Innovations in Health-Care Service Delivery during the Pandemic

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Introduction

The COVID-19 pandemic disrupted health service delivery as countries implemented lockdowns and issued stay-at-home orders. Despite attempts to make essential health services available throughout, the pandemic strained health systems and resulted in rampant shortages of health commodities, beds and health-care staff. There were concomitant declines in tuberculosis screening, HIV testing, and maternal and child health services.[2] However, the global pandemic also accelerated the pace of innovation. Some initiatives served as stopgap measures implemented to maintain health services, whereas others helped leapfrog progress in the areas of health information systems, telemedicine, and regulatory policy, bringing efficiencies that could be applied even beyond the public health emergency. This contribution presents examples of some innovative approaches that were implemented during the pandemic and reflects on their applicability in a post-pandemic context.

Innovations in regulation and generic manufacturing

The pandemic presented new challenges in regulatory policymaking at the national and global levels while also offering lessons to be learned from key innovations. Regulators and policymakers learned about the importance of strengthening regulatory collaboration and harmonizing regional regulatory policies to facilitate the approval of and access to COVID-19 diagnostics and therapeutics. Examples of regulatory innovations included relying on the World Health Organization's Emergency Use Listing Procedure and regulatory decisions made by stringent regulatory authorities,[3] providing conditional approvals,[4] and having regulatory agencies accept rolling submissions rather than the usual approach of accepting submissions only once all the data have been finalized. Partnerships through the Pharmaceutical Inspection Cooperation Scheme (PIC/S),[5] a network of select regulators, also supported the harmonization standards for good manufacturing and distribution practices for medicines. PIC/S was seen as an important platform for promoting regulatory convergence and cooperation that could ultimately help countries at various levels of regulatory maturity ensure access to quality, safe and efficacious drugs.

Learning from COVID-19 vaccine inequity, Governments and multilateral organizations began focusing their attention on leveraging and strengthening manufacturing capacity in several low- and middle-income countries to facilitate the rapid scale-up of generic manufacturing. This inspired the development of a global platform known as the COVID-19 Technology Access Pool,[6] which was launched to allow developers of COVID-19 vaccines, therapeutics, and other health products to share intellectual property and data with qualified manufacturers. Through this process, patent holders voluntarily licensed their patents, which were then sub-licensed to qualified and vetted generic manufacturers that paid royalties on the sale of the medicines.

Innovations in testing and disease surveillance

The pandemic necessitated innovations in the areas of testing, contact tracing, and disease surveillance. Asymptomatic transmission of SARS-CoV2 meant that mass testing was needed for disease control; however, countries faced challenges in administering polymerase chain reaction (PCR) testing due to complex logistics and infrastructure requirements. The City of Vienna started the Everything gurgles! (Alles gurgelt!) initiative to address these challenges.[7] The initiative allowed students, workers and other residents to access home PCR test kits by registering online, accessing a bar code, and picking up the test through hundreds of participating drugstores. Samples could be submitted at 680 supermarkets, drugstores, and gas stations. The postal service took the samples to laboratories, and results were emailed within 24 hours.

The authorization of over-the-counter (OTC) fully at-home diagnostic tests for COVID-19 using rapid antigen testing was also a game changer. The Singapore Ministry of Health provided guidance on how to use OTC antigen testing for screening before large gatherings such as sports events, concerts, weddings, and funerals, allowing people to gather more safely and return to their normal lives.[8] The Government of the United States of America required private insurance to cover the cost of the testing. Germany, Austria, and England included rapid tests as part of their strategy to control COVID-19, providing them through schools, pharmacies, and volunteers going door-to-door.

Finally, 50 countries in Africa, Asia, Europe, and the Americas engaged in COVID-19 digital data surveillance and tracking using the District Health Information System (DHIS2) open-source health management information platform developed and coordinated by the Health Information Systems Programme (the HISP Centre) at the University of Oslo.[9] The Ministry

of Health, Nutrition and Indigenous Medicine in Sri Lanka developed eight modules for COVID-19 tracking–including a digital vaccine certificate–within four months. The open-source modules were designed to allow countries to monitor transmission, detect new cases, conduct risk assessments, and aggregate data to guide preparedness and response decisions by national and local government and other stakeholders. Another open-source application–the Surveillance Outbreak Response Management and Analysis System (SORMAS)–was developed by a German non-profit foundation. It supported public health authorities in identifying and monitoring individuals who might have been exposed to an infected person and following them for testing and treatment. The SORMAS-ÖGD application was used by several federal health departments in Germany, France, Switzerland, Nigeria, Ghana, and Fiji.[10]

Innovations in service delivery

During the initial phase of the pandemic, health departments developed COVID-19 triage systems to rapidly manage the demand for services and provide patients with appropriate care depending on the severity of illness. Some countries, such as India, Pakistan and Japan, set up a centralized system through which COVID-19 patients were directed to a broader network of private and public hospitals based on the severity of illness.[11] These hospitals were staffed with relevant medical experts and equipped to provide a specific level of health services based on a patient's medical classification (mild, moderate, major, or extreme severity of illness).

