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VIEWPOINT

#Cardioonc

Are We Reaching Across the Digital Aisle?

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Twitter is a social media and microblogging service that has grown in popularity since its inception, both in the public domain and more recently within many academic spheres (1,2). Twitter use during major cardiovascular symposia has recently gained significant traction because of its ability to deliver relevant scientific data in real-time to a global audience (3-5). Although prior work has illustrated an increase in Twitter use during cardiovascular meetings (1), data regarding its application within the field of cardio-oncology are lacking. Although data also suggest that social media facilitates medical education (5), our viewpoint is that there is an important need to better understand the impact and the quality of the information shared on Twitter (1-4).

To inform our viewpoint, we analyzed Twitter use within the field of cardio-oncology through a detailed assessment of utilization trends during 5 major cardiovascular and 5 major oncological meetings from 2014 to 2018. We evaluated the utility of social media as a tool for medical education through content analysis of tweets for scientific relevance and educational value.
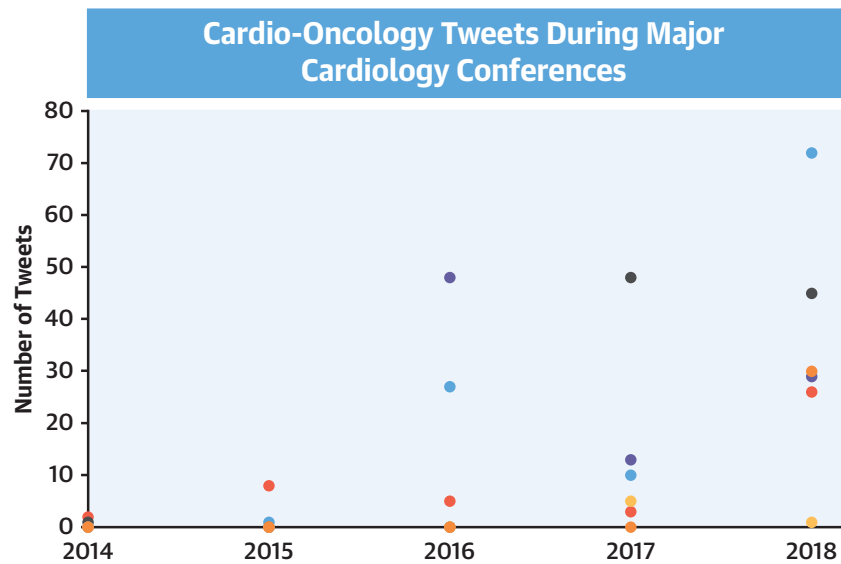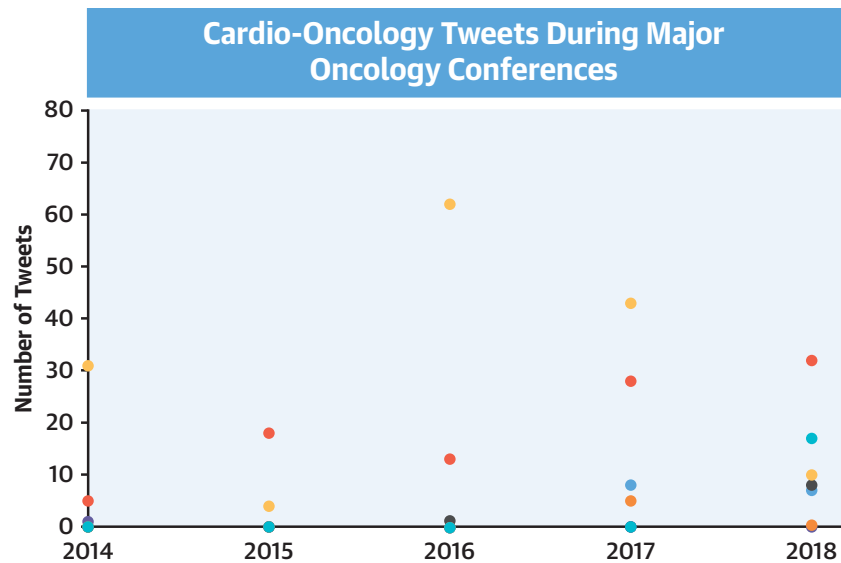
Symplur Signals (Symplur LLC, Los Angeles, California), a health care social media analytics platform, was used to access data for the 2 official hashtags within cardio-oncology: #CardioOnc and #CardioOncology. Hashtags used during 5 major cardiology and 5 major oncology conferences from 2014 to 2018 were analyzed (Figure 1). Official dates of these conferences were listed on the respective society websites. The analysis period for each session was defined as 3 days before the official beginning of the conference, the conference itself, and 3 days following the conclusion of the conference. Institutional review board review was not required per the primary authors' institutional policy, because Symplur's database draws on publicly available data.

