SOCIAL MEDIA ACTIVITY FOR OPTIMIZING PUBLICATION TIMING IN ACCORDANCE WITH DRUG APPROVAL

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ABSTRACT

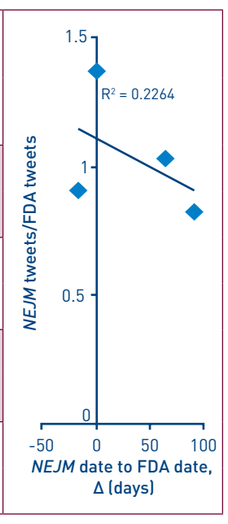
Objective: Significant progress in prostate cancer drug development has led to recent *New England Journal of Medicine* (*NEJM*) publications and Food and Drug Administration (FDA) approvals. Notably, publication timing has varied in relation to approval. We sought to determine optimal publication timing relative to regulatory approval to maximize publication impact by measuring the association of social media activity of these events.

Research Design and Methods: We searched Twitter user activity by generic drug name for *NEJM*- and FDA-related tweets and determined the correlation of *NEJM*/FDA tweets versus *NEJM* publication timing in relation to FDA approval.

Results: There was some indication of diminishing publication impact post-approval, but the correlation was weak (**Table**).

Table: Twitter activity associated with *NEJM* publication and FDA approval of prostate cancer drugs in accordance with the time between the 2 events

Prostate cancer drug (trial)	*NEJM* publication date / FDA approval date	*NEJM* date to FDA date, Δ (days)	*NEJM* tweets	FDA tweets	*NEJM* tweets /FDA tweets*
Enzalutamide (AFFIRM)	August 15, 2012 / August 31, 2012	–16	254	279	0.91
Abiraterone (COU-AA-302)	December 12, 2012 / December 12, 2012	0	85	62	1.37
Radium-223 (ALSYMPCA)	July 18, 2013 / May 15, 2013	+64	119	116	1.03
Sipuleucel-T (IMPACT)	July 29, 2010 / April 29, 2010	+91	23	28	0.82



*FDA tweets (reference) = 1.0.

Conclusions: Social media activity indicates that managing timing of publication in relation to FDA approval to potentially optimize publication impact may not be warranted.

INTRODUCTION

- Social media oncology conversations on Twitter have become ubiquitous with greater than 13 million tweets in 2012. Overall activity is episodic and conversation spikes are associated with clinically-related news events.[1]
- The contribution by physicians is relatively sparse (~27,000 tweets) with only a small amount of tweets attributed to oncologists. Nevertheless, the discussion of oncology-related tweets within the overall physician cohort is growing more quickly than in the general public.[1]
- Social media is now recognized as a useful tool for oncology professionals to disseminate evidence-based information, generate heightened awareness of clinical trials, and to share information with other healthcare professionals.[2]
  - To support this activity, the American Society of Clinical Oncology (ASCO) Integrated Media and Technology Committee has provided guidelines for the proper use of social media by oncologists in consideration of legal and privacy concerns[2]
- Oncology-related Twitter activity by the physician cohort varies by cancer type; prostate cancer shows the most activity along with skin and breast cancer, and is the fifth-most disease tweeted, surpassed only by diabetes, flu, and stroke.[1]
- Within prostate cancer tweets, *treatment-related* prostate cancer tweets are highest (~33%) relative to other cancers, which is very much aligned with recent advances in prostate cancer drug development.[3]

OBJECTIVE

- We earlier demonstrated an underutilization of social media usage by oncology medical journals compared with leading general journals, but saw hints of publication planning impact based on dissemination of individual articles.[4]
- In the current study, we sought to determine the optimal publication timing of registration trials relative to regulatory approval to maximize publication impact by measuring the association of social media activity, specifically Twitter, of these 2 disparately timed events.

METHODS

- We tracked Twitter activity against the publication record timeline of enzalutamide (searched by generic name), a representative newly approved prostate cancer drug, in the AFFIRM prostate cancer trial.
- Key events associated with this trial were used to assess Twitter activity, including:
  - Independent Data Monitoring Committee (IDMC) recommendation of trial stoppage
  - Data presentation at key oncology and urology congresses
  - Registration trial publication in the *New England Journal of Medicine* (*NEJM*) (online)
  - Food and Drug Administration (FDA) approval notification
  - European Medicines Agency (EMA) approval notification
- Based on data showing most activity associated with the publication of the registration trial and US regulatory approval (see results), we determined the correlation of tweets associated with these 2 events for other prostate cancer drugs.
  - Specifically, we examined the correlation of time from *NEJM* publication with FDA date of approval (days) versus *NEJM* tweets divided by FDA tweets
- We sought to characterize the nature of Twitter users by their listed profiles for either the *NEJM* publication or the FDA approval, again utilizing enzalutamide Twitter activity as a representative sample.
- Finally, we examined the generalizability of our findings by expanding the analysis to all oncology drugs approved in 2013 regardless of cancer type.

