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EDITORIAL



Advances in cancer research dissemination through the pandemic and beyond

The coronavirus 2019 (COVID-19) pandemic has deeply impacted biomedical research. Rapid dissemination of research findings (both clinical and laboratory-based) plays a pivotal role not just to facilitate scientific progress, but also to guide clinical decision-making in the clinic. Traditional platforms for disseminating information included the three Ps (paper, podium, and poster): first, papers published in peer-reviewed journals; second, podium oral talks; third, poster presentations at professional meetings. However, as worldwide strategies to mitigate infection transmission significantly decreased these opportunities for the traditional face-to-face contact, the scientific community had to immediately adapt and innovate to identify and deploy new research dissemination methods.¹ In oncology, scientific breakthroughs, Food and Drug Administration approvals, and practice-changing studies are shared at major society meetings, such as the annual meetings of the American Society of Clinical Oncology (ASCO), European Society for Medical Oncology (ESMO), and others. For many oncology stakeholders, these annual congresses may be their primary dedicated time away from the office for an intense immersive didactic experience to keep abreast of the field's developments. Moreover, for academia and industry colleagues, face-to-face meetings foster collaborations. With increased workload, coupled with the strain of the pandemic and meetings transitioning to an entirely virtual platform, clinicians and researchers work to identify different methods of research dissemination, recognizing this circumstance as both a challenge and opportunity given the critical importance of effective sharing of data.² This adaptation required researchers to consider thinking beyond traditional output formats to complement conventional research.¹ Recognizing that how we share gains significance when the news cycle is very short. Here, we explore 10 ways that may improve both upstream and downstream research impact (Figure 1).

1. **Twitter:** The role of social media platforms such as Twitter for dissemination and critique of scientific research findings increased significantly during the pandemic. The increasing use of Twitter among hematology-oncology professionals at medical conferences has been previously described.³ The pandemic, however, has led to novel ways of incorporating Twitter outside of medical conferences. Fabiano

et al.⁴ showed that articles on COVID-19 had significantly higher tweet rates than citation rates, highlighting the importance of social media in rapidly expanding research periods. Furthermore, increased utilization of crowdsourcing (via Twitter) for disaster response has also emerged.⁵ This has led to the development of patient registries to answer some key questions. One such example is the COVID-19 and Cancer Consortium (CCC19) that started from a tweet to resulting in a landmark *Lancet* publication in 10 weeks.⁶ These community-led initiatives are already filling critical knowledge gaps to tackle crucial clinical problems on the complexities of COVID-19 among patients with cancer with real-world implications.⁷

2. **Podcasts:** Podcasts are increasingly becoming a popular resource for disseminating clinical research findings. Podcasts are digital audio files made available on the Internet to download or directly listen to on a computer or mobile device. New installments can be received by subscribers automatically. Over the last 20 years, we have seen tremendous growth within medicine, both in medical education and in medical updates.⁸ With increasing demands on time for the busy physician during the pandemic, podcasts have emerged as a crowd favorite for receiving bite-sized information during their daily commute. Such data can range from practice-changing trial discussions to the discussion of FDA approvals. For example, the *OncoAlert* podcast delivers short 20-30 min updates on critical studies weekly, with an accompanying 2 min recap of the week's most impactful research articles. The open format and flexibility of the podcast format allows for the podcast hosts to engage those stakeholders critical to the discussion in that episode, as though leaders in a specific tumor type dissecting the findings of a major study or patient advocates discussing the barriers to clinical trial participation.

3. **Preprints:** We have seen a meteoric rise of preprint servers during the pandemic, especially since most journals were inundated with editorial reviews requiring longer times from submission to publication. During the early stage of the pandemic, preprints represented nearly 40% of all English language COVID-19 scientific corpuses (6000+ preprints/16 000+ articles). As of mid-August 2020, that proportion dropped to around 28% (13 000+ preprints/49 000+ articles). Nevertheless, preprint servers remain a crucial engine in disseminating scientific work on this infectious

