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Physician-scientists or celebrities? Kardashian-index of gastroenterologists

Onyinye Ugonabo, Saad Ullah Malik, Usman Ali Akbar, Zarlakhta Zamani, Wesam Frandah

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Abstract

BACKGROUND

The coronavirus disease 2019 pandemic unleashed a flood of untrustworthy information on social media platforms, resulting in the unfortunate consequence of expert scientists' opinions getting lost amidst the chaotic sea of misinformation. The question of how much influence these esteemed scientists hold on social media platforms remains elusive. To address this scientific quandary, we sought to explore the concept of the Kardashian index (K-index), a term introduced by Hall in 2014. This metric provides a rudimentary means of evaluating whether a physician scientist's popularity on social media aligns with their significant scientific contributions.

AIM

To evaluate if a Gastroenterologist physician's popularity on social media is at par with their scientific contributions (research articles and publications).

METHODS

We conducted an extensive search to identify all gastroenterologists actively practicing and associated with the top 100 hospitals as reported by the United States News. We collected specific data on a sub-group including their names,

affiliations, degrees, and sub-specializations. To gauge their social media popularity, we utilized the K-index calculation which is determined by dividing the actual number of Twitter followers by the number of researcher's citations. The expected number of followers (F) is calculated using the formula $F = 43.3 \cdot C^{0.32}$, where C represents the number of citations.

RESULTS

Physicians affiliated with the Mayo Clinic emerged as the most prominent presence on Twitter, constituting 16% of the total. They were followed closely by physicians from Mount Sinai Hospital (9%) and the University of Michigan Hospital (9%). Surprisingly, 76% of the physicians evaluated exhibited a low K-index, falling within the range of 0 to less than 2. This suggests that a significant number of highly influential physician-scientists are not receiving due recognition, as indicated by their relatively low number of followers. On the other hand, 24% of the physicians had an inflated K-index, exceeding 5, which positioned them as the "Kardashians". These individuals enjoyed greater social media popularity than their actual scientific contributions. Interestingly, our analysis revealed no discernible association between sex and K-index (*P* value of 0.92).

CONCLUSION

In the gastroenterology field, our study estimated that a majority (76%) of highly researched physicians are undervalued despite their significant scientific contributions.

Key Words: Kardashian index; Gastroenterology Twitter; Kardashian index of gastroenterology; Physician-scientists; Social media; Physician celebrities

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Core Tip: Twitter has become the most used social media by physicians to connect with colleagues and disseminate health information. People are prone to believing any information posted on social media to varying degrees. Thus, when do we consider this information factual and the truth? In our study, we used the Kardashian index to estimate whether the Twitter followers of the top 100 gastroenterologists are relatable to their scientific contributions in terms of citation of their scholarly works, and we found the majority of the gastroenterology physician scientists scored < 2 because of inactivity on Twitter and very low number of followers. We postulated that an avenue to mitigate the prevalence of misinformation on social media could emerge by involving a greater number of physician-scientists on this platform. Their engagement, coupled with the dissemination of their research discoveries could contribute significantly to this endeavour.

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INTRODUCTION

The role of social media platforms in the promotion and exposure of medical literature has shown marked improvement in the last several years. Numerous societies and journals patronize Twitter, Facebook, and other platforms to bring their readership closer to their published articles. Twitter, with an estimated 300 million monthly users, has become a major nerve center between medical practitioners, patients, journals, and healthcare for discussion and transit of information. A directory of researchers on Twitter does not exist, hence it is difficult to estimate the percentage of researchers that patronize this popular media[1] A systematic review of scholars on Twitter by Costas *et al*[2] identified > 385000 scholars linked to a Twitter account, however, the number varies based on level of productivity, identifying scholars with a higher level of productivity to have a stronger presence on Twitter especially those in social science and humanities by discipline. The K-index was proposed by Neil Hall in 2014 to study the effect the number of Twitter followers a physician or scientist has on the degree of citation of their research publications[3]. It was inspired by a popular celebrity with millions of followers on social media, Kim Kardashian. Her status, though not related to academics galvanized a new index to measure the dissemination of research to reach millions of people. The concept of the K-index centers around the fact that the popularity of a clinician on Twitter depends on the number of followers. The more followers, the more fame and success which in turn increases a gastroenterologist's research visibility, thus increasing the likelihood of having more citations of research articles. A couple of studies have been published for other specialties correlating the effect of their social media influence on their scientific works. We, therefore, sought to evaluate that of gastroenterologists. Our study hypothesized that many high-impact gastroenterology (GI) physicians don't have a significant social media presence limiting their outreach and popularity among the public, despite significant scholarly work.

