

## Artificial Intelligence in healthcare: Embracing the future

Suchita V Dabhadkar<sup>1</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, Bharati Vidyapeeth (DU) Medical College and Hospital, Pune, Maharashtra, India

E-mail ID: sdabhadkar9@gmail.com

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Artificial intelligence (AI) is the buzzword you must be listening to everywhere these days. The discussion doesn't end without mentioning Artificial Intelligence in every conference, research platform, and academic gatherings! While we are still busy debating whether AI is a boon or bane, we must accept that it is the future of Mankind. AI is not going to replace real doctors, but it will replace those who have not adopted AI.

AI refers to the ability of computers to perform tasks that typically require human intelligence, such as reasoning, problem-solving, and learning<sup>(1)</sup>. Computer Vision, Natural Language Processing, Speech Recognition and Synthesis, Knowledge Acquisition and Representation, Expert Systems, and Robotics are essential components for enabling computers to perform complex tasks akin to humans. Though replacing humans with 'General AI' is still a far-fetched idea, AI is transforming our lives in fields such as economics, medical science, internet shopping, transport management, and public safety today. AI has rapidly progressed since 2000 as machine learning and deep learning have matured<sup>(2)</sup>. Data science has progressed with leaps and bounds. Statistics, neuroscience, and physics came together in building Artificial Neuronal Networks (ANN)<sup>(2)</sup>. This has helped AI further achieve unsupervised learning. Our lives have been transformed as artificial intelligence is used in applications such as facial identification, computer vision, biometrics, surveillance, forecasting, and decision-making<sup>(3)</sup>. The da Vinci Surgical System is a prominent example of AI in robotic surgery, used for various procedures, including prostatectomies and hysterectomies<sup>(4)</sup>. In this editorial, I delve into the multifaceted implications of AI in health sciences, examining its profound impact on diagnosis, treatment, and healthcare delivery. Additionally, I explore the legislative and ethical considerations that accompany the integration of AI in the medical field, highlighting global developments and pertinent examples.

The