Visual Abstracts to Disseminate Research on Social Media

A Prospective, Case-control Crossover Study

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Nearly all major academic research journals have adopted social media platforms, such as Twitter, to disseminate their publications and make them more accessible to readers.[1] One recent study suggested that articles featured on Twitter may be 3 times more likely to be read versus those that were not.[2] Despite the widespread adoption of Twitter by academic journals, the extent to which the social media platforms and strategies can influence practical outcomes, such as number of article reads, remain understudied.

In July of 2016, *Annals of Surgery* adopted the use of ''visual abstracts'' as a novel strategy to improve dissemination of the journal's publications. A visual abstract is simply a visual representation of the key findings typically found in the abstract portion of an article. They are produced by the journal after an article is accepted. Examples can be found in Figure 1. As of March 2017, more than 15 journals have utilized visual abstracts in their social media dissemination strategy,[3] yet no data exist describing how their use impacts dissemination of publications.

In this context, a case-control crossover study was conducted to compare tweets that included only the title of the article versus tweets that contain the title and a visual abstract. Such information would be valuable to help journals and authors understand the impact of different dissemination strategies for their publications.

METHODS

Between July 2016 and December of 2016, a prospective case-control crossover study was performed using 44 original research articles published that same year in the *Annals of Surgery*. Each article was tweeted from the *Annals of Surgery* Twitter account in 2 formats; as the title of the article only and as the title with a visual abstract. Half (n = 22) of the articles were tweeted as title alone, then after a 4-week ''washout'' period, the same article was also tweeted as a visual abstract. The other half of the articles (n = 22) were tweeted on the same protocol, but in the opposite order. Thus, by the end of the study period, all 44 articles were tweeted using the both formats allowing for a matched-pair *t* test analysis (Fig. 2).

The primary outcomes of this study were (i) number of times the tweet was seen (impressions), (ii) the number of times the tweet was shared (retweets), and (iii) the number of times the article link was clicked on (article visits) that were tracked prospectively using Twitter Analytics.

As a secondary outcome, we wanted to assess if nonvisual abstract tweets for articles besides the 44 original contributions benefited from a ''spill over'' effect after visual abstracts were implemented. To do so, we performed an interrupted time series in the six months before and after visual abstracts were implemented and compared average number of impressions per tweet between the 2 groups. All analyses were 2 tailed, using 0.05 as the threshold for significance.

RESULTS

We found a strong correlation between the use of visual abstract tweets and increased dissemination on social media (Table 1, Fig. 3). When article titles were tweeted, each tweet averaged 3073.3 impressions and 11.0 retweets. However, when the same articles were tweeted as a visual abstract, each tweet averaged 23,611 impressions (7.7-fold increase; $P < 0.001$) and 92 retweets (8.4-fold increase; $P < 0.001$). Similarly, tweets with title only resulted in average of 65.6 article visits, whereas tweets with a visual abstract averaged 175.4 article visits (2.7-fold increase; $P < 0.001$.)

We also observed an increase in impressions for nonvisual abstracts tweets after the visual abstract strategy was implemented (Fig. 3). Between January and June of 2016, the average number of impressions per tweet was 2417 compared with 4574.9 between July and December of 2016 ($P < 0.001$).

Between July 2016 and December of 2016, the *Annals of Surgery* Twitter account acquired 3455 new followers (average 575 per month, range 490 to 847).

CONCLUSIONS

Social media, and specifically Twitter, is an effective platform to disseminate research. The use of visual abstracts was associated with higher levels of dissemination as measured by impressions, shares, and article visits on the publishers' website. Moreover, the modest use of them (44 over 6 months, roughly 1–2 weeks) was associated with broader dissemination of other nonvisual abstract tweets. Taken together, these findings represent an important strategy to be considered by publishers and authors to communicate their research findings.

The extent to which other journals can expect increased dissemination on social media by using visual elements in their tweets remains to be determined. Like many interventions, the visual abstract likely has heterogeneity of effect based on the design quality and content of the tweet. Our study was specifically design to limit to these 2 possible confounders by having all visual abstracts

