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The Democratization of Scientific Conferences: Twitter in the Era of COVID-19 and Beyond

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Abstract

Purpose of Review The coronavirus disease 2019 (COVID-19) pandemic has had profound impacts upon scientific discourse in our field, most prominently through the abrupt transition of malignant hematology conferences to all-digital formats. These virtual components will likely be incorporated into future iterations of these conferences even as in-person attendance is reincorporated. In this review, we discuss ways in which usage of the social networking platform Twitter has expanded in the past year during virtual conferences as a method to facilitate—and, in some ways, democratize—information flow and professional networking.

Recent Findings Emerging Twitter-based tools in malignant hematology include presenter-developed *#tweetorials*, conference-specific “poster walks,” and disease-specific online journal clubs. Twitter is also increasingly being used for networking across institutional and international lines, allowing for conversations to continue year-round as a first step toward multicenter collaborations as well as in-person *#tweetups* at subsequent meetings.

Summary The ability of Twitter to enable uninterrupted information exchange has reinforced its central role in medical and scientific communication in a way that will certainly outlive the COVID-19 pandemic.

Keywords Social media · Twitter · COVID-19 · Conferences · Disease-specific hashtags

Introduction

One of the many seismic shifts induced by the coronavirus disease 2019 (COVID-19) pandemic has been its impact on scientific discourse within medicine, including the field of

malignant hematology [1–5]. The role of preprint servers for disseminating information and changing clinical practice (all prior to peer review) has risen substantially since January 2020 [6,7]. Conversely, traditional in-person conferences—which are more established venues for presenting this type of cutting-edge research—have resulted in COVID-19 (*#COVID19*) “super-spreader” events [8]. It is thus no surprise that scientific meetings across the world have abruptly moved to an entirely digital format using streamed sessions, web-based question and answer (Q&A) sessions, and online-only posters. Thankfully, this transition has been feasible for several conferences to date. Given the potential for lowered travel costs, expanded access for participants with limited time or from distant geographies, and reduced carbon footprints [9,10], expanded digital content will likely remain an important, if not essential, component of a new paradigm for scientific discourse even after the pandemic abates.

The role of Twitter-based discussions at medical and scientific conferences, which had already been rising in the past decade [11–13], has morphed qualitatively in the wake of the pandemic as well. In lieu of conference-related conversations

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occurring during impromptu hallway discussions and planned dinner meetings, we have anecdotally seen these interactions migrate to the public domain on Twitter—often with more participants and a longer chronological “tail” extending days later. At the all-virtual American Society of Hematology (ASH) meeting in December 2020 (#ASH20), over 6000 unique attendees posted over 30,000 times on Twitter; these tweets collectively gathered over 150 million views globally [14]. These Twitter-based conversations at #ASH20 included scientific discussions, real-time commentary on research being presented, and even some more advanced Twitter concepts. Specifically, Dr. Jyoti Nangalia (@jyoti_nangalia), the senior author of a late-breaking abstract, directed attendees to her pre-composed #tweutorial (a sequential thread of informative tweets) at the conclusion of her oral remarks to learn more about her research and its implications [15,16]. To our knowledge, this represents the first instance of a “tweutorial” being invoked at a scientific meeting of this scale.

In this review, we summarize these and other recent changes to Twitter usage at scientific conferences, in terms of both scientific discourse and networking. We also discuss next steps and unmet needs for the malignant hematology community to leverage these changes beyond the COVID-19 era. Even as the pandemic subsides in coming years, we anticipate continued growth for Twitter as an essential platform for exchanging information and building collaborations during scientific conferences. While nothing can fully replace the stateliness of in-person plenary sessions or the spontaneity of face-to-face networking, Twitter offers the potential to foster increased communication between stakeholders at conferences. Indeed, by allowing any member of the community to ask a question or to contribute their unique interpretation of data and its context, Twitter may democratize scientific discourse altogether. This possibility, in turn, provides the malignant hematology field with rich opportunities not just to promote scientific collaboration but also to improve the quality of our research and our clinical care [17, 18, 19].

