Development Trends and Promotion Strategies of Scientific Information Exchange under the Impact of COVID-19

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Abstract

Purpose/Significance The high transmissibility, prolonged duration, and extreme uncertainty of the COVID-19 pandemic have prompted a transformation in scientific information communication models. This paper proposes strategies for developing scientific information communication in the post-pandemic era by examining its current state and existing problems under the pandemic's impact. Methods/Process By searching multiple domestic and international databases and open access platforms, this study reviews the current state and existing problems of scientific information communication using web surveys, text analysis, and other methods. Results/Conclusion Based on the current situation of active promotion by all participants in the scientific communication system, rapid development of preprint publishing models, and widespread dissemination and sharing of scientific data, combined with issues such as the coexistence of current scientific information communication and traditional communication models, the sustainable development of new publishing models, and the standardized development of scientific evaluation mechanisms, measures such as building integrated scientific communication platforms, promoting and publicizing new publishing models, establishing dynamic expert review databases, and creating multi-channel authoritative and reliable information sources can be adopted in the post-pandemic era to promote the development of scientific information communication.

Full Text

The Transformation of Scientific Information Exchange in the Context of COVID-19

Abstract

[**Objective/Significance**] The novel coronavirus outbreak, characterized by high infectivity, prolonged duration, and significant uncertainty, has accelerated the transformation of scientific information exchange modalities. By examining the current state and existing challenges of scientific information exchange under pandemic conditions, this paper proposes developmental strategies for the post-pandemic era.

[**Method/Process**] Through systematic searches of domestic and international databases and open-access platforms, this study employs network survey methods, literature induction, and textual analysis to summarize the current landscape and challenges facing scientific information exchange.

[**Results/Conclusion**] Key developments include the active engagement of all stakeholders in the scientific communication ecosystem, rapid evolution of preprint publishing models, extensive dissemination and sharing of scientific data, symbiotic relationships between emerging and traditional communication models, sustainable development of new publishing paradigms, and standardization of scientific evaluation mechanisms. For the post-COVID-19 era, we recommend: (1) constructing integrated platforms for scientific communication, (2) promoting awareness and adoption of new publishing models, (3) establishing dynamic expert reviewer databases, and (4) developing multi-channel authoritative information sources.

Keywords: COVID-19; Scientific Information; Information Exchange

Background

The COVID-19 pandemic has fundamentally transformed scientific communication practices, creating unprecedented challenges and opportunities for information exchange. In response to the global health crisis, major stakeholders—including publishers, academic institutions, governments, and international organizations—have implemented innovative measures to accelerate knowledge dissemination.

Publisher-Led Open Access Initiatives. Commercial publishers rapidly adapted their policies to support pandemic response efforts. Elsevier established a Novel Coronavirus Information Center providing free access to over 63,000 related articles, while Wiley launched a dedicated COVID-19 portal aggregating relevant publications. In China, CNKI created a specialized knowledge service platform for epidemic prevention and control. International initiatives such as Project DEAL, negotiated between German academic institutions and Wiley, secured open-access provisions for participating institutions. These publisher re-

sponses demonstrate the critical role of commercial entities in emergency knowledge dissemination.

Preprint Platforms and Accelerated Publication. The pandemic catalyzed widespread adoption of preprint publishing. Mature platforms like arXiv saw exponential growth in submissions, while regional repositories expanded their scope. ChinaXiv, the Chinese Academy of Sciences' preprint server, has accepted over 33,500 manuscripts, with more than 17,000 undergoing review and publication, accumulating over 3.02 million visits. Discipline-specific preprint servers proliferated globally, including bioRxiv and PeerJ Preprints for life sciences, ChemRxiv for chemistry, AgriXiv for agriculture, and PsyArXiv for psychology. These platforms enabled researchers to share findings rapidly, circumventing traditional publication delays.

Data Sharing Policies and Infrastructure. International organizations established frameworks for emergency data sharing. The World Health Organization (WHO) convened stakeholders in 2015 to discuss public health emergency data policies, subsequently issuing policy statements in 2016 and 2018. The Global Research Collaboration for Infectious Disease Preparedness (GloPID-R) published guiding principles emphasizing ethics, transparency, timeliness, objectivity, and quality assurance. Complementing policy efforts, specialized data repositories emerged: RCSB Protein Data Bank, Genomic epidemiology of SARS-CoV-2, Gene Expression Omnibus, Protein Data Bank Japan, ProteomicsDB, and the Infectious Diseases Data Observatory. These resources provided essential infrastructure for genomic, proteomic, and epidemiological research.

Innovations in Peer Review. Traditional peer review proved inadequate for the urgency of pandemic research. The conventional model's lengthy review cycles could not accommodate the rapid pace of COVID-19 research, prompting experimentation with open peer review (OPR). OPR models, which disclose reviewer identities and facilitate interactive discussions, offer greater transparency, flexibility, and accountability. Studies indicate OPR can reduce publication bias, accelerate review timelines, and enhance article quality. Platforms like Publons provide reviewer recognition, tracking an average of 4.73 reviews annually per reviewer. Blockchain-based initiatives such as Orvium propose tokenized incentives to support open access and reproducibility. However, OPR adoption remains limited, requiring institutional support and cultural shift within academic communities.

Public Science Communication and Health Literacy. The pandemic necessitated unprecedented public engagement with scientific information, creating challenges in health literacy, misinformation control, and cross-disciplinary communication. Effective public communication requires collaboration among medical professionals, policymakers, media, and educational institutions. Governments and health organizations must establish authoritative information channels while promoting critical evaluation skills among citizens. The proliferation of misinformation on social media platforms underscores the need for

robust verification mechanisms and public trust-building measures.

Key Challenges and Future Directions. Despite rapid adaptations, several critical issues persist:

1. **Quality Control:** The acceleration of publication has compromised quality assurance. Notable cases include a bioRxiv preprint claiming artificial similarities between SARS-CoV-2 and HIV, which was withdrawn within 48 hours due to methodological flaws. Balancing speed with rigorous peer review remains a central challenge.
2. **Privacy Protection:** Emergency data sharing must safeguard individual privacy while enabling research utility. Institutional review boards and data governance frameworks require strengthening to protect sensitive health information.
3. **Sustainability:** Funding models for open-access infrastructure remain precarious. Reliance on voluntary contributions or short-term grants threatens long-term viability. Diversified funding mechanisms, including institutional support and public-private partnerships, are essential.
4. **Evaluation Mechanisms:** Traditional impact metrics inadequately capture the value of rapid dissemination and societal engagement. Developing dynamic, multi-dimensional evaluation criteria that reward timeliness, accessibility, and public impact is necessary for sustainable reform.
5. **Infrastructure Integration:** Fragmented platforms and inconsistent standards hinder seamless information exchange. Building interoperable, integrated communication ecosystems requires coordinated efforts among stakeholders.

In conclusion, the COVID-19 pandemic has irreversibly transformed scientific information exchange, demonstrating both the potential for rapid innovation and the persistent challenges of quality, equity, and sustainability. Future development must prioritize integrated infrastructure, transparent evaluation, sustainable funding, and enhanced public engagement to build a resilient scientific communication ecosystem for future crises.

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Note: Figure translations are in progress. See original paper for figures.