COVID-19 – Driving Digitization, Digitalisation & Digital Transformation in Healthcare

Anurag Agrawal

THE COVID-19 pandemic has driven home many important points, of which one is about the value of digitally functioning societies at times when physical interactions become difficult. It would not be inaccurate to say that COVID-19 will be a major catalyst of progress along the Digitization, Digitalisation and Digital transformation axis, especially in healthcare. The Council of Scientific and Industrial Research (CSIR) must walk this path itself and help others to do so as well, building new competencies and finding new partners, as necessary.

Digitization refers to a situation where workflow remains analog or paper-based but digital copies are kept. Here, digital is not the primary mode of work but rather used for efficiencies like indexing, storage, and dissemination. In health, this is equivalent to working on paper, but scanning and transmitting digital copies.

Digitalisation then refers to changing the workflow into a natively digital one such that tasks can be automated and made efficient, for example, electronic health records and prescriptions.

Digital transformation is the final stage when the entire ecosystem is virtually connected with the seamless and secure flow of needed information enabling efficient decision-making and actions.

In a futuristic vision, this would be where there is continuous digital monitoring of health parameters, with data accessible to patients and authorized health providers, acted upon by approved algorithms that detect any actionable event and communicate it back in real-time, with smooth cashless transitions from home to the hospital when needed. This path would require a national health-stack built upon universal identification, secure and controlled access, and universal payment interfaces.

The passage of the National Digital Health Blueprint (NDHB) in May 2020 is an important step towards making this happen. However, there will be many technological challenges and opportunities starting from basic digitization, data collection and integration, to wearable devices and real-time analytics with machine learning capabilities.

Each nation will face their own challenges on the road towards such a vision, but India's path will be especially different given the twin challenges of heterogeneity in socio-economic progress, and the need to compensate for inadequate public health infrastructure, compensated in part by a strong digital backbone of Aadhar and Universal Payment Interface (UPI) that can form the nucleus of an India-stack, on which Health Stack can be founded. The question then is how to harness these advantages in an innovative fashion, so that the national needs are met and India becomes a leading player of the emerging global digital health economy.

The first part of the solution is of course to build better public health infrastructure that is natively digital and telemedicine capable. This would integrate healthcare delivery with data capture, bringing in automatic transparency and quality assessment. A previous effort by CSIR and Hewlett Packard (India) had led to the creation of eHealth Centres. This was an integrated solution that harnessed together with the rapid infrastructure-creation advantages of cargo containers, and telemedicine-readiness

National Digital Health Blueprint

Ministry of Health & Family Welfare
Government of India
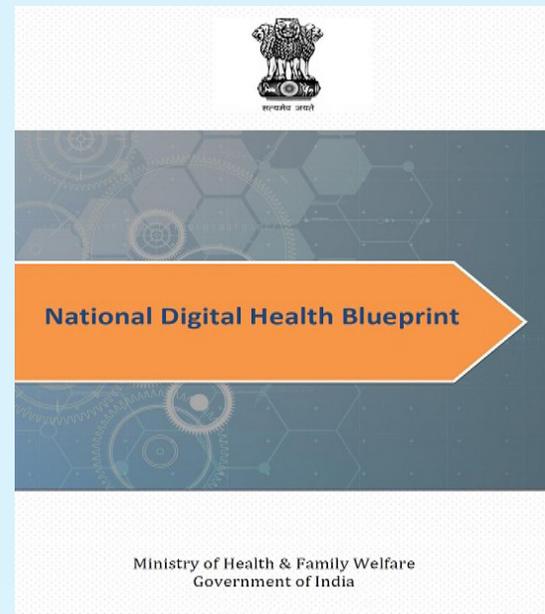
KEY GOALS

- Establishing and managing the core digital health data and the infrastructure required for its seamless exchange.
- Promoting the adoption of open standards by all the actors in the national digital health eco-system, for developing several digital health systems that span across the sector from wellness to disease management.
- Creating a system of personal health records, based on international standards, and easily accessible to the citizens and the service providers, based on citizen-consent.
- Following the best principles of cooperative federalism while working with the states and union territories for the realisation of the vision.
- Promoting health data analytics and medical research; enhancing the efficiency and effectiveness of governance at all levels.
- Ensuring the quality of healthcare.
- Leveraging the information systems already existing in the health sector.

