

Trends in Twitter Use by Physicians at the American Society of Clinical Oncology Annual Meeting, 2010 and 2011

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Abstract

Purpose: Social media channels such as Twitter are gaining increasing acceptance as mechanisms for instantaneous scientific dialogue. Professional medical societies such as ASCO are using social media to expand the reach of scientific communications at and around their scientific meetings. This article examines the how Twitter use by oncologists expanded at the ASCO Annual Meetings from 2010 to 2011.

Methods: In both years, tweets that were specifically generated by physicians and that incorporated the official meeting hashtag were harvested from the public domain, and a discourse analysis was performed by three independent raters. Follow-up surveys were conducted to assess physician attitudes toward Twitter and its potential role in clinical practice.

Results: A combined total of 12,644 tweets were analyzed for 2010 and 2011. Although the number of physicians authoring tweets was small (14 in 2010, 34 in 2011), this group generated nearly 29% of the total meeting dialogue examined in this analysis in 2010 and 23% in 2011. Physicians used Twitter for reporting clinical news from scientific sessions, for discussions of treatment issues, for promotion, and to provide social commentary. The tangible impact of Twitter discussions on clinical practice remains unclear.

Conclusion: Despite the 140-character limit, Twitter was successfully used by physicians at the 2010 and 2011 ASCO Annual Meetings to engage in clinical discussions, whether or not an author was on site as a live attendee. Twitter usage grew significantly from 2010 to 2011. Professional societies should monitor these phenomena to enhance annual meeting attendee user experience.

Introduction

In contrast to the traditional model of the Internet, in which users passively view Web content created by others via a desktop browser, Web 2.0, a concept initially popularized by technology publisher Tim O'Reilly in 2004,¹ denotes a set of Internet tools and their supporting technologies that allow users to create and share content in an interactive and social manner. As a form of communication, social media—including blogs, wikis, and social networking sites—have become deeply embedded in modern society. Social media use has grown exponentially in recent years, with Facebook claiming over 800 million active users in 2011² (see glossary of related terms in Appendix Table A1, online only). Social media have penetrated health and medicine, and the impact on clinical care, patient-provider communication, and medical education is being studied intensively.^{3,4}

Twitter (www.twitter.com) is a privately held San Francisco-based company and a social networking “microblogging” tool in which users denoted by “@name” unique identifiers can send and receive updates called “tweets” of 140 characters or fewer.⁵ Posting a tweet requires an account and can be performed from the Twitter Web site, with a desktop or mobile application, or by cell phone text message. Twitter has become a cultural phenomenon, and users include celebrities, President Barack Obama,⁶ and protestors during the 2011 revolution in Egypt.⁷ Usage has grown remarkably since Twitter’s 2006 founding, with 100 million active users and up to 250 million tweets sent per day in mid-2011.⁸ According to the Pew Internet and American Life Project, 13% of US Internet users have used or currently use Twitter, with more than half accessing it with a

mobile device.⁹ Users choose to “follow” other Twitter users and can view their tweets in a constantly updated timeline. All tweets are in the public domain by default unless a user elects to keep updates private. Tweets can be organized by topic or theme through the use of optional hashtags, a community-driven convention for adding context and metadata. For example, adding #cancer to a tweet allows the community of users to identify that topic of interest, and searching on “#cancer” creates a “tweet-stream” that is constantly updated on any device used to access Twitter. User communities can be organized around hashtags of interest, which has led to “tweet chats,” prearranged synchronous online conversations in which interested users post tweets related to the same hashtag.¹⁰ Another common activity is “retweeting,” rebroadcasting the tweet of another user with the designated tag “RT.”

