

REVIEW ARTICLE

Social Media as a Means to Disseminate and Advocate Cardiovascular Research: Why, How, and Best Practices

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Abstract: The use of Twitter or other social media platforms for research can transcend current limitations in the dissemination of research and present new opportunities for research networking by connecting researchers, clinicians, policymakers, the public, and other stakeholders on a global scale. As social media influence continues to expand, it becomes increasingly important for cardiovascular researchers to employ social media strategies to increase the impact of their research work, for the ultimate goal of improved outcomes for patients living with or at risk for cardiovascular diseases. Altmetrics are novel metrics that track the attention that scholarly outputs are receiving in non-traditional sources such as in the news, blogs, and social media posts. These alternative metrics record research dissemination beyond traditional journal citation indices, while also predicting and even promoting future citations. This review outlines various methods of how social media can be used to disseminate research, guidance on how to develop a social media portfolio for consideration of academic promotion, and some best practices for promoting one's research work.

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1. INTRODUCTION: SOCIAL MEDIA FOR CARDIOVASCULAR RESEARCHERS

In 2019, Twitter reported 126 million daily active users, with over 69 million users in the United States alone [1]. With the widespread use of social media platforms, it is imperative for cardiology researchers to consider the possible impact and utility of social media for the dissemination of their research work. Multiple studies have investigated social media, and Twitter in particular, as an effective means to present research work, with a study in 2011 demonstrating that the number of tweets in the first 3 days of publication can predict whether a publication will be highly cited [2]. The use of Twitter or other social media platforms for research can transcend current limitations in knowledge translation and also present new opportunities for research networking by connecting cardiovascular researchers, clinicians, policymakers, the public, and other stakeholders on a global scale (Fig. 1) [3]. As social media influence continues to expand, it becomes increasingly important for cardiovascular researchers to adapt to modern technologies and employ social media strategies to increase their research impact. This is for the ultimate goal of improved care and outcomes for patients living with or at risk for cardiovascular diseases.

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2. ADVANTAGES OF SOCIAL MEDIA USE FOR RESEARCH

2.1. Social Media and Rapid Dissemination of Knowledge

One of the greatest challenges in academic medicine is the delay in the clinical implementation of new information after the release of research publications. A prior study estimated that there is a lag of approximately 17 years for the translation of new research to reach patient benefit [4]. Maloney *et al.*, have suggested that a possible barrier to translation is the limited time physicians have to find and engage with new publications; they demonstrated that social media can be an educational tool to bridge that gap [5]. In a study involving 317 clinicians across different disciplines, the authors found that presenting evidence-based knowledge through posts with key findings and links to open access publications composed an effective educational model for physicians [5]. This model could be adapted for research findings, specifically, and keep clinicians up-to-date with breakthroughs in cardiovascular research and important clinical trials.

Cardiovascular clinicians and researchers who use social media can stay updated with new research and begin incorporating novel information and techniques into clinical practice or designing future studies. Traditional journals, which typically have smaller audiences or subscriber bases, are less efficient in disseminating research, but, a strategic promotion on social media can rapidly increase the exposure of new