The number and volume of telehealth services increased dramatically during the pandemic as video conferencing tools, telephones, and online platforms were leveraged for remote health-care provision. In India, for example, telemedicine became an instantaneous adaptation to allow doctors to stay connected with patients when the nationwide lockdown took effect in March 2020. This experience paved the way for the development of inaugural policy guidelines for telehealth in India.[12] In some countries, including the Republic of Korea, formal policy changes allowed telemedicine to be practiced exceptionally during a public health emergency. Current policy discussions in the Republic of Korea suggest that telemedicine will become part of the new normal.[13] In the United States, the Centers for Medicare and Medicaid Services expanded telemedicine access from only Medicare patients living in rural areas or in specific health facilities to all patients. This expansion of telemedicine has been shown to increase health-care access to people living in the most disadvantaged neighbourhoods.[14] More broadly, the pandemic also spurred demand for telepsychiatry services, which has been growing across various countries.[15]

Another innovation was in the area of health workforce training, which was provided via online platforms. Findings suggest that online training increases learning opportunities without affecting training quality and knowledge acquisition and is an affordable and convenient alternative to in-person training, particularly in low- and middle-income settings.[16]

Finally, the pandemic led to increased reliance on innovations such as the use of drone technology to bring vaccines and treatments to areas with limited access to transportation. In Rwanda, for example, the public health sector partnered with a for-profit drone company to deliver medicines to cancer patients living in rural settings.[17] While the scalability, feasibility and applicability of this approach over the longer term is unclear, it nonetheless offers important lessons on how non-traditional technologies may be used to solve problems in the health sector.

Digitalization of data management

The pandemic inspired critical innovations in the digitalization of data for managing supply chains and tracking vaccinations and to speed up the compilation of data for decision-making. India expanded its Electronic Vaccine Intelligence Network (eVIN),[18] developed in 2015 to track vaccines in the country's Universal Immunization Programme throughout the supply chain, to provide data on who was getting vaccinated and to send reminders to those who had not yet received their shots. Panama developed a system called Panavac19, which included a portal for residents to make vaccination appointments and download a digital vaccination certificate.[19] The system was expanded to include laboratory results as well. The Saudi Data and AI Authority and Ministry of Health developed a COVID-19 digital tracking system called Tawakkalna to help people access testing and to safely begin opening up access to services post lock-down.[20]

Digital vaccination IDs were used during the pandemic to provide information on what vaccine a person received, when they received it, and when they should get their booster dose. This helped ensure that vaccines were in stock and could be accessed where and when they were needed. A digital identification system called Simprints was used in Ghana to record COVID-19 vaccination delivery in areas where many births are unregistered and people lack formal identification.[21] China and the state of South Australia used a health QR code system that required citizens to upload personal information through a cell phone application to evaluate exposure risk. Though effective, some of these systems were considered controversial because the information gathered could be used to restrict people's movement and access to facilities or to impose quarantine.

Partnering with the private sector

Partnerships with the private sector were critical to the COVID-19 response. Collaborations ranged from vaccine development and strengthening capacity for diagnostics to supporting service delivery for COVID-19 patients. Operation Warp Speed, in which the United States Government invested $18 billion, supported the development and early manufacturing of COVID-19 vaccines meant for the United States population,[22] while the Coalition for Epidemic Preparedness Innovations expanded global access to COVID-19 vaccines with a $1.4 billion investment. These efforts stimulated a market for accelerated vaccine manufacturing. In the future, such public-private partnerships may be leveraged to study long-term vaccine safety and virus mutations and to strengthen pandemic response capacity globally.

During the pandemic, public-private collaboration often produced a synergy that drove innovation and accelerated progress. Working with private hospitals and laboratories helped expand access to care for COVID-19 patients and access to testing for the general population. In Uttar Pradesh, India, the Government rapidly engaged and mobilized private laboratories and enlisted private hospitals to provide COVID-19-related services.[23] In the Netherlands, a public-private consortium rapidly designed and implemented a high-throughput diagnostic platform for SARS-CoV2.[24] The open-source Systematic Testing using Robotics and Innovation during Pandemics (STRIP) platform allowed 14,000 tests per day, forming the basis for a nationwide infrastructure and strengthening preparedness for future pandemics. Similarly, public-private partnerships expanded laboratory capacity and testing in Ghana, Nepal, and Nigeria and extended hospital capacity in Ghana, Nepal, and Bangladesh–countries where urban populations rely heavily on private health-care providers.[25]

Private companies helped convert private spaces for use during quarantines, made financial and in-kind contributions to provide the supplies and equipment needed for treatment, organized mass COVID-19 communication campaigns, and provided food relief.

Mobilizing human resources and expanding workforce capacity

The high demand for health services during the pandemic led to a concomitant need to expand the health workforce. In some cases, temporary workers were hired to support crisis management efforts, while in others, a pathway was created to integrate temporary workers into the Government's permanent health workforce cadre.[26] In Thailand, for example, the Ministry of Public Health converted 40,000 of its 150,000 temporary medical employees to permanent civil service staff to recognize their crucial contributions to the country's pandemic response.[27]

India launched a call for Covid Warriors–including retired doctors, armed forces medical staff and private sector medical professionals–to support the COVID-19 response.[28] Final-year medical students and paramedical students were also brought in to conduct screenings and contact tracing and administer vaccinations. Similarly, Brazil encouraged final-year medical students to support COVID-19 health services and reinstated the medical licenses of Cuban medical professionals who were living in Brazil.[29] Mexico began contracting foreign health workers to expand the domestic health workforce and called on doctors from various specialties to participate in the COVID-19 response.[30]

Conclusions

Innovations flourished during the pandemic. Some innovations were implemented spontaneously as stopgap measures, while others, such as telehealth and digital health technologies, tended to be implemented systematically by national Governments and institutes of public health. Lessons from the innovations implemented suggest that engaging in partnerships with the private sector, maintaining a strong health workforce, strengthening national regulatory systems, and leveraging advances in telemedicine and other digital health technologies were particularly critical in responding to the pandemic. As lessons and experiences continue to be gathered and chronicled, it will be important for countries to assess the applicability and adaptability of these innovations to their local contexts so that they are prepared for the next health crisis.

Endnotes

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