Reports are emerging in the medical literature on the use of Twitter for improving health and wellness, enhancing health care–related communication, and enhancing public health.^{11,12} Hospitals and health care institutions have increasingly embraced social media for branding, marketing, and patient education, with an unofficial US tally as of October 2011 of 4,118 social networking sites across 1,229 hospitals, including 814 Twitter accounts.¹³ Recognizing the impact of the growing popularity of social media on its membership, the American Medical Association published a *Policy on Professionalism in the Use of Social Media*, covering issues such as maintaining patient privacy, ensuring accuracy of content posted, and upholding public trust in the profession through responsible online interactions.¹⁴ Others have proposed that, in order to maintain the

highest professional standards, physicians should separate their personal and professional social networking identities.¹⁵ Nonetheless, in a content analysis of 260 physician users of Twitter, Chretien et al¹⁶ demonstrated that up to 10% had posted content deemed to be unprofessional, including potential patient privacy violations, profanity, and promotion of unsubstantiated health claims.

The number of physicians who currently use Twitter for both social and professional dialogue is thought to be low. A 2011 e-mail survey of 485 physicians (186 oncologists and 299 primary care physicians) reported in abstract form by McGowan et al¹⁷ showed that only 7% used Twitter for sharing medical knowledge with other physicians, and 33% stated they would never do so. Beyond anecdotal cases,¹⁸ there are few published studies examining the level of absolute awareness, adoption, and use of Twitter among oncologists. The purpose of this article is to examine the use of Twitter by physicians at, and subsequent to, the 2010 and the 2011 ASCO Annual Meetings and to characterize how Twitter is being used to enhance clinical communication and knowledge sharing among physicians.

Methods

In order to conduct an analysis of discourse surrounding the ASCO Annual Meeting in 2010 and 2011 (on-site attendance 2010 = 32,700; 2011 = 31,800), all tweets containing the official hashtags #ASCO10 and #ASCO11, respectively, were harvested from freely available tweet aggregator services. In 2010, the tool TwapperKeeper¹⁹ was used for the period June 3 to 9, 2010. Because of a change in the Twitter terms of service that occurred on March 3, 2011, the Twapperkeeper tool could not be used for data analysis in 2011. A tool with comparable functionality entitled The Archivist, which was compliant with the terms of service, was used in 2011 for the period June 2 to 7, 2011.²⁰ Although it is possible that a significant amount of content related to the meeting was generated by users who did not use a hashtag, the complexities involved in identifying and aggregating such data preclude those tweets from inclusion in this analysis. In addition, it could not be distinguished whether a tweet was generated on site in Chicago or from a remote location, as streaming videos of most of the sessions were posted on the Web-based ASCO Virtual Meeting²¹ within 24 hours of presentation. A total of 684 unique user names generated 4,456 tweets in 2010, and of these, 169 user names generated four or more tweets, accounting for approximately 84% of the entire conference Twitter discussions. In 2011, a total of 1,537 unique user names generated 8,188 tweets, with 321 user names generating four or more tweets (approximately 80% of the total meeting discourse). A demographic analysis of these high-frequency users was conducted in order to determine the author's name, location, professional background, and size of following by examining their publicly available Twitter profile or other accessible online information. The final analysis was restricted to English-language tweets only, and user names were excluded if their identity could not be established. In 2010, the

final data set comprised 979 tweets (29% of the Twitter discourse analyzed) collectively generated by 14 unique physicians. In 2011, the final data set comprised 1,477 tweets (approximately 23% of the total Twitter discourse) collectively generated by 34 unique physicians. Although a few studies have attempted to categorize tweets by purpose (conversational, self-promotion, news, etc),²² in this study we initially determined whether the physician-generated content was original versus retweeted and then assigned tweet discourse according to one of the following four subjective categories²³:

- Clinical management discussion (eg, commentary on data presented with a clinical management focus)
- Clinical news or trial outcome (eg, microreporting of breaking news or statements of efficacy/safety outcomes from scientific sessions)
- Promotional tweet (eg, self-promotion or retweet of a promotional discussion)
- Social comment or other tweet (eg, directions to a session, pass-along value, spam, conversational exchanges, personal or humorous tweets, or any other tweet not able to be assigned to the categories above)

The three physician authors independently performed subjective tweet assignments according to these categories, and the average categorical assignments are reported in Table 1. In addition, tweets were evaluated for the presence of any links and the mention of any drug names, abbreviations, or drug-drug combinations.