MATERIALS AND METHODS

We conducted an extensive search using usnews.com to identify all gastroenterologists currently practicing and affiliated with the top 100 hospitals as reported by the United States Health News and World Report. From this comprehensive search, we collected specific sub-group data including names, affiliations, degrees, and sub-specializations. Additionally, we collected other variables such as sex, title [Doctor of Medicine degree (MD) or Doctor of Osteopathic Medicine (DO)], and number of years in practice. We randomized the data using randomization software to ensure unbiased selection and selected the top 2000 gastroenterologists for our study.

Utilizing Twitter as our chosen social media platform, we evaluated the number of followers for each of these selected gastroenterologists, excluding those whose accounts were no longer active. It's important to note that we were unable to determine the occupation of each follower, thus we could not ascertain whether the majority were medical professionals or not.

To authenticate the number of citations, we utilized various publications and citation search engines, including Semantic Scholar, Scopus, ResearchGate, and Google Scholar. The K-index was then calculated using the formula $K\text{-index} = F_{(a)} / F_{(c)}$, where $F_{(a)}$ represents the number of Twitter followers and $F_{(c)}$ represents the number of followers based on citations. The actual trend of Twitter follows was described using the formula $F = 43.3 \cdot C^{0.32}$, where F denotes the number of Twitter followers and C represents the number of citations.

A higher K-index suggests a lower proportion of actual scientific contribution in relation to the number of followers on Twitter. Demographic data were presented as mean or median values, and associations were assessed using appropriate statistical tests such as *t*-tests, chi-square tests, and Spearman tests. Further evaluation of significant results was performed using ordered logistic regression. All statistical analyses were conducted using STATA version 15.1.

RESULTS

A total of 1979 GI physicians had analyzable data. 98.8% ($n = 1956$) were MDs and 1.16% ($n = 23$) were DOs. Only 6.6% ($n = 131$) had an extra-degree. The mean years as faculty was 19.8 years (SD = 9.4). Only 16.6% ($n = 330$) had an active Twitter account and among them 66% ($n = 218$) were males, and 34% ($n = 112$) were females. Only 2.5% ($n = 50$) of Twitter-using physicians had an extra degree and their median years as faculty was 18 (SD = 8.6). The most dominant presence on Twitter was by physicians from Mayo Clinic (16%), followed by Mount Sinai Hospital (9%) and the University of Michigan Hospital (9%) (Figure 1, Table 1). Approximately 76% of the physicians studied exhibited a low K-index (ranging from 0 to less than 2), suggesting a significant under-representation of highly influential physician-scientists on Twitter. Conversely, 24% displayed an inflated K-index (> 5), classifying them as “Kardashians” or physician celebrities, implying that their popularity surpasses their actual scientific contributions. (Figures 2 and 3). We found no association between sex and K-index (P value = 0.92). There was a significant association between K-index and extra degree ($P = 0.17$). A higher K-index was associated with lower odds of an advanced degree [odds ratio (OR): 0.74, 95% confidence intervals (95%CI): 0.57-0.96, P value = 0.03] when adjusted for sex and years as faculty. There was a significant association between the number of years as faculty and K-index (P value = 0.008) but this association did not remain significant when adjusted for sex, years on Twitter, and extra degree (P value = 0.69). A higher number of years of Twitter use leads to higher K-index (OR: 1.39, 95%CI: 1.11-1.74, P value = 0.004) after controlling for sex, years as faculty, and extra degree.

