



This is a repository copy of *Staying updated on COVID-19 : social media to amplify science in thrombosis and haemostasis*.

White Rose Research Online URL for this paper:
<https://eprints.whiterose.ac.uk/162726/>

Version: Accepted Version

Article:

Makris, M. orcid.org/0000-0001-7622-7939 (2020) Staying updated on COVID-19 : social media to amplify science in thrombosis and haemostasis. *Research and Practice in Thrombosis and Haemostasis*, 4 (5). pp. 722-726. ISSN 2475-0379

<https://doi.org/10.1002/rth2.12410>

© 2020 The Author(s) and the International Society on Thrombosis and Haemostasis. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

Reuse

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) licence. This licence only allows you to download this work and share it with others as long as you credit the authors, but you can't change the article in any way or use it commercially. More information and the full terms of the licence here: <https://creativecommons.org/licenses/>

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>



Article type : Forum

Staying updated on COVID-19: social media to amplify science in
thrombosis and haemostasis

Mike Makris 1, 2

Addresses

1. Department of Infection, Immunity and Cardiovascular Disease, University of Sheffield, UK
2. Haemophilia and Thrombosis Centre, Royal Hallamshire Hospital, Sheffield Teaching Hospitals NHS Trust, Sheffield, UK

Email: m.makris@sheffield.ac.uk

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/rth2.12410

This article is protected by copyright. All rights reserved

Accepted Article

Essentials

The number of manuscripts published on COVID-19 is overwhelming.

Social media allows sharing of information rapidly.

Twitter offers one of the best ways to remain up to date.

The reach of Twitter is far greater than print information ever achieves.

Abstract

COVID-19 is the most serious pandemic of the internet era. The number of scientific manuscripts published on the subject daily has been overwhelming. The use of twitter enables interested health professionals and the public to stay informed.

Background

COVID-19, the infection caused by a new corona virus SARS-CoV-2, was first identified in the Wuhan province of China and declared a pandemic by the World Health Organisation (WHO) on the 12th March 2020 (1). It is thought that the virus originated from an animal species, most likely the bat, which is a reservoir for this type of virus (2). At the time of writing, over 7 million persons have been infected worldwide and over 400,000 have died. The infection leads to primarily respiratory symptoms and the elderly, men, those with comorbidities, the obese, immunosuppressed and persons from Black and other ethnic minorities are disproportionately affected with severe COVID-19 (1,3). In this commentary, I will discuss the value of twitter in keeping users up to date and helping them identify trends of relevance to haemostasis and thrombosis.

Information overload and dissemination

The COVID-19 pandemic has resulted in a tsunami of information in scientific journals as well as on social media. During any pandemic the thirst for information is almost as great as the search for treatments. During the 1918 Spanish flu pandemic, when the main way for disseminating information was through print media, newspapers released up to six editions daily. In 2020, constant delivery of information is made possible through the almost universal availability of the internet. The only thing that outstrips the exponential number of new SARS-CoV-2 infections, is the number of new pieces of information about the virus published daily online or in print. There are now many ways to communicate including television, radio, newspapers, journals and multiple social media platforms.

One way to keep up with the massive amount of available information is through the use of twitter which has very wide, instantaneous reach. Twitter divides people with users swearing by it and non-users thinking it a waste of time. In my view, twitter is now one of the most important ways to share knowledge with other scientists and the public, both rapidly and simultaneously. The number of manuscripts published on COVID-19 has been huge with more than 300 per day during May 2020 (Figure 1); it is impossible for a single individual to read them all. Twitter has been invaluable in helping to identify and share the most important ones.

Twitter in science communication

The reach of standard publications in science is relatively small, slow and not always in a format that would be understandable to most people. Twitter facilitates this by being widespread, quick and simple. Since the start of the pandemic almost 11 million tweets have been posted that included the hashtag #COVID19. An example of a tweet and its reach

is shown in figure 2. I started tweeting about COVID-19 to try and stay up to date in a very rapidly moving field and to share information I thought was important with a wider audience, both health professionals and the public. As it can be seen in table 1, each tweet is read by thousands of persons and the number of impressions per month are many times higher than scientific publications in journals can ever achieve.

