DIGITAL REVOLUTION IN HEALTH CARE via ARTIFICIAL INTELLIGENCE: LEGAL IMPLICATIONS

Written by ***Amrutha K***

Research Scholar, Government Law College, Ernakulam, Kerala, India

ABSTRACT

Artificial intelligence is rapidly being applied to a variety of fields, including medicine, and is being considered as a method that could supplement or replace human professionals in primary care. Artificial Intelligence (AI) has become a vital element of our health care system, which play crucial role in medical functions, such as diagnosis and clinical treatment. AI can find new insights into diseases, increase efficiency and accelerate the discovery of novel drugs. But with misuse and mistreatment, intentional or otherwise, it can also harm people's rights. International human rights law necessitates those individuals be treated without any discrimination and also provides a universally accepted agenda for considering, evaluating, and ultimately rectifying the impacts of artificial intelligence on individuals and society. AI, on the other hand, poses a number of problems and ethical issues. There are certain human right risks posed by AI in the area of health care. Several legal issues also arise, as no specific laws have been enacted to deal with AI and the advanced technology in relation thereto. However, the regulatory framework has not been updated to keep well-informed with developments in AI in the field of human right to health care. Though many developing countries especially, in India is having the right talent and technological resource, does not have specific regulations which govern AI in this field. In India, AI is still in its early stages, and there is no regulatory body dedicated solely to AI. AI technology has aided in the fight against COVID-19. There are numerous obstacles in the way of India's adoption of AI-driven healthcare. This paper discusses some of the most important benefits and drawbacks of AI in healthcare. The main object of this article is to explore the impact of artificial intelligence technologies in human right to health care. The paper examines the current legal regulation on Artificial Intelligence (AI) and robotics in the field of health care across some countries including India. This article concluded by making recommendations to the government, including encouraging public-private

partnerships in the field of AI and health, as well as enacting and effectively enforcing AI and health-related laws and regulations.

INTRODUCTION

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."[i]

Health care systems faces significant challenges in terms of accessibility, affordability, availability, quality and equity. Healthcare establishments are also struggling to keep up with all of the new technological developments and the high expectations of patients in terms of service and outcomes/results. However, the requisite for healthcare needs and services is constantly rising and many countries are facing unavailability of healthcare practitioners. As a result, more care providers are thinking about artificial intelligence (AI) as a possible resource for providing precise, effective and efficient treatments. Artificial intelligence (AI) is a relatively new branch of science and technology. AI is rapidly expanding in almost every industrial, economic, and societal sector, ranging from information technologies to commerce, manufacturing, space, remote sensing, security and defence, transportation and vehicles. From 21st century, it is effectively cross the threshold of medicine and health care.[ii] Artificial intelligence in the healthcare sector is defined as a collection of internet-based technologies that enable machines to sense, learn, and perform organizational and clinical healthcare tasks, as well as be used for training and research purposes.[iii] The integration of AI into the healthcare system is being hailed as a game-changer in terms of lowering costs and improving the efficiency, quality, and accessibility of healthcare services for millions of people. According to the available documents on AI and healthcare systems, the focus of most AI-based proposals in India has been to spread AI-based medical services to remote rural people who cannot afford quality healthcare. There is plethora of situations where AI in healthcare has resulted in multi fold benefits in areas such as drug discovery, personalised care for chronic diseases, predictive healthcare diagnosis, medical test automation, efficient healthcare delivery, and detecting abnormalities through medical images. The current Covid-19 pandemic crisis has accelerated the use of artificial intelligence (AI) in controlling the spread of disease through contract tracing and vaccine development.

AI is bringing a standard move to healthcare, driven by growing availability of healthcare data and speedy progress of analytics techniques. Artificial Intelligence in robotics and methods like machine learning, can improve economic, social welfare and the exercise of human rights. At the same time, AI may be abused or perform in unexpected and potentially harmful ways if it is not properly handled. Problems on the impact of the law, ethics and technology in governing AI systems are thus more significant than ever before. Artificial intelligence also creates challenges for human rights. There are positive and negative impacts on human rights opportunities to deploy AI in the healthcare Artificial intelligence's proclivity to infringe on human rights grows as it becomes more integrated into our daily lives.[iv] Even though there are many implications of AI in healthcare sector, one of the big challenges faced by the world is that of the lack of a comprehensive regulatory frame work across in this regard. Countries like Canada, Singapore, France, China and the UK, to name a few, has already made some attempts to regulate the law relating to AI and Robotics.[v] But, India who has the right talent and technological resource currently does not have specific regulations which governs AI. Hence, this article emphases on the current challenges faced by the health care delivery in India and the impact of artificial intelligence in health care sector. This paper examines the legal and human rights issues including how the application of AI in health care can impact the rights to equality, privacy, free expression, association, and assembly, and suggests ways that these impacts can be redressed.

EMERGENCE OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE

Artificial intelligence (AI) is one of the latest fields of engineering, with formal research on the subject dating back to the 1950s.[vi] Alan Turing was the first to describe the idea of using computers to simulate intelligent behaviour and critical thinking in 1950. Turing described a simple test to determine whether computers were capable of human intelligence in his book Computers and Intelligence. This test later became known as the "Turing test."[vii] AI began as a simple set of "if, then" rules and has progressed over decades to include more complex algorithms that mimic the human brain's functions. Figure 1 illustrates brief overview of the historical evolution artificial intelligence and its emergence of artificial intelligence in medicine (AIM).