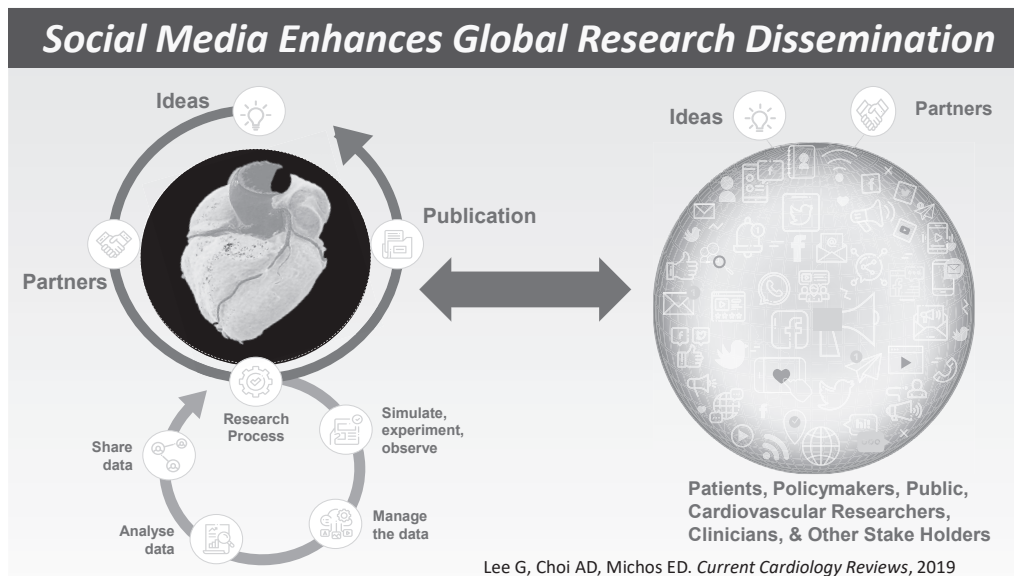


Fig. (1). Mechanisms to enhance global research dissemination through the use of Social Media. (A higher resolution / colour version of this figure is available in the electronic copy of the article).

Fig. (2). Altmetric score, a non-traditional bibliometric, measures a publication’s real-time global impact. (A higher resolution / colour version of this figure is available in the electronic copy of the article).

publications to the global audience that accesses online content [3, 6]. The instantaneous availability of work to a targeted audience may also spur essential reactions that improve modern research, such as commentary, post-publication peer review, or greater discussion surrounding the research topic [7].

2.2. Altmetric: a New and Complementary Metric to Traditional Citation Counts

Social media presents new considerations in regard to a publication’s impact. Citation counts are important metrics for measuring the usefulness and quality of a published work. Traditional metrics used in academia, such as citation count, journal impact factor, and the H-index, are all used

when researchers are considered for promotion and academic appointment [6]; however, these conventional systems are linked to certain limitations when it comes to measuring the impact efficiently and accurately. Not only do traditional citation counts accumulate slowly, these metrics may favor men (see more on gender implications below). Furthermore, traditional metrics do not account for a journal article’s impact online. The use of social media to publish research findings introduces a different metric system that considers how social media, online media coverage, public blog discussions and documents might contribute to research impact (Fig. 2) [3, 6, 8]. Known as Altmetrics, these non-traditional bibliometrics are used to complement conventional methods [8]. By tracking the views an article receives – the number of

appearances, mentions, or more generally, “impressions” of a publication – from a broad variety of online sources from the moment the work is published, Altmetrics quantify a publication’s impact score almost in real-time, and much faster than citation counts could demonstrate [6].

Research also suggests that a publication’s Altmetric attention score can be correlated to traditional citation counts [9, 10]. A recent study that analyzed over 900 cardiovascular research publications in 8 different journals showed a “modest correlation” between Altmetric score and the number of citations a paper received from 2015 to 2017 [9]. Twitter use, in particular, has been connected to greater citations and a higher journal impact factor [11]. A 2016 study of the top 50 radiology journals by impact factor showed that journals affiliated with Twitter accounts had higher impact factors than the ones without [10]. An even more recent study showed that major cardiology journals with more Twitter activity had higher Altmetric scores and impact factors [12]. In this analysis of 28 cardiology journals, the journal’s impact factor correlated with their number of followers and increased with the number of tweets per year [12].

2.3. Social Media for Women in Academic Research

As mentioned above, traditional citation count metrics may favor male researchers. With fewer female authors represented in medical journals and men being more likely to self-cite, the probability of men receiving attention for their research and becoming eligible for promotion increases relative to women in their same field of research [6, 13]. In contrast, social media may foster non-traditional opportunities for women to disseminate their research in a forum that does not depend on conference invitations or senior sponsorship [14]. Thus, social media may level the playing field by presenting a more equitable opportunity for researchers of any gender or experience level to elevate their voices and their science in the cardiovascular research community.