Results

In 2010, the 14 physicians who were the high-frequency tweeters generated an average of 70 tweets throughout the course of the conference, directed to an average following of more than 740 other Twitter users (Table 2). Assuming that each tweet was read by all followers, this would total 1,210,457 tweet-reader interactions. A total of 979 tweets were generated, of which 76% were original content and 24% were retweets. One physician user was responsible for 44% of the 979 tweets. Physician Twitter users predominantly used the medium to broadcast the results of clinical data presentations and disseminate their perspectives on the treatment implications of these data. A significant number of tweets also fell into the social/other tweet category. Of note, 55% of the clinically focused discussions in the final data set mentioned a total of 82 unique drugs or drug-drug combinations. Ipilimumab, featured in a plenary session presentation, was the most highly discussed agent overall with 87 mentions, followed by bevacizumab ($n = 18$) and crizotinib ($n = 13$).

In the following year, the number of frequent physician tweeters had grown to 34, collectively generating 1,477 tweets, with the average number of physician tweets decreasing to 43. Each user name broadcast their tweets to an average of 1,302 followers, projecting an estimate of 3,788,087 tweet-reader interactions. The universe of total #ASCO11 tweet discourse also swelled in 2011, and so this cohort generated only about 23% of the discourse incorporating the official hashtag. In contrast to

Table 1. Tweet Content Assignment by Blinded Rater

Tweet type	2010 Tweets (N = 979)				2011 Tweets (N = 1,477)			
	Rater 1	Rater 2	Rater 3	Average	Rater 1	Rater 2	Rater 3	Average
Clinical management discussion	31.4	25.3	20.9	25.9	15.2	24	17.6	18.9
Clinical news or trial outcome	23.2	27.2	35.3	28.6	38.9	39	46.5	41.5
Promotional	6	16.3	10.9	11.1	5.5	15.2	9	9.9
Social comment or other	39.4	31.3	32.8	34.5	40.4	21.8	27.3	29.8

2010, when the majority of content generated was original in nature, the 2011 physician group generated 52% original tweets and retweeted 48% of the time. Approximately 26% of all tweets in 2010 included a link to an external source, and the 2011 rate was similar, with 22% of tweets including links. In contrast to 2010, in 2011 there appeared to be less clinical management dialogue overall; however, the tweets did mention more than 100 unique drugs or drug-drug combinations. The frequency of drug mentions loosely correlated with abstracts featured in the plenary session. Vemurafenib was most frequently cited ($n = 34$), followed by bevacizumab ($n = 18$) and ipilimumab ($n = 15$).

Despite the 140-character limit of the Twitter platform, physicians were able to discuss and debate a variety of clinical issues within tweets, such as the magnitude of survival benefit, toxicity and serious adverse event profiles, and potential clinical implications of breaking data (Table 3). Some users expressed how Twitter improved their overall meeting experience, increasing understanding of the data through following others and through the instantaneous accessibility of the proceedings for those unable to travel to the event. When the 2011 tweets were compared with those from 2010, it appeared that there were fewer threaded conversations in 2011, for reasons that are not entirely clear but possibly related to inconsistent Wi-Fi coverage in the plenary hall in 2011, which reduced immediate interaction.

Follow-up surveys were conducted after both the 2010 and 2011 meetings to assess general use of and satisfaction with Twitter, focusing on the use of Twitter at the meetings in particular. The high-frequency physician Twitter users from 2010 and 2011 were targeted, although the surveys were anonymous and were open to all physician Twitter users. In 2010, there were eight survey respondents. Three reported that they had tweeted about the proceedings remotely, presumably because they were able to follow tweets and view sessions on the ASCO Virtual Meeting. Most reported that their Twitter use was the same or greater after the meeting and that they found Twitter discussions during the meeting useful. Overall, the quality of clinical discussions and information was perceived as credible. In 2011, 14 physicians responded to the postmeeting survey. Interestingly, of these respondents, 50% actually attended live, and 50% were following the proceedings remotely. The majority of this group used Twitter as a vehicle to learn about new studies, provide clinical commentary on breaking data, and disseminate breaking results to their followers. Three of the respondents reported using Twitter for self-promotion. Exam-