DISCUSSION

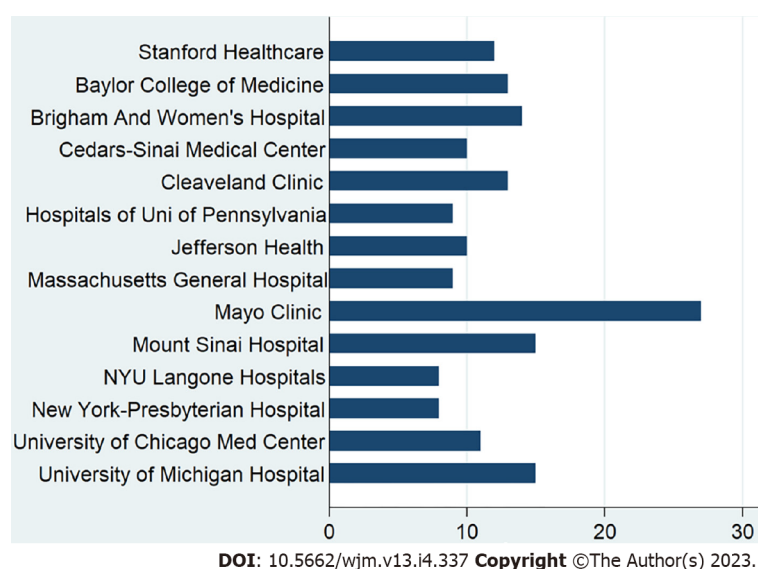
Some gastroenterologists have utilized Twitter as a platform for sharing interdisciplinary discussions and raising awareness about their areas of expertise. Out of the 1979 GI physicians analyzed, only 16.6% maintained an active Twitter account. Among the Twitter users, 76% had a K index ranging from 0 to less than 2 depicting undervalued on social media, despite their scientific contribution. The adoption of social media among physicians significantly increased from 41% in 2010 to approximately 90% in 2011[4]. A study by Madde and Zickuhr[5] suggested that social media usage grew by 43% between June 2009 and 2010, becoming the most time-consuming internet activity[6].

Analysis of social media usage has revealed some notable trends. Twitter appears to be more popular among individuals aged 15 to 29, compared to only around 7% of those over 65-years-old[7]. According to a survey conducted by Woitowich *et al*[8] on sex differences in social media usage among physicians, the majority of respondents were women. However, men were found to utilize social media more extensively for building professional networks and staying updated on research and clinical topics[9]. Another study by Demailly *et al*[10] focused on anesthesia and critical care researchers reported lower visibility of women compared to their male counterparts on a scientific research-dedicated social network called ResearchGate. Similarly, our study found that male GI physicians had a higher prevalence of Twitter usage (66%) compared to females (33%).

Although our data analysis did not show a significant difference between sex and K-index (P value = 0.92), it revealed an association between years of experience as faculty and K-index. However, when adjusting for sex, years on Twitter, and additional degrees, this association no longer remained significant (P value = 0.69). It is important to note that the K-index, used as a measure of celebrity status, has been referenced to evaluate researchers in certain clinical specialties such as cardiology and interventional neuroradiology. The K-index studies conducted by Khan *et al*[11] and Vilanilam *et al*[12] on cardiologists and interventional neuroradiologists, respectively, demonstrated that most physicians on Twitter had a

Table 1 Top 15 hospitals contributing to most gastroenterology physician users on Twitter

	Frequency	Percent
Stanford Healthcare-Stanford Hospital	12	6.90
Baylor College of Medicine	13	7.47
Brigham and Women's Hospital	14	8.05
Cedars-Sinai Medical Center	10	5.75
Cleveland Clinic	13	7.47
Hospitals of University of Pennsylvania-Penn Presbyterian	9	5.17
Jefferson Health-Thomas Jefferson University Hospitals	10	5.75
Massachusetts General Hospital	9	5.17
Mayo Clinic	27	15.52
Mount Sinai Hospital	15	8.62
NYU Langone Hospitals	8	4.60
New York-Presbyterian Hospital-Columbia and Cornell	8	4.60
University of Chicago Medical Center	11	6.32
University of Michigan Hospital-Michigan Medicine	15	8.62

**Figure 1 Top 14 hospitals contributing to most gastroenterology physician users on Twitter.**

low K-index between 0 and 2, while only a few were considered the Kardashians or physician-celebrities (K-index > 5), consistent with the findings of our study. However, it should be emphasized that the K-index formula has limited scientific value and may not accurately reflect a physician's true value and worth[3].