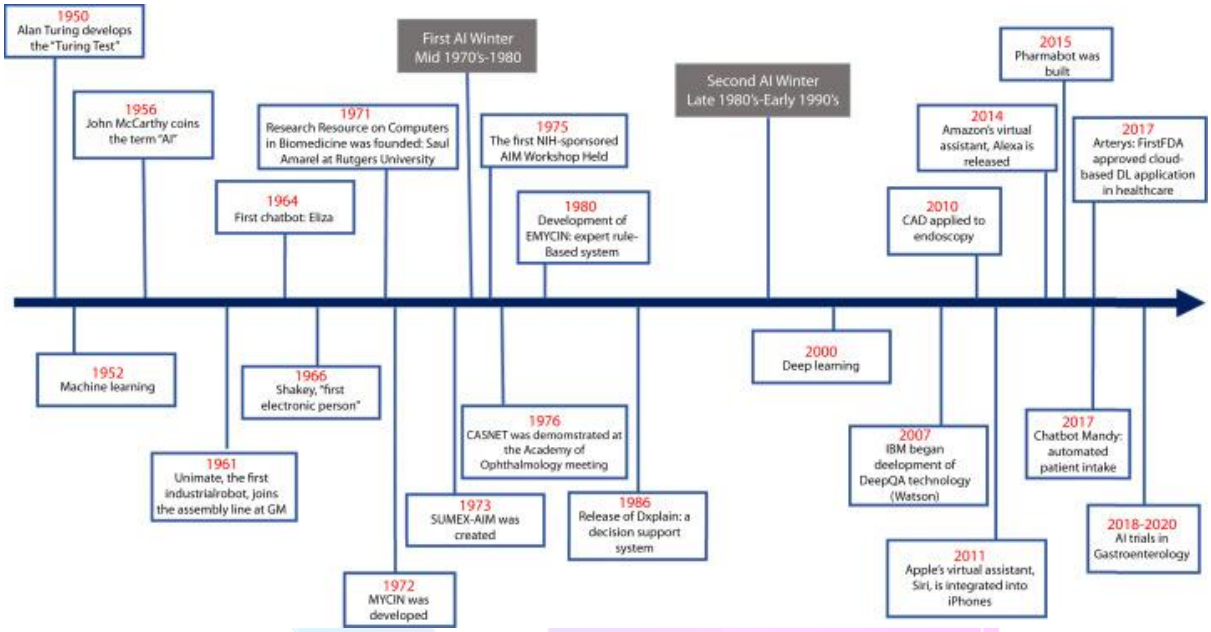

***Figure 1**: Artificial Intelligence in Medicine: A Timeline of Development and Use*

***Source**: History of artificial intelligence in medicine*[viii]

The advent of AI in the modern era coincided with the discussion of its use in medicine. This is unsurprising, given that AI systems are designed to mimic the human brain's functions.[ix] In 1970, a physician named William B Schwartz published an influential paper titled "Medicine and the Computer: The Promise and Problems of Change" in the New England Journal of Medicine. 'Computing science will most likely exert its major effects by augmenting and, in some cases, largely replacing the intellectual functions of the physician,' he wrote in the paper.[x] By the 1970s, it was clear that traditional computing techniques were inadequate for dealing with complex medical issues. For clinical problem solving, a more sophisticated computational model that simulated human cognitive processes, i.e. AI models, was required.[xi] Setting up rules-based systems to assist with medical reasoning was one of the first attempts to apply AI in medicine. Serious clinical problems, on the other hand, are far too complex to be solved using simple rule-based problem-solving techniques. The construction of computer programs based on disease models followed problem solving in medicine. AI was being used to help with problem solving in a variety of fields, not just general medicine.[xii]

Gunn, a Scottish surgeon, pioneered the use of computational analysis to diagnose acute abdominal pain in 1976.[xiii] Clinical audits of structured case notes via computers were used to achieve this, with diagnosis through this route proving to be about 10% more accurate than the

traditional route. By the 1980s, AI research communities had established themselves all over the world, but particularly in learning centers in the United States.[xiv]

This advancement aided the spread of new and innovative AI approaches to medical diagnosis.[xv] Medicine was an ideal testing ground for these AI applications, so there was a lot of push behind it. At this point, the expert system methodology was used in a large number of AI applications in medicine.[xvi] Medical AI research had begun to use new techniques like machine learning and artificial neural networks to aid clinical decision-making by the end of the 1990s.

In 2007, IBM developed Watson, an open-domain question–answering system that competed against humans and won first place on the television game show Jeopardy! in 2011.[xvii] Rather than using forward reasoning (following rules from data to conclusions), backward reasoning (following rules from conclusions to data), or hand-crafted if-then rules, DeepQA used natural language processing and various searches to analyze data over unstructured content and generate probable answers. This system was more convenient to use, easier to maintain, and less expensive.[xviii] Bakkar et al[xix] successfully identified new RNA-binding proteins that were altered in amyotrophic lateral sclerosis using IBM Watson in 2017.