Twitter for Information Exchange at Scientific Conferences

There is no doubt that virtual meetings can ease several encumbrances associated with in-person attendance at scientific conferences. Time spent in transit, whether by plane to the host city or by foot between opposite ends of a convention center, is eliminated. And simultaneous sessions, a necessity of large scientific conferences regardless of their format, are more straightforward to navigate during virtual meetings. The importance of being able to attend specific presentations with greater precision cannot be understated, particularly during large meetings with sessions that overlap thematically and chronologically. For conference attendees hoping to

selectively maximize exposure to a domain of interest that spans across multiple sessions, the ability to prioritize the viewing of key presentations during a multi-hour session is helpful or even essential if the sessions occur simultaneously. Conversely, attendees can repeat or rewind these key presentations to ensure full understanding of the material being presented. And for attendees who hope to save or tweet key slides, screenshots of streamed slides (or slides captured by other tools such as Microsoft Lens) are often less distorted and more legible than obliquely taken smartphone photos of projector screens.

These advantages come with relevant counterpoints, however. Without dedicated time allotted for transit and conference participation, balancing the competing needs of clinical service or childcare responsibilities can become cumbersome for attendees. Internet connectivity issues for presenters and attendees may limit the feasibility of real-time discourse during the Q&A sessions set up by conference organizers, particularly for international presenters. And in an era where information overload is a real phenomenon for oncologists [20,21], the synchronous availability of all content in one’s domains of interest presented at a meeting might rapidly become overwhelming. Similarly, the precision offered by virtual conferences lowers the odds of serendipitously overhearing interesting content being presented in a nearby conference hall or stopping to see an innovative abstract on display while meandering the poster hall. Several organizations have experimented with “virtual poster walks” organized by disease group or theme—or alternatively with audio “postercast” commentaries uploaded by authors [22]—as a way to circumvent this limitation of digital posters, which is a practice we encourage.

Regardless of a conference’s format, Twitter continues to offer attendees an opportunity to retain precision over the information they receive while maintaining the ability to discover relevant content as well. Compared to other social media platforms, advantages of Twitter include its intrinsically public nature and the accommodation of asymmetric engagement: in other words, the ability of users to rapidly toggle between viewing and posting content [23]. For newer Twitter users, one starting point is to search for the disease-specific and conference-specific hashtags shown in Table 1 [24]. From there, users can choose to follow selected authors and interact with their tweets through “likes,” “retweets,” or replies. While individual tweets are limited to 280 characters (approximately 30–50 words), Twitter-posting attendees can link tweets into longer threads and add relevant screenshots of posters or slides [25••]. Other attendees can thus quickly learn about emerging research in bite-sized chunks through short tweets and high-yield images, often alongside spontaneously written summaries and commentaries added by the authors of each tweet. The distillation of content from the spoken word and evanescent presentation slides into a quickly digestible

Table 1 Updated listing of hashtags within malignant hematology

Disease-related	Scope
#ALamyloidosis	Light-chain amyloidosis
#BMTsm	Stem cell transplantation
#CLLsm	Chronic lymphocytic leukemia
#leusm	Leukemia, in particular ALL/AML (<i>also abbreviated: #leuksm</i>)
#lymsm	Lymphomas
#MDSsm	Myelodysplastic syndromes
#mmMRD	Multiple myeloma: measurable residual disease
#MMsm	Multiple myeloma
#MPNsm	Myeloproliferative neoplasms
Conference-related*	Scope
#ASCO21	American Society of Clinical Oncology
#ASH21	American Society of Hematology
#EBMT21	European Society for Blood and Marrow Transplantation
#EHA25Virtual	European Hematology Association
#TCTM21	American Society for Transplantation and Cellular Therapy / Center for International Blood and Marrow Research (<i>formerly BMT Tandem meetings</i>)

In general, hashtags are not case-sensitive

*Conference-related hashtags generally end with the last two digits of their year of occurrence, for example, #ASCO21 for the annual American Society of Clinical Oncology meeting to be held in June 2021

format is one of the key attributes that make Twitter so important during medical and scientific conferences, both during and after the COVID-19 pandemic.