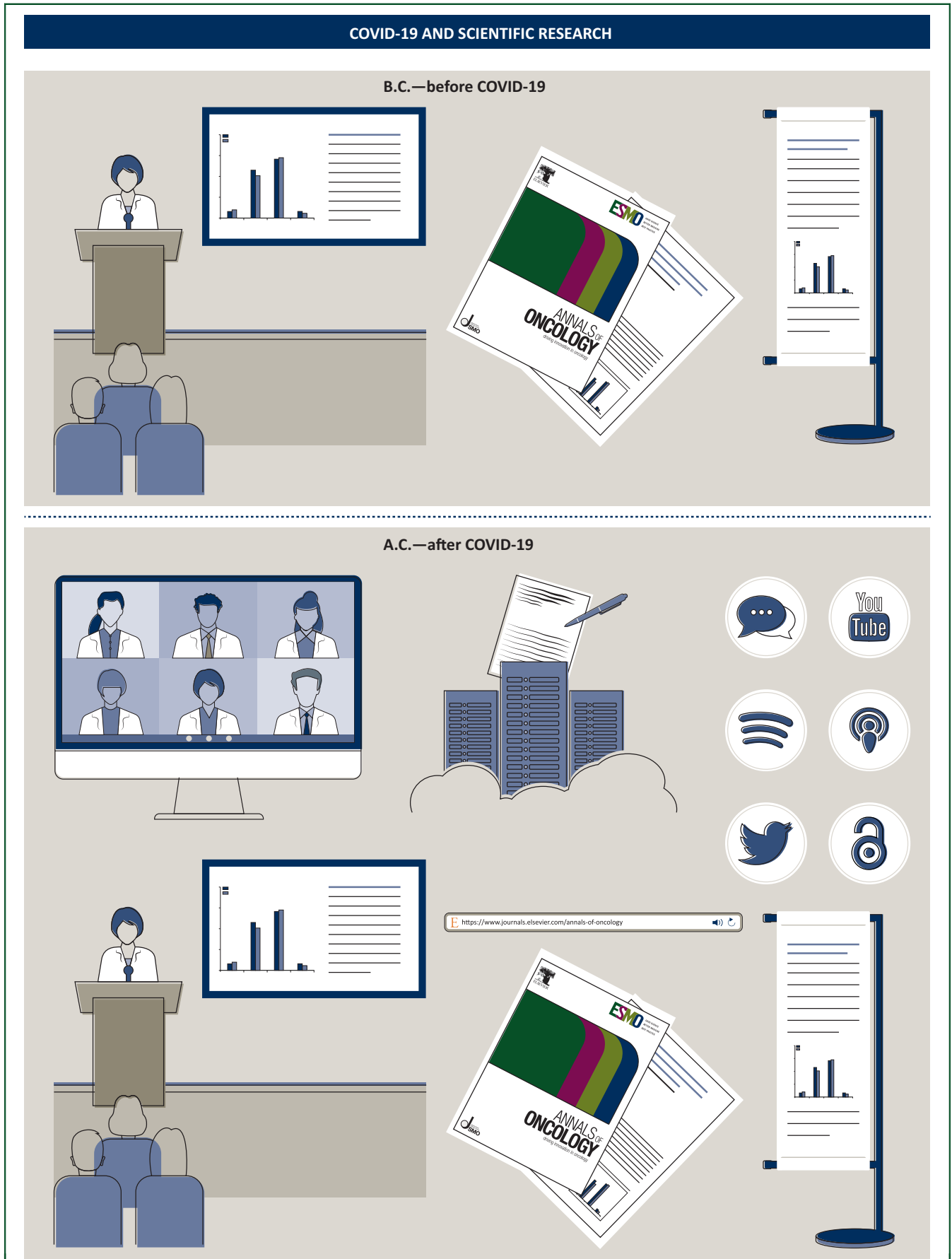


Figure 1. Change in scientific research dissemination methods with COVID-19.
 COVID-19, coronavirus disease 2019.

disease. However, the ‘uncertified’ nature of the scientific manuscripts curated on preprint repositories and their integration into the global ecosystem of scientific communication is not entirely clear.⁹ Moreover, data published even in prestigious journals have scrutinized duplications¹⁰ and compromised scientific integrity leading to retractions.¹¹ A clinical trial, currently underway, aims to study the effect of social media on knowledge dissemination during the COVID-19 outbreak by utilization of an online internet survey (NCT04319315).¹²