All tweets published during the study period were analyzed for relevance and content by a single independent physician reviewer (S.B.J.); ambiguity was resolved by a second reviewer (E.H.Y.). Tweets were considered relevant if they included the official conference hashtag or directly referenced the conference or organizing society. #CardioOnc and #CardioOncology tweets that occurred during the conference period but did not reference conference material were excluded from review. Tweets were categorized as scientific (educational, related to meeting content), administrative (direct attendees to meeting sessions or locations), industry (nonacademic institutions, advertisements), or social (not related to conference or scientific topic). Tweets were analyzed for the presence of additional media (images, videos, tutorials, and paper links). Finally, tweets were classified as "high" or "low" quality for educational potential based on predefined criteria. Tweets were considered high quality if they contained the following: 1) new data presented at the conference; 2) images or videos pertinent to the subject matter; and/or 3) links to guidelines, papers,

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FIGURE 1 A Comparison of Cardio-Oncology Tweets Related to Major Society Meetings

Annual tweets related to major cardiology and oncology academic meetings.

abstracts, or expert opinions. Tweets that did not meet these criteria were deemed low quality.

There were a total of 14,935 tweets tagged with #CardioOnc or #CardioOncology between January 1, 2014, and December 31, 2018. Of these tweets, a total of 5,759 (2,337 cardiology and 3,422 oncology) were posted during major cardiovascular or oncologic symposia. Further analysis showed that 374 and 294 tweets were cotagged with a cardio-oncology hashtag and either the official cardiology conference or oncology conference hashtags.

There was an increase in the total number of cardio-oncology conference-related tweets annually from 2014 to 2018. The number of total conference-related tweets in cardiology rose from 3 in 2014 to 203 in 2018, with the majority related to the American College of Cardiology (ACC) and the Heart Failure Society of America (27.27% and 25.89% of tweets, respectively). The smallest number of tweets was seen in the Heart Rhythm Society, with only 6 tweets from 2014-2018 (1.65%). Oncology conference-related tweets rose from 37 in 2014 to 75 in 2018, a 102.71% increase. The majority of tweets occurred during the American Society of Hematology (ASH) and the American Society of Clinical Oncology (ASCO) conferences, representing 52.26% and 32.06% of total oncology conference-related tweets. The smallest number of tweets stemmed from the San Antonio Breast Cancer Symposium (17 [5.92%]), the American Association for Cancer Research (15 [5.23%]), and the European Society for Medical Oncology (3 [1.04%]). For both cardiology and oncology conferences, most tweets were classified as scientific (249 [66.58%] and 194 [65.99%], respectively). The total number of Twitter users increased from 32 in 2014 to 223 in 2018, a 597% increase. The majority of analyzed tweets were authored by physicians (488 [73.05%]) with tweets from every continent—the majority from North America (70.57%), Europe (19.43%), and South America (5.33%).

A total of 196 (52.41%) tweets during cardiology conferences were graded as high quality based on the prespecified criteria and were predominantly composed of scientific images (47.45%) or links to major guidelines and papers (58.16%). A total of 177 (60.20%) tweets during oncology conferences were characterized as high quality, with a majority caused by sharing images (76.63%) or links to major guidelines and papers (24.56%). A total of 6 tweets contained video media, of which 4 were lecture recordings and 2 were short educational videos. All tweeted videos were published during the 2018 ACC conference. Among both cardiology and oncology conferences, a total of 284 tweets were characterized as low quality, the majority of which were social content (84.21%).

