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EARLY CAREER PERSPECTIVE

#Cardiotwitter: The Global Cardiology Fellowship

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From the early days of medicine, aspiring physicians learned medicine by apprenticeship, gaining knowledge by following and learning from older experienced physicians. In the late 18th century and the beginning of the 19th century, hospital-based medicine training was introduced and increasingly gained popularity. In the 20th century, official organizations were established to oversee medical education and training, with rules and regulations put forth to ensure physicians-in-training receive adequate medical training before independent practice.[1] This evolution in medical training took a unique turn in the 21st century, where social medial platforms in general, and Twitter (#CardioTwitter) in particular, became a rich source for knowledge exchange and dissemination.[2–6]

In the United States, postgraduate training is the default pathway for physicians who want to go into clinical practice.[7] Specialty training focused on the ability to gain as many experiences as possible within a prespecified time frame. Slogans such as "you only train once" became central to the physicians' training programs, partly justifying the long training path and at times the long working hours. Logbooks became the standard for keeping track of cases and procedures that a trainee performed, and unusual cases with educational merit would be shared among all trainees in the program so as not miss learning opportunities. Before the Information Age and Digital Revolution era, a cardiologist could practice over a lifetime without encountering certain diseases or phenotypes. At that time, gaining and disseminating knowledge outside of one's own institution occurred mainly at (inter)national conferences, case reports and publications in scientific journals, and educational activities.

Twitter was launched in 2006 as a microblogging website. Biz Sone, the cofounder of Twitter, grew up in Boston and chose to name the bird logo after Larry Bird (from the Boston Celtics who was regarded as one of the greatest basketball players of all time). The #CardioTwitter hashtag refers to the community of individuals interested in cardiovascular sciences. It has grown tremendously overtime, with more than 600 000 tweets using this hashtag since October 2017.[6] Other popular cardiology-related hashtags include #RadialFirst, #echofirst, #whycmr, #CVNuc, #YesCCT, and #Epeeps. These hashtags are used to group topics and create communities that can be easily searched for and posts accessed.

#CardioTwitter represents a fascinating collection of tweets by healthcare providers and scientists from all walks of life covering a wide range of topics centered around cardiology-related topics. #CardioTwitter provides unprecedented opportunities for fellows-in-training and cardiologists alike. New knowledge is the everlasting fuel of #CardioTwitter. As a platform, one can ask questions, share experiences, discuss difficult cases, and present a unique imaging or diagnostic finding. In addition, #CardioTwitter is a strong platform to report live from various medical conferences around the globe, allowing for immediate transmitting of knowledge and flowing of ideas as well as lively discussion. Perhaps this has been most appreciated during the COVID-19 pandemic, when many conferences have gone virtual.

A step further is sharing parts of the new knowledge one acquires in a brief and concise manner. Notably, #CardioTwitter can also be used as a citation manager. By posting on Twitter the abstract, key images, link to

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the article, and the hashtags relevant to the topic (in addition to #CardioTwitter), one can create a continuous archive that can be accessed and searched using the Twitter handle and the hashtag to find the study of interest. Another excellent educational approach is using a group of succinct tweets about a certain topic to teach others about a specific issue in medicine or cardiology, termed a *tweetorial*. Many colleagues have made this part of their online portfolio, expanding the understanding of mechanisms underlying diseases.[8] Others have used #CardioTwitter to disseminate new techniques in interventional cardiology such as #distalradial. The international nature of #CardioTwitter makes it an exceptionally rich source for learning and getting exposed to how different healthcare systems and providers around the world approach certain issues. Aside from #CardioTwitter, other metrics exist to measure article engagement on online platforms including the Altmetric Attention Score and are largely driven by Twitter engagement. The Altmetric Attention Score is an automatically computed score that provides a weighted count of all of the attention a research output has received. It is well tracked by academic journals and has been investigated as complementary to other citation indices.[9] Despite an earlier randomized trial showing no difference in article page views at 30 days,[10] cardiovascular journals such as *Circulation*, *Journal of the American College of Cardiology*, and *European Heart Journal* recognized the power of #CardioTwitter, appointing social media editors to their editorial boards and restructuring article submission processes to include information about author Twitter handles and a suggested tweet for when an article is published.

