



Patient Care, Practice Management and Education Original Research

Examining Twitter use in interventional radiology: A comparison with cardiology and orthopedic surgery

Sakshum Chadha¹, Neel Nirgudkar¹, Pratik Shukla¹, Abhishek Kumar¹

¹Departments of Radiology and Interventional Radiology, Rutgers New Jersey Medical School, Newark, New Jersey, United States.



***Corresponding author:**

Abhishek Kumar,
Department of Radiology
and Interventional Radiology,
Rutgers New Jersey Medical
School, 150 Bergen St,
Newark - 07103, New Jersey,
United States.

kumarab@njms.rutgers.edu

Received : 25 November 2020

Accepted : 12 February 2021

Published : 08 March 2021

DOI

10.25259/AJIR_41_2020

Quick Response Code:



ABSTRACT

Objectives: The objectives of the study were to characterize the similarities and differences in amount and quality of user engagement on Twitter between interventional radiology (IR), cardiology, and orthopedic surgery and identify trends in Twitter use by the IR community.

Material and Methods: General specialty hashtags and groups of users were identified for IR, cardiology, and orthopedic surgery and used for stratified searches of tweets using Symplur Hashtag Finder over a 5-year period. Analytics for total statistics, associated hashtags, common words, total Twitter activity, and a network analysis were obtained for predefined user groups.

Results: A total of 278,866 IR, 420,021 cardiology, and 106,684 orthopedic surgery tweets were analyzed. IR had the highest percentage of retweets, media files, mentions, and replies. Between physicians, IR had fewer users than cardiology and orthopedic surgery but a greater percentage of users tweeting at higher volumes compared to cardiology and orthopedic surgery. IR had greater average interactions per user than cardiology and orthopedic surgery, but IR overall had a lower percentage of tweets by organizations.

Conclusion: Social media activity in IR demonstrates substantial interaction and engagement despite having less users than cardiology and orthopedic surgery. Most of this activity was noted to be between IR physicians, while the other two specialties had more interaction with users unrelated to the medical field. These data provide insight into the nature of Twitter users within IR; being aware of these results could motivate users to increase their own interactions with patients and members of the public sphere.

Keywords: Interventional radiology, Social media, Twitter

INTRODUCTION

Health care has seen a significant increase in the impact and use of social media in recent years.^[1] Various user groups including providers, institutions, media, and patients play a key role in shaping public opinion and understanding of medical practice.^[1] Twitter is the most popular social media platform for health-care communication both within the medical community and with the public.^[1] A wide variety of medical specialties are represented on Twitter with accounts by individual practitioners, health-care organization, and medical societies.^[1] These specialties greatly vary both in proportion of contribution from each user group and the types of contributions and connections being made on Twitter. Interventional radiologists in particular have been using Twitter to engage in collaboration and more sharply carve out interventional radiology (IR) contribution to patient care.^[2] Cardiology and orthopedic surgery have been

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2021 Published by Scientific Scholar on behalf of American Journal of Interventional Radiology

identified in the literature as specialties with a well-established social media presence and strong patient education of their procedures.^[3-5] The purpose of this study was to examine Twitter activity in IR by comparing it to two other procedural specialties active on Twitter (i.e., Cardiology and orthopedic surgery) using Twitter analytics.

MATERIAL AND METHODS

This study was exempt from Institutional Board Review at our institution. Data collection was conducted with the use of Symplur Signals, an online health-care analytics software (Symplur, Upland, California). Calculation of mean and standard deviation, along with the generation of charts and graphs, was completed with Microsoft Excel.

Symplur Hashtag Finder application was used to search for tweets with hashtags specific to three specialties, IR, cardiology, and orthopedic surgery, from the time period March 1, 2014, to March 1, 2019. Hashtags are user-based tags used on Twitter to classify the content of tweets. The hashtags used to create the search results were selected based on Symplur algorithm that identifies user accounts associated with a specialty by searching the account bio section and then analyzes tweets from each account to identify the most common hashtags. From these, the hashtags directly related to the specialty were selected, as described in Table 1.