As a result of this momentum, as well as improved computer hardware and software programs, digitalized medicine became more widely available, and AIM began to expand quickly. Chatbots went from superficial communication (Eliza) to meaningful conversation-based interfaces thanks to natural language processing. In 2011, this technology was used to create Apple's Siri virtual assistant, and in 2014, it was used to create Amazon's Alexa virtual assistant. Mandy was created in 2017 as an automated patient intake process for a primary care practice, and Pharmabot was created in 2015 to assist in medication education for pediatric patients and their parents.[xx]

In AIM, DL was a significant step forward. Unlike ML, which requires human input and uses a set of traits, DL can be trained to classify data on its own. Although DL was first studied in the 1950s, the problem of "overfitting" limited its application in medicine. Overfitting occurs when machine learning is overly focused on a single dataset and is unable to accurately process

new datasets, which can be caused by a lack of computing capacity or a lack of training data.[xxi] With the availability of larger datasets and significantly improved computing power in the 2000s, these limitations were overcome.

CONCEPT OF ARTIFICIAL INTELLIGENCE

There are various interpretations of what AI is and what goes into developing AI because of the complexity involved in developing synthetic intelligence that is comparable to human intelligence.[xxii] In spite of its growing existence across many aspects of our lives, there is no commonly accepted definition of "artificial intelligence."[xxiii] Instead, it is an umbrella term which contains a variety of computational techniques and associated processes dedicated to refining the ability of machines to do things which requires intelligence, such as language processing computer vision and pattern recognition.[xxiv] "The science and engineering of making intelligent machines, especially intelligent computer programs".[xxv]

AI is "a field of science concerned with the computational understanding of what is commonly called intelligent behaviour, and with the creation of intelligent agents that exhibit such behaviour"[xxvi] One of the first AI scholars, Marvin Minsky, defines it as "the science of making machines do things that would require intelligence if done by men."[xxvii] John McCarthy, another founding scholar, defines it as "the science and engineering of creating intelligent machines."[xxviii] According to a Stanford University report, AI is "a science and a set of computational technologies inspired by—but typically operating quite differently from the ways people use their nervous systems and bodies to sense, learn, reason, and take action."[xxix] Machine learning, robotics, neural networks, vision, natural language processing, and speech processing are all subfields of AI. There is a lot of crossovers between these sub-fields. Psychology, neuroscience, cognitive science, philosophy, linguistics, probability, and logic are some of the fields that AI draws from outside of computer science.

Over the past five decades, AIM has changed dramatically. Machine learning (ML), deep learning (DL), and computer vision are few of the subfields in AI, similar to medical specialties.[xxx] Since the introduction of ML and DL, AIM applications have grown, allowing

for personalized medicine rather than algorithm-only medicine. Machine learning, a subset of AI, has become the most popular approach in recent AI healthcare applications because it allows computational systems to learn from data and improve their performance without having to be explicitly programmed.[xxxi] Deep learning is a subset of machine learning that uses multiple layers of artificial neural networks to identify patterns in very large datasets.[xxxii] Predictive models have the potential to be used for disease diagnosis, therapeutic response prediction, and, in the future, preventative medicine.[xxxiii]

CHALLENGES FACED BY HEALTH CARE IN INDIA

Every country's healthcare industry faces unique challenges. Even advanced economies struggle to set up the right infrastructure for seamless integration of different functions when it comes to the last mile delivery of health services. When we consider the vast area and the sheer number of potential beneficiaries, the challenges for a country like India take on a whole new meaning. Additional challenges include population diversity, challenges specific to a particular geographic area, and digital literacy, to name a few.[xxxiv]

In India, health systems face significant challenges in terms of quality, accessibility, affordability, and equity. The ideal doctor-patient ratio as prescribed by World Health Organization (WHO) is 1:1000. In India, as per the current population estimate of 135 crores, there is one doctor for every 1,445 Indians, which is lower than the WHO's recommended ratio. On the one hand, India has some of the world's best hospitals, contributing to the growing medical tourism industry.[xxxv] Despite the fact that AI doctors will not be able to replace human doctors, it will undoubtedly support in making clinical decisions. In time, artificial intelligence could grow to the extent and efficiency of care providers and make up for talent shortages around the world. In India, healthcare is one of the most dynamic, yet challenging, sectors, with a Compound Annual Growth Rate (CAGR) of upwards of 16 percent expected to reach 280 billion USD by 2020, up from nearly 100 billion USD now.[xxxvi]

However, for a large portion of the population, healthcare faces major challenges in terms of quality, accessibility, and affordability.[xxxvii]

The following are some of the most pressing issues confronting Indian healthcare:

- There is a shortage of qualified healthcare professionals and services, such as qualified doctors, nurses, technicians, and infrastructure, as evidenced by the presence of 0.76 doctors and 2.09 nurses per 1,000 people (as opposed to WHO recommendations of 1 doctor and 2.5 nurses per 1,000 population, respectively).
- In India, hospital beds are in short supply, with only 1.3 hospital beds per 1,000 people, compared to the WHO's recommended 3.5 hospital beds per 1,000 people.[xxxviii]
- Non-uniform healthcare access across the country, with physical access remaining a major barrier to both preventive and curative health services, as well as a stark divide between rural and urban India.
- Patients have to travel significant distances for basic and advanced healthcare services because most private facilities are concentrated in and around tier 1 and tier 2 cities.
- The fact that most patients must travel thousands of kilometres on average to receive treatment for life-threatening diseases is a sad example of a lack of access to high-quality healthcare. Patients are burdened by the stress and financial implications of traveling such a long distance from home, in addition to fighting a potentially life-threatening disease. [xxxix]
- The problem is exacerbated by a lack of consistent quality in Indian healthcare; the majority of services are provided by individuals rather than institutions, and only about 2% of hospitals in India are accredited.
- Affordability is still an issue, with private spending accounting for 70% of healthcare costs, with 62 percent of that being out-of-pocket spending, which is likely among the highest in the world.
- Due to lack of awareness, access to services, and behavioural factors, the majority of patients visit a hospital or physician only when their disease has progressed to an advanced stage, increasing the cost of care and reducing the chances of recovery.

The Indian government has demonstrated a bold commitment to achieving Universal Health Coverage and increased access to comprehensive primary health care through recent policy interventions. The Government of India has embarked on a path-breaking journey to ensure the affordability and accessibility of healthcare in India through the Ayushman Bharat program

announced in Union Budget 2018, which is likely the world's largest government-funded health-care program. The Mission's benefits will be available at both public and private health care facilities that have been empanelled.

A commitment of INR1,200 crore was made in the Union Budget 2018 for Health and Wellness Centres (HWC), which will lay the groundwork for India's health system as envisioned in the National Health Policy 2017. From 2018 to 2022, 1.5 lakh Health Sub Centres will be transformed into HWCs, with the goal of shifting primary healthcare from selective (reproductive and child health / a few infectious diseases) to comprehensive which include the management and screening of Non-Communicable Diseases (NCD) NCDs are mostly chronic illnesses that disproportionately affect the poor, due to the high treatment costs. To reduce the disease burden, prevention and early detection are critical. Artificial intelligence (AI) combined with cloud computing platforms has the potential to address these issues in a cost-effective way.

Notwithstanding the apparent economic potential in healthcare sector in India, it is multi-layered and complex, and it is ripe for disruption at multiple levels from emerging technologies. As evidenced by the increasing activity from large corporations and start-ups alike in developing AI focused healthcare solutions, it is probably the most intuitive and obvious use case primed for intervention by AI driven solutions. Increased technological advancements, as well as increased interest and activity from innovators, present India with an opportunity to address some of its long-standing challenges in providing appropriate healthcare to a large segment of its population. AI combined with robotics and the Internet of Medical Things (IoMT) has the potential to transform healthcare by providing solutions to problems and assisting the government in achieving the above goals.

ARTIFICIAL INTELLIGENCE AND ITS APPLICATION IN HEALTH CARE DELIVERY IN INDIA

Figure 2 explains some of the main uses of artificial intelligence in health care delivery. There are far too many potential AI applications in healthcare to list here.

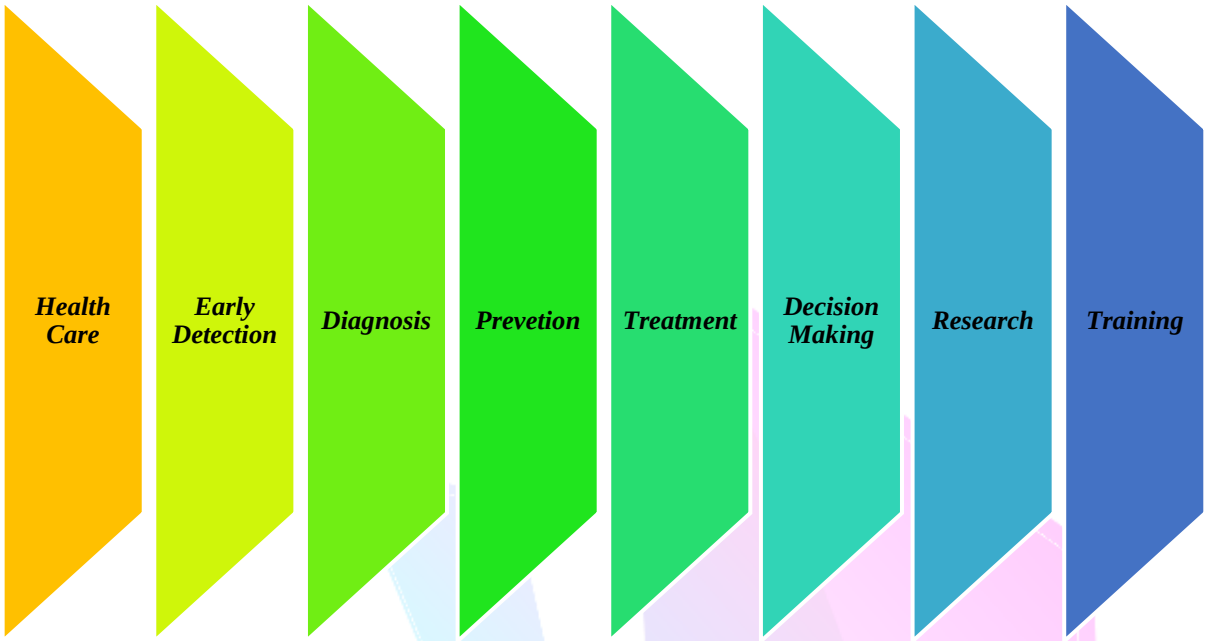

***Figure 2**: Illustrates the potential uses of AI in Indian Healthcare*

***Source**: Compiled by author*

Following are some other important applications or uses of AI in healthcare.