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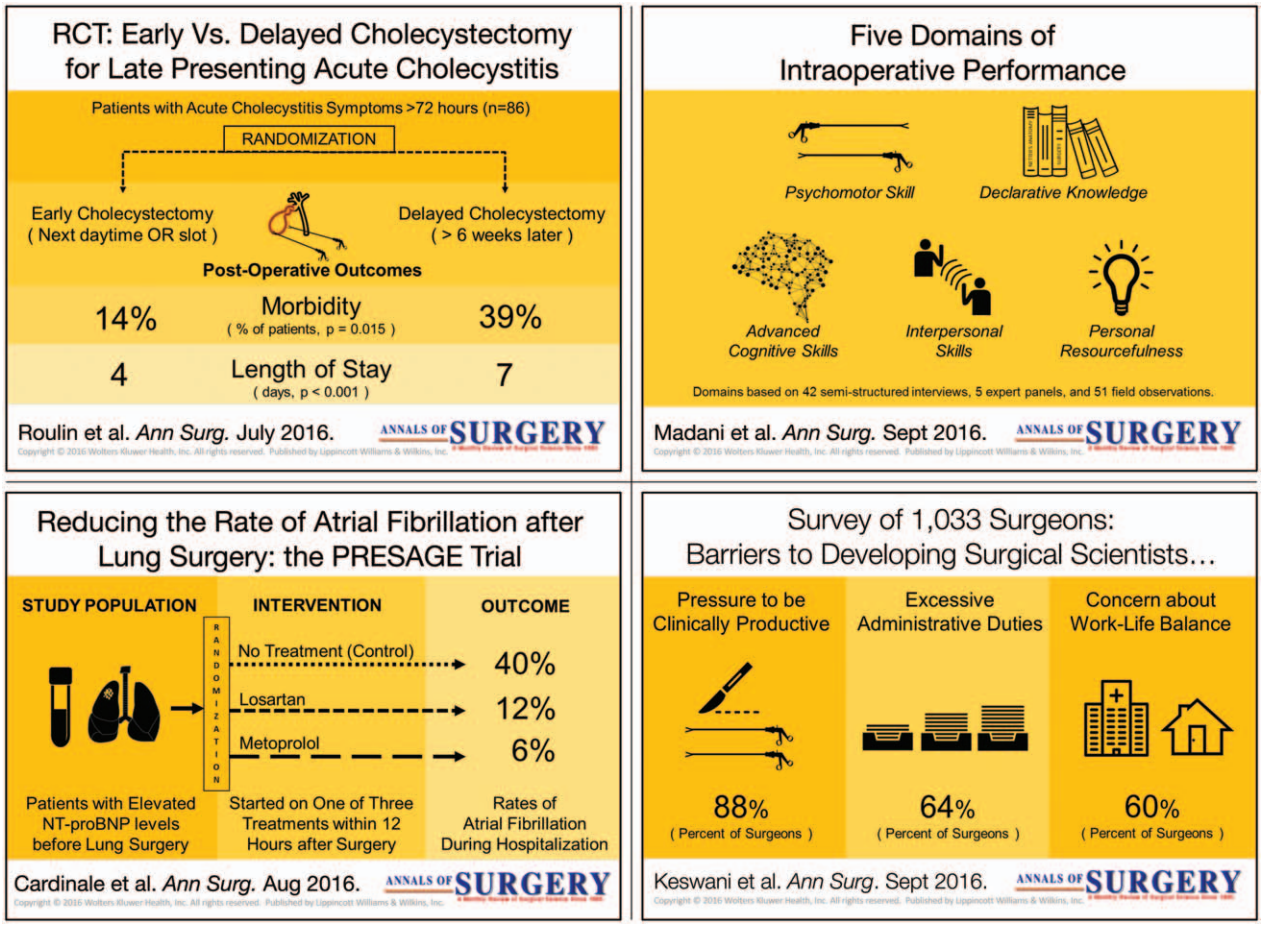

FIGURE 1. Examples of Visual Abstracts. After piloting several different formats with focus groups, 6 different formats were ultimately included in the study; 4 of them are shown here.