The search results of the subsets from each specialty were then filtered to look for the following metrics: Total number of tweets, common words, associated hashtags used, activity of the users on the platform, and an overall network analysis.

Table 1: Hashtags searched for each specialty.

Specialty	General hashtag
Interventional radiology	#Irad
	#TwittIR
	#Withoutscalpel
Cardiology	#InterventionalRadiology
	#Cardiology
	#Cardiotwitter
Orthopedic surgery	#Cardiovascular
	#OrthopedicSurgery
	#SportsMedicine
	#Orthopedics

Of note, the hashtags seen in Table 1 were excluded from the associated hashtags metric since all the search results contained those hashtags and would, therefore, generate a selection bias within the results. Symplur algorithm was also able to break down the total tweets into four categories: Replies, retweets, media, and links. A “reply” was defined as a published tweet that directly responded to the tweet of another user, and a “retweet” was defined as publishing another user’s tweet on one’s own account. A tweet was considered to have “media” if it contained an image or GIF file, and any tweet containing a link to a non-twitter webpage was defined as a “link.”

The search results were also sorted by Symplur algorithm to identify the nature of the account that published the tweets and sort these accounts by the type of users as described in Table 2.

Network analysis

The results of Symplur “Network Analysis” algorithm, which looks at the interactions between users, were recorded and the average node weight and number of edges were calculated for each specialty as well as for the group of IR physicians. Based on the algorithm, every Twitter profile is represented by a node, and the influence of that user in the Twitter community defines the node’s weight/size. Influence is measured by the amount of engagement a particular user’s tweets have including replies, mentions, retweets, or quoted tweets. An edge is defined by communication between users with the arrow representing the direction of communication. Edges represent replies, mentions, retweets, or quoted tweets specifically between two users. The average weight of nodes and number of edges were calculated for each specialty as well as for IR physicians specifically.

RESULTS

Total tweets

A total of 805,571 tweets, which included retweets, were analyzed within the 5-year time period by filtering for specialty-specific hashtags, with 278,866 IR tweets, 420,021 cardiology tweets, and 106,684 orthopedic surgery tweets. An overview of the total tweets, broken down by specialties and user groups, is shown in Tables 3 and 4. Within IR, physicians and other health-care professionals combined had

Table 2: Breakdown of user groups based on Symplur algorithms.

Individual Organizations	Physicians	Other HCPs	Caregivers and patients	Research and academic	Journalists and media outlets
	Organizational HCPs		Other organizations–health and non-health	Research organizations and medical device companies	Government, advocacy, pharmaceutical, and media groups

HCPs: Health-care providers

Table 3: Breakdown of tweets by individual users.

	Interventional radiology(%)	Cardio(%)	Ortho(%)
Total	278,866	420,021	106,684
Physicians	67,561 (24.2)	139,498 (33.2)	20,369 (19.1)
Other health-care providers	150,998 (54.1)	14,725 (3.5)	5765 (5.4)
Caregivers/patients	17,338 (6.2)	67,683 (16.1)	15,693 (14.7)
Research/academic	2013 (0.7)	11,536 (2.8)	1671 (1.6)
Journalists/media	1110 (0.4)	7968 (1.8)	1212 (1.1)

Table 4: Breakdown of tweets by organizational users.

	Interventional radiology(%)	Cardio(%)	Ortho(%)
Total	278,866	420,021	106,684
Health-care groups	12,135 (4.4)	10,564 (2.5)	12,954 (12.1)
Other health and non-health organizations	7850 (2.8)	101,215 (24.1)	33,597 (31.5)
Research/medical devices	2886 (1.0)	7001 (1.7)	2159 (2.0)
Govt./pharm/media	16,975 (6.1)	60,101 (14.3)	13,264 (12.4)

78.3% of the total tweets related to the specialty while every other user group was <10%. However, both cardiology and orthopedic surgery had multiple user groups with over 10% of total tweets: Physicians were 33.2% and 19.1%, caregivers/patients were 16.1% and 14.7%, and other health and non-health organizations were 24.1% and 34.5%, respectively.

