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.

Citation

Submitted: Apr 9, 2021; Accepted: Aug 1, 2021; Published: Aug 25, 2021

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.

The 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 context (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
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](image)

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 fea-
tures like autonomous explainable, bias, trust, akin to
c 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

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OJHAS 2021;20(2):6 Pradhan KB, Sarbangadikar SN, John P. A Framework of Responsible Innovation (RI) Model for Artificial Intelligence (AI) in Indian Healthcare.
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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