The use of Twitter has become a powerful tool by which late-breaking science is broadcasted during medical conferences (4) In the era of the COVID-19 pandemic, Twitter has further demonstrated its ability to rapidly disseminate meaningful and potentially practice-changing data in real-time (6). Several studies have also investigated Twitter's emerging role in fostering academic promotion (3,7). Although these studies have established the rise of Twitter use in academic medicine, there has been no study to date that analyzes Twitter use related to cardio-oncology.

In this Viewpoint, we highlight the rapid increase in Twitter use related to cardio-oncology during major cardiovascular and oncologic conferences. This parallels observations in the larger academic societies, where Twitter is being used to promote and discuss scientific material (1,4,8). As cardio-oncology is becoming increasingly recognized as a specialty, one goal is to identify societies where there may be less exposure to this field. By highlighting these areas, we hope to identify venues to raise awareness of the specialty and foster academic conversation over social media.

We identified several notable trends in Twitter activity during both cardiology and oncology conferences. In the larger cardiology societies, although we do note a substantial increase in cardio-oncology Twitter activity in the ACC and Heart Failure Society of America, the American Heart Association saw relatively fewer tweets. There were also very few tweets seen in the more subspecialty-focused conferences of the Society for Cardiovascular Angiography and Interventions and Heart Rhythm Society. Within oncology societies, there was an overall growth in cardio-oncology Twitter activity; however, this increase was relatively smaller than that observed in cardiology societies. The majority of tweets were seen in the larger U.S.-based oncology conferences (ASH, ASCO), and relatively few were seen during the European Society for Medical Oncology and American Association for Cancer Research conferences and during the GI and GU conferences of ASCO. These societies could represent possible avenues for cardio-oncologists to spread awareness of the specialty.

One notable finding was the large increase in the number of tweets during ASH in 2016, caused by multiple retweets of an image containing updated guidelines related to screening for cardiac disease in patients treated for Hodgkin's lymphoma (46.78% of total tweets). There was then a substantial decrease in tweets seen during ASH, from 43 tweets in 2017 to 4 in 2018. Upon review, we found that the majority of tweets in the prior years appeared primarily from 2-3

users who had either not attended ASH in 2018 or had refrained from posting on Twitter during that year. Fewer tweets from these individuals with thousands of followers led to a substantial reduction in Twitter activity overall in 2018. These findings demonstrate the influence that individual Twitter users can have in engagement.

Our analysis indicates there is educational potential for Twitter use during academic symposia. Content analysis of tweeted content revealed that a majority of tweets were scientific in nature and confirmed that the tweets provided educational value based on our quality metrics. The findings further illustrated that Twitter users employ broad methods to propagate scientific information, as evidenced by the large increase in published scientific images, links, and videos. Taken together, these findings corroborate the ongoing rise of social media use during national meetings and the scholastic value of the dissemination of high-quality data.

There are limitations to our analysis. First, underuse of official conference hashtags and/or established cardio-oncology hashtags likely augments undercaptured data. Second, content categorization of tweets was a subjective process, as the authors' intent could not always be accurately determined. Third, because of the smaller quantity of tweets during conferences related to cardio-oncology, individual users could potentially have a significant impact on the conference total tweet volume, as outlined in detail previously.

Although this is an initial step toward understanding Twitter content in the academic community, there are several areas that have yet to be investigated. Further analysis of impressions and engagement could further inform Twitter's impact on medical education. The methods used in this study could also be applied to other subspecialties of medicine to characterize and contrast both usage and content. Last, academic Twitter usage has very likely changed during the COVID-19 pandemic, especially with most national conferences (9) and didactics (10) assuming a virtual format. Studies investigating social media use during the pandemic can inform future efforts in medical education.

There has been significant Twitter growth with both cardiology and oncology conferences, but less in oncology, and less in oncology subspecialty conferences. We feel that understanding trends in social media use can be used to target subspecialty fields with relatively low dissemination of cardio-oncology-related subject matter in cardiology, hematology, and oncology to raise awareness of cardio-oncology education and improve multidisciplinary patient care and collaboration.

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