A study by Cawcutt *et al.* evaluated the effectiveness of disseminating publications through Twitter by hosting a “tweet chat” that highlighted eight recently published articles pertaining to workforce gender equity. Twitter analytics and Altmetric data were collected before, during, and after the tweet session, which itself had been promoted on social media a few weeks before [13]. During the chat, questions related to each article were posted to Twitter, prompting public response. TweetReach analytics counted 1500 tweets posted during the event that had the potential to reach 569,785 Twitter users. After the event, the Altmetric attention scores for all eight articles increased by an average of 126.5 points. One article, reported a 1093% increase in article downloads. The study ultimately concluded that social media can be used strategically to increase dissemination and interest in journal publications. Social media was a key strategy in calling attention to these gender equity studies, and can be similarly used to promote and advance research work led by female researchers (first and senior authors).

2.4. Building a Network of Collaborators and Followers

In addition to spreading information faster than traditional journals, social media can help facilitate networking with researchers who have similar interests. The use of the

hashtag (#) on Twitter sorts posts into relevant topics and appears in the feeds of Twitter users that follow that thread. By using relevant hashtags that relate to the field of one’s publication, such as #Cardiotwitter or #CardioEd, Twitter makes it easier for collaborators to engage with the work, possibly leading to increased viewership, more citations, and potentially more projects [3]. Increasing the visibility of work by amplification of impressions is important for both rapid dissemination and for prompting further research; As cardiovascular disease remains the leading causes of death globally [15], it is an important responsibility of researchers in cardiology to build science and disseminate knowledge as quickly as possible by using every tool available. Twitter and social media can certainly allow researchers to find these connections quickly.

With a larger Twitter following, a researcher’s posts may reach beyond the medical community and ultimately increase the number of impressions a post receives. A study found that scientists with fewer followers tend to tweet to other similar scientists, but once scientists reached a critical mass of more than 1000 Twitter followers, their followers included more non-scientists such as common public, members of media, and government/political decision makers [16]. Posts with novel research developments could reach individuals in education, law, and government. By directly disseminating published work to a lay audience, the research could have a more direct impact on policy changes seen in the community. Attention from news sources presents opportunities for research work to be presented on television or news media, both of which would contribute to a work’s Altmetric score. Such opportunities have the potential to greatly increase interest in or education about the research topic in the general public. Adding information for public access may also invite patients to be more active and responsible for educating themselves with new research pertaining to their health.

3. RESEARCH PRESENTATION APPROACHES

Cardiovascular researchers should focus on building a strong following to which they can present their work. Tweets can connect research findings and ideas to collaborators, policymakers, and the public alike (Fig. 1). So how can researchers begin incorporating social media use into their dissemination techniques? While social media offers a multitude of ways to present work, such as blog posts and podcasts, cardiovascular professionals should prioritize producing interactive and engaging content. There are several different ways for researchers to present their work in a creative manner that will maximize engagement with a post and build the foundation of a strong and involved follower base. While individual Twitter posts are limited to 280 characters, opportunities for deeper discussion can be attained in the setting of Twitter journal club discussions, tweetorials, press releases, links to podcasts, and amplification of scientific conferences (Fig. 3).

3.1. Twitter Journal Clubs

One way to present one’s work or engage in discussions about cardiology research is to join Twitter Journal Clubs, such as the American Society of Echocardiography



Fig. (3). Social Media for Academic Research: the Why and How?