LIMITATIONS

- The Twitter search was conducted by generic name to increase the likelihood of detecting tweets by medical professionals. Although we may have missed activity accordingly, many of the detected tweets also included the brand name.
- These data represent oncology social media usage and may not be generalizable across therapeutic areas. However, oncology is best suited for this type of analysis with a high number of recent approvals that coincide with single, key registration trial publications in leading medical journals. A sampling of other therapeutic areas did not lead to different findings.
- The sampling was done in general Twitter feeds, and more direct assessment of professional sites (eg, journal-/congress-related blogs) may be more appropriate for assessment of publication planning applications.

Managing publication timing in relation to FDA approval to optimize publication impact may not be warranted

1 Why was this research needed?
Social media is recognized as a useful tool for oncology professionals to disseminate information. We sought to determine if measurement of Twitter activity could be utilized as a tool to optimize oncology publication timing in relation to regulatory drug approval to maximize publication impact.

2 What did we learn from this investigation?
Oncology-related Twitter activity is episodic and most apparent for registration trial publication and FDA regulatory approval. Twitter activity surrounding these 2 events is poorly correlated, and attempts to manage publication timing in relation to FDA approval may not be warranted.

3 What are our recommendations for the future?
As a relatively small fraction of Twitter activity is conducted by oncologists, a more focused assessment of oncologist-specific conversations may be a better gauge to optimize timing of oncology publications to maximize impact.

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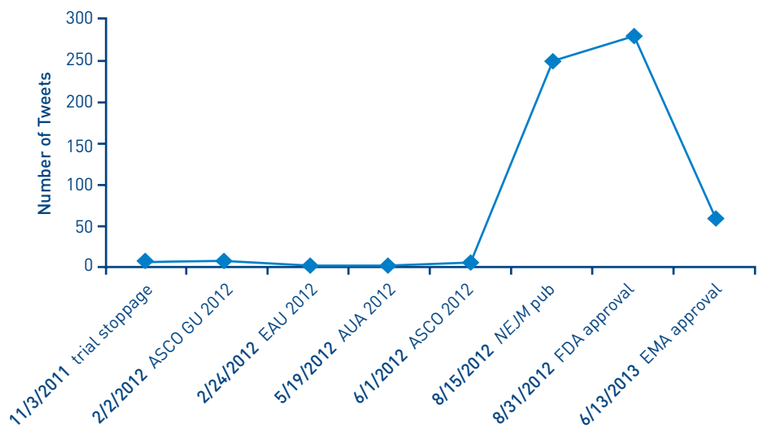
SUMMARY AND CONCLUSIONS

- We found episodic Twitter usage related to publication and regulatory activity to be in concert with trends in overall Twitter activity.
- We focused on 2 key events—(1) publication of registration trial and (2) FDA approval—and did not observe an association between the timing of these events and respective Twitter activity.
- These data of overall Twitter social media activity therefore suggest that managing timing of registration trial publication to FDA approval to potentially optimize publication impact may not be warranted.
- The presence and visibility of medical professionals on Twitter, particularly of specialists, is limited and may reflect privacy and legal concerns in the general Twitter community. More select targeting of professional blogs and congress feeds may be a more appropriate vehicle for assessing publication planning or any assessment of professional behavior related to social media activity.

RESULTS

- Tracking Twitter activity for the AFFIRM trial of the newly approved prostate cancer drug enzalutamide showed minimal activity with IDMC recommendation of trial stoppage, and the early dissemination of trial data regardless of whether presented at oncology (American Society of Clinical Oncology [ASCO], Genitourinary Cancers Symposium [ASCO GU]) or urological society (European Association of Urology [EAU], American Urological Association [AUA]) congresses.
- In contrast, Twitter activity was much more pronounced for both trial publication in the *NEJM* and upon announcement of US regulatory approval (**Figure 1**). European Union approval also led to Twitter activity but this was less pronounced.