- ***Compile Medical History***

One of the important steps in health care is collecting and analysing information (like medical records and previous medical history). For that data management is widely used application of artificial intelligence and digital automation. Robots collect, store, re-format, and trace data to provide quicker, more reliable access.

- ***Repetitive Tasks***

Analysing medical tests, CT scans, X-Rays, data entry, and other routine tasks can all be complete faster and more accurately by robots. Radiology and Cardiology and are two streams where the amount of data to analyse can be overwhelming and time consuming. Radiologists and Cardiologists in the future should only consult at the most complicated cases where human supervision is useful.

- ***Digital Consultation***

There are many software application (Apps like Babylon in the UK. Babylon is a subscription health service provider that provides remote consultations with doctors and health care professionals via text and video messaging through its mobile application) which use AI to give medical consultation based on personal medical history and common medical knowledge. Users report their symptoms into such application, which uses speech recognition to compare against a database of illnesses. Such applications then offer a recommended action, taking into account the user's medical history.

- ***Drug Creation***

Drug development is a lengthy, expensive, and complicated process that can take more than ten years from the discovery of molecular targets to the approval and marketing of a drug product. In recent years, the amount of data available for evaluating drug compound activity and biomedical data has increased significantly.[xl] This is due to increased automation and the introduction of new experimental techniques such as hidden Markov model text to speech synthesis and parallel synthesis. To efficiently classify potential drug compounds, however, large-scale chemistry data must be mined, and machine learning techniques have demonstrated great promise. Amidst the Ebola virus scare, a program powered by AI was used to scan existing medicines that could be redesigned to fight the disease. This very program found two medications that may reduce Ebola infectivity in one day when analysis of this type generally takes months or years, a difference that could mean saving thousands of lives.

- ***Precision Medicine***

With the assistance of AI, body scans can identify cancer and vascular diseases early and predict the health issues people might face based on their genetics.

- ***Health Monitoring***

Health trailers, like those from FitBit, Apple, Garmin and others, monitors heart rate and activity levels. They can give alerts to the users to get more exercise and treatment, they also can share this information to doctors and AI systems for additional data points on the needs and habits of patients.

- ***Healthcare System Analysis***

The companies working with AI can scrutinise patient's data to point out mistakes in workflow inefficiencies, treatments, and also helps in the area of healthcare systems avoid preventable patient hospitalizations.

- ***AI-assisted robotic surgery***

Robot-assisted surgery is "minimally invasive" so patients won't need to heal from large slits. With artificial intelligence, robots can use information from past operations to notify new surgical techniques. The positive results are indeed promising. A study that involved 379 orthopaedic patients found that AI-assisted robotic technique resulted in 5 times lesser complications compared to surgeons operating alone. A robot was used on an eye surgery for the first time, and the most advanced surgical robot, the Da Vinci allows doctors to perform complex procedures with greater control than conventional approaches. Heart surgeons are assisted Heartlander, a miniature robot, that enters a small incision on the chest to perform mapping and therapy over the surface of the heart.

- ***Virtual nursing assistants***

Virtual nursing assistants interact with patients and directing patients to the most effective care setting. As virtual nurses are available 24/7, they can answer to the queries, observe patients and deliver quick answers. Today, most of the applications of virtual nursing assistants permit for more regular communication between patients and health care providers to prevent hospital readmission or unnecessary hospital visits. Care Angel's virtual nurse assistant can even provide wellness checks through voice and AI.[xli]

BENEFITS OF INCORPORATING ARTIFICIAL INTELLIGENCE IN HEALTH CARE

Health care is undoubtingly improving through AI. Following is the some of the major benefits enjoyed by both the patient and medical practitioners.

a) ***Predictive Medical Care*** **–** Prediction on health care will lead to a rising treatment model wherein the patient data is studied constantly to check for any anomalies, followed by suggestions of medical intervention.

b) ***Personalized Medication*** **-** On the basis of patient's body constitution and past medical history AI makes it possible for them to have personalized care. In 2017, an old lady was treated for a rare type of leukaemia by the University of Tokyo. The treatment was proposed by Watson, a cognitive supercomputer by IBM. It suggested in 10 minutes by searching 20 million cancer research writings.

c) ***Better Diagnosis*** **–** Fast searching and cross referring of data leads to better diagnosis of diseases. The data also includes test results, handwritten notes, and geospatial and sensor data. Environmental factors both human and natural are also be considered.