The role of pulmonary microthrombi in the underlying pathogenicity

SARS-CoV-2 is an RNA virus that enters the cell through its receptor angiotensin-converting enzyme 2 (ACE-2) after which it is internalised. ACE-2 converts the vasoconstrictor angiotensin II (Ang II) to angiotensin 1-7, a vasodilator. Following infection, ACE-2 is downregulated and the resulting increase in Ang II contributes to endothelial damage. Endothelial damage is one of the critical elements in SARS-CoV-2 pathogenicity changing the microenvironment from thromboprotective to highly prothrombotic (4). The increasingly prothrombotic environment leads to pulmonary microthrombi in a process termed Pulmonary Intravascular Coagulation (PIC). PIC leads to impaired oxygen exchange and respiratory failure (5).

D-Dimer, thrombotic risk and heparin use to prevent thrombosis

The initial publications from China recognised coagulation activation as being very common in COVID-19 (6). The D-Dimer level on hospital admission correlated with disease severity and progressive elevation in the intensive care unit (ICU) patients correlated with death (7). The use of heparin prophylaxis, which was not initially routinely used in China, was associated with improved overall survival (7). What was at first not reported from China, was the very high prevalence of pulmonary emboli in patients in the ICU (Table 2). It is not clear if this was due to a reduced thrombotic risk in Chinese patients or the lack of systematic investigation of patients for thrombosis. Subsequent reports from Europe have shown that the risk of venous thrombosis both in terms of pulmonary embolism and deep vein thrombosis is very high. Given this high risk, it is imperative to offer all COVID-19 patients admitted to hospital pharmacological thromboprophylaxis with LMWH, unless contraindicated. Many groups and societies have produced anticoagulation guidelines which are invariably based on clinical opinion rather than evidence of benefit. Among the non evidence-based guideline variations used are doubling the prophylactic LMWH dose, giving therapeutic anticoagulation on ICU admission and increasing anticoagulation based on a specific D-Dimer level. It can be difficult to radiologically image deteriorating ICU patients and often treatment dose LMWH is administered without objective evidence of a thrombus. The D-Dimer elevation reflects the thrombo-inflammatory process and has not been used previously as a test to alter the anticoagulation dose. If rapidly rising, the D-Dimer could be an indicator for the development of VTE and the need for imaging, but I do not believe it should form the basis for anticoagulation in isolation.

The amplification of reach of standard publications by social media

Social media can amplify the reach of published papers and one way to quantify this is through the use of the Altmetric Score of each paper. Altmetric Scores are a weighted count of online non-scholarly attention including mentions in mainstream news, public policy documents, Wikipedia, social networks and blogs (17). The Altmetric Score of original cardiovascular articles in the eight highest Web of Science Impact Factor journals have a median score of 10 (interquartile range 2-37) (17).

The Tang et al paper (6) mentioned above has been cited 215 times since its online release on 19 February 2020 and has an Altmetric Score of 594. It has had 633 tweets from 491 users with an upper bound of 1,078,516 impressions. It is unlikely that a paper published in the Journal of Thrombosis and Haemostasis would have reached more than 1 million people without the use of social media.

The second Tang et al paper (7) has been cited 151 times since its release on 27 March 2020 and has an Altmetric Score of 1382. It has received 1788 tweets from 1509 users with an upper bound of impressions of 3,180, 846 which is even more impressive as it relates to treatment.