ples provided included promoting a poster presentation, sharing results of a clinical trial in order to recruit more patients, and generating traffic to a personal blog. In general, this group still appeared divided on the value of Twitter. They did not see a lot of oncology “thought leaders” tweeting, and the majority stated that the quality of information is contingent on knowing the people that you follow and maintaining transparency regarding the nature of any commercial interests tweet authors may have. Survey respondents agreed that Twitter is a valuable educational tool that allows for more rapid dissemination of news in a condensed fashion, but it is probably not a forum for discussing patient-specific information. Of note, one physician, who commented that ASCO 2011 was a “scientifically dull” meeting and that Twitter traffic is related to the volume of new data, proposed that this was the reason for the lack of clinical dialogue in 2011 compared with 2010.

Overall in both years, the significance of postmeeting use of Twitter information remains unclear, as the majority stated that Twitter usage did not currently affect the way they deliver patient care. Although this group of early adopters is not averse to using social media as an appropriate vehicle to discuss patient care, sites such as Facebook were cited as more secure and more conducive to closed discussions. Broadly speaking, time and technical limitations, coupled with skepticism regarding the general value of Twitter, were cited in these surveys as limitations to its broader adoption by the clinical community.

Discussion

Social media have revolutionized the speed and breadth at which we can access information. Within the realm of medical and academic congresses, Twitter appears to be a potentially beneficial tool for assisting clinicians to learn and instantaneously disseminate news on relevant medical advances. It may also enhance the conference experience for both on-site attendees and nonattendees, providing up-to-the-second colleague-generated commentary and perspective on breaking data, far ahead of traditional online or print news organizations covering the meeting, let alone formal peer-reviewed publication. This study demonstrated that Twitter could be valuable for a small but active subset of physicians attending the ASCO Annual Meeting (and some viewing the presentations remotely). Despite the 140-character limit, tweets conveyed content that was often robust and clinically relevant, accessible to peers and patients alike. Conversation threads could be discerned in this analysis, and there was a frequent back-and-forth dialogue between physician participants regarding treatment issues. Fur-

Table 2. Tweet Activity for Physicians Who Generated Four or More Tweets

Twitter name	2010		2011	
	No. of Tweets	No. of Followers*	No. of Tweets	No. of Followers†
alantanmd			12	121
Ascotwit‡	8	10	10	26
Colonrectum			5	21
ctsinclair			4	3,665
davidgrahammd			34	91
Doctor_V			11	7,048
DrAnasYounes	5	1,369	12	3,975
DrCesarNunez			4	182
drdchao	6	1	0	4
DrLCohen			9	539
drlemon			11	1,076
drlen			35	1,885
DRMarkham			13	426
DrRichLeff			18	78
drseisenberg			24	1,708
drsteventucker	50	1,412	40	2,221
DrWestGRACE§	80	797	0	0
fischmd			11	1,259
GlenWeissMD			6	0
HaemOnc			5	111
JackWestMD§			57	1,839
JediPD			31	524
jfclearywisc			8	487
krupali	6	1,794	26	3,611
Melanoma_doctor	73	98	13	622
melanoma_Drs	92	79	4	341
mfenner	78	489	24	1,280
mtmdphd			181	359
nycdoc29			18	19
oncologiaaf	5	495	0	697
PacificOncology	117	299	7	918
rsm2800‡	17	280	88	1,301
ryanmadanickmd			8	1,511
StocksMD	6	1,038	0	2,139
stuiteri			29	171
subatomicdoc			5	1,769
teamoncology	428	2,222	546	4,989
weldeiry			181	1,180

* No. of followers as counted on June 18, 2010.

† No. of followers as counted on October 8, 2011.

