

**Short Report:****A Framework of Responsible Innovation (RI) Model for Artificial Intelligence (AI) in Indian Healthcare****Authors:**

Keerti Bhusan Pradhan, Professor, Healthcare Management,
Suptendra Nath Sarbhadhikari, Adjunct Professor,
Preethi John, Professor and Dean,
Chitkara University, Chandigarh-Patiala National Highway (NH-64), Punjab 140401.

Address for Correspondence

Suptendra Nath Sarbhadhikari,
Adjunct Professor,
Chitkara University,
Chandigarh-Patiala National Highway (NH-64)
Punjab 140401
E-mail: supten@gmail.com.

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Abstract: COVID 19 pandemic has hastened the digitalization of healthcare in India and a key disruption has been the adoption of Artificial Intelligence (AI) enabled systems. AI enabled healthcare information system (HIS) is the fountain bed on which AI can grow as it impacts data collection, data cleaning data privacy, data comprehensiveness, and data robustness. The allied healthcare staff are vital for using AI enabled Health / Hospital Information Systems (HIS). AI, like any other technology, can be used as a double edged sword and can be used for both good and bad purposes. Therefore, responsible innovation (RI) is essential to tilt the balance more towards social good rather than harm. Here we propose a framework of RI model for useful adoption of healthcare delivery in India that is AI-enabled. This will need policy level driving, as well as ethical building of capacity of the human resources required for healthcare delivery.

Key Words: Responsible Innovation Framework, AI for Healthcare, Responsible AI for Indian Healthcare, Policy making and Capacity Building

Introduction:

Artificial intelligence (AI) is viewed as a key game changer for achieving the 17 Sustainable Development Goals (SDGs), within the defined timeframe, to which India is a signatory. Artificial intelligence (AI) is a part of smart intelligent technologies has evolved considerably since 1956 when this field came into existence. In current scenario, there is already a large deployment in healthcare in developed and high-income countries to support and improve healthcare. AI in healthcare can be used for prediction, prevention, screening, diagnosis, treatment, rehabilitation and cure. Besides this it can also help in drug discovery, in chronic condition management, health services delivery and detection of disease. However, this is now rapidly gaining widespread attention even in the that have low or middle income (LMICs). It is important to take stock of the deployment of AI in healthcare in India.

The era of computerization in hospitals has evolved to digitalization and a key catalyst to accelerate this era is the adoption of AI enabled systems. AI enabled healthcare information systems (HIS) is the fountain bed on which AI can grow as it impacts data collection data cleaning, data privacy, data comprehensiveness, and data robustness. The allied healthcare staff are vital for using AI enabled Health / Hospital Information Systems (HIS). Very few studies have been conducted among them, globally to understand their role in technology uptake.

Literature suggests large scale deployment of AI in healthcare has high potential especially in a country like India with chronic shortage of healthcare workforce. During the recent COVID 10 pandemic, India, like many other countries, has utilized digital health interventions quite successfully (1,2) However, literature also points to the need for technology acceptance by users for uptake as well as diffusion of technology. AI in healthcare literature also points to the need for establishing RI framework for developing AI products used for healthcare delivery. (3)

Healthcare sector in India is considered ripe for innovation, which offers huge economic potential. It is expected that adoption of AI for healthcare applications will witness an exponential increase in the times to come. AI healthcare market is expected to achieve compound annual growth rate (CAGR) of 40% by the end of 2021 (4).

For achieving Sustainable Development Goals (SDGs) particularly with the global priority to achieve Universal Health Coverage, AI is pitched as one of several tools that could help in making this a reality. This was established with the conclusion of two high profile global meetings convened by United Nations (UN) in 2017 wherein it brought together a host of stakeholders for discussing how to develop, as well as deploy, of applications of AI for achieving the Sustainable Development Goals (SDGs). Increasing research, along with financial provisions for developing AI tools in LMIC are likely to accelerate the exploration of the possible roles of AI to improve health

globally (5). AI in healthcare applications will need to be tailored to meet the local, epidemiological, socio-cultural health system and political contexts (6).

For a country like India, the way forward requires large scale transformational interventions in both public and private sector. The interventions have to be owned and led by the government primarily to have a larger public health impact. The following steps may be considered to make headway:

1. The incentivization model has been considered as a successful model for newer interventions specifically in a country like India for applied research and core research.
2. Skilled healthcare personnel to be well equipped for AI wave
3. Adoption to be accelerated: The adoption of AI is to be accelerated at all levels.
4. Ensure security, data privacy, and ethics for all AI beneficiaries: It can be said that AI might be the tipping point in technological evolution that takes place. Therefore, careful consideration has to be put in place for any document promoting the use of AI as systems should be ethical while safeguarding the privacy and security issues around beneficiaries and associated data.

Hence the grand challenge is to ensure AI development and application in healthcare in LMIC context is in line to quicker development, diffusion and utilization to see whether it can develop mitigating the challenges it faces today.

It has been felt that in the post-pandemic era, the healthcare delivery workforce must be technology-enabled, and at the same time safe and ethical (3).