The lack of a physical poster hall or session podium can similarly curtail the ability of abstract presenters to engage meaningfully with their audience during virtual conferences. The solutions described above are thus as equally relevant to abstract presenters as to conference attendees. Including one's Twitter handle in slide materials, as was explicitly encouraged by the American Society of Clinical Oncology (ASCO) at the #ASCO20 meeting in June 2020 [26], is a simple way to be a part of the conversation surrounding one's research and its implications. Compared to in-person Q&A sessions that may be limited by time constraints and comments presented in the guise of questions, the bidirectional flow of information on Twitter can extend over time and be accessed by any attendee to read, promote, or reply with comments. By allowing a more diverse audience to essentially provide peer review in real time [23], this democratization of scientific discourse can enhance the quality of both research-related discussions and subsequent manuscripts. There is also evidence to suggest that Twitter discussion of research can predict future citations, amplifying the impact (#twimpact) of the paper [27]. Similarly, a well-presented abstract that receives Twitter commentary or a retweet from a prominent conference attendee can spread the word about this research more quickly than in-person conversations. While these features of Twitter were certainly in use before COVID-19, their broader adoption to encourage information-sharing at medical and scientific conferences can be expected to outlive the pandemic.

Twitter for Networking and Mentorship at Scientific Conferences

In the years preceding the COVID-19 pandemic, groups such as the #WomenInMedicine chat had already been showcasing Twitter as a networking tool for women and underrepresented minorities (URMs) in medicine. Virtual discussions of issues such as burnout, imposter syndrome, and disparities in academic medicine allowed for participants to share experiences and provide mutual support in ways that are more difficult to accomplish in person at many institutions [28•,29]. The year 2020 brought issues related to social justice into sharp focus and catalyzed broader transitions toward online networking across medicine for reasons unrelated to the COVID-19 pandemic. For example, the #ShareTheMicNowMed trend—whereby non-Black physicians allowed Black physicians (often trainees) to tweet from their accounts about prejudice in medicine and other social justice issues—has served as an important platform to raise discussions of inequities and raise the profiles of URMs in medicine [29].

While online media cannot fully correct for the sudden absence of in-person meetings, Twitter networking at conferences offers a broader audience than ever before. Attendees of meetings often adopt a collaborative mindset focused on absorbing and responding to content in ways that may temporarily shift beyond their respective niches within hematology. At the 2020 ASH meeting (#ASH20), for example, discussions about gene-based therapies and measurable residual disease (MRD; #mmMRD) quickly spawned across disease groups (e.g., practitioners with expertise in leukemia,

lymphoma, or myeloma) and among both adult and pediatric specialists. This sort of delocalized collaboration was most evident throughout the past year at the intersection of COVID-19 and hematology. Relevant topics spanned from cancer-related morbidity and mortality (*#COVID19nCancer*) to clinical trials (*#COVID19ClinicalTrials*), public health campaigns (e.g., *#MaskUp*), vaccine safety (e.g., *#COVID19Vaccine* and *#ThisIsOurShot*), and more. Twitter maximizes the ability of these interdisciplinary discussions to coalesce into meaningful discourse by allowing attendees to contribute to whatever extent they feel comfortable. Even without commenting, clicking to “like” the tweet of another attendee helps that tweet garner more attention based on internal Twitter algorithms. That, in turn, helps assure that more conference attendees will see and potentially contribute to the ensuing discussion.