The need for RCTs, even in a pandemic

Faced with a disease that has an ICU mortality of 30-50%, a large number of off-label drugs have been used alone or in combination, based on theoretical or in vitro evidence of possible benefit. Randomised trials have been uncommon and these drugs have been used largely outside clinical studies. The result is that many patient populations worldwide have been repeatedly exposed to the same non-effective medications. Had a good quality randomised controlled study been done initially, thousands of patients worldwide might have been spared these ineffective treatments subsequently. However tempting it is to try something in a critical situation, all drugs have adverse effects and these can be detrimental. The call for RCTs in epidemics and pandemics is not new and most of the arguments we have seen with COVID-19, were also suggested during previous epidemics (18).

The exit strategy

This will have an impact on all of us and the lessons from the 1918 Spanish Flu pandemic, where early abandonment of isolation measures resulted in a larger second wave of infections that killed more people, must not be forgotten (19). Countries are dealing with the loosening of lockdowns differently, claiming to follow scientific advice, and often interpreting the evidence in different ways. These decisions cannot be separated from the economic ones and politicians take responsibility for making them. Implementation of testing, tracking and isolating contacts should be essential to limit infections. Many believe that the way out of the SARS-CoV-2 era will be through the use of a vaccine, even though there is no certainty that an effective one will be available. Twitter is the ideal platform for dissemination of information about rapid developments, which would be impossible to achieve at the same rate in the traditional scientific print journals.

Long term complications

One aspect of SARS-CoV-2 infection that has not made an impact in the print literature yet but which has gained traction on social media, is the long-term complications in patients with COVID-19 pneumonia, especially in those who have required ventilation. It is essential that these patients are followed up prospectively to identify problems related to pulmonary, vascular, psychological, cardiac and neurocognitive systems. Of major interest will be the frequency of long-term interstitial lung disease and pulmonary hypertension. It is assumed that COVID-19 related PE can be treated with 3 months anticoagulation as this is a transient risk factor, but this may not be the case, and the long-term thrombotic risk may be higher.

Conclusion

COVID-19 is the most serious pandemic of the internet era. The number of scientific manuscripts published on the subject daily has been overwhelming. The use of twitter enables interested health professionals and the public to stay informed. Pulmonary micro and macrovascular thromboses are very frequent and contribute to the pathogenicity and mortality of the disorder. However tempting the desire to give highest doses of anticoagulation is, the real value of this therapy can only be determined through RCTs.

Acknowledgement:

The author wishes to acknowledge the invaluable help provided by Professor Mary Cushman in making suggestions for the improvement of the manuscript.

References

1. Wu D, Wu T, Liu Q, Yang Z. The SARS-CoV-2 outbreak: What we know. *Int J Inf Dis* 2020; 94:44-48
2. Decaro N, Larusso A. Novel human corona virus (SARS-CoV-2): A lesson from animal corona viruses. *Vererinary Microbiology* 2020 (in press)
3. Doherty AB, Harrison EM, Green CA, et al. Features of 20133 UK patients in hospital with covid-19 using the ISARIC WHO clinical characterisation protocol: prospective observational cohort study 2020; 369:m1985
4. Varga Z, Flammer AJ, Steiger P, et al. Endothelial cell infection and endotheliitis in COVID-19. *Lancet* 2020 (in press)
5. McGonagle D, O'Donnell JS, Sharif K, Emery P, Bridgewood C. Immune mechanisms of pulmonary intravascular coagulopathy in COVID-19 pneumonia. *Lancet Rheumatology* 2020 (in press)
6. Tang N, Li D, Wang X, Sun X. Abnormal coagulation parameters are associated with poor prognosis in patients with novel corona virus pneumonia. *J Thromb Haemost* 2020; 18:844-847
7. Tang N, Bai H, Chen X, Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. *J Thromb Haemost* 2020; 18:1094-1099
8. Cui S, Chen S, Li X, Liu S, Wang F. Prevalence of venous thromboembolism in patients with severe novel corona virus pneumonia. *J Thromb Haemost* 2020 (in press)
9. Ren B, Yan F, Deng Z, et al. Extremely high incidence of lower extremity deep vein thrombosis in 48 patients with severe COVID-19 in Wuhan. *Circulation* 2020 (in press)