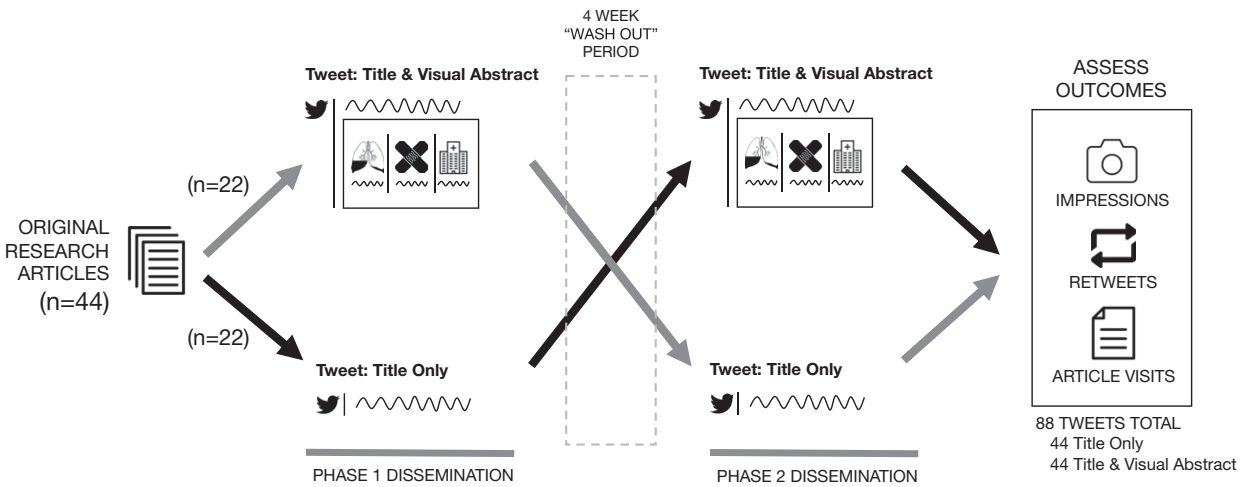

FIGURE 2. Study Design. Prospective, case-control crossover study to evaluate the impact of visual abstracts on Twitter.

TABLE 1. Case-control Crossover Results: Title Alone Versus Title with Visual Abstract

Outcomes (Mean)	Title Alone (n = 44)	Title with Visual Abstract (n = 44)	Increase of Outcome with Visual Abstract	*P*[*]
Impressions	3073.3	23611.2	7.7 fold	<0.001
Retweets	11.0	92.1	8.4 fold	<0.001
Article visits	65.6	175.4	2.7 fold	<0.001

[*]Comparison of means using matched-pair *t* test analysis comparing 88 total tweets from 44 articles in the case-control crossover study.
Definitions: Impressions (number of times tweet is seen), Retweets (number of times a tweet is shared), article visits (number of times link to article was clicked from tweet).

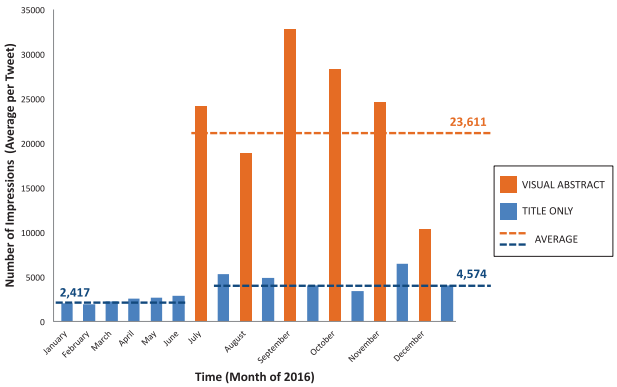

FIGURE 3. Dissemination of Research on Twitter: title only versus visual abstract. Interrupted time-series analysis of 629 nonvisual abstract tweets (ie, those not included in the case-control crossover study) in the 6 months before and after the visual abstract strategy was implemented (shown in blue). Differences in means; 2417 vs 4574 ($P < 0.001$). Orange bars represent the 44 visual abstracts from the case-control crossover portion of the study.

created by a single author (A.M.I.) and by match-pairing articles in our analysis.

Through feedback from our readership, we learned about several ways in which the visual abstract has been helpful to them. For the busy clinicians, it allowed them to quickly look through ''previews'' of several articles to find the content most relevant to them to read. Educators giving lectures have been able to integrate the visual abstract in their slide decks to facilitate discussions of research from *Annals*. Researchers have reposted visual abstracts into social media groups as a way to generate discussion around a clinical topic. Public relations representatives from institutions have requested visual abstracts to help communicate the research to public press who may be interested in the article.

We did also hear from a few readers who were concerned that the visual abstract format may be ''too simple'' in contrast to the rigor of the research itself. We take every opportunity, including this one, to remind readers that ''visual abstracts are not a substitute for reading an article, but only meant to highlight or preview it.'' Nonetheless, we made important changes to our visual abstract creation process to help minimize potential bias or over simplification. This included a policy for an internal review (from another editorial board member) and as an external review (from a colleague not affiliated with the journal or the article) before the content was shared on social media. Moreover, we've made conscious efforts to include more study details (eg, study design, *P* values) to give the findings reported more contexts.

In January of 2017, *Annals* began inviting authors to join us in cocreating visual abstracts for their upcoming publications, which has been great in helping us scale and improve our process. We look forward to continuing and improving our social media dissemination efforts, as they fulfill the mission of our journals founder, Lewis Pilcher, to share the best surgical research to a ''worldwide audience.''[4]

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