Overall, IR tweets had the highest frequency of retweets, media, mentions, and replies compared to cardiology and orthopedic surgery tweets, respectively, as shown in Table 1. In contrast, IR tweets had the lowest frequency of links compared to cardiology and orthopedic surgery tweets, respectively. Every individual and organizational user group in Table 2 demonstrated a similar pattern with IR displaying the highest frequency of retweets, media, mentions and replies, and the lowest frequency of links, with one exception in individual journalists and media outlets that showed more retweets in cardiology than in IR.

Associated hashtags

The top 10 associated hashtags were collected for each specialty and stratified by each user group within the 5-year time period. The top 10 associated hashtags used by

physicians can be found in Figure 1. IR top three hashtags with respective frequencies were #MIIP, #MIIPs, and #FilterOUT while cardiology top three were #foamed, #cardioed, and #echofirst. Orthopedic surgery top three were #surgery, #Radiology, and #MedEd [Figure 1].

Common words

The top 10 common words used in tweets were collected for each specialty, stratified by each user group within the 5-year time period. The top 10 common words used by physicians can be found in Figure 2. IR top three common words with respective frequencies were “great,” “interventional,” and “artery,” cardiology top three were “heart,” “health,” and “risk,” while orthopedic surgery top three were “sports,” “great,” and “injuries” [Figure 2].

Twitter activity

The user group of physicians within each specialty was also analyzed for amount of activity per user [Figure 3]. Within the 5-year period, cardiologists had the highest number of tweets and users (139,498 tweets from 11,411 users) compared to IR (67,561 tweets from 2377 users) and orthopedic surgery (20,369 tweets from 3387 users). However, the percentage of users who tweeted only once was 43.24%, 38.70%, and 54.30% in cardiology, IR and orthopedic surgery, respectively. The percentage of users who tweeted 10 or more times was 16.98%, 25.73%, and 10.54% and the percentage of users who tweeted 50 or more times was 4.15%, 10.43%, and 2.16% in cardiology, IR and orthopedic surgery, respectively.

Network analysis

A network analysis was conducted to analyze nodes and edges representing users and the connections between users, respectively [Figure 4]. The average weight of the nodes was 3.6 for IR, 3.8 for IR physicians, 2.7 for cardiology, and 2.0 for orthopedic surgery. In addition, the average number of edges was 4.5 for IR, 4.8 for IR physicians, 2.6 for cardiology, and 1.6 for orthopedic surgery, indicating that individual IR users are more active and more engaging on Twitter than their cardiology and orthopedic surgery counterparts. In addition, further examination of the nodes themselves revealed that for all three specialties, most of the interactions were occurring between various physicians or physician groups. Only one account “Learntheheart.com” was found within the top 30 accounts of each specialty that could be considered a non-physician account. This account was identified under cardiology.

DISCUSSION

Over the past 5 years, the use of twitter has offered physicians and other health-care providers increased access not only