During this extended meeting time on social media, attendees can engage in discussions regarding scientific collaborations, contextualize data by citing references and suggesting future directions they would not have had the time or bandwidth to identify in person, or foster professional connections with the goal of career development or professional advocacy [30,31]. Of note, these effects may be even more pronounced for smaller region- or disease-focused meetings. There were several successful online annual meetings for smaller organizations including the Society of Hematologic Oncology (*#SOHO2020*), the Texas Myeloproliferative Neoplasm Workshop (*#TxMPN2020*), and the International Society on Thrombosis and Haemostasis (*#ISTH2020*). All of these events facilitated education, data sharing, and networking in a more intimate setting than larger meetings such as *#ASH20* or *#ASCO20*. Given the potential for attracting a larger audience—with colleagues from Africa, Asia, Europe, the Middle East, and beyond—these smaller and more specialized conferences may particularly benefit from maintaining their virtual platforms in the future.

What about networking at an individual level? Interactions via Twitter at scientific conferences can be initiated in a number of ways: tweeting about one’s own research or interests, interacting with others’ tweets, and even direct messaging. The informal nature of Twitter communication allows attendees to engage with others interested in similar ideas—not just physicians but also nurse practitioners, physician assistants, nurses, pharmacists, scientists, patient advocates, and others—and thus allows sub-networks and offline collaborations to form. There is also unique value in networking directly (and publicly) with senior hematologists via Twitter as well [14,17]. While “liking” the tweet of a content expert might not feel like networking for trainees or junior faculty, this can help raise awareness of one’s name and career interests among like-minded attendees. The often-dreaded idea of a “cold call” or “cold email” to a potential mentor or collaborator, one that may go undelivered or unread, can perhaps be replaced, or at

least augmented, in the era of Twitter as well. And while these types of conversations might have occurred only annually if reliant on in-person conferences, Twitter allows for these discussions to continue year-round. Conversely, Twitter-based networking during the current and post-pandemic era of conferences may serve as a bridge to *#tweetups* (Twitter-organized meetups in real life), thus completing the circle of symbiosis between virtual and in-person interactions.

Another benefit of the virtual setting is that these Twitter-based connections can be forged with others at a local, national, or even global level. The democratization of networking means that attendees can engage with colleagues across international boundaries, including attendees who would have been unable to attend an in-person conference because of financial or logistical considerations. More so than at in-person events, then, we can interact with colleagues around the world to identify areas of mutual interest and establish collaborations. Organic international collaborations are increasingly gaining a foothold in malignant hematology, particularly in the past year: for example, the recently published analysis of COVID-19 outcomes among patients with multiple myeloma (facilitated by the International Myeloma Society) that enrolled patients from 10 countries [32]. The first step toward these endeavors is networking with colleagues in different time zones, which can occur more easily at conferences thanks to the power of technology. For example, the inaugural *#TxMPN2020* meeting held in August 2020—organized by Drs. Ruben Mesa (@mpdrc), Naveen Pemmaraju (@doctorpemm), and Srđan Verstovsek—garnered over 1300 participants from over 30 countries. The potential to develop these international collaborations via Twitter remains, in our minds, an untapped resource.

Next Steps for Twitter in Malignant Hematology

We envision four specific future directions for *#HemeTwitter* during future conferences and possibly even year-long: [1] presenter-developed *#tweetorials* about their research, [2] standardization of hashtags to facilitate the organization of tweeted content, [3] new intersections of research and advocacy interests between fields, and [4] timely trainee-focused Twitter journal clubs. Of these four, the first point is possibly the easiest to implement immediately. Professional societies and journals have experimented with a number of methods to distill posters and slide decks into their essence, for example, key learning objectives, “postercast” recordings [22], or visual abstracts. These may be difficult to create or, with regard to postercasts, require a special app in order to be accessed. In contrast, *#tweetorials* are easy to create and digest; more importantly, they constitute open-access content. We believe that encouraging poster presenters to develop *#tweetorials*

containing 5–15 tweets at upcoming meetings will both promote Twitter adoption as well as centralize subsequent discussions around their research. Similar *#tweetorials* for published research may offer benefits over visual abstracts in terms of preparation, flexibility with figures and tables, and ease of sharing these synopses while retaining attribution to the original authors. Because Twitter is free to use, this paradigm may also democratize access to key research findings regardless of journal subscription status. That said, of course, we caution against changes in patient care based exclusively on material tweeted during a conference.