(#ASEchoJC), *Circulation: Cardiovascular Interventions* journal (#CircIntvJC), and *Heart* journal (#HeartJC), among many others. Similar to a traditional journal club, researchers participate in an online group that regularly discusses and evaluates recent publications in a specified field or topic [3, 17]. A few different models for a Twitter-based journal club exist: the club #GeriMedJC is hosted at the same time as an in-person club meeting. #NephJC hosts frequent but short live sessions that introduce new publications in depth. #UroJC occurs over a period of 48 hours, allowing enough time for a detailed discussion [18]. Participation in an online public forum or discussion promotes engagement with new research, facilitates new connections with other academics in the field, and provides opportunities to introduce one's own research work. As an example, one of the authors of this article (Dr. Michos) recently had one of her publications [19] discussed in a Twitter Journal Club by the *Journal of the American Heart Association* (#JAHAJC) on January 9, 2019, a discussion which included 127 participants and generated 755 tweets and over 5 million impressions [20]. This garnered wider attention to her work. Cardiovascular researchers should consider joining an existing club or create an open one with other committed collaborators.

3.2. Tweotorials

Another approach to disseminating one's research is to create a "Tweotorial" on Twitter, during which one can present the important points of new research through a "thread," which is a series of multimedia tweets that are linked and posted all at once [3]. Professionals in cardiology have already used tweotorials for other educational purposes (such as topics of clinical medicine), but its structure can be easily repurposed for research dissemination. For example, one could start by posting the research question along with an image, containing statistics or background information that prompted the investigation. The tweets that follow might briefly mention the methods used

or display some of the data that was collected. A graphical abstract or electronic poster could highlight the key take-away findings of the study that would pique the interest of readers, with the final tweet directing the reader to learn about the complete discovery by reading the publication itself (link to the URL of the article). Since there is a 280-character limit per tweet, each post in the thread must be short and engaging in order to encourage the reader to continue following the walkthrough to their ultimate destination: the researcher's publication.

3.3. Tweet Chats

Similar to the journal club format, a twitter chat can be conducted around a specific research topic, rather than a single publication. A strategy similar to the aforementioned case study on workforce gender equity is an effective and engaging approach; instead of just discussing the details of the articles, authors pose questions directed toward other professionals or stakeholders in the field. The tweet chat on gender equity was sponsored by *Physicians Weekly* and focused on eight different articles. Based on the success of their event, researchers might consider collaborating with other authors or having an outside twitter account, such as that of the publishing journal, to help facilitate discussion [13]. The questions posed should be open-ended to generate discussion on themes of the research presented or directions that future research might take. While not focusing directly on the publication itself may seem counterintuitive, raising attention to related questions and crowdsourcing opinions in a facilitated way can be a beneficial learning opportunity for both participants and researchers while increasing a publication's exposure.

3.4. Press Releases

The lead or corresponding authors should also take advantage of press releases put forth by their institutions or by

the journals. Researchers should work with their respective media teams to make sure these releases accurately represent their work and are not over-sensationalized or overreaching from the study conclusions. Reposting of these releases on social media can further amplify impressions for any published work and boost Altmetric impact. Since press releases are written in clear language designed for a general public audience, these posts can attract a wide audience of readers who may be interested in the research topic. Researchers should be sure to tweet any article that covers their recent publication, and retweet any post that promotes their work, including any posts by the publishing journal's Twitter account.

3.5. Amplify Research Presented at Scientific Sessions

Using Twitter during research conferences is another excellent way to promote new research findings presented *via* posters and oral abstracts at the meeting. Many past cardiology conferences have created event hashtags, such as the Scientific Sessions for the American College of Cardiology (#ACC19), the American Society of Echocardiography (#ASE2019), the Society of Cardiac Computed Tomography (#SCCT2019), and the European Society of Cardiology (#ESCCongress). These meeting hashtags promote an interactive environment and enable dissemination of key takeaways and findings to clinicians, researchers, and even patients who are following online [21]. Any post introducing new research presented in oral or poster abstracts should include the conference hashtag so that it reaches the audience following along with the meeting. It is suggested that abstract presenters also include their own twitter handle name on their poster or on their slides so that others can tweet about their work and tag them in their posts.

