

Staying updated on COVID-19: Social media to amplify science in thrombosis and hemostasis

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Abstract

Coronavirus disease 2019 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.

KEYWORDS

COVID-19, pulmonary intravascular coagulation, SARS-CoV-2, thrombosis, Twitter

Essentials

- The number of manuscripts published on coronavirus disease 2019 is overwhelming.
- Social media allows rapid sharing of information.
- Twitter offers one of the best ways to remain up to date.
- The reach of Twitter is far greater than print information ever achieves.

1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19), the infection caused by a new coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in the Wuhan province of China and declared a pandemic by the World Health Organization on March 12, 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 people 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, those who are immunosuppressed, and people 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 hemostasis and thrombosis.

2 | 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 of 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,

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instantaneous reach. Twitter divides people, with users swearing by it and nonusers considering 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.

3 | 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 include 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 seen in Table 1, each tweet is read by thousands of people, and the number of impressions per month are many times higher than scientific publications in journals can ever achieve.

4 | 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 internalized. 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 called pulmonary intravascular coagulation (PIC). PIC leads to impaired oxygen exchange and respiratory failure.⁵

5 | D-DIMER, THROMBOTIC RISK, AND HEPARIN USE TO PREVENT THROMBOSIS

The initial publications from China recognized 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 in terms of both pulmonary embolism and deep vein thrombosis is very high. Given this high risk, it is imperative to offer all patients with COVID-19 admitted to hospital pharmacological thromboprophylaxis with low-molecular-weight heparin (LMWH), unless contraindicated. Many groups and societies have produced anticoagulation guidelines that 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 thromboinflammatory 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 venous thromboembolism and the need for imaging, but I do not believe it should form the basis for anticoagulation in isolation.

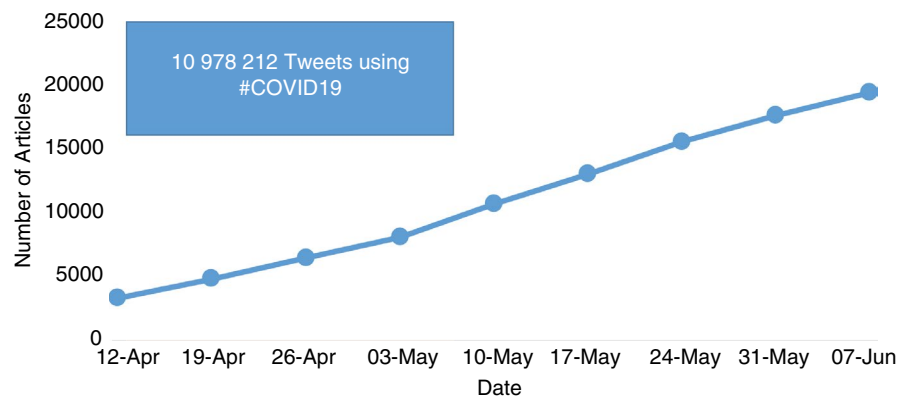
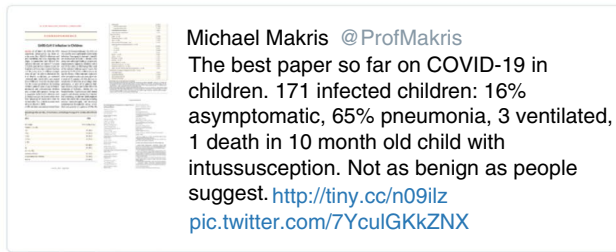


FIGURE 1 The number of publications listed on PubMed with the search term COVID-19. Over the same period, almost 11 million tweets were posted using the same term

Tweet activity



Impressions	57 686
Total engagements	7226
Media engagements	3689
Detail expands	1925
Link clicks	585
Likes	366
Profile clicks	323
Retweets	319
Replies	19

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

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	3617
March	286	1 110 000	3881
April	358	1 590 000	4441
May	287	1 260 000	4390

6 | 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 nonscholarly attention, including mentions in mainstream news, public policy documents, Wikipedia, social networks, and blogs.⁸ 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).⁸

A paper by Tang et al⁶ has been cited 215 times since its online release on February 19, 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 *Research and Practice in Thrombosis and Haemostasis* would have reached more than 1 million people without the use of social media.

A second paper by Tang et al⁷ has been cited 151 times since its release on March 27, 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.

7 | THE NEED FOR RANDOMIZED CONTROLLED TRIALS, 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. Randomized controlled trials (RCTs) 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 noneffective medications. Had a good quality RCT 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.⁹

8 | 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.¹⁰ 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

TABLE 2 Risk of thrombosis in hospitalized patients with COVID-19

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 et al ¹¹ (China)	Mixed	81	81 (100)	11	Not given	20 (24.7)	20 (24.7)	Not given
Ren et al ¹² (China)	Screening	48	48 (100)	Not given	Not given	41 (85.4) ^a	41 (85.4)	Not given
Klok et al ¹³ (Netherlands)	Clinical	184	184 (100)	65 (35.3)	65 (35.3)	3 (1.6)	68 (36.9)	3 (1.6)
Middelcorp et al ¹⁴ (Netherlands)	Mixed	198	75 (37.8)	16 (8.1)	13 (6.6)	25 (12.6)	39 (19.6)	Not given
Helms et al ¹⁵ (France)	Clinical	150	150 (100)	>101 (>67.3)	25 (16.7)	3 (2.0)	28 (18.6)	6 (4.0)
Lodigiani et al ¹⁶ (Italy)	Mixed	388	61 (15.7)	Not given	10 (2.6)	6 (1.5)	16 (4.1)	13 (3.3)
Thomas et al ¹⁷ (UK)	Clinical	63	63 (100)	>28 (>44.4)	5 (7.9)	1 (1.6)	6 (9.5)	2 (3.2)
Longchamp et al ¹⁸ (Switzerland)	Mixed	25	25 (100)	2 (8.0)	5 (20.0)	6 (24.0)	8 (32.0)	Not given
Demelo-Rodriguez et al ¹⁹ (Spain)	Screening	156	0 (0)	Not given	0	23 (14.7) ^b	23 (14.7)	Not given
Total		1293	687		123 (9.5)	128 (9.9)	249 (19.2)	

Pharmacological prophylaxis was given in all studies except the one by Cui from China.

DVT, deep vein thrombosis; ICU, intensive care unit; PE, pulmonary embolism; VTE, venous thromboembolism.

^aFive of 48 (10.4%) were proximal DVT, while 36 of 48 (75%) were isolated distal DVT detected by screening.

^bOne of 156 (0.6%) was proximal DVT, while 22 of 156 (14.1%) were isolated distal DVT detected by screening.

be impossible to achieve at the same rate in the traditional scientific print journals.

9 | LONG-TERM COMPLICATIONS

One aspect of SARS-CoV-2 infection that has not made an impact in the print literature yet but 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 a COVID-19-related pulmonary embolism can be treated with 3 months of anticoagulation as this is a transient risk factor, but this may not be the case, and the long-term thrombotic risk may be higher.

10 | 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 be determined only through RCTs.

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