d) ***Advanced Treatment Plans*** **-** New treatment techniques and methods are generated and introduced, including robotic surgery, stem therapy, cell biology, genomics and proteomics. Amrita Institute of Medical Sciences (AIMS), Kochi, has become the first healthcare facility in the Asia-Pacific region to use robotic technology for neurosurgery, successfully conducted four surgeries for treatment of epilepsy with the new generation robotic surgical technology.[xlii]

e) ***Non-stop Monitoring*** **-** Uninterrupted monitoring of patients would ensure timely care and cure and even reduced hospital stay. The AI based applications can check for the patient's health and vital signs in case of critically ill patients before informing for medical interference.

f) ***Long Term Cost Savings for Both Patient and Medical Care Provider*** **-** AI can make health care both proficient and affordable as it helps in managing treatment choice. Making more efficient diagnosis helps the patients to make better decisions regarding their health and decisions in drug development.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN COVID 19 PANDEMIC IN INDIA

In dealing with India's COVID-19 situation, AI and its applications have proven to be a boon. This new technology can help with pandemic tracking, COVID-19 case screening, corona virus containment, contact tracing, quarantine and social distancing, suspect tracking, COVID-19 patient treatment and remote monitoring, vaccine and drug development, and more. PwC India conducted a global study and found that during COVID-19, India saw the greatest increase in

the use of artificial intelligence (AI). According to the survey, 73 percent of healthcare and pharmaceutical companies used AI in the previous year.[xliii]

Predictive models based on artificial intelligence have emerged as one of the most potent weapons in the fight against COVID-19 in the country. Computer simulations have been used by decision makers to better understand how the COVID-19 situation will evolve over time. Many scientists and businesses, including TCS (Tata Consultancy Services) and KPMG[xliv] India, have developed machine-learning models to predict disease severity and identify at-risk populations across the country.[xlv] TCS (Tata Consultancy Services) has developed 'Digital twin,' a virtual computerized model to forecast the spread of COVID-19 in urban districts in India, in collaboration with Pune-based Prayas Health Group. The Government of India's MyGov, the world's largest citizen engagement platform, has partnered with Amplify.ai, a company that specializes in conversational AI technology, to raise awareness of COVID-19 and provide real-time updates[xlvi]. Citizens can also use the virtual assistant or chatbot to ask relevant questions and clear their doubts about COVID-19.

ARTIFICIAL INTELLIGENCE *VIS-A-VIS* HUMAN RIGHTS

Human rights are universally binding, and are codified in a body of international law. Respecting human rights is obligatory of both governments and companies equally, while governments have additional obligations to protect and fulfil human rights.[xlvii] The 'International Bill of Human Rights' sets out a wide range of rights. This includes three key instruments: the Universal Declaration of Human Rights (UDHR);[xlviii] the International Covenant on Civil and Political Rights (ICCPR);[xlix] and the International Covenant on Economic, Social and Cultural Rights (ICESCR).[l] The human rights set out in these instruments are go along with a range of other international treaties which explains how these standards can be applied in specific situations and to particular groups of people. Which includes treaties relating to discrimination against women, racial discrimination, the rights of people with disability and the rights of children, among other issues.

Recent progresses in health outcomes are attributed into improvements in the three pillars of healthcare: **prevention, diagnosis, and treatment**. AI has applications across all these three pillars, but its ultimate impact to date has been on improving the precision of medical diagnosis.

There are positive and negative impacts on human rights opportunities to deploy AI in the healthcare. AI has generated new forms of oppression, and in many cases strangely affects the most vulnerable and powerless. Human rights law can address some of the daring social harms initiated by AI, and prevent such harms from occurring in the future.

Following is some of the examples of how human rights and new technology can interconnect. These examples indicates that new technology can develop or restrict human rights, and sometimes offers both options at once.[li]

a) Right to Life, Liberty, and Adequate Standard of Living

AI-based diagnostic systems improve the enjoyment of the right to life by making precise, high-quality diagnostic amenities more widely available. One can claim that the fundamental right to life may be positively impacted with the introduction of AI in diagnostic systems, which comprises the promise of not only reducing the rate of diagnostic errors, but creating high quality diagnostic services cheaper or more widely available. Although, the right to life is usually observed as a protection against the arbitrary deprivation of life by the state, the Supreme Court of Canada in Chaoulli's case has ruled that inadequate access to medical care can result in deprivations of the right to life.[lii] Similarly, developments in the availability of high-quality medical care services can be viewed as enhancing the right to life. By identifying diseases earlier and more perfectly, AI-based diagnostic systems will improve living standards and quality of life.