Figure 1: Twitter activity associated with the publication activity and regulatory approvals of an illustrative newly approved prostate cancer drug (enzalutamide)



- The timing of the enzalutamide *NEJM* publication preceded FDA approval by 16 days.
  - The timing of these 2 events was different for other newly approved prostate cancer drugs: abiraterone acetate (same day), radium-223 (64 days later), and sipuleucel-T (91 days later) (**Table 1**)

Table 1: Twitter activity associated with *NEJM* publication and FDA approval of prostate cancer drugs in accordance with the time between the 2 events

Prostate cancer drug (trial)	*NEJM* publication date / FDA approval date	*NEJM* date to FDA date, Δ (days)	*NEJM* tweets	FDA tweets	*NEJM* tweets /FDA tweets*
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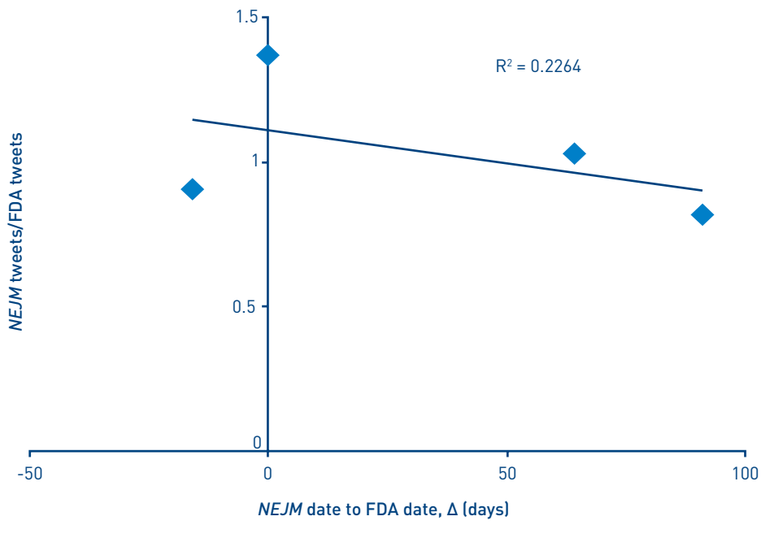
*FDA tweets (reference) = 1.0.

- The association of *NEJM* publication timing and FDA approval was poorly correlated with the volume of *NEJM*/FDA tweets (correlation coefficient = 0.2264) (**Figure 2**).

Figure 2: Correlation between *NEJM* tweets/FDA tweets and *NEJM* date to FDA date of recently approved prostate cancer drugs



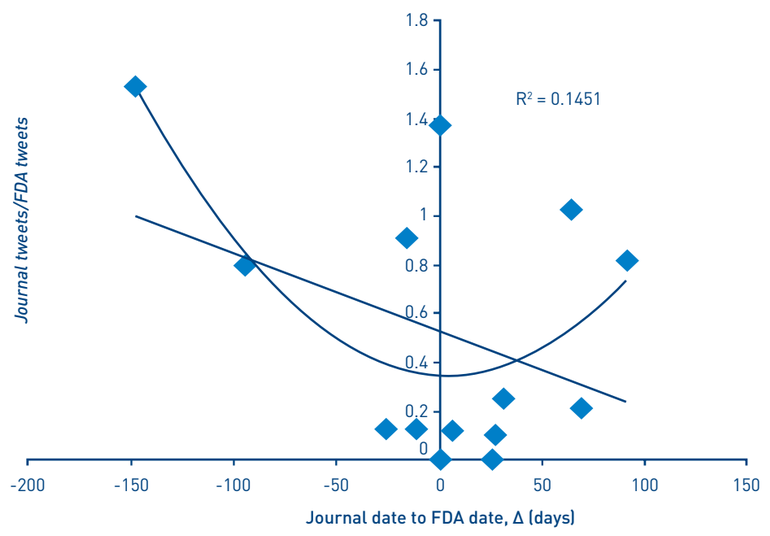
- We expanded the analysis to include all oncology drugs approved in 2013 regardless of therapeutic area and publication journal.
- We observed a wide disparity between publication date of the registration trial and the FDA approval date, ranging from –148 days for ibrutinib (indicated for mantle cell lymphoma) to + 69 days for obinutuzumab (indicated for chronic lymphocytic leukemia) (**Table 2**).
- Examination of the correlation of these events along with the previously determined prostate cancer drugs also generated a weak correlation (correlation coefficient = 0.1212) (**Figure 3**). However, the distribution with a polynomial trend line illustrates the potential for greater impact when the publication date is farthest from the FDA approval date, whether most proximal or distal to FDA approval.