Secondly, we see an ongoing need for *#HemeTwitter* to standardize the current database of cancer tag ontology (CTO) and expand on developing hematology tag ontology (HTO) [24]. The CTO hashtag initiative initially developed 23 formal CTO hashtags for usage within oncology, including many of the hashtags identified in Table 1 [33]. These hashtags allow for quick categorization of thematic intent in a 280-character-limited tweet, for example, *#MMsm* rather than “for members of the multiple myeloma community.” While any hashtag can be created on Twitter by prefixing the # symbol to a word, abbreviation, or phrase without spaces, the benefit of coalescing around a single hashtag (e.g., a CTO hashtag formally registered with the healthcare analytics company Symplur as illustrated in Fig. 1) includes a refined ability to search for this content both in real time and subsequently and study its usage over time. This standardization is particularly relevant for members of a disease-specific community who could not attend a conference, for example patients or international residents. At the current time, some unintentional CTO-related ambiguity persists within malignant hematology, for example, is it *#leusm* or *#leuksm* for leukemia? Conference-endorsed lists of hashtags, as done before the *#ASH20* meeting (recommending *#leusm*) [34], may help to standardize these hashtags. Development and maintenance of a database of endorsed hashtags by one or more professional organizations would be a worthwhile endeavor to increase standardization and further ease access to information being shared.

Thirdly, we see an opportunity for use of the Twitter platform to address gaps within hematology and build bridges to other specialties. Within malignant hematology, the *#BMTsm* hashtag has already begun to link clinicians, researchers, advocacy groups, and patients within the stem cell transplantation community [35,36]. In the space of rare and ultra-rare diseases including myeloproliferative neoplasms (*#mpnsm*) and blastic plasmacytoid dendritic cell neoplasms (*#bpdcn*), Twitter has been used to connect patients with clinical trials and—for BPDCN, in particular—dermatologists with malignant hematologists interested in BPDCN [37–39]. We foresee continued initiatives to link researchers and patients across disciplinary and institutional lines within malignant hematology. For example, the *#Hemepath* hashtag within the field of

hematopathology can be used to foster case discussions with *#leusm* and *#lymsm* participants within malignant hematology [40]. An analogous concept is taking root within the growing field of cardio-oncology (*#CardioOnc*), where social media is being used to connect cardiologists and oncologists with shared interests [41]. We hope to see more of these discussions entering the Twittersphere, particularly for rare diseases or rare conditions where these conversations would otherwise have occurred only within the siloed walls of specialized academic institutions.

Lastly, we anticipate increased growth in the use and reach of audience-specific Twitter journal clubs. The most pertinent example for readers of this journal was the previously operational Blood and Marrow Transplantation Online Journal Club (@bmtojc), which was run quarterly by the American Society for Transplantation and Cellular Therapy from 2014 to 2017 across multiple platforms, including Twitter [17•]. Other active Twitter-based journal clubs include the Hematology/Oncology Journal Club (@HOJournalClub) and Health Policy Journal Club (@HPJournalClub). Twitter journal clubs can include attendees from across the world and—while generally tailored toward trainees—can easily include guest speakers, patient advocates, or other members of the community. Journal clubs can capitalize on the spirit of critical feedback and contribution at scientific meetings to review cross-disease themes (e.g., MRD-based decision-making) or to set the stage for plenary sessions using fast-paced and real-time discussions [42]. Even during in-person meetings of the future, these virtual sessions can serve as powerful tools for trainees and first-time attendees to quickly gain familiarity with major findings and network with other attendees virtually before arranging in-person *#tweetups*.