10. Klok FA, Kruij MJHA, van der Meer NJM, et al. Confirmation of the high cumulative incidence of thrombotic complications in critically ill ICU patients with COVID-19: An updated analysis. *Thromb Res* 2020 (in press)
11. Middeldorp S, Coppens M, Haaps TF, et al. Incidence of venous thromboembolism in hospitalized patients with COVID-19. *J Thromb Haemost* 2020 (in press)
12. Helms J, Tacquard C, Severac F, et al. High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study. *Intensive Care Med* 2020 (in press)
13. Lodigiani C, Lapichino G, Carenzo L, et al. Venous and arterial thromboembolic complications in COVID-19 patients admitted to an academic hospital in Milan, Italy. *Thromb Res* 2020 (in press)
14. Thomas W, Varley J, Johnson A, et al. Thrombotic complications of patients admitted to intensive care with COVID-19 at a teaching hospital in the United Kingdom. *Thromb Res* 2020; 191:76-77
15. Longchamp A, Longchamp J, Manzocchi-Besson S, et al. Venous thromboembolism in critically ill patients with COVID-19: Results of a screening study for deep vein thrombosis. *Res Pract Thromb Haemost* 2020 (in press)
16. Demelo-Rodriguez P, Cervilla-Munoz E, Ordieres-Ortega L, et al. Incidence of asymptomatic deep vein thrombosis in patients with COVID-19 pneumonia and elevated D-dimer levels. *Thromb Res* 2020; 192:23-26
17. Chi G, Cushman M. Social media optimisation in medicine. A journal's perspective. *Res Pract Thromb Haemost* 2019; 3:144-146
18. Ellenberg SS, Keusch GT, Babiker AG, et al. Rigorous clinical trial design in public health emergencies is essential. *Clin Infect Dis* 2018; 66:1467-1469
19. Simonsen L, Chowell G, Andreasen V, et al. A review of the 1918 Herald Pandemic Wave: Importance for contemporary pandemic response strategies. *Ann Epidemiol* 2018; 28:281-288

PubMed Articles on COVID-19: 2020

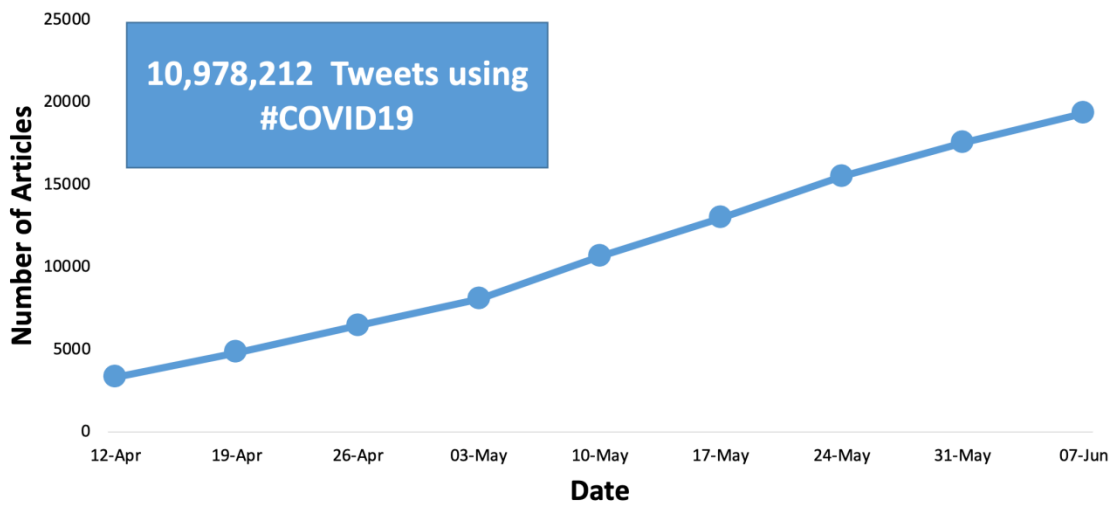
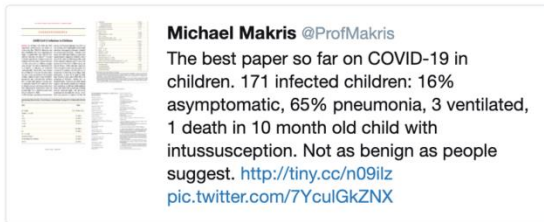


