

The Use of X (Formerly Twitter) in Cardiovascular Imaging: Opportunities and Risks

Alex dos Santos Felix¹ 

National Institute of Cardiology,¹ Rio de Janeiro, RJ – Brazil

Introduction

Social media has decisively transformed the way we disseminate medical information and knowledge, launching new digital tools to boost scientific debate and help redesign healthcare education. Globally, X, formerly Twitter, stands out in the medical field as a more scientific platform, with great interaction between peers, helping doctors and other healthcare professionals from all continents connect to discuss publications, debate scientific evidence, and share clinical experiences. X is also highly important as a channel for the dissemination of scientific events, courses and conferences. In a recent study involving healthcare professionals from 35 countries, Guerra et al. identified that X was the second most accessed social network (55.1%), second only to LinkedIn (60.8%).¹ The speed of dissemination of information and interactivity are strong points of X, with the possibility of bringing together younger doctors, or those who work in institutions with lower complexity, with renowned professionals who work in large centers around the world. This valuable exchange of experiences creates a large virtual “grand round,” bringing other professionals into the debate and allowing for the discussion of controversial technical concepts and challenging clinical cases.

X was founded in 2006, still as Twitter, as an environment for the exchange of short messages, initially limited to 140 characters, having been extended to 280 characters in 2017, and recently relaxed to 25,000 characters for Premium users only. According to the Digital Report 2024, Brazil is the second country in the world where users spend the most time online.² There are 245 million users on X, with more than 500 million posts per day, making Brazil the fourth largest user base of this platform in the world.²

Current use of X in cardiovascular imaging

In the area of cardiovascular imaging, despite the frequent focus on multimodality in publications, which greatly reflect our clinical practice, in X there is a subdivision of content among the main diagnostic modalities, identified by the abbreviations after the symbol “#” (“hashtag”): 1 - #EchoFirst: echocardiography,

2 - #YesCCT: cardiac computed tomography, 3 - #WhyCMR: cardiac magnetic resonance and 4 - #CVNuc nuclear cardiology (Table 1). The use of these “hashtags” enables a targeted search by field of research within the platform itself, facilitating the screening of content related to each of these specific areas. Using the search tool, one can also select posts specifically by pathologies, using the # followed by the term (example: #Ebstein), or search by name for specific renowned physicians in certain areas of expertise. It is possible to monitor the traffic of publications marked with # (metadata tags) using specific programs or websites for this purpose (<https://www.symplur.com>, for example). During conferences, specific “hashtags” are usually created to mark content published in correlation with the activities and schedule of these events, which can be used by congress participants in general or by teams focused on this dissemination, the so-called social media teams (#SoMe), or even social media “ambassadors” (“#SoMe ambassadors”). As an example, during the American Society of Echocardiography Congress in June 2024, using the #ASE2024 tag in the posts, we can see that in the period from 06/11 to 06/16, 2024, there were 2,019 related posts, with an incredible 24,292,000 impressions (Figure 1), data that allows us to measure the reach and penetration of the event on this platform, like a “thermometer” that helps to evaluate the performance of specific activities and the impact of the event in general, as well as plan future actions.

In clinical practice, we often come across rare and challenging diseases, in which experience can be decisive for a quick and effective diagnosis, and discussion among peers is essential for this task. Diseases with regional distribution may be rare in some countries and endemic in other parts of the world, such as rheumatic heart disease, which is endemic in South and Central America. Echocardiographic images can be disseminated quickly, for example, and make it easier for a doctor with great expertise on the matter to help another who has never seen the disease to make the correct diagnosis and guide possible therapeutic options, simulating a virtual “Heart Team” in real time.