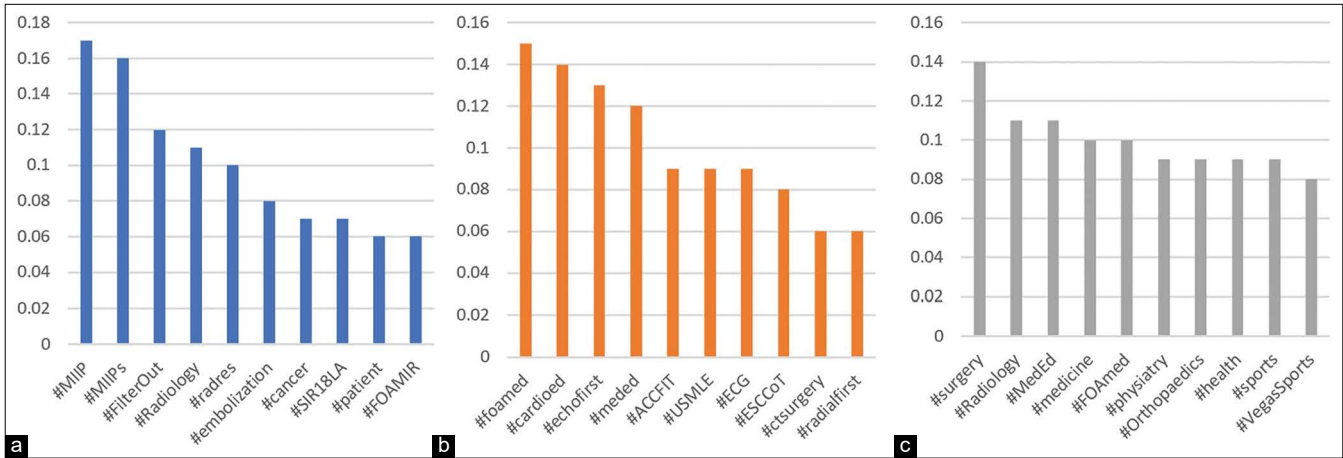


Figure 1: Ten most frequently used hashtags in tweets by physicians stratified by specialty. (a) Interventional radiology, (b) cardiology, (c) orthopedic surgery.

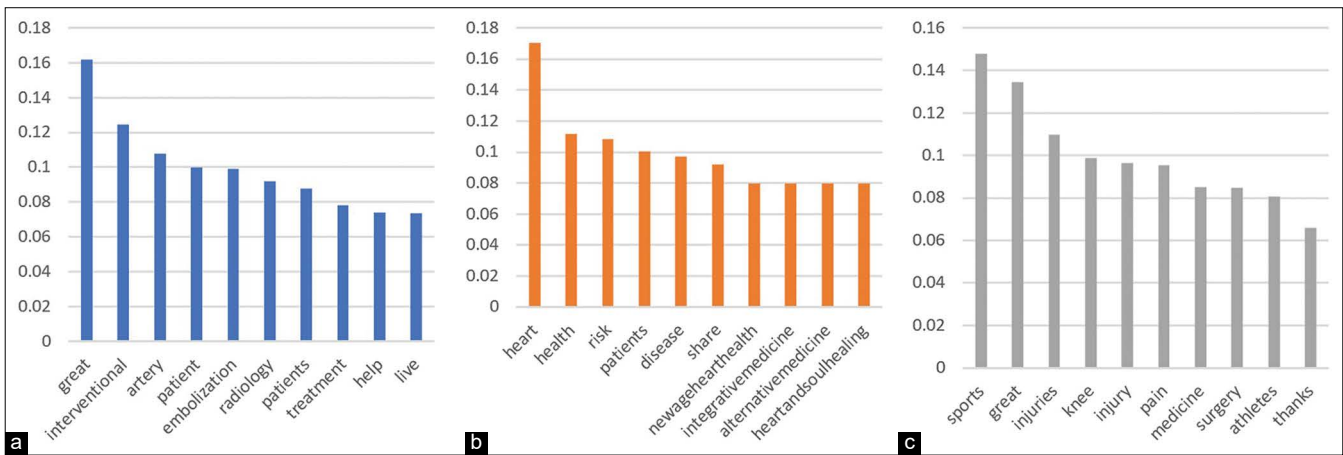


Figure 2: Ten most frequently used words in tweets by physicians stratified by specialty. (a) Interventional radiology, (b) cardiology, (c) orthopedic surgery.

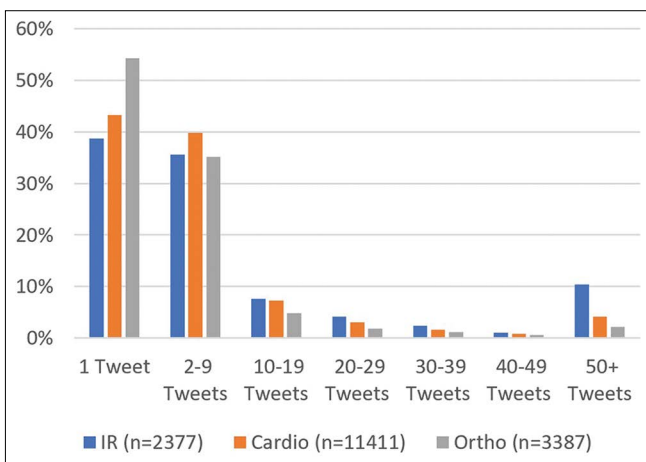


Figure 3: Distribution of tweets/user across interventional radiology (blue), cardiology (orange), and orthopedic surgery (gray).