Nonetheless, spending more time on Twitter may have a positive impact on the citation of scholarly works. Recent studies have suggested a positive correlation between highly tweeted articles and increased citations. For instance, a study by Haustein *et al*[13] on tweeting biomedicine, demonstrated a positive correlation between tweeting and citation behavior across various specialties. Eysenbach[14] reported that highly tweeted articles were more likely to be cited than less tweeted articles, with statistically significant Pearson correlation coefficients ranging from 0.42 to 0.72 for log-transformed Google Scholar citations. Gunaratne *et al*[15] illustrated that articles tweeted by authors experienced a 3.08-fold increase in citations within a year and a 1.51-fold increase in total citations. Furthermore, a recent prospective randomized controlled trial study by Luc *et al*[16] found that tweeted articles achieved a significantly higher increase in altmetric scores compared to non-tweeted articles, along with a greater change in citations in 1 year.

The issue of information authenticity on social media is a contentious one, particularly since many individuals rely on social media instead of journals or guidelines. Our hypothesis is that if highly cited GI physicians become more active on Twitter, it may be possible to raise the K-index of a majority of physicians to 3. This would lead to more tweets on published research articles and guidelines, attract more followers, and potentially reduce the dissemination of

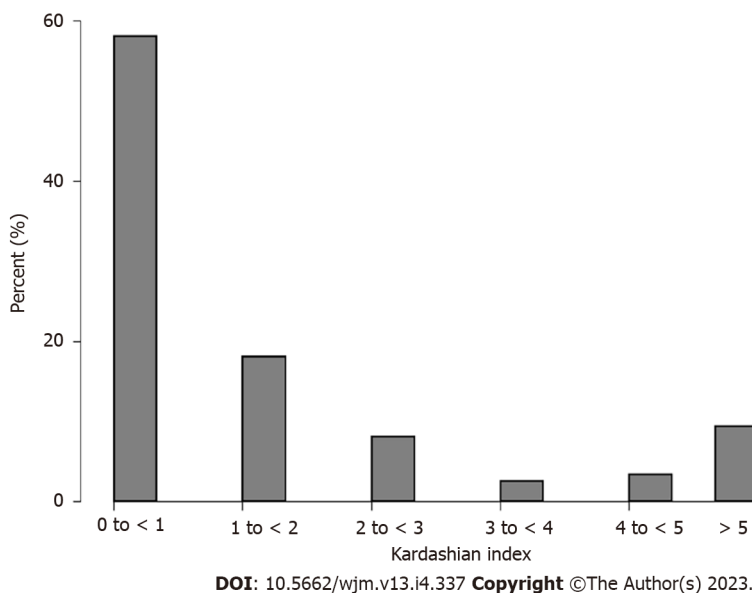


Figure 2 Kardashian index of gastroenterology physicians on Twitter.

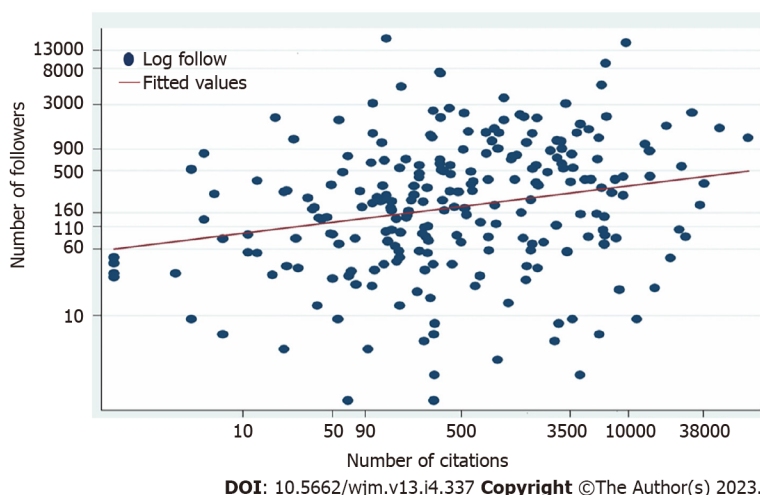


Figure 3 Number of followers of studied gastroenterology physicians on Twitter vs the number of citations for their publications.

misinformation. Aside from increasing research citations and providing factual health information to the public, Twitter offers various other benefits. As a GI physician on Twitter, you have the opportunity to network with colleagues, recruit diverse applicants for fellowship programs, participate in discussions like the Monday night inflammatory bowel disease initiated by John Hopkin's GI physician, Dr. Charabaty, and engage in academic forums like Liver Twitter, which focuses on sharing contents related to chronic liver diseases with a global audience[9,17]. GI mentors with high Twitter impact who are advanced in their field can use this medium to promote the accomplishments of their mentees, increase their visibilities, and open up channels for additional career opportunities[18].