Figure 1: The number of publications listed on PubMed with the search term COVID-19. Over the same period almost 11 million tweets were posted using the same term.

Figure 2 Example of a tweet with the analysis provided by Twitter. Impressions is the total number the individual tweet has been seen by users. Engagements is the total number users interacted with a tweet such as by retweeting, replying, liking, opening a link etc.

Tweet activity



Michael Makris @ProfMakris
The best paper so far on COVID-19 in children. 171 infected children: 16% asymptomatic, 65% pneumonia, 3 ventilated, 1 death in 10 month old child with intussusception. Not as benign as people suggest. <http://tiny.cc/n09ilz> <pic.twitter.com/7YculGkZNX>

Impressions	57,686
Total engagements	7,226
Media engagements	3,689
Detail expands	1,925
Link clicks	585
Likes	366
Profile clicks	323
Retweets	319
Replies	19

Table 1 The number of tweets sent from @ProfMakris and the total number of impressions they achieved.

Month in 2020	Number of tweets	Total impressions	Impressions per tweet
February	128	463,000	3,617
March	286	1,110,000	3,881
April	358	1,590,000	4,441
May	287	1,260,000	4,390

Table 2. Risk of thrombosis in hospitalised patients with COVID-19. Pharmacological prophylaxis was given in all studies except the one by Cui from China.

Study	Clinical diagnosis or screening	Total patients n	ICU patients n (%)	Still in hospital n (%)	PE n (%)	DVT n (%)	Total VTE n (%)	Total arterial n (%)
Cui (China) (8)	Mixed	81	81 (100)	11	Not given	20 (24.7)	20 (24.7)	Not given
Ren (China) (9)	Screening	48	48 (100)	Not given	Not given	41 (85.4) (*)	41 (85.4)	Not given
Klok (Netherlands) (10)	Clinical	184	184 (100)	65 (35.3)	65 (35.3)	3 (1.6)	68 (36.9)	3 (1.6)
Middeldorp (Netherlands) (11)	Mixed	198	75 (37.8)	16 (8.1)	13 (6.6)	25 (12.6)	39 (19.6)	Not given
Helms (France) (12)	Clinical	150	150 (100)	>101 (>67.3)	25 (16.7)	3 (2.0)	28 (18.6)	6 (4.0)
Lodigiani (Italy) (13)	Mixed	388	61 (15.7)	Not given	10 (2.6)	6 (1.5)	16 (4.1)	13 (3.3)
Thomas (UK) (14)	Clinical	63	63 (100)	>28 (>44.4)	5 (7.9)	1 (1.6)	6 (9.5)	2 (3.2)
Longchamp (Switzerland) (15)	Mixed	25	25 (100)	2 (8.0)	5 (20.0)	6 (24.0)	8 (32.0)	Not given
Demelo-Rodriguez (Spain) (16)	Screening	156	0 (0)	Not given	0	23 (14.7) (**)	23 (14.7)	Not given
Total		1293	687		123 (9.5)	128 (9.9)	249 (19.2)	

(*) 5 of 48 (10.4%) were proximal DVT whilst 36 of 48 (75%) were isolated distal DVT detected by screening

(**) 1 of 156 (0.6%) was proximal DVT whilst 22 of 156 (14.1%) were isolated distal DVT detected by screening