b) Right to Desirable Work

The enriched health outcomes that AI-based diagnostic systems are likely to contribute will reduce the number of persons who are omitted from the dignity of work for medical reasons. As with many other computerized technologies, there is a chance that AI-based diagnostic technologies will cause employment losses in the medical field. While the right to work does not entail the right to work in any particular position, occupation, or field, the state obligation to protect the right to work and progressively adopt measures to realize full employment could be burdened by the widespread adoption of AI-based technologies that displace workers.[liii]

c) ***Right to privacy***

AI-based diagnostic systems contain the assortment of huge quantities of sensitive data relating to person's often immutable health features, raising serious privacy concerns. The right to privacy is a fundamental human right, recognized in article 12 of the Universal Declaration of Human Rights, Article 17 of the International Covenant on Civil and Political Rights and in many other international and regional human rights instruments.[liv] In order to impart the algorithms, healthcare providers must collect a huge range of extremely personal health and genetic data. The scope for the misappropriation of this data is high, especially since an individual's genetic and health features are often immutable with potential inferences for privacy,[lv] freedom from discrimination,[lvi] dignitary rights,[lvii] and fair criminal procedure.[lviii] For instance, such data could be used to reject a person health coverage on the basis of genetic factors that are away from their control.[lix] Or such data might be taken by the government for law administration purposes, as in a case from California, of a 1970s-era serial killer, who was known based on the statistical analysis of DNA samples which his relatives submitted to a family ancestry website.[lx] The right to privacy is not only influenced by the analysis or use of information about a person by a human or an algorithm.[lxi] Even the mere generation and collection of data concerning to a person's identity, life or family already affects the right to privacy, as through from those steps an individual misses some control over information that could put his or her privacy in danger.[lxii] In addition, the mere existence of undisclosed observation amounts to an interference with the right to privacy.[lxiii]

d) ***Right to Equality and Non-Discrimination***[lxiv]

The rights to equality before the law and the non-discrimination are important to the UDHR; these two rights set out in the Declaration[lxv]. 'All human beings are born free and equal in dignity and rights.[lxvi] The UDHR provides that everyone is entitled to all rights and freedoms 'without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status'[lxvii] In engaging new technologies, both state and private sector players will likely required to find new ways to protect human rights, as new challenges to equality and representation of and impact on various individuals and groups arise. Machines perform on the basis of what humans tell them. If a system is provided with human biases the result will certainly be biased. The lack of diversity and insertion in the design of AI systems is therefore a key concern: instead of making our

decisions more objective, they could reinforce discrimination and prejudices by giving them an appearance of objectivity. Studies shows that women, children, people with disabilities and LGBTI persons ethnic minorities, particularly suffer from discrimination by biased algorithms.

e) ***Right to education***[lxviii]

Should AI-based diagnostic systems provide on their promise, fewer people will be omitted from the enjoyment of the right to the education for reasons of ill-health. New technologies can help in meeting the obligation to deliver universal, free primary school education. Lack of access to technology can build inequality, based on factors such as age, Indigenous status, disability, and rural or remote location. These international human rights treaties hardly refer specifically to the protection of human rights through technology. Instead, new technology provides a setting in which human rights are applied. The better health outcomes that AI-based diagnostics are likely to produce will positively impact the enjoyment of the right to education by those who would otherwise be excluded by reasons of illness.[lxix]

f) ***Right to benefit from scientific progress***[lxx]

New technologies can progress enjoyment of human rights such as access to health, education and food. But ensuring accessibility across all sectors of the community is a difficult task.

g) ***Intellectual Property Rights***

The Universal Declaration of Human Rights (UDHR, Article 27), the International Covenant on Economic, Social, and Cultural Rights (ICESCR, Article 15), the International Covenant on Civil and Political Rights (ICCPR, Article 19), and the Vienna Declaration and Programme of Action (VDPA) 1993 all include intellectual property rights. They have a "human rights character" and "have become contextualized in a variety of policy areas," according to the report. WIPO (World Intellectual Property Organization).

AI raises a number of intellectual property concerns, such as who owns AI-generated or produced works or inventions. Should the inventions of artificial intelligence be considered prior art? Who owns the dataset from which a machine learning algorithm must learn? Who should be held liable for AI-generated creativity and innovation if it infringes on others' rights or violates other legal provisions? Many intellectual property rights issues remain unresolved, and current regimes have been deemed "woefully inadequate to deal with the growing use of more and more intuitive artificial intelligence systems in the production of such works". More

research and exploration are required, especially as AI advances and it becomes more difficult to identify the creator.[lxxi]

CHALLENGES OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE

Artificial intelligence is a wonderful field of technology. "Healthcare as a system advocates 'do no harm' first and foremost. Not 'do good', but 'do no harm'. Every application of A.I. in healthcare is regulated by that fundamental philosophy," [lxxii]

a) ***Risk in new/exceptional health cases***

AI not only have to be accurate and safe; it has to be up to date with new health cases. In other words, a program will only be as good as the data it learns. Programs need to be taught, or at least regularly updated, to be able to identify new/exceptional health cases.

b) ***Risk for Doctors & Patients***

Since AI application is health care has not been completed, doctors cannot fully trust on AI and still need to make decisions based on their knowledge and expertise. Patients are also at risk for the same way. If a program gives incorrect information, patients will not be treated properly.

c) ***Adoption***

Another challenges AI faces in healthcare is extensive clinical adoption. To understand the value of AI, the healthcare industry needs to create a workforce that is well-informed about AI so they are comfortable using AI technologies.