Certain limitations are associated with the K-index. Younger researchers tend to score higher due to a faster accumulation of Twitter followers compared to lifetime citations. Additionally, effective communication of scientific knowledge to attract a large audience is a necessary skill. Furthermore, researchers working in fields with highly ranked professionals are more likely to have their articles cited compared to those in smaller fields[19]. Our data analysis revealed that most GI physicians active on Twitter were affiliated with top-ranked hospitals, with Mayo Clinic having the highest percentage (16%) of physicians with an active Twitter presence, followed by Mount Sinai Hospital (9%) and the University of Michigan Hospital (9%).

It is important to acknowledge the limitations of our study. Firstly, our focus was solely on GI physicians on Twitter due to the original Kardashian study's emphasis on Twitter. We were unable to determine how many of the Twitter followers were medical professionals likely to retweet or quote articles. We also were not able to analyze the contents of the Tweets. Although we conducted a thorough search, there remains a chance that certain Twitter accounts might have eluded detection. Lastly, it is worth noting that the Kardashian formula lacks scientific validation to determine a physician's worth. It is common for celebrity physicians to forgo the humorous intent behind the creation of the K-index

by Hall and take it too seriously, misinterpreting it in a different light than it was created. Hall, 2014 advocated that physicians on Twitter may find it useful to calculate their K-index and attach it to their profile.

CONCLUSION

In conclusion, encouraging highly cited GI physicians to be more active on Twitter may have positive implications, including increased citation of research works and the availability of accurate health information. Twitter also offers opportunities for networking, recruitment, and participation in academic discussions. Nonetheless, the K-index has its limitations, and caution should be exercised when interpreting its results. By sharing and retweeting articles, fostering scientific discussions, forming professional connections, and potentially boosting the impact factor of journals through increased citations, Twitter can serve as a valuable platform. However, it is essential to remember that having an opinion on a subject does not automatically make one an expert. Increased participation of GI physician-scientists on Twitter, specifically in sharing new clinical guidelines and research findings, may help combat misinformation within the GI community.

ARTICLE HIGHLIGHTS

Research background

There is a growing recognition among certain physicians about the significance of social media in facilitating the dissemination of research findings. While some physicians are beginning to appreciate the usefulness of social media, a ton of others are yet to comprehend its importance. In 2014, Hall proposed the K-index as a scientific metric aimed at evaluating if a physician's celebrity status on Twitter (assessed by the high number of followers) is at par with their scientific contributions based on the number of cited research work.

Research motivation

The coronavirus disease 2019 pandemic brought about a lot of misinformation on social media relating to its treatment and prevention. Hence, there arose a need to measure the scientific contribution (number of cited research works) of physician celebrities on Twitter. A study on the K-index of cardiology showed that the majority of the cardiologists on Twitter had a K-index < 2 (indicating more research works compared to the number of social media followers). We were motivated to find out the K-index of gastroenterologists on Twitter.

Research objectives

Our objectives are: (1) To assess whether a gastroenterologist's celebrity status on Twitter equates to the number of published and cited research works; (2) to assess the Twitter activity level of the gastroenterologists in the Top 100 hospitals as reported by the United States World News; and (3) to determine the effect of high Twitter followers on the number of cited scholarly works.

Research methods

An extensive search was done to identify all gastroenterologists actively practicing and associated with the top 100 hospitals as the United States News reported. We collected specific data on a sub-group including their names, affiliations, degrees, and sub-specializations. To gauge their social media popularity, we utilized the K-index calculation which is determined by dividing the actual number of Twitter followers by the number of researcher's citations. The expected number of followers is calculated using the formula $F = 43.3 C^{0.32}$, where C represents the number of citations.