to each other but also to patients, clients, students, and trainees.^[1-4,6-9] In the field of IR in particular, the use of Twitter

has risen dramatically, with more IR-related users, tweets, and interactions.^[2,7,8] Social media use is encouraged at both local and national IR meetings through the use of specific meeting hashtags that serve to increase communication between interested parties. This study aimed to study and compare the use of Twitter by user groups in IR with those in two other procedural specialties, namely, cardiology and orthopedic surgery.

Despite having a lower number of physician users (2377) compared to cardiology (11,411) and orthopedic surgery (3387), IR has a greater percentage of active users with 25.73% of users tweeting more than 10 times and 10.43% of users tweeting more than 50 times. IR physicians are also interacting more with each other compared to their cardiologist and orthopedic surgeon counterparts who are interacting with public and private organizations, members of the media, and patient advocacy groups, as can be seen by the larger number of average edges in the network analysis. Throughout this comparison between specialties,

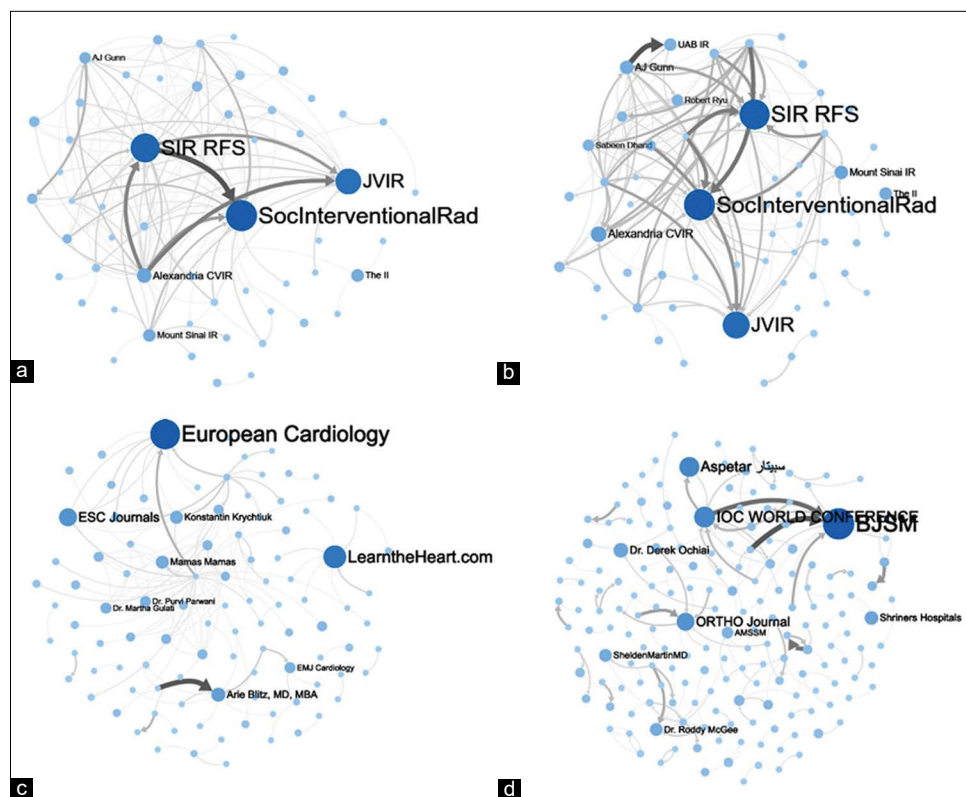


Figure 4: Network analysis maps based on Twitter engagement between accounts. The average weight of the nodes and the average interactions between the nodes were also calculated. (a) Interventional radiology (IR) overall, (b) IR physicians, (c) cardiology, (d) orthopedic surgery.