‡ Coauthors of this manuscript.

§ This user changed Twitter name from @DrWestGRACE in 2010 to @JackWestMD in 2011.

thermore, the utility of a tweet was often extended by linking it to external content, either the abstract being discussed or other content such as a journal article or photo. The importance of the social aspects of Twitter use at the conference should not be underestimated, as almost 40% of tweets were categorized as

social comment or other. A criticism frequently heard about the ASCO Annual Meeting is the impersonal nature of the conference, given the 32,700 attendees in 2010 and 31,800 in 2011 and the resultant congestion of the lecture rooms and exhibit hall. On one hand, social media such as Twitter may serve a valuable role by reducing some of these barriers. On the other hand, the extremely small number of physicians using Twitter in comparison to the number of meeting attendees suggests that this medium is not, at present, likely to replace the on-site social interactions anytime soon.

Our attempt to categorize the content of tweets (Table 1) with three independent observers was challenging. Although there was general agreement about social commentary (“meet me for lunch. . .”), it was more difficult to find agreement regarding the other three categories (clinical discussion, news, or promotional). We intentionally did not discuss our methodology for categorization so that the independence of the physician authors could potentially represent a larger point of view. Each of us read the examples listed and used these as a guiding principle. Numerous examples could be cited to illustrate this challenge. If a tweet from MD Anderson was about one of its scientist’s presentations, did it represent promotion or news? If it was related to a new paradigm in treatment or diagnosis, could it be considered a clinical discussion? In the end, we felt that the table was useful in trying to summarize three independent attempts at this type of analysis, even though other observers might well reach differing conclusions.

This study had several limitations. The number of physicians actively tweeting at both meetings identified by this study is small and may not be representative of typical physician users of social media. Furthermore, the number of physician Twitter users who were passive followers, who did not use hashtags in their tweets (or who used variants such as #ASCO2011 which were not searched in this analysis), or who keep their updates private is unknown, as our analysis was strictly limited to physicians who generated tweets using the two official hashtags. As the physician authors of this article will attest from their personal experience, the real power of Twitter is experienced more by passively viewing tweets and following embedded links, and less by generating content. Another limitation, as noted above, is that the analysis of tweet purpose we undertook was admittedly subjective, as the intent of the tweet author could not always be discerned in 140 characters. This was particularly true for retweets, for which it was often difficult to distinguish news reporting from commentary. Finally, the number of physicians who responded to our postmeeting Twitter surveys in 2010 and 2011 was small, and because the survey was anonymous, we could not determine whether the high-frequency physician tweeters identified both years were survey respondents.

We believe that professional associations wishing to promote Twitter as a legitimate medium to communicate meeting proceedings and enhance attendee experience should encourage participation through the development and advance distribution of official hashtags posted on their Web sites and their own Twitter accounts. ASCO first endorsed an official hashtag for