4. **Press releases:** Press releases of significant findings from pharmaceutical companies and academic institutions also became a source of rapid information, as exemplified by the press release of remdesivir data by Gilead’s and Pfizer’s vaccine data. However, unlike peer-reviewed data, press releases and other content directly from the primary source with a vested interest carry the concern for bias and may not represent the dataset in its entirety. Hence, caution and judgment should be exercised while interpreting the topline data from such sources.
5. **Virtual meetings:** Almost all annual meetings and conferences have migrated to the virtual platform. This change has also opened avenues for conducting Continuing Medical Education conferences and disease-focused meetings at a low cost and increased participation. Closed group small meetings, breakout rooms, live video chat sessions, and meet the expert sessions for questions and answers are some of the platforms that have kept groups involved and informed. Another concept that has emerged is the use of social media to conduct digital journal clubs. One such example is the HOJournalClub, the first digital hematology-oncology journal club for trainees and fellows inviting guest discussants for a monthly new research article.¹³ Content matter experts on that month’s topic are engaged to co-lead discussions, breaking geographic and role barriers as the discussions are open to all members of a multidisciplinary oncologic team and the community overall. The ESMO plenary sessions are an example of major societies adopting the virtual platform. These are monthly presentations of the latest, original scientific data from randomized phase III trials in oncology, or from phase II trials which demonstrate remarkable therapeutic benefit, scientific insight or progress in an area of unmet need.
6. **Virtual tumor boards:** The current situation has led to an increase in the number of virtual tumor boards, at local, national, and international levels. Utilization of virtual meeting software has been vital in disseminating evolving information on ongoing COVID-19 research, but also discussion around essential aspects of cancer care and management by the conduct of virtual tumor boards.¹⁴ Madhavan et al.¹⁵ showed that a cloud-based, asynchronous virtual tumor board integrating multimodal patient data provides a scalable integration platform for facilitating case review with no geographical and time/attendance restrictions.²
7. **Visual abstracts:** Conventional research publications can be supplemented by adding layperson summaries, graphical abstracts, blogs, and podcasts. Visualizing data by way of visual abstracts can distill complex findings in an easy-to-consume way that can pique the interest of stakeholders in the oncologic community, whether it is clinicians, researchers, patient advocates, pharmaceutical entities, and others, to explore the content of the work in greater depth. Visual abstracts can be rapidly disseminated across social media channels with links to the original manuscript. Other successes in visual communications include hand-drawn pictorial representations of communicational skills to guide clinicians in any discipline reconciling with the impact of the COVID-19 pandemic on their patients’ oncologic care.¹⁶
8. **Open data:** Open data, source-based research leads to higher usability, verifiability, transparency, quality, and collaborative research. During the COVID-19 pandemic, various open data sources ranging from medical imaging, text fields, speech, data repositories such as GitHub and other machine learning and bigdata modules have emerged.¹⁷ This has introduced an excellent culture of collaboration among the scientific community. COVID-19 open access data and computational resources are being provided by federal agencies, including the National Institutes of Health, public consortia, and private entities. These resources are freely available to researchers, enabling research collaborations and informing practice. Furthermore, using Findable, Accessible, Interoperable, Reusable (FAIR) guiding principles as a tool for data management and data stewardship, one can increase the impact of research by opening up study by diverse groups.¹⁸
9. **Open access:** The COVID-19 outbreak has made funders, researchers, and publishers agree to have research publications become openly available. In this extraordinary research context, publishers have come together making all coronavirus-related articles immediately accessible in appropriate open repositories, like PubMed Central. This has fueled more discussion on the need to break down scientific paywalls, with countries like India proposing free access to scholarly literature for everyone as part of the government’s latest science, technology, and innovation policy: ‘One nation, One subscription’.¹⁹ Embracing open access of articles makes them more widely read and available than closed subscription access.²⁰ With journals having multiple ways to make articles open access,¹⁹ it will be interesting to see how the academic publishing industry adapts in the post-COVID-19 era.
10. **Measuring impact and reach:** Researchers should evaluate the qualitative and quantitative metrics of research projects to measure impact. Beyond traditional citations, funding agencies are increasingly

aware of the impact of the research and visibility in social media, e.g. the Altmetric score.²¹ Altmetrics are metrics and qualitative data that are complementary to traditional, citation-based metrics. These include (but are not limited to) peer reviews, citations on Wikipedia and in public policy documents, discussions on research blogs, mainstream media coverage, bookmarks on reference managers like Mendeley, and mentions on social networks such as Twitter. Sourced from the web, altmetrics provides information on the ongoing discussions and usage of scientific literature around the world. It has tremendous potential to break open traditional silos and foster broadcasting research widely, and promote non-traditional collaborations.

Overall, the pandemic has changed the dogmatic view of research dissemination at a rapid pace. This has instilled speculation on what the future holds for meetings and virtual learning in the postpandemic era. Physical sessions can be replicated virtually to some degree with many benefits, including making access easier for people who have limited budgets, are clinically busy, and with family commitments or disabilities. Moving virtually can also save attendees time and reduce their carbon footprint. Offering virtual format meetings with every conference can be more economical while being far-reaching at the same time.²²

This move to the new format also offers many benefits, including a sharp increase in attendance, with increased engagement among trainees who may be pressed for time. Given that preparing talks requires a significant amount of time and energy, knowing that a larger audience could attend these conferences makes an effort even more rewarding. Some of the technological blessings offered by this format include the ability to share slides/images more readily, ‘chat’ without interrupting the conference’s flow, and ability to record talks for viewing later. While connecting with peers in person may be a benefit specific to live seminars, perhaps the most promising aspect of virtual learning is its ability to communicate with diverse colleagues worldwide as one of the ‘silver linings’ of the pandemic.

A. Desai¹, I. M. Subbiah² & V. Subbiah^{2,3,4*}

¹Department of Hematology and Medical Oncology, Mayo Clinic College of Medicine, Rochester; Departments of ²Palliative, Rehabilitation & Integrative Medicine;

³Investigational Cancer Therapeutics, Division of Cancer Medicine, University of Texas MD Anderson Cancer Center, Houston; ⁴Division of Pediatrics, University of Texas MD Anderson Cancer Center, Houston, USA

(*E-mail: vsubbiah@mdanderson.org).

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