d) Development

Due to the lax of India's lax intellectual property laws, which allow patents to be taken over and used to make less expensive generic drugs, most pharmaceutical companies outsource their R&D to contract research organizations. The lack of robust medical open data sets in India can stymie AI development, as developers must rely on data sets from other countries to prototype their systems. Though the Indian government has created a number of incentives to encourage domestic production of medical devices, drugs, and other products, it is unclear whether AI technologies and businesses benefit from these incentives.[lxxiii]

e) ***Training Doctors/Patients***

Learning and educating doctors about how to use technology may be a challenge for some. Likewise, not everyone is open to information given by a "robot." In other words, accepting AI technology is a great challenge which needs to be addressed through education.

f) Investment

Despite the fact that investment in health-related AI is increasing, research appears to be under-funded and explored in India, particularly by the government.

g) Information asymmetry

The issue of information asymmetry between the doctors who use the system and the coders who built it is common in AI-based healthcare solutions. As a result, some people may be hesitant to use the software. Furthermore, how AI technologies are perceived can have a direct impact on how effective they can be used in treatment. This is something that needs to be looked into further, especially in developing countries like India, where technology penetration and understanding are significantly lower than in developed countries.

h) Privacy

Healthcare data is extremely private, and data breaches can jeopardize an individual's personal autonomy, dignity, and even access to work. The Ministry of Health and Family Welfare in India made a draft of the proposed Digital Information Security in Healthcare Act (DISHA 2018)[lxxiv] in March 2018, which is available to the public, which would allow hospitals and clinics to share personal health records digitally. DISHA would establish a rights-based framework for medical privacy, guaranteeing patients' privacy, confidentiality, and security. Patients would have the right to refuse consent for the generation, storage, and collection of their data under the draft law, which requires that each instance of transmission of digital health data obtain the owner's explicit prior permission.[lxxv]

i) Misuse

The possibility of health data being linked to other systems, as well as the new avenues for discrimination that this may open up, is cause for concern. Discrimination in the workplace or in other entitlements and social benefits could result from the flow of health data to companies outside of the healthcare sector.

j) Accountability

Then there's the issue of accountability. In the event of a misdiagnosis or error, who is responsible? On the one hand, AI systems are currently thought of as decision-making aids. They aren't meant to take the place of doctors, but rather to serve as a first layer of screening. To put it another way, it is expected that a 'human in the loop' will interpret the results and point out any errors. However, it's worth considering what kind of professional this person is, as well as their capabilities and incentives for verifying the validity of AI-generated suggestions.

k) ***Regulations***

Lack of proper regulations is also a challenge for AI in the healthcare industry. States must observe to relevant national and international laws and regulations that codify and implement human rights obligations protecting against discrimination and other related rights harms, for example data protection and privacy laws. In the case of AI in healthcare, India currently lacks a regulatory authority. The Medical Council of India (/National Medical Commission), the Drug Controller General of India, or a new entity created specifically for this purpose are all possibilities. Empowering the MCI to oversee medical aspects and a regulator under the Data Protection Bill to oversee data issues could be a viable alternative. There is also a regulatory gap in the area of medical devices, which the recent Indian Medical Devices Rules, 2017 attempted to address

CONCLUSION

The present study has illustrated the risks and opportunities posed by AI to human right to health care. A single AI application can influence the civil, political, economic, social, and cultural rights, with simultaneous positive and negative impacts on the same right for different people. The human rights framework which is developed over the last 70 years is successfully applied and adjusted to new and emerging issues. There is no need to reinvent the wheel. Rather, the big challenge is to successfully implement and operationalize the existing framework, and to apply it to both state and non-state actors, so that human rights are promoted and protected in the digital age. Different techniques of AI and different spheres of application raise specific ethical and regulatory human rights issues in health care. In order to ensure that human rights protect individuals from the risks posed by AI, existing laws and regulation must be reviewed, and if necessary amended, to address the effects of new and emerging threats to

all human rights issues in health care. A comprehensive legal framework must be developed to ensure compliance so that the benefits of health care AI balance the risks within the context of healthcare. It is time for the lawmakers and the judiciary to step in and pave the way for a successful changeover of world's health care sector into the age of artificial intelligence and thereby to solve complex healthcare problems.

For national and international companies, India is currently in a unique position to be a driver in the AI and healthcare space. With vast amounts of data and a burgeoning startup community, India has the potential to use AI to solve a variety of health-care issues. In order for India to join the AI revolution, the government has launched a series of initiatives aimed at increasing AI adoption across the country. However, lack of regulatory clarity on issues of data, design, and certification, as well as a lack of resilient and ethical data collection and processing systems, continue to obstruct widespread adoption and implementation. A strong open data policy, comprehensive privacy legislation, increased investment in AI research and development, a strong national infrastructure, equipping workers with the necessary skills to adopt AI and be prepared for the changes that AI may bring, and a regulatory framework that ensures transparency and accountability while not impeding innovation are all things that need to be considered in order to create a thriving AI healthcare ecosystem in India. We will be able to reduce / resolve the shortages and accessibility of specialized Doctors/Hospitals, especially in rural parts of India, if AI and other digital healthcare techniques / devices are widely used, which will also improve and thrive the health of the less privileged citizens. A rightly balanced use of Technology within the law is the need of the hour which AI can bring if it is successfully managed and regulated.

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