#CardioTwitter especially represents a unique opportunity for cardiology fellows-in-training. An essential component of training is to get exposure to as many cases and pathologies as possible. Other essential components are learning how others approach complex presentations and how to troubleshoot unusual procedural challenges. In the Figure, we present an example of a comparative evaluation of experiences and knowledge acquired during imaging fellowship training (A.M.) and #CardioTwitter-based learning as well as the complementary intersection between those 2 worlds. This contrast is mainly driven by the prevalence and incidence of certain diseases and phenotypes. When sharing clinical cases on #CardioTwitter, utmost care should be taken to avoid inadvertently sharing identifiable patient information and imaging. Finally, #CardioTwitter offers a unique platform to understand the strengths and weaknesses of clinical trials and various other studies. There is a strong presence of epidemiologists and statisticians on Twitter who provide unparalleled opportunities to understand some of these issues and not infrequently answer specific questions related to study design and statistical analysis.

Beyond learning, #CardioTwitter and Twitter in general constitute an excellent platform to meet colleagues, form collaborations, network, and search for jobs as well as meet patients who offer unique insights and are always generous in sharing their experiences and journeys.[11] These are all good reasons to be part of the #CardioTwitter community. However, many challenges exist (Table), and striking the right balance requires commitment and rigor.

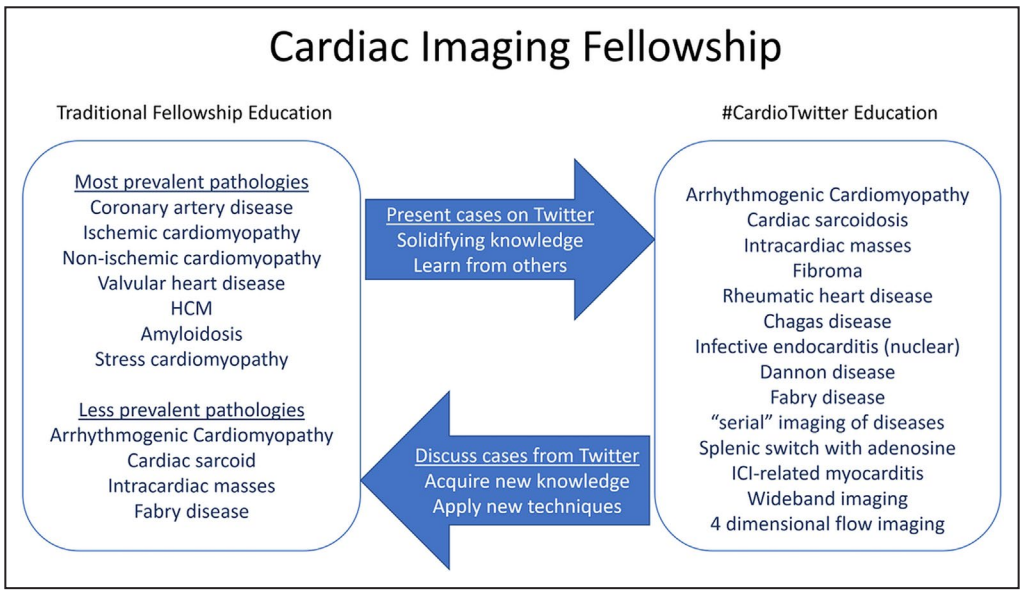

Figure 1. Examples of experiences acquired during imaging fellowship and on #CardioTwitter and the intersection between those experiences.
HCM indicates hypertrophic cardiomyopathy; and ICI, immune checkpoint inhibitors.

Table. Opportunities and Challenges Engaging in #CardioTwitter

Opportunity	Challenge
Acquiring new knowledge Enhancing one's practice	Spending majority of time on noneducational content
Democratizing education	Identifying misinformation and inaccuracies
Sharing clinical experiences, images, or patient stories	Inadvertently revealing a patient's identity
Engaging in productive respectful exchanges	Avoiding ad hominem, antagonistic, and disrespectful exchanges Public forum where tweets can be referenced and used in future proceedings, including legal proceedings Disengagement of individuals holding views opposite to the prevailing one Inappropriate and judgmental tweets Belittling others
Dissemination of science	Amplification or misinterpretation of certain viewpoints Frequent self-promotion without disseminating science or educating others Information overload
Networking, job opportunities	One's Twitter timeline harming job prospects
Working with journals and societies on social media efforts	Undefined career development pathway and unclear benefits for the time invested