4. USE OF SOCIAL MEDIA METRICS FOR ACADEMIC PROMOTION

While still in the early stage of adoption, more institutions have begun including Altmetric scores in academic promotion considerations. Thus, the strategic dissemination of research *via* social media provides the unique opportunity for women and younger researchers to garner attention for their research work more quickly [6, 13, 22]. The Mayo Clinic Academic Appointments and Promotions Committee started considering academic social media use in addition to citation count, grant awards, and other typically recognized achievements in 2016 [22]. With 69% of adults on social media and 24% of adults specifically on Twitter as of January 2018, many of whom are physicians, researchers should take advantage of Twitter's wide reach scope and preemptively begin building online portfolios to promote their publications and ultimately advance their careers [23].

4.1. Social Media Portfolio

Cardiovascular professionals may consider developing a "social media portfolio" to demonstrate how social media was used to meaningfully increase the impact of their research work and/or their institution. This portfolio could be included as part of the submission for consideration of academic promotion. A recent perspective article recommended

that this portfolio outlines a "social media scholarship philosophy" that aligns with institutional values and policies. If alternative metrics are to be used during deliberations for academic promotion or appointment, researchers must demonstrate that their social media presence is engaging and promotes academic discussion [3]. Similar to a traditional *curriculum vitae*, the portfolio should have a clear objective, describe any original content made, and explain any favorable result attained by social media participation. By documenting successful instances of effective social media promotion, displaying impact and Altmetric scores, and demonstrating how social media use aligns with established institutional priorities, researchers can provide evidence that social media is a worthwhile means of research dissemination that institutions should consider when deliberating a faculty member's merits for promotion [3, 6, 22].

5. BEST PRACTICES

Regardless of the approach taken, there are best practices that, when followed, may increase readership, generate discussion, and widen the impact. Simply choosing an appropriate time to post a publication is quite easy and can be extremely effective [24]. Sprout Social, a social media management company, performed an analysis on over 25,000 social media users to determine "peak posting times" for publications. According to Sprout, the highest twitter engagement is around 9:00 am, which is likely when readers are catching up with the latest news and updates first thing in the morning [25]. However, this time may not be ideal for reaching cardiology clinicians who are likely to be engaged in clinical activities during work hours. While researchers do not need to strictly follow peak posting times, they should consider when their own specific target audiences will be awake and available to be scrolling on social media instead of working. Sprout also noted that there is typically higher Twitter engagement on Wednesdays, and lower engagement on Saturdays [25].

On the post itself, cardiologists should always include a link to their publication or the relevant journal so that an interested reader can easily access the publication without wasting extra effort to search for it. Using the "@" symbol, investigators should "tag" all the collaborators who contributed to the project and the publishing journal to assign credit where it is due and to expand the reach of one's post; the post will appear to followers of anyone tagged, which could help build one's own twitter base. Relevant hashtags should also be added so that people who are interested in the research topic can still find the research even if they are not following any of the tagged investigators. Some of the most widely used general hashtags include #CardioTwitter and #CardioEd, with more specific hashtags related to subspecialties or conferences, such as #EchoFirst or #ACC19 [3]. Adding hashtags to further categorize research into specialties or highlighting conferences where the research was presented selectively curates an audience that is most likely going to read the content.

Adding a graphic to a post also increases readership. The *PM&R* journal recently implemented a social media strategy pairing recent publications with hashtags and a compelling image, which resulted in a 56.2% increase in followers to the

PM&R journal account and a 565% increase in total engagements with the account, whether through tweets, retweets, mentions, or profile visits [26]. A social media management platform called Buffer found that its posts with images received 150% more retweets than those without [27]. An effective graphic is uncluttered and provides clear data or important discoveries. One might consider posting large text about a research finding with a small graph underneath. A colored and eye-catching image will grab the attention of scrolling readers and increase the likelihood that they continue to engage with the post, and, presumably, read the content of the publication. Researchers must be particularly careful that any images or figures do not violate copyright, and that any public posting of such images has received the necessary and appropriate approval.