The National Digital Health Blueprint and the key goals
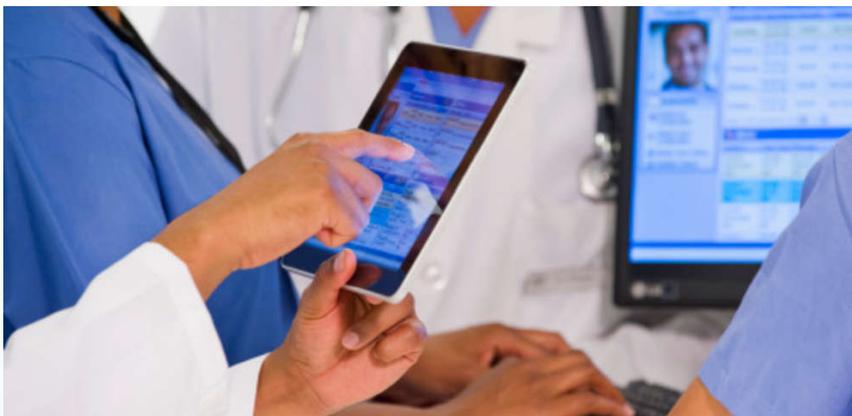
The area of electronic health records is wide open for academia or industry innovation (https://health.economictimes.indiatimes.com)

to enable healthcare access, and operational transparency of a cloud-based electronic workflow. Automated analysis of data for various levels of decision support was conceived but turned out to be difficult due to low data quality and lack of incentives for better data entry.

AI was critical in the discovery of a new class of antibiotics – Halicin, named after HAL (Heuristically Programmed Algorithmic Computer), a sentient computer in Arthur C. Clarke's *2001: A Space Odyssey*

The new National Digital Health Blueprint overcomes that to some degree, creating a path where insurance payments would be digitally linked to delivered services, which in turn would be digitally captured. A major challenge would be that healthcare delivery in India is mostly by individual practitioners and providing them free access to digital infrastructure necessary to participate in the new digital health economy is needed. This requires a strong concept of public digital goods provided by the state, with open application programming interfaces that would allow interoperable software products to be created at low cost. Some products such as electronic health records would need to be created and provided in standardized formats in a free or use-linked payment system. As of now, this area is wide open for academia or industry innovation and would be an enabling area of social innovation.

The second part of the solution is to build better digital health services. There is a huge scarcity of Health Care Workers (HCW), as well as inequitable distribution. The front door of healthcare must be digital and accessible from home to really make a difference. This is only partly possible by telemedicine and requires smart solutions that either support a less-skilled HCW, of which India has large numbers, or provides autonomous advice. These typically require either declarative or machine learning forms of Artificial Intelligence (AI).

An example of the former is the conversion of national health guidelines

into context-sensitive easy-to-use app formats that local ASHA workers can use. Examples of the second that have recently reached clinical practice are tools for detecting diabetic retinopathy on fundus images or tuberculosis on chest X-rays. Creation of such AI tools, as well as packaging into use-based application suites, will be major contributors towards an effective health system. However, this will be critically dependent on the data repositories and implementation platforms that a digitally enabled public health infrastructure creates.

Last, but not the least, we will need a generation of health data-scientists who can convert data into insights. Such researchers are needed at every step from tools to policy. Today, no field is left untouched by the power of data science. AI was critical in the discovery of a totally new class of antibiotics, of which the first – Halicin – is named after HAL (Heuristically Programmed Algorithmic Computer), a sentient computer in Arthur C. Clarke's *2001: A Space Odyssey*. It is now routinely used in screening lead molecules for drug discovery.

Insights into biology and health are probably harder, because our understanding is shallow at best, but are only a matter of time. One could argue that because our understanding is shallow and the possibilities so many, AI will be needed for new insights. It seems likely that AI capable of true insights will be quite different from current machine learning systems and such cognitive computing is an area that needs strategic investments at a national scale.

To end, AI and digital technologies are an important part of health futures. CSIR and other national bodies need to invest strategically into all the aspects discussed here. These must be paralleled by discussions on appropriate regulatory frameworks for lean and balanced governance of such systems.

Dr Anurag Agrawal is Director of the CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB), Mathura Road, New Delhi