Table 3. Sample Physician-Generated Twitter Content

2010		2011	
Tweet	Author @	Tweet	Author @
RT @MaverickNY: Ipilimumab data looks promising in melanoma, but 1.5% death rate frm bowel perforation, immune response is a worry. Remember TGN1412 #asco10	drsteventucker	Overall, amrubicin v topotecan trial reminds me of topo v CAV in SCLC, or pemetrexed v docetaxel in NSCLC. I'd welcome amru option. #ASCO11	JackWestMD
Great results but how to reconcile with earlier neg Ipi trials? RT @matthewherper: Bristolâ€™s Big Win http://bit.ly/c62GMI #asco10 #melanoma	melanoma_Drs	@TTalessandroTT I totally agree. For bevacizumab, any trial is not good enough with PFS. Need improved survival improvement. #ASCO11	teamoncology
HLA A2 only, 50% of pts. I think yes. RT @BiotechStockRsr: ipi trial HLA restricted. Will FDA label have restriction? #asco10 #melanoma	melanoma_Drs	Despite heavy pretreatment pts had 61% response and durable responses to Crizotinib #ASCO11	weldeiry
If Ipi approved based on this trial, would/should it be used first line therapy? #asco10 #melanoma	melanoma_Drs	#ASCO11 #myeloma lenalidomide assoc second primary malignancies seems assoc w Len-Mel and not Len-dex. Benefit of Len for MM ctrl > risk	mtmdphd
If pending Ipi/DTIC versus DTIC study negative when analyzed, how should we view this study as DTIC better control arm? #asco10 #melanoma	melanoma_Drs	Anti-BCL2 obatoclax trial fails to show signif benefit in OS, but trends toward better RR, PFS, & OS in recipients of obatoclax. #ASCO11	JackWestMD
Sondak: Ipi optimal dose unknown with many different doses done in various trials #asco10 #melanoma	melanoma_Drs	The benefits of Zolindonic Acid on SRE in MM or solid tumors far out weigh risks inherent. #ASCO11 A comforting palliation.	JediPD
Abstract #004: impressive improv in overall survival with ipilimumab for melanoma. But study was restricted to HLA-A*0201 patients #asco10	mfenner	Second post-plenary thought: #melanoma thought-should dtic be added to Ippi-i don't think so, stays monotherapy #asco11	Melanoma_doctor
RT @Melanoma_doctor Sondak: ipi is toxic beyond that what med oncs used to. Training essential. Deaths even with experienced docs #asco10	teamoncology	#ASCO11 randomized phase III pazopanib versus placebo in metastatic soft tissue sarcoma progressed on chemo 3 fold PFS benefit.	alantanmd
My No. 1 ASCO news: Phase III Ipilimumab, with/or w/out gp100 peptide vax v. vax, improved survival in met melanoma. #asco10 immunotherapy	teamoncology	No definitive evidence that oxaliplatin effective in stage II colon ca even if hi and low risk stage II evaluated #ASCO11	weldeiry

its Annual Meeting in 2009. Since that time, we have noted an explosion in the use of meeting hashtags and Twitter dialogue associated with scientific meetings. Examples abound and include the American College of Cardiology ACC.10/i2 Summit, Atlanta, GA, March 14-16, 2010 (#ACC10); the American Society of Hematology 2010 Annual Meeting and Exposition, Orlando, FL, December 4-7, 2010 (#ASH2010); and the Society of General Internal Medicine Annual Meeting, Phoenix, AZ, May 4-7, 2011 (#SGIM2011). Meeting hashtags might be officially endorsed and promoted by a society before the conference, but this pattern is not consistent, as it appears that in some cases the meeting participants choose the hashtag themselves on site. This practice makes post hoc meeting analysis of the Twitter dialogue inconsistent.

It is likely that the number of physician Twitter users will grow as text input interfaces improve on smart phones and other mobile devices. Some physicians already actively use Twitter as a tool to increase patient referrals and enrollment onto clinical trials, so other novel uses for the medium will likely be developed. Professional medical societies such as ASCO can continue to promote the legitimacy and utility of social media for members and meeting attendees by embracing technologies such as Twitter and validating their use as mainstream communication. As with any new communication medium, societies should exercise appropriate caution to ensure that content in tweets sent from an official society account is accurate, appropriate in tone, and devoid of any protected health information. Societies might also consider adopting social media policies to govern the interactions between attendees tweeting or blogging and presenters, who might be concerned

about premature release of their data or data being reported out of context.²⁴ However, given the nature of social media, societies will have little control over tweets sent by conference attendees, whether they use an official hashtag or not. Moreover, setting up a Twitter account does not require authentication or even identification, so conflicts of interest cannot easily be discerned. Our analysis does not exclude the possibility that some of those tweeting about specific agents had a commercial interest in the products being discussed. Medical societies also need to better understand different physician learning styles and how younger physicians in particular may feel quite at ease with Web 2.0 applications.²⁵ As the cultural acceptance of Facebook, YouTube, Twitter, and other social media as legitimate forms of communication increases, medical societies must be engaged in this space to remain patient centered and relevant to their physician members.

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