the growth of IR on Twitter is evident; however, one of the biggest differences noted is that while IR does have a significant twitter network, most of it is among user groups within IR that do not include patients or other medical communities. Caregivers and patients make up only 6.2% of the total tweets searched in IR compared to 16.1% in cardiology and 14.7% in orthopedic surgery. This pattern of IR having the smallest percentage of non-physician, non-medical user groups can also be seen with journalists and media outlets (0.4%, 1.8%, and 1.1%) as well as government, pharmaceutical, and media groups (6.1%, 14.3%, and 12.4%) where the percentage of total tweets within IR is strikingly lower compared to both cardiology and orthopedic surgery, respectively. It is possible that this is a direct result of the unfamiliarity of IR procedures to patients, suggesting that social media use in IR may benefit from a focus on patient education that may make terms such as “embolization” familiar to a large patient population.

A closer examination of the tweet distributions over the past 5 years shows that the majority of IR tweets consist of retweets, mentions, and media files, likely related to other IR users and content. Meanwhile, a large percentage of cardiology and orthopedic surgery tweets tend to contain outside links to articles and other media content in a likely attempt to facilitate dialog between members of their

specialty and those outside the specialty. The use of these additions to tweets, such as hashtags, links, and images, has been shown to increase the number of users that not only see the tweet but also interact with or respond to it.^[10] We theorize that the use of a similar strategy could be a potential option for reaching out to patients and generating interest in IR among the general public.

Doctors and health-care providers in IR typically use social media as a tool for communication among one another to drive innovation and improvement of practice.^[7] As IR enters a period of focus on creating an established clinic practice, a shift in social media content may be desirable to create a baseline understanding of IR presence in the outpatient setting in the general public.^[2] Cardiology is known for having well-established patient recognition of its services and IR may benefit from emulating cardiology patient-friendly marketing on social media. Orthopedic surgery is a more procedure guided specialty compared to cardiology, and yet there is less medical jargon and there are less abbreviations used in the associated hashtags and common words seen in physicians’ tweets [Figures 1 and 2]. For example, IR top three common words were great, interventional, and artery while cardiology were heart, health, and risk and orthopedic surgery were sports, great, and injuries. A high frequency of words such as “interventional” and “artery” in IR tweets,

while familiar to many physicians, may add to the foreign nature of IR procedures and interventions when it comes to the general patient population, especially when considered in context of the words such as “heart” and “health” in cardiology or “sports” and “injuries” in orthopedic surgery. Our analysis showed that in both cardiology and orthopedic surgery, the emphasis on patient-oriented communication is shared by individual and organizational health-care providers while within IR, individual physicians drive the social media communications. Finding ways to relate medical practice to patients in a way that is easily understood by the layperson may be accomplished in IR by (1) advocating for physicians to market content directly to patients while (2) increasing the emphasis on social media communication by organizational user groups.

One of the biggest advantages that Twitter offers are the ability to interact with other users on the platform, through either mentioning another user in one’s own tweet or retweeting another user’s tweet. These actions open pathways of communication between individuals and are efficient ways in which physicians can interact and collaborate not only with each other but also their patients and the general population. Social media campaigns to raise patient awareness in health care have been successful in the past. Various studies found that active use of social media by health-care professionals led to increased positive awareness and knowledge of the HPV vaccine in the general public.^[11] According to the network analysis of these three specialties, however, this does not seem to be the case. Other than “Learntheheart.com,” all of the 10 highest active users in IR, cardiology and orthopedic surgery networks are either physicians, hospitals, or national societies, none were patient organizations or advocacy groups. This void across all the examined specialties provides the next opportunity for IR to grow toward in the future. The separation of IR user groups is a well-noted phenomenon and it has been suggested that IR incorporate communications with the broader radiology community to better reach patients and other specialties.^[12]

Limitations of drawing conclusions based on Twitter use include the user demographic, with only 10% of those aged 50–64 using the platform compared with 27% of individuals aged 18–29.^[5] In addition, the hashtags used to identify tweets from the three individual specialties only include a subset of all tweets from the specialties. The accuracy of Symplur algorithm with respect to identifying individual doctors from other health professionals through an account’s description may also be a limitation of the study. Further studies could potentially include a further comparison of tweet and media content between specialties to examine what kind of tweets can better facilitate interactions between physicians and their patients.