All posts should be devoid of any patient's personal information and should be double-checked with HIPAA regulations and institutional guidelines. After posting, an investigator should stay selectively engaged with threads or posts pertaining to their work. Answering meaningful or clarifying questions about the research and staying informed about the conversation surrounding one's work can help build a Twitter following while also preventing the spread of any misleading information.

Posts should be varied in content and, if possible, posted on multiple platforms. A study by the Mayo Clinic found that posts with original content were more engaging than retweeted posts. In order to gain more followers, tweets should be based on a diverse array of topics, ranging from journal articles and upcoming conferences to relevant cardiovascular clinical and science updates. Tweeting or retweeting at least once or twice a day will help keep the account active and maintain the follower base. While Twitter use has been the primary focus of this article, other highly used social media platforms, such as Facebook and Instagram, should not be discounted. Facebook posts can follow similar guidelines to twitter posts, with the exception that there is no text limit. Text can be a little more detailed but should remain relatively short, and images and links to the publication should be included. Instagram is an image sharing site where the emphasis should be placed on an eye-catching infographic. Of course, Twitter has a more open structure that allows posts to appear in the feeds of people who are likely to engage with the content; unlike on Facebook, Twitter feeds are not necessarily limited to what approved "friends" post or promoted advertisements. Facebook and Instagram certainly take more time and require strategic use; however, with 68% and 35% of adults using Facebook and Instagram respectively, publicly posting on multiple platforms can help spread content to a larger audience. The number of social media platforms is not as important as regular posts and an engaged following, and it is up to an individual to decide which platforms they would prefer to be active on [23].

6. CONSIDERATIONS: THE DON'Ts

As scientific professionals in cardiology, it is our responsibility to present information as accurate findings and not as clickbait. Accuracy should not be sacrificed for simplicity.

Researchers posting about their work must be aware that people may not read the full article, and that posting inaccurate or misleading information could lead to misunderstandings and real consequences. One should be clear when reporting observational research that there is a difference between associations and causal inferences. Any quotes must be cited properly so readers can verify all information. The language used in the post must also be refined. The goal of a post or thread is not to be extensive or information-heavy; a reader should not be able to learn the entire purpose and discovery of a publication through Twitter. Rather, they should be able to glean the topic and perhaps preliminary data, prompting them to actually read the publication itself. Investigators should be thoughtful in their writing and avoid excessive jargon or causal language when presenting research findings.

Clinicians must take care to *not* make any personal medical treatment advice online, as these should be left to a person's medical provider. Avoid wasting time on Twitter by only responding to comments when it is productive to learning or engagement, and never respond to a tweet with information that violates HIPAA. As with any social media account, researchers should be reminded that their online activity, in addition to their published work, is representative of the institutions that they work at. Since twitter and all other social media platforms are public and generally unmoderated spaces, respect and professionalism should always be prioritized. Whether an investigator is discussing their own research or commenting on another's work, all disagreements should focus on the ideas presented or the research conducted, rather than an author or critic's character.

CONCLUSION

In summary, cardiovascular professionals have found numerous advantages of participating in social media: physicians can stay updated with medical breakthroughs, forge new connections with potential collaborators, and engage with a larger community that works towards improved heart health and care. By providing access to a global community and with committed participation of cardiovascular professionals, Twitter and other forms of social media can strengthen the impact of new research on clinical care and facilitate new research questions in the cardiovascular community. Social media offers the advantages of rapid dissemination of research work, potential increases in the novel and traditional impact metrics for publications, and may also facilitate academic promotion. However, along with the great potential and power of social media comes the responsibility that its features are being utilized appropriately and that scientific information is being disseminated accurately and rigorously.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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