Incorporating AI, ML (or Machine Learning), digitalization, big data, as well as human-robot interaction, as applicable to Industry 4.0 / 5.0, particularly in the health domain, will require “change processes, transformation management, and organizational development”. (7) This will be possible only in a responsible innovation (RI) environment, keeping the human in the loop.

Another related paper (8) opines that transparency, in a limited form of, which can focus to provide explanations for choices, may purvey adequate “ground for perceived legitimacy without producing the harms” brought in by complete transparency.

Before proceeding further, let us look at are our operational definitions for these terms: AI and RI.

Artificial intelligence (A.I.) It is “the capability of a machine to imitate intelligent human behavior” or “an agent’s ability to achieve goals in a wide range of environments.” (9)

Responsible innovation: Responsible Innovation can be defined as “a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in society)”. (10).

We feel that there is a need for a unifying framework, which will integrate technology acceptability, technology application and responsible innovation in the context of AI in healthcare in India. Of course, only proposing a theoretical framework will not suffice its widespread adoption. That will require policy advocacy, stakeholder consultation and awareness raising, followed by adequate building of capacity of the human resources required for healthcare delivery, particularly the health professional educators.

In the next section we propose a framework to embrace RI model for AI in Indian healthcare.

Proposed Framework

While there has been the application of AI-enabled clinical decision support systems (CDSS) development for quite some

time (11), the stress towards social and ethical issues are now evolving (3).

India needs to have a framework for responsible innovation as it is a country with scarce resources. Hence responsible innovation is all the more important to ensure the outputs of innovation must go to benefit the vulnerable population. The RI framework developed focuses on the myriad ethical challenges facing AI. The four dimensions identified by the researchers through the interaction with experts are social justice, beneficence, security and minimum bias (Figure 1).

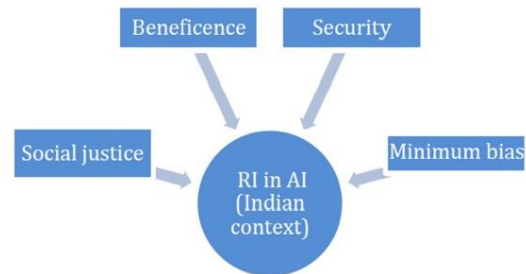


Figure 1: Proposed Framework of RI model for AI in Indian Healthcare

Social justice refers to enhancing transparency and accountability, ensuring more diversity and inclusion in AI workforce and upgrading the educational system to duly support the proposed change.

The second dimension – beneficence focuses on upholding fundamental human rights such as human dignity, privacy, and consent.

The third dimension – security refers to ensuring that AI does not interfere with national and international security.

And the last dimension – minimum bias – refers to equity and lack of discrimination.

Way Forward

There are several challenges associated with AI use in healthcare that includes maintaining balance between privacy, transparency and access to data; Competency of physicians in terms of their critical appraisal skills and social skills including empathy to tackle AI biases; chatbot development in regional languages and user-friendly for low literacy geographic areas; Incorporating AI specific features like autonomous explainable, bias, trust, akin to clinical governance model. The overall user acceptance for AI enabled HIS is average and there is a lot of scope for improvement. It is recommended to the top management regarding the acceptance of AI enabled HIS in the hospitals.

The broad consensus around the proposed structure of Responsible Innovation framework for AI in healthcare in India signifies that the frameworks available from the western countries should be customized to meet the contextual needs of India. These frameworks should take into consideration the process of innovation and integration of the RI framework in the AI innovation in healthcare process in India.

One of the guiding documents of health policy in India, the National Health Policy 2017 had mentioned setting up of the National Digital Health Authority (NDHA) to facilitate the adoption of a national ecosystem for digital health in India. The NDHA needs to be set up soon rather than delegating the responsibility to any other generalized regulatory authority (12). In India, in 2018, the National Strategy was released for Artificial Intelligence with one priority area being healthcare. The strategy for Responsible AI, termed #AIForAll, marks important matters such as ethics, bias, as well as privacy concerns related to AI. It foresees the Government of India encouraging technology research to alleviate these worries. The draft policy of Responsible AI framework (13) has been released by NITI Aayog for inputs from stakeholders in July 2020. Our proposed framework, envisioned in 2016 is in

alignment to the policy and is being used to provide inputs to national policy for framing framework for responsible innovation in healthcare related to development of artificial intelligence. It will also be used to promote the development, adoption and diffusion of Indian AI products in healthcare. Strengthening of the health system is an ethical and safety imperative, especially in a crisis as caused by the Covid 19 pandemic. While the use of AI has been noted (1) for tracking hotspots, monitoring, and understanding the nature of Covid-19. The issues of privacy, Confidentiality and stigma are yet to be addressed adequately.

To sum up, AI, like any other technology, can be used as a double edged sword that can be used for both causing good and bad effects on the society in general, and community health in particular. Therefore, responsible innovation (RI) is essential to tilt the balance more towards social good rather than harm. Here we have proposed a framework of RI model for useful adoption of AI-enabled healthcare in India. To fully embrace this framework, it will require policy level driving, as well as ethical capacity building of human resources for health.

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