For example, instead of sharing just a link to one's new publication, one should take some time explaining the premise and findings of the study with representative figures. Another example is being able to discuss and debate without belittling others or being condescending. The attractiveness of #CardioTwitter lies in its ability to democratize education and give a platform to those who indeed excel at education, even outside of traditional academia. One major challenge is the lack of mechanisms in place to mitigate misinformation, falsehoods, and inaccurate interpretations. On #CardioTwitter, credentials and legacy are related to one's contributions on the platform, not one's H-index or current position (although the combination of all the above certainly strengthens one's portfolio). The public nature of Twitter combined with equal access give opportunities to all #CardioTwitter members to counteract falsehoods with facts. #CardioTwitter also provides a platform for patients and the general public to interact with physicians and scientists and exchanging knowledge in a clear and engaging fashion. Although it is hard to predict what the future holds for #CardioTwitter, it remains clear that its platform provides a unique and powerful way of communication and disseminating information. One risk is for the medium to become mainly a social platform with shrinking educational value. However, this is unlikely given no single entity controls the direction of #CardioTwitter; rather, it is derived from all participants' efforts in furthering science and patient care. Finally, despite the clear advantages of #CardioTwitter, one should avoid the silos and echo chambers on #CardioTwitter but, rather, follow and learn from a diverse group of individuals because most of the worthy exchange of ideas and challenging dogma still happen in the trenches. Nevertheless, #CardioTwitter has transformed the cardiology fellowship into a global experience, and fellows and healthcare providers are encouraged to participate to enrich their own education as well as contribute to this unique platform.

ARTICLE INFORMATION

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REFERENCES

1. Custers E, Cate OT. The history of medical education in Europe and the United States, with respect to time and proficiency. *Acad Med*. 2018;93(3S Competency-Based, Time-Variable Education in the Health Professions):S49–S54. DOI: 10.1097/ACM.0000000000002079.
2. Alraies MC, Raza S, Ryan J. Twitter as a new core competency for cardiologists. *Circulation*. 2018;138:1287–1289. DOI: 10.1161/CIRCULATIONAHA.118.032999.
3. Mandrola J, Futyma P. The role of social media in cardiology. *Trends Cardiovasc Med*. 2020;30:32–35. DOI: 10.1016/j.tcm.2019.01.009.
4. Yeh RW. Academic cardiology and social media: navigating the wisdom and madness of the crowd. *Circ Cardiovasc Qual Outcomes*. 2018;11:e004736. DOI: 10.1161/CIRCOUTCOMES.118.004736.
5. Aggarwal NR, Alasnag M, Mamas MA. Social media in the era of COVID-19. *Open Heart*. 2020;7:e001352. DOI: 10.1136/openhrt-2020-001352.
6. #CardioTwitter Healthcare Social Media Hashtag. Available at: https://www.symplur.com/healthcare-hashtags/cardiotwitter/. Accessed December 13, 2020.

7. Federation of State Medical Boards. Available at: https://www.fsmb.org/step-3/state-licensure/. Accessed March 3, 2021.
8. Breu AC. Why is a cow? Curiosity, tweetorials, and the return to why. *N Engl J Med*. 2019;381:1097–1098. DOI: 10.1056/NEJMp1906790.
9. Barakat AF, Nimri N, Shokr M, Mahtta D, Mansoor H, Mojadidi MK, Mahmoud AN, Senussi M, Masri A, Elgendy IY, et al. Correlation of altmetric attention score with article citations in cardiovascular research. *J Am Coll Cardiol*. 2018;72:952–953. DOI: 10.1016/j.jacc.2018.05.062.
10. Fox CS, Gurary EB, Ryan J, Bonaca M, Barry K, Loscalzo J, Massaro J. Randomized controlled trial of social media: effect of increased intensity of the intervention. *J Am Heart Assoc*. 2016;5:e003088. DOI: 10.1161/JAHA.115.003088.
11. Parwani P, Choi AD, Lopez-Mattei J, Raza S, Chen T, Narang A, Michos ED, Erwin JP, Mamas MA, Gulati M, et al. Understanding social media: opportunities for cardiovascular medicine. *J Am Coll Cardiol*. 2019;73:1089–1093. DOI: 10.1016/j.jacc.2018.12.044.