views, Downloads) were retrieved from the respective journal websites where available.
 - Open access status was assigned according to whether or not the full article could be viewed/obtained freely via the journal website, PMC or similar.
- Correlations between different metrics were assessed using Pearson's r (Pearson Correlation Coefficient Calculator, SocSciStatistics.com).

Results and Observations

- Summaries of the primary and secondary publications and congress activity over time for each agent are shown in **Figures 1a–c**.
- Only ~40% of publications had any associated social media activity, with article level metrics available for <25% of these.
 - Many of the metrics show limited potential for differentiation between publications owing to a limited number of values or no observed activity for several metrics.

- Correlations were seen between certain key metrics as shown in **Table 1**.
- No analysis based on qualitative factors was performed, as the limited sample size for certain subcategories would have prevented any meaningful findings.

Table 1. Correlations between metrics for publications in the initial case study.

	Article views	Mendeley readers	Twitter activity	Citations
Journal impact factor	-0.214 (0.685)	0.026 (0.851)	0.585 (0.002)	0.139 (0.445)
Citations	0.836 (0.038)	0.556 (0.001)	0.641 (0.003)	
Twitter activity	0.564 (0.186)	0.277 (0.153)		
Mendeley readers	0.817 (0.007)			

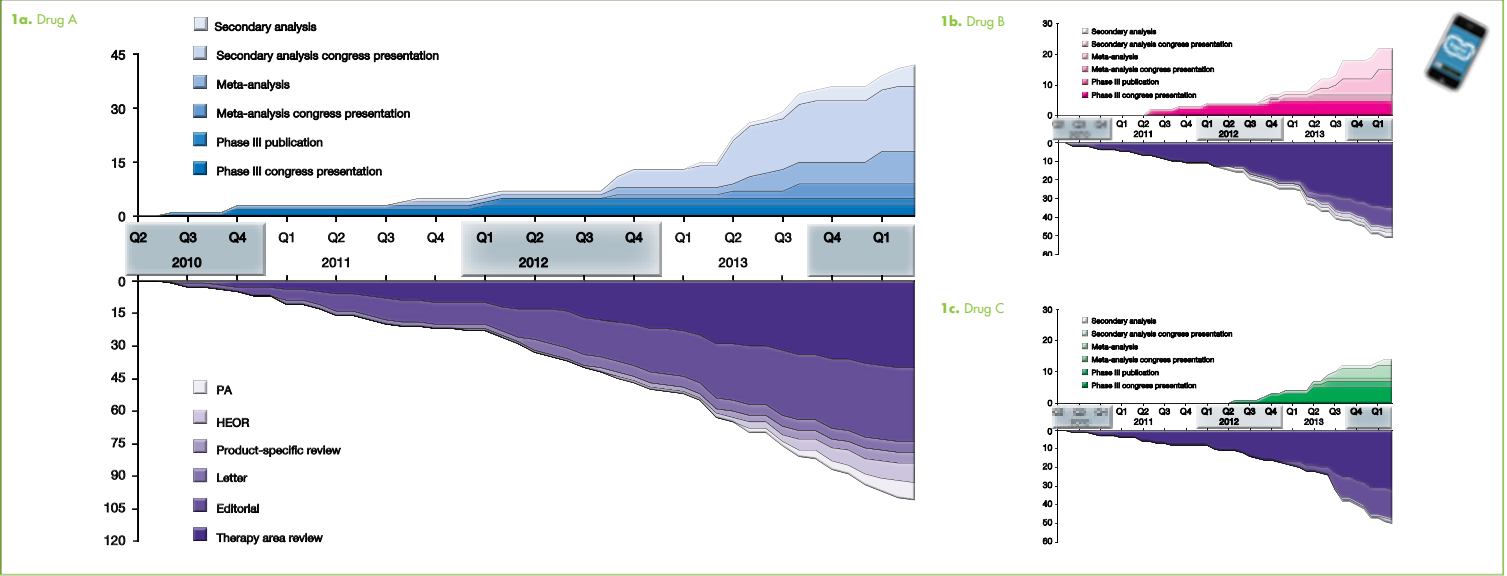
All data are given as Pearson's r (P-value)

Red = not significant
Yellow = moderate correlation
Green = strong correlation

Conclusions

- Many of the available alternative metrics based on social media are likely to be of limited value owing to the lack of activity or limited range of values, which reduced the ability to differentiate between publications.
- Within the limited dataset from this case study, a strong correlation between article views and citation counts and a moderate correlation between citation counts and Twitter or Mendeley activity was seen.
 - Interpretation of any relationships to citation counts from this dataset is also limited, owing to the large proportion of articles (>40%) that were only published within the previous 12 months, which may limit the opportunity for citation.
 - Limited alternative metrics and article level metrics were available for articles published prior to 2011.

Figure 1. Publication and key congress activity relating to treatment of venous thromboembolism from June 2010 to May 2014 for Drug A, Drug B and Drug C.



Secondary analysis

- To overcome some of the limitations of the initial case study and confirm the preliminary relationships identified, a second analysis was performed using a larger dataset that included all articles published from 2011 to 2013 and related to anticoagulation using the same three agents in any of three specific indications (non-valvular atrial fibrillation [NVAF], acute coronary syndrome [ACS] and VTE prophylaxis following orthopaedic surgery).
- Statistical analyses (Pearson's r , ANOVA, Chi-squared automated interaction detection) were performed using Watson (IBM.com) to identify and confirm relationships between the available metrics and Twitter activity or citation counts.