Research results

We found that physicians affiliated with Mayo Clinic emerged as the most prominent presence on Twitter, constituting 16% of the total. They were followed closely by physicians from Mount Sinai Hospital (9%) and the University of Michigan Hospital (9%). 76% of the physicians evaluated exhibited a low K-index of 0-2 which suggested that a significant number of highly influential physician-scientists are not receiving due recognition, as indicated by their relatively low number of followers. However, 24% of the physicians had an inflated K-index of > 5, which positioned them as the "Kardashians" or physician celebrities. These individuals enjoyed greater social media popularity than their actual scientific contributions.

Research conclusions

Encouraging highly cited gastroenterology physicians to be more active on Twitter may have positive implications, including increased citation of research works and the availability of accurate health information and research findings for the public. Twitter also offers opportunities for networking, recruitment, and participation in academic discussions.

Research perspectives

Some physicians, though, may misunderstand the intent of creating the K-index measure. We have been able to determine from the literature review that active presence on Twitter as evidenced by increased tweeting and retweeting

of articles can help boost citation and the H-index of scientists. Physicians who are actively invested in research may find an alternative way to get the result of their research findings to the public and increase their visibility. Mayo Clinic has been at the forefront of utilizing socialmedia in health care, embarking on its journey with podcasting in 2005 and eventually expanding to various social media platforms like Twitter, YouTube, and Facebook. Their objective has been to disseminate the knowledge and expertise of their physicians to a wider audience while also providing a platform for patients to share their stories and experiences. By leveraging these channels, Mayo Clinic has effectively made healthcare information and personal narratives easily accessible to a diverse range of individuals. It is not surprising they ranked number 1 in our study. We hope that other programs will adopt and replicate this approach. In the future, we hope for a scientifically proven index or metric to assess a physician's impact and research influence.

FOOTNOTES

Author contributions: Malik US performed the analysis and wrote both the methods and results; Akbar AU and Zamani Z assisted in data analysis and findings; Ugonabo O performed a comprehensive literature review, wrote the introduction, discussion, and edited and merged all of the author's contributions to fit with the Journal's requirements; Akbar AU assisted in reviewing the manuscript; Frandah W did a final review of the manuscript and made significant contributions before submission to the journal.

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REFERENCES

- 1 Hadgu AT, Jäschke R. Identifying and analyzing researchers on twitter. *WebSci* 2014; 23-32 [DOI: 10.1145/2615569.2615676]
- 2 Costas R, Mongeon P, Ferreira MR, van Honk J, Franssen T. Large-scale identification and characterization of scholars on Twitter. *Quantitative Science Studies* 2020; 1: 771-791
- 3 Hall N. The Kardashian index: a measure of discrepant social media profile for scientists. *Genome Biol* 2014; 15: 424 [PMID: 25315513 DOI: 10.1186/s13059-014-0424-0]
- 4 Irfan KS, Farhana I, Eiad AF, Nassr AM, Al Mohammed AQ, Maya N, Ali AH, Ahmed Abdullah MA, Gominda P, Cees van der V. Family physicians' utility of social media: a survey comparison among family medicine residents and physicians. *Afr Health Sci* 2018; 18: 817-827 [PMID: 30603016 DOI: 10.4314/ahs.v18i3.41]
- 5 Madde M, Zickuhr K. 65% of online adults use social networking sites. Pew Internet and American Life Project. [cited March 28, 2016]. Available from: http://www.pewinternet.org/Reports/2011/Social_Networking_Sites.aspx
- 6 The Nielsen Company. What Americans do online: social media and games dominate the activity. [cited August 20, 2011]. Available from: http://blog.nielsen.com/nielsenwire/online_mobile/what-americans-do-%20online-social-media-and-games-dominate-activity/
- 7 Soto-Perez-de-Celis E. Social media, ageism, and older adults during the COVID-19 pandemic. *EClinicalMedicine* 2020; 29: 100634 [PMID: 33235988 DOI: 10.1016/j.eclinm.2020.100634]
- 8 Woitowich NC, Arora VM, Pendergrast T, Gottlieb M, Trueger NS, Jain S. Gender Differences in Physician Use of Social Media for Professional Advancement. *JAMA Netw Open* 2021; 4: e219834 [PMID: 33983403 DOI: 10.1001/jamanetworkopen.2021.9834]
- 9 Baliss M, Vinsard DG, Grover SC, Oxentenko AS, Bilal M. Leveraging Social Media to Enhance Recruitment Efforts in Fellowship Training Programs. *Clin Gastroenterol Hepatol* 2022; 20: 2671-2674 [PMID: 36113551 DOI: 10.1016/j.cgh.2022.08.012]
- 10 Demailly Z, Brulard G, Selim J, Compère V, Besnier E, Clavier T. Gender differences in professional social media use among anaesthesia researchers. *Br J Anaesth* 2020; 124: e178-e184 [PMID: 31987471 DOI: 10.1016/j.bja.2019.12.030]
- 11 Khan MS, Shahadat A, Khan SU, Ahmed S, Doukky R, Michos ED, Kalra A. The Kardashian Index of Cardiologists: Celebrities or Experts? *JACC Case Rep* 2020; 2: 330-332 [PMID: 32292918 DOI: 10.1016/j.jaccas.2019.11.068]
- 12 Vilanilam GK, Wadhwa V, Purushothaman R, Rohilla M, Radvany MG. The Kardashian index of interventional neuroradiologists: measuring discrepant social media influence. *Neuroradiol J* 2020; 33: 525-527 [PMID: 32907482 DOI: 10.1177/1971400920950928]

