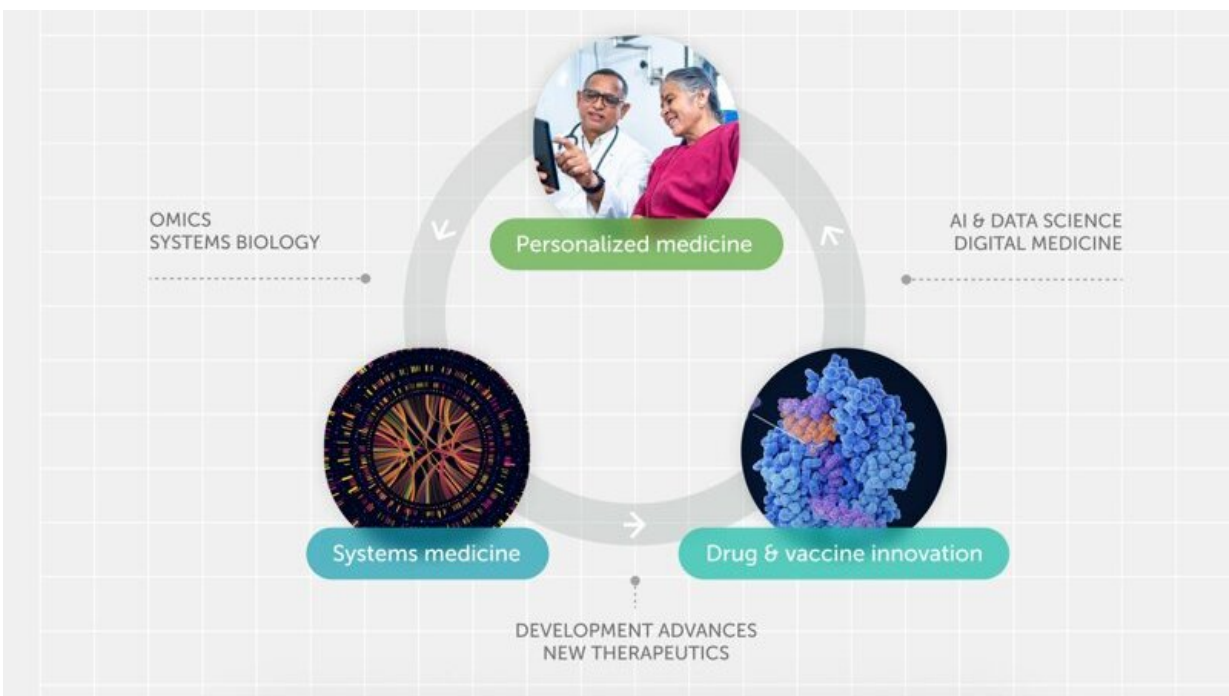# COVID-19 changed medicine forever: Scientists reveal a new vision for the health care of the future

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Credit: Cauchemez S et al/Frontiers

What should the medicine of the future look like? A team of scientists

[writing](#) in *Frontiers in Science* lays out a bold vision for precision approaches to understanding, preventing, and treating diseases, driven by revolutionary technologies and new interdisciplinary collaborations between researchers and other health sector professionals.

The authors—led by Prof. Michel Goldman, recipient of the Blaise Pascal Medal 2024 for his exceptional contributions to immunology and health care innovation, and leading microbiologist Prof. Philippe Sansonetti from the Institut Pasteur and Collège de France—build on the many lessons of COVID-19, from strategies for radically faster vaccine development to use of [big data](#) and digital medicine.

"The COVID-19 pandemic will have profound, long-lasting impacts on the anticipation of risk, practice of medicine, and the management of health care," said Goldman, who is President and founder of the Institute for Interdisciplinary Innovation in Health care (I3H) at the Université Libre de Bruxelles and former Executive Director of the Innovative Medicines Initiative (IMI).

"It demonstrated the importance of collaboration across sectors and disciplines to develop new solutions for major public health threats, and the power of artificial intelligence and [digital tools](#) for the advancement of medicine."

Credit: Cauchemez S et al/Frontiers

## Changing the paradigm

To overcome COVID-19, the world needed to take a radically different approach to care—and scientists innovated to make this happen. Research shows that 9% more health-related articles were published worldwide than expected in 2020–22, reflecting scientists' search for tools to solve the problems of the pandemic, which ultimately went far beyond the treatment of infectious diseases.

Because there were initially no vaccines to control transmission, we needed non-pharmaceutical interventions like lockdowns, planned using large-scale mathematical modeling. Video calls ensured patients could speak to a doctor without risking catching the virus, while insights from big data were used to identify vulnerable patients and target treatments.

Goldman and his colleagues say that these are innovations in medicine—personalized, taking advantage of big data and new technology—that we should use to design the future of health care and public health.

"Personalized medicine delivers the right treatment to the right patient at the right time," said Sansonetti. "It will depend on in-depth characterization of both the genetic makeup of the affected individual and the molecular mechanisms of the disease. A patient's way of life and environment will also be taken into consideration."

Systems medicine could also enable more effective care: It "exploits large quantities of different kinds of data, gathered through different sources, to generate highly precise diagnosis, prognosis, and therapeutic options," explained Sansonetti. For instance, it could help identify pre-existing drugs already known to be safe that can be quickly repurposed to treat new diseases.

Meanwhile, digital health can take medicine to the individual. Telehealth can make it easier for patients to consult with a medical professional, while wearable monitors allow for at-home management of some conditions, which is associated with better outcomes.

## A roadmap for health care

However, the scientists stress that a lot of work must be done to make this vision a reality. The necessary conditions for this medicine of the future are not equally available worldwide; for instance, in some places, the technology for digital health or the tests necessary for personalized medicine are less available. For systems medicine to work effectively and safely, AI applications must be more transparent, and must be carefully managed to ensure patient privacy and avoid bias.

We also urgently need to implement a framework for funding and research that supports the kind of interdisciplinary work that drove innovation during the pandemic. Goldman and colleagues lay out what this could look like, and what we need to tackle first. The greatest likely challenges of the future, antimicrobial resistance and zoonotic illnesses that jump from animals to humans, will need to be addressed by scientists and clinicians from many disciplines working together. We need to enable this cooperation now, by encouraging interdisciplinary studies and collaboration, to build health care that can overcome these future challenges.

"As we navigate the complexities of the post-COVID era, we must foster multidisciplinary collaborations that transcend traditional boundaries, encompassing molecular, clinical, and social determinants of health," concluded Dr. Giuseppe Remuzzi, director of the Istituto di Ricerche Farmacologiche Mario Negri and senior author of an editorial commentary on the article.

"This very timely article is a statement of intent—a testament to the resilience and adaptability of science to address forthcoming public health challenges."

 **More information:** Standing the test of COVID-19: charting the new frontiers of medicine, *Frontiers in Science* (2024). DOI: 10.3389/fsci.2024.1236919

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