Results

- A total of 1194 publications met the criteria for inclusion and information regarding social media activity could be retrieved for ~35% of articles.
 - By topic: NVAF 80.4%; ACS 13.0%; VTE prophylaxis 11.2%
 - By publication type: 35.5% data manuscripts (including 33 Phase II/III, 37 health economics and outcomes research, 27 meta-analyses and 36 post-approval study manuscripts); 26.7% therapy area reviews; 15.4% editorials; 9.3% product-specific reviews; 7.6% comments or letters.
 - By agent: 55.3% Drug A; 70.7% Drug B; 39.9% Drug C.
 - 52.6% of publications were open access and 5.6% were negative in tone or finding.
- Using Twitter activity as the outcome, strong main effects were seen for bloggers, Facebook wall mentions and CiteULike readers ($P < 0.001$ for all), with three significant strong interaction effects identified (**Figure 2**).
 - There was a strong positive correlation between Facebook wall mentions and Twitter activity ($r = 0.69$, $P < 0.001$).
 - Both open access status and a negative tone or finding had a strong interaction effect with key alternative metrics in relation to the associated twitter activity ($P < 0.01$, **Figure 3**).

Figure 2. Prediction spiral: correlations and interactions relating to Twitter activity.

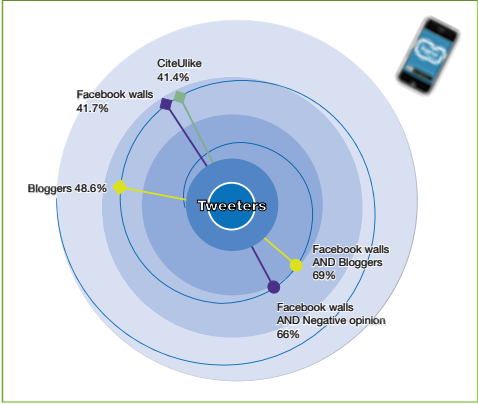
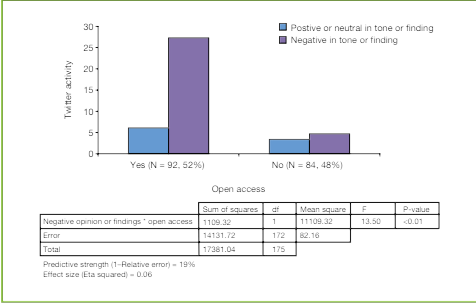


Figure 3. Example interaction: Open access * Negative tone or findings and Twitter activity.



- Using citation count as the outcome, moderate main effects were seen for Mendeley readers, bloggers and publication type ($P < 0.01$ for all), with several significant strong interaction effects identified (**Figure 4**).
 - There was a strong positive correlation between Mendeley readers and citation count ($r = 0.79$, $P < 0.001$).
 - A strong interaction effect was seen between a negative tone or finding and key alternative metrics with respect to citation counts ($P < 0.001$).

Figure 4. Prediction spiral: correlations and interactions relating to Citation counts.

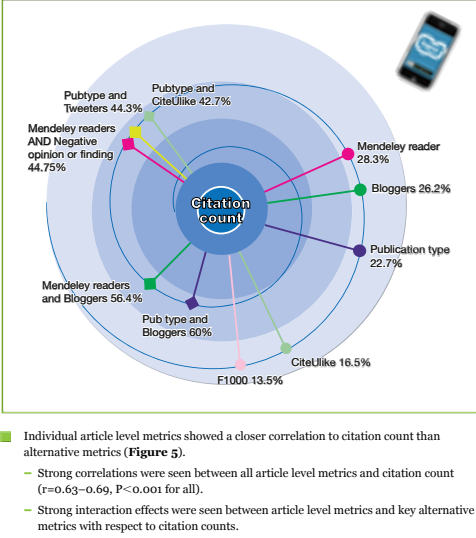
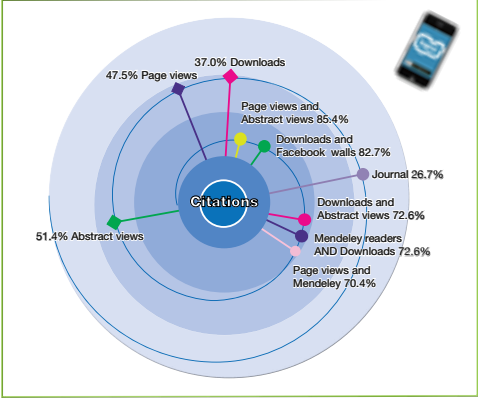


Figure 5. Prediction spiral: correlations and interactions relating to Citation counts and article level metrics.



Limitations

- The relationships identified between alternative and article level metrics may be self-reinforcing, and could mask the true extent of the interaction.
- While alternative metrics are easily available, activity is only seen for a subset of articles.
- Article level metrics are not available for the majority of publications and are often provided in non-standard formats, making automated retrieval difficult.

Conclusions

- From this analysis, it is clear that the 'flavour' of the data must also be considered if meaningful comparisons are to be made.
 - Although some metric providers take account of factors such as date of publication and journal, to our knowledge, none of them account for qualitative factors.
- Some metrics and qualitative factors, while not useful in isolation, show significant interaction effects that improve the predictive value of other metrics that are useful in isolation.
- Alternative, article level and traditional metrics should be considered complementary, as they look at different aspects of how a publication has been received, and it is important to select the appropriate metric(s) for the criteria of interest.

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