Should these future directions be organic endeavors spearheaded by motivated attendees or organized initiatives launched by professional societies? We believe that the answer is a mix of both; however, there is a clear opportunity for professional society leaders and conference organizers to coordinate some of these much-needed virtual interactions. While Symplur has already been crowning *top influencers* after prior hematology conferences, we envision a future where these individuals and other senior members are tapped by conference organizers in advance to fill specific social media roles. These might include serving as networking chairs or facilitators of domain-specific discussions, similar to the “ambassador” role incorporated at *#ISTH20* last year [42]. Future iterations of trainee-specific events, for example “ASH-a-Palooza,” which takes place every year before the ASH annual meeting, might involve pre-specified leaders who serve as virtual mentors of sorts by connecting senior and junior members. Public discussions can model the Q&A format of online journal clubs but focus on career development or community-wide advocacy issues. The American Medical Association (@AmerMedicalAssn) organized a number of *#AMACHat*

a Hematology Tag Ontology:

The aim of the Hematology Tag Ontology is to develop and organize hashtags to promote better hematology online information signal-to-noise for patients, caregivers, and healthcare professionals interested in hematologic conditions. [Learn more.](#)

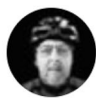
120,604 Hematology Tweets
 31 Hematology Hashtags

Tweet

Add a hashtag

b #MMSM Tweet Chats: Multiple Myeloma, also known as myeloma or plasma cell myeloma, is cancer of the plasma cells - a kind of white blood cell which is present in the bone marrow.

[#MMSM](#) is a [healthcare tweet chat](#) hashtag submitted by [@mtmdphd](#)



@DrGarethMorgan1

an hour ago

At iwMM Dr Mateos suggests the evidence supports early intervention in high-risk SMM. [#iwMM](#) [#mmsm](#)



@VJHemOnc

an hour ago

RT [@IreneGhobrial](#): lwmyeloma meeting. First session on genomics in smoldering and high risk myeloma. [#mmsm](#) <https://t.co/mT7eeolR3f>



@SLentzsch

an hour ago

RT [@VJHemOnc](#): [#iwMyeloma21](#): [@mvmateos](#) discusses Interventions and update on current clinical trials for SMM View [#Myeloma](#) updates here: [ht...](#)

c Select Hashtag Type

- Conference
- Tweet Chat (one-time event)
- Disease
- Other

Select Hashtag Type

Hashtag

#

Use only alphanumeric characters. Underscore _ is also allowed. A hashtag must be more than 4 and less than 30 characters long.

Topics

My Role

Submit Hashtag

Fig. 1 Hashtag viewing and creation via the Symplur website. **a** Overview of the Symplur page (<https://www.symplur.com/healthcare-hashtags/ontology/hematology/>). **b** Example of a Symplur listing for a

hematology hashtag (<https://www.symplur.com/healthcare-hashtags/mmsm/>). **c** Adding a new hematology hashtag (<https://www.symplur.com/submit-hashtag/>). Note: figures modified for ease of viewing

discussions earlier this year involving timely topics such as racial health equity and personal protective equipment shortages, which can serve as a template for future [#HemeChat](#) discussions within malignant hematology.

In conclusion, the year 2020 has taught us how critically important Twitter is to maintaining connections across the field of malignant hematology. Twitter is well poised to maintain the communication we rely upon for dissemination of

advances presented at these conferences as well as professional networking across institutions, disciplines, and disease groups. We hope to see conference attendees and professional societies lean more heavily into the abovementioned Twitter-based interactions in future years. By participating in #HemeTwitter and HTO, members of our field can all contribute in coming years to its, and our own, growth.

Declarations

Conflict of interest The authors declare no competing interests.

Human and animal rights and informed consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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