Overall, our data indicated that despite having fewer total users, the IR community is more active on Twitter and

interactive among each other compared to their cardiology and orthopedic surgery colleagues – two other procedural specialties that are active on social media. However, the data also showed that this robust IR Twitter activity was mostly between physicians and other medical professionals within IR whereas the other two specialties had larger interactions with users unrelated to the medical field. The results of this study may serve to provide insight into the nature of Twitter use in the IR community, which may encourage members to diversify social media interactions with the public sphere.

CONCLUSION

Twitter activity in the IR community is robust with high amounts of interaction and discussion despite having fewer users than counterpart procedural specialties such as Cardiology and Orthopedic Surgery. This increasing interaction within IR was noted to be mostly between medical professionals, while Cardiology and Orthopedic Surgery had a more diverse user base in the medical and non-medical spheres. This data could serve as an insight into the nature of Twitter users within IR, and may encourage members to broaden their own personal spheres to interact with patients and other non-medical users on social media.

Declaration of patient consent

Patient’s consent not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Pershad Y, Hangge PT, Albadawi H, Oklu R. Social medicine: Twitter in healthcare. *J Clin Med* 2018;7:121.
2. Hage AN, Chick JE, Jeffers B, Srinivasa RN, Gemmete JJ, Srinivasa RN. #Interventional radiology. *J Vasc Interv Radiol* 2018;29:669-75.
3. Mandrola J, Futyma P. The role of social media in cardiology. *Trends Cardiovasc Med* 2020;30:32-5.
4. Hughes H, Hughes A, Murphy C. The use of twitter by the trauma and orthopaedic surgery journals: Twitter activity, impact factor, and alternative metrics. *Cureus* 2017;9:e1931.
5. Gouda P, Das D, Clark A, Ezekowitz JA. The impact and implications of twitter for cardiovascular medicine. *J Card Fail* 2017;23:266-7.
6. Hawkins CM, DeLa OA, Hung C. Social media and the patient experience. *J Am Coll Radiol* 2016;13:12 Pt B:1615-21.

7. Wadhwa V, Brandis A, Madassery K, Horner PE, Dhand S, Bream P, *et al.* #TwittIR: Understanding and establishing a twitter ecosystem for interventional radiologists and their practices. *J Am Coll Radiol* 2018;15 Pt B 1:218-23.
8. Bundy JJ, Hage AN, Chick JE, Srinivasa RN, Patel N, Johnson E, *et al.* #Radiology: A 7-year analysis of radiology-associated hashtags. *Curr Probl Diagn Radiol* 2018;47:296-301.
9. Hage AN, Srinivasa RN, Bundy JJ, Gemmete JJ, Johnson EJ, Srinivasa RN, *et al.* #Vascular surgery. *Ann Vasc Surg* 2018;53:217-23.
10. Wadhwa V, Devgan A, Patel MV, Bourgeois AC, Ahmed O. Factors increasing tweet engagement rate for the journal of vascular and interventional radiology twitter feed. *J Vasc Interv Radiol* 2018;29:1057-9.
11. Ortiz RR, Smith A, Coyne-Beasley T. A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination. *Hum Vaccin Immunother* 2019;15:1465-75.
12. Miles RC, Patel AK. The radiology twitterverse: A starter's guide to utilization and success. *J Am Coll Radiol* 2019;16:1225-31.

How to cite this article: Chadha S, Nirgudkar N, Shukla P, Kumar A. Examining Twitter use in IR: A comparison with cardiology and orthopedic surgery. *Am J Interv Radiol* 2021;5:4.