- 13 **Haustein S**, Peters I, Sugimoto CR, Thelwall M, Larivière V. Tweeting Biomedicine: An Analysis of Tweets and Citations in the Biomedical Literature. *J Assn Inf Sci Tec* 2014; **65**: 656-669 [DOI: [10.1002/asi.23101](https://doi.org/10.1002/asi.23101)]
- 14 **Eysenbach G**. Can tweets predict citations? Metrics of social impact based on Twitter and correlation with traditional metrics of scientific impact. *J Med Internet Res* 2011; **13**: e123 [PMID: [22173204](https://pubmed.ncbi.nlm.nih.gov/22173204/) DOI: [10.2196/jmir.2012](https://doi.org/10.2196/jmir.2012)]
- 15 **Gunaratne K**, Haghbayan H, Coomes EA. Tweeting Authors: Impact on Research Publicity and Downstream Citations. *J Gen Intern Med* 2020; **35**: 1926-1927 [PMID: [31654356](https://pubmed.ncbi.nlm.nih.gov/31654356/) DOI: [10.1007/s11606-019-05454-0](https://doi.org/10.1007/s11606-019-05454-0)]
- 16 **Luc JGY**, Archer MA, Arora RC, Bender EM, Blitz A, Cooke DT, Hlci TN, Kidane B, Ouzounian M, Varghese TK Jr, Antonoff MB. Does Tweeting Improve Citations? One-Year Results From the TSSMN Prospective Randomized Trial. *Ann Thorac Surg* 2021; **111**: 296-300 [PMID: [32504611](https://pubmed.ncbi.nlm.nih.gov/32504611/) DOI: [10.1016/j.athoracsur.2020.04.065](https://doi.org/10.1016/j.athoracsur.2020.04.065)]
- 17 **Mikolajczyk AE**, Ufere N, Breu AC, Parikh ND, Garcia-Tsao G, Tapper EB. #LiverTwitter: An Emerging Tool for Liver Education and Research. *Hepatol Commun* 2020; **4**: 1229-1233 [PMID: [32766481](https://pubmed.ncbi.nlm.nih.gov/32766481/) DOI: [10.1002/hep4.1539](https://doi.org/10.1002/hep4.1539)]
- 18 **Little JS**, Romee R. Tweeting from the Bench: Twitter and the Physician-Scientist Benefits and Challenges. *Curr Hematol Malig Rep* 2020; **15**: 419-423 [PMID: [33179209](https://pubmed.ncbi.nlm.nih.gov/33179209/) DOI: [10.1007/s11899-020-00601-5](https://doi.org/10.1007/s11899-020-00601-5)]
- 19 **Powell K**, Haslam A, Prasad V. The Kardashian Index: a study of researchers' opinions on twitter 2014–2021. *Scientometrics* 2022; **127**: 1923-1930 [DOI: [10.1007/s11192-022-04281-1](https://doi.org/10.1007/s11192-022-04281-1)]



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