Table 2: Twitter activity associated with journal publication and FDA approval of newly approved oncology drugs in accordance with the time between the 2 events

Drug	Indication	Journal	Publication date	FDA Date	Δ	Journal tweets	FDA tweets	Journal tweets/ FDA tweets
Ibrutinib	Mantle cell lymphoma	*NEJM*	June 19, 2013	November 13, 2013	–148	406	265	1.53
Obinutuzumab	Chronic lymphocytic leukemia	*NEJM*	January 8, 2014	November 1, 2013	+69	33	160	0.21
Afatinib	NSCLC	*JCO*	July 1, 2013	July 12, 2013	–11	31	236	0.13
Pomalidomide	Multiple myeloma	*Blood*	January 13, 2013	February 8, 2013	–26	26	206	0.13
Regorafenib	GIST	*Lancet*	November 22, 2012	February 25, 2013	–95	87	109	0.80
Dabrafenib	Metastatic melanoma	*Lancet*	June 25, 2013	May 29, 2013	+27	12	126	0.10
Trametinib	Metastatic melanoma	*NEJM*	June 4, 2013	May 29, 2013	+6	15	126	0.12
Lenalidomide	Mantle cell lymphoma	*Lancet Oncology*	June 6, 2013	June 5, 2013	+1	0	118	0
Denosumab	Giant cell tumor of bone	*Lancet Oncology*	July 16, 2013	June 13, 2013	+33	33	131	0.25
Ado-tratuzumab	HER2+ metastatic breast cancer	*JCO*	March 20, 2013	February 22, 2013	+26	0	81	0

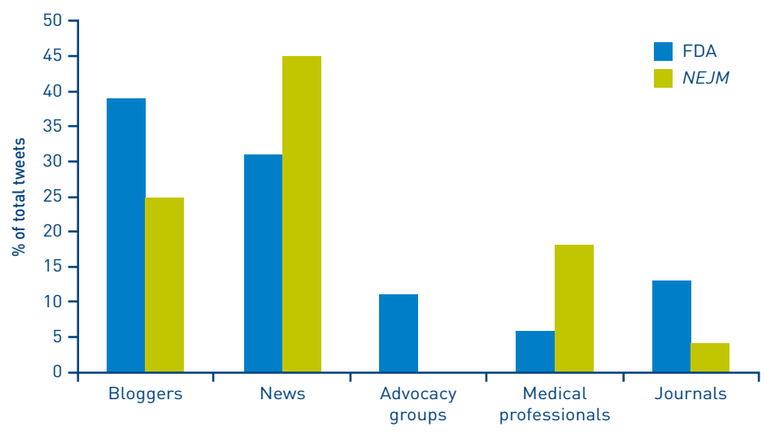
GIST, gastrointestinal stromal tumor; HER2+, human epidermal growth factor receptor2-positive; *JCO, Journal of Clinical Oncology*; NSCLC, non-small cell lung cancer.

Figure 3: Correlation between *NEJM* tweets/FDA tweets and *NEJM* date to FDA date of recently approved oncology drugs



- One potential explanation for the lack of correlation could be the characterization of Twitter users tweeting on these activities. Shown in **Figure 4** are the profiles of 100 Twitter users tweeting either the FDA approval of enzalutamide or the *NEJM* publication.
  - FDA: bloggers/individuals, 39%; news, 31%; advocacy groups/ organizations, 11%; medical professionals, 6%; other 13%
  - *NEJM*: bloggers/individuals, 25%, news 45%; medical professionals, 18%; journals 4%; other 8%

Figure 4: Characterization of Twitter profile user type tweeting an illustrative newly approved prostate cancer drug related to either *NEJM* publication or FDA approval (enzalutamide)



- A greater proportion of medical professionals posted tweets related to the *NEJM* publication (18%) when compared with the FDA approval (6%); this may partially explain the observed poor correlation.
- Moreover, the distribution of specialists was even lower, as identified oncologists and urologists within the medical professional group were sparse. This agrees with data that shows only 2.6% of oncologists are identified physician Twitter users.[1]
- It should be noted that although oncologist and urologist Twitter users are relatively limited in number, our observations of their activity are consistent with data showing that oncologists tweet more than twice a day on average, greater than observed with other specialists (ie, psychiatrists 1.8/day; cardiologists 1.8/day; dermatologists 0.7 tweets/day).[1] Anecdotally, we have detected a growing trend of influential oncologists joining the Twitter community.

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References

1. Reid BR, et al. The Social Oncology Project. MDigital Life. http://www.wcgworld.com/mdigitallife. Accessed February 17, 2014.
2. Dizon DS, et al. Practical guidance: The use of social media in oncology practice. *J Oncol Pract*. 2012;8:e114-e119.
3. Madan RA, Arlen PM. Recent advances revolutionize treatment of metastatic prostate cancer. *Future Oncol*. 2013;9:1133-1144.
4. Mills I, et al. Social media usage by medical journals: Implications for publication planning. *Curr Med Res Opin*. 2012;28s1;S1-S19.

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