With the use of X, we can also disseminate the best use of new techniques and tools in cardiovascular imaging, for example, in the form of tutorials (“tweotorials”)³ or by illustrating their use in the context of specific diseases and commented cases. Due to character limitations, many tutorials are designed to develop a subject sequentially, with linked posts on a given topic, called “threads”, which can be illustrated with figures or videos, providing more consistent information on a given subject. To this content, we can also add interactive surveys on the subject, called “polls”, which enhance engagement and generate anonymous data that helps identify patterns and trends, and can even be used in scientific publications, conference presentations, or related posts.

Keywords

Cardiac Imaging Techniques; Echocardiography; Social Media.

Mailing Address: Alex dos Santos Felix •

National Institute of Cardiology. Rua das Laranjeiras, 374. Postal code: 20521-290. Rio de Janeiro, RJ – Brazil
E-mail: alexsfelix@gmail.com

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Table 1 - Top hashtags (#) related to cardiovascular imaging identified in X

Acronym	Significado
#EchoFirst	Echocardiography
#YesCCT	Cardiac computed tomography
#WhyCMR	Cardiac magnetic resonance
#CVNuc	Nuclear cardiology
#TreatTR	Interventional treatment of tricuspid regurgitation
#3DEcho	3D echocardiography
#IC	Interventional Cardiology
#CardioTwitter	Cardiology community
#CardioED	Education in cardiology
#CVImaging	Cardiovascular Imaging
#VHD	Valvular heart disease
#ACHD	Adult congenital heart disease
#HF	Heart failure

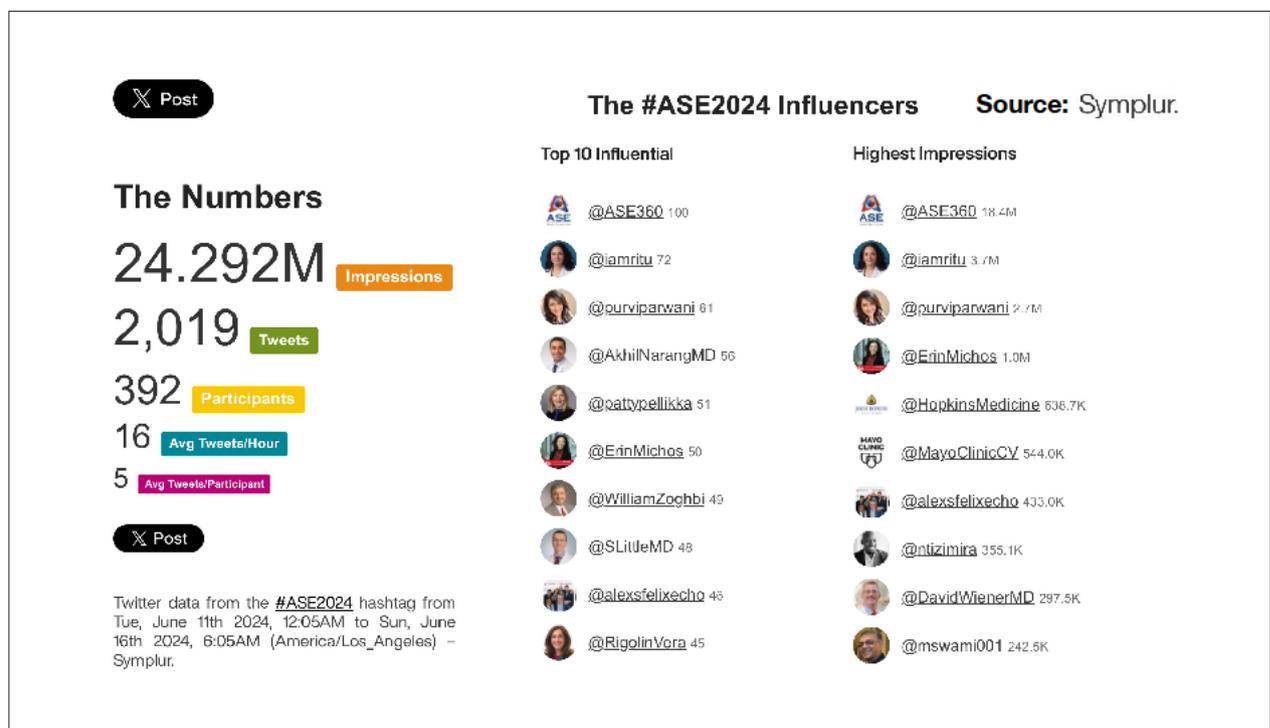


Figure 1 – Analysis of posts related to the hashtag #ASE2024 during the American Society of Echocardiography congress 2024, illustrating reach and impact of these posts and the participation of Top digital influencers during the period from 11-16 June 2024 . Data Source: Symplur (TM) platform.

In summary, below are the main uses of the X platform in cardiovascular imaging:

I – Dissemination of specific diagnostic techniques or approaches, through discussions or illustrative videos. For example, the description of new echocardiographic windows (<https://x.com/alexfelixecho/status/1813967278964101463>) or the popularization of other less used echocardiographic

windows, such as the right parasternal (https://x.com/nat_echo/status/1508827908101529601). Younger doctors in training, such as residents or fellows, in particular, use social media to seek tips and ask questions to more experienced doctors;

II – Use for recruitment of research centers or even inclusion of patients in randomized scientific studies;

III – Journal clubs and other forms of interaction between professionals through X for academic and scientific purposes. Discussions of important topics or recent publications with an analysis of their impact on clinical practice are often sponsored by major cardiovascular imaging journals or initiatives by societies, such as the ASE Journal Club of the American Society of Echocardiography. All of these activities have specific hashtags that mark the discussions;

IV – Discussion of complex cases, including images and videos of challenging cases, which elicit opinions from experts on the subject, and discussions of possible diagnostic complements and therapeutic approaches;

V – Tutorials, also called “tweotorials”, sequential posts on a subject that can cover diverse topics from basic concepts, statistical data from related publications, and references to new research and innovations, with the intention of an abbreviated review of a given topic or discussion on a specific article or trial;

VI – Publications aimed at patients and the lay population, with content focused on generating knowledge about certain diseases (“awareness”), their diagnosis, and possible treatments;⁴

VII – Use to enable the community to follow the latest news on trials or publications, released at major conferences, in real time, with the possibility of discussion and focus on important points about new guidelines and their impact on our clinical practice;

VIII – Encouragement of inclusion or visibility of a specific group, such as greater female inclusion in cardiology, like the #WIC (“women in cardiology”) movement,⁵ reducing the difference in academic and scientific representation and participation;

XIX – Forum for critical discussions of articles, open in a democratic manner for public debate among professionals in the field.

When used properly, X opens doors to knowledge and is an important source of updates and case discussions. Some accounts are particularly active and useful, posting relevant content and sparking important discussions for education in the area of cardiovascular imaging. It would be impossible to include the accounts of all relevant digital influencers in the area of cardiovascular imaging on X in this publication, but Table 2 suggests 51 accounts to follow, which can serve as a good start for new X users.

Risks of social media for use in medicine

As with any social media, despite the great advances and functionalities presented, we must observe ethical issues

and good conduct in the posts made on X, reinforcing our primary focus on caring for our patients. The platforms are public, and we must remember that patients and their families have access to the posts, and their privacy must be protected (Table 3).

There are some risks to using social media to post medical content:

I – Patient privacy is the main issue; we should never expose their data nor any form of identification;

II – We should never expose other professionals or institutions through posts containing personal opinions, or that expose data on treatments or patients admitted to these institutions;

III – Limiting the number of characters or even the format of the publication of posts can lead to inadequate communication, leading to erroneous interpretations. Written communication, in itself, can often be inadequate, due to the lack of tone or context, and can lead to erroneous conclusions in some cases;

IV – The lack of peer review of data or information, can allow information with no scientific basis to be presented as correct and definitive;

V – There is no regulation of activities or checking whether people are really doctors or specialists in a given area, which affects the credibility of the posts.

Best practices in using X for cardiovascular imaging

Based on that presented above, good practices for the use of social media in the area of cardiovascular imaging are necessary, in such a way that we can maintain the ethical and professional care of our patients⁶ and continue to pursue the goal of promoting quality and learning, with the use of this important communication and information dissemination tool.

The acronym RESPECT summarizes many of these considerations (Figure 2), guiding posts with (R)esponsibility, (E)vidence supporting the statements, (S)ensitivity and common sense in the content and form with which we put together the posts, preserving the (P)rivacy of patients, for (E)ducational or research purposes, obtaining the (C)onsent of the patient when applicable, and always using (T)echnically-based information.

Institutional rules for the display of images and information must also be observed, in addition to always

Table 2 – Some profiles of professionals related to cardiovascular imaging recommended by the author.

Profile (@)	Professional	Country
@alcantaramonica	Monica Alcantara	BRAZIL
@alex1708ander	Alexander Mladenow	GERMANY
@alexfelixecho	Alex Felix	BRAZIL
@AntonioBarros_	Antonio Carlos L. de Barros Filho	BRAZIL
@argulian	Edgar Argulian	USA

@cardiopedhnn	Jorge Faerron	COSTA RICA
@CASivaram1	Chittur Sivaram	USA
@ctinocomesquita	Claudio Tinoco Mesquita	BRAZIL
@denisamuraru	Denisa Muraru	ITALY
@DonalErwan	Erwan Donal	FRANCE
@dr_benoy_n_shah	Benoy Shah	ENGLAND
@drahmedmohsen85	Ahmed Mohsen	EGYPT
@drEdgarFuentes	Edgar Fuentes Molina	COSTA RICA
@drozgeozden	Ozge Ozden Kayhan	TURKEY
@DrRajeshG1	Gopalan Nair Rajesh	INDIA
@echo_stepbystep	Vladyslav Kavalarchyk	GERMANY
@EchoSoliman	Hatem Soliman	ENGLAND
@echotalk	Jose Roberto R. Matos-Souza	BRAZIL
@ecocardio_cl	Julián Vega Auday	CHILE
@EGarciaSayan	Enrique Garcia-Sayan	USA
@FGraziani_Grace	Francesca Graziani	ITALY
@fiore_corrado	Corrado Fiore	ITALY
@GE_IanMc	Ian McLeod	ENGLAND
@GoncalvesCortez	Arthur Cortez	BRAZIL
@HeartToProve	Carlos El-Tallawi	USA
@iamritu	Ritu Thamman	USA
@Irina67790690	Irina Akhmedova	KYRGYZSTAN
@KemalogluOz	Tugba Kemaloglu Oz	AUSTRALIA
@kevin_domingues	Kevin Domingues	PORTUGAL
@LopezOpitz	J. Lopez-Opitz	CHILE
@lpadano	Luigi P. Badano	ITALY
@MAecocardio	Miguel A. Garcia Fernandez	SPAIN
@marcelohaertel	Marcelo Haertel Miglioranza	BRAZIL
@marciomp50	Marcio Mendes	BRAZIL
@NadeenFaza	Nadeen N. Faza	USA
@NMerke	Nicolas Merke	GERMANY
@ono_cardiology	Juan Lopez-Mattei	USA
@OungSavly	Oung Savly	CAMBODIA
@papadocardio	Konstantinos Papadopoulos	GREECE
@pattypelikka	Patricia Pelliikka	USA
@purviparwani	Purvi Parwani	USA
@RodrigogpLima	Rodrigo G. P. Lima	BRAZIL
@RODRIGOVISCONT1	Rodrigo Visconti	BRAZIL
@Sarah_Moharem	Sarah Moharem Elgamal	ENGLAND
@senguptasp	Shantanu Sengupta	INDIA
@StellEkaterina	Ekaterina Stellbrink	GERMANY
@strain_rate	Asbjørn Støylen	NORWAY
@VazyurVasquez	Zuilma Vásquez	MEXICO
@VDelgadoGarcia	Victoria Delgado	SPAIN
@VerwerftJan	Jan Verwerft	BELGIUM
@VLSorrellImages	V. L. Sorrell	USA

Editorial

Table 3 – Suggestions on how to make relevant posts on X, avoiding risks and exposure of patients and institutions.

Recommended	Caution	What not to do
Follow your institution's and country's policies.	When addressing sensitive topics (religion, politics).	Never share patient data.
Pursue a specific niche/area of interest.	Always consider how a meme or figure can be interpreted.	Never share photos of patients.
Try to post in accordance with best practices/ common sense.	When posting clinical cases and images, be careful not to personalize and expose patients.	Do not share institutional data, dates, or anything that could indirectly lead to patient identification.
Try to answer technical questions about your post.	Consider separating professional and personal profiles.	Do not give specific medical advice that could be construed as diagnostic or treatment definitions.
Always give credit when retweeting something.	Always make it clear if there is any conflict of interest with the post.	Do not discuss medical issues directly with patients on X.
Be professional and courteous in your posts.	Try to control the amount of time spent on social media.	
Follow opinion -makers in your field.		

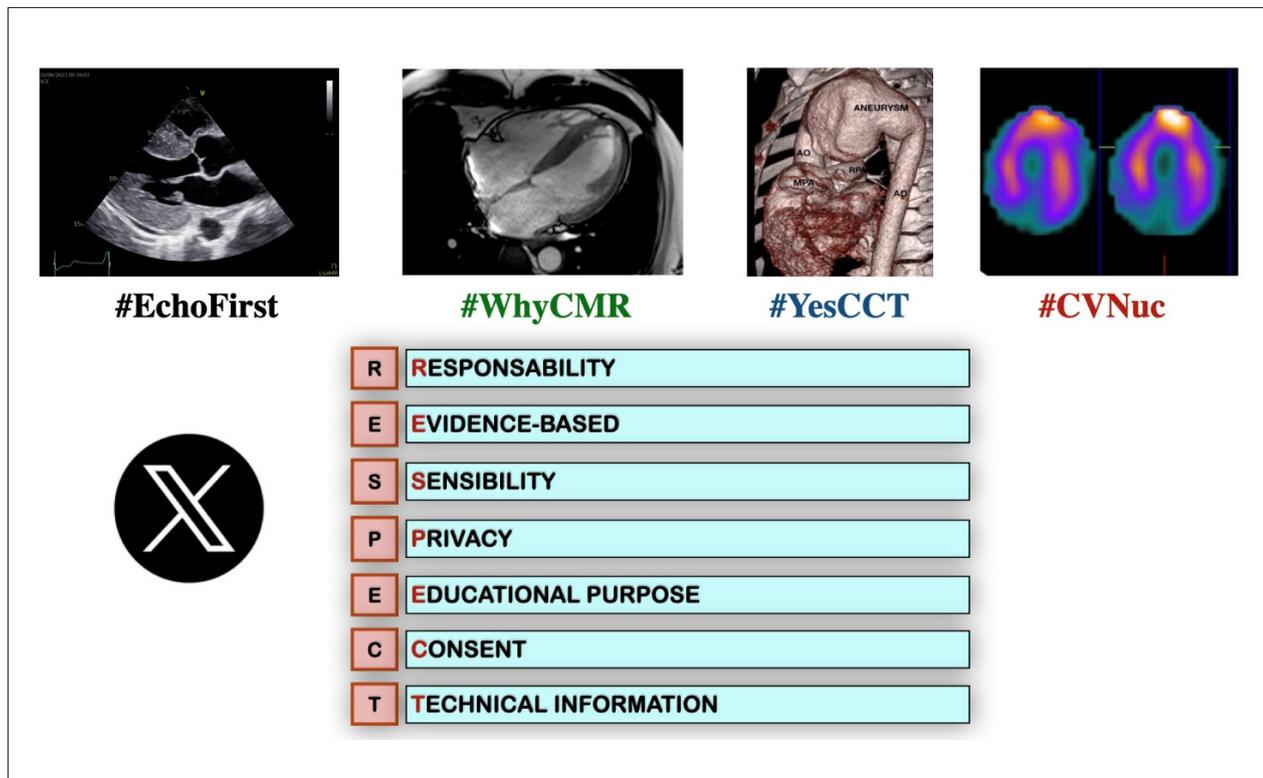


Figure 2 – Acronym for good conduct standards when publishing technical posts in the area of cardiovascular imaging on X: RESPECT. Main hashtags that identify the main methods of cardiovascular imaging: #EchoFirst: echocardiography, #YesCCT: cardiac computed tomography, #WhyCMR: cardiac magnetic resonance and #CVNuc nuclear cardiology.

making any conflicts of interest transparent when the professional has a relationship with the industry, medical journals, a society or a specific trial, when the posts are related to these.

Regarding opinions and comments posted on the platform, it is always important to remember that medicine requires human contact, the doctor-patient relationship, and a thorough physical examination. Therefore the analysis of

selected images or fragmented information, and not inserted into a “whole” that includes all of these factors, can lead to errors in diagnosis and conduct, and must therefore be used with common sense and caution. Many doctors place the phrase “retweet ≠ endorsement”, “personal views ≠ medical advice”, “tweets = my opinion” in their profile as a way of making it clear that comments posted there reflect only their personal opinions and cannot serve as a definition of conduct.

Academic use of X

The use of social media has changed the way academia determines influence in the medical field and its power over the content of information. Today, anyone can freely publish whatever they want in real time, with no restrictions or peer-review processes, meaning that belonging to academia is no longer a prerequisite for influence and recognition. New initiatives have emerged from the digital connections and networking that are established through social media, such as the creation of discussion groups, digital communities, or even the emergence of initiatives that bring together people who only know each other digitally and who decide to organize projects together, such as virtual or in-person meetings, the collaborative writing of articles, the writing of books, among others. As an example, recently, in 2022, a cardiology society was created in a fully digital and online environment, the GSOC (Global Society of Cardiology - account X: @GSOCers), bringing together members from several countries, all collaborating virtually. On the initiative of this group, the first Cardiology Congress in Metaverse was held, which was attended by renowned speakers in a completely virtual environment, with a large audience (Figure 3).

X can also be used as a research tool, through surveys or polls, in which data can be collected directly through user participation. Another way to promote research is through the direct recruitment of eligible individuals for inclusion in registries, through direct calls on social networks that can target patients themselves, other professionals, or institutions that may have patients who would benefit from such participation.

Despite being a social network, some rules of good conduct are important for operating on X:

I – It is important to cite references or tag experts, authors, or editors when discussing an article, or when posting any part of it or a figure/table.

II – You should always give due credit to the authorship of another user's post when reposting it or when making a new personal post using material from it, whether in part or in full, be it a text, an image, or a video.

III – It is important to always use professional discourse when discussing scientific matters, with a respectful tone, always in the most technical manner possible.

IV – It should always be made clear in the post when the use of a technique is "off-label".

Studies show that articles published on social media gain greater visibility and number of accesses, citations, and downloads,^{7,8} encouraging X users to search for content on the digital platforms of these online journals.⁹ X is an important tool for promoting case reports or scientific research,¹⁰ and access to scientific papers from social media is monitored by alternative metrics, such as the Altmetric index (<https://www.altmetric.com>), which includes references to research beyond medical publications, including: citations in the press and websites, online blogs, Wikipedia, and social networks, such as X. The Altmetric index is linked to the article's URL address and can assess an article's performance in terms of impressions and reach among readers more quickly than conventional indexes (H-Index).

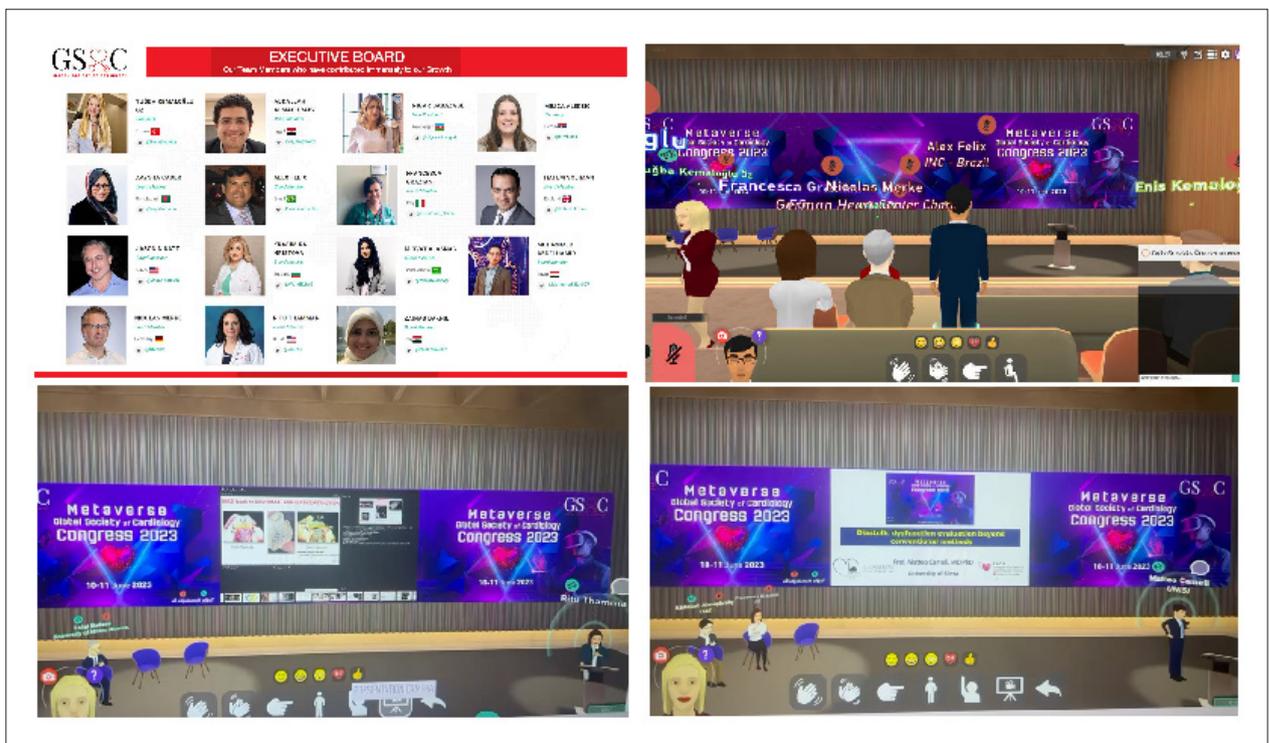


Figure 3 – Example of digital networking on X, giving rise to scientific, educational and networking initiatives, like in the field of Cardiovascular Imaging. These images are from an entirely virtual conference held in the Metaverse (sponsored by GSOC) with avatars representing speakers and audience.

Conclusion

The use of social media in the field of cardiovascular imaging has revolutionized the way we connect and share knowledge. X has features that make it an attractive platform for discussing clinical cases, disseminating new technologies

and scientific research in real time, in a dynamic and interactive way. We must always seek to observe the rules of good practice, adhering to ethical limits and protecting the privacy of patients, remembering that X is another important tool for the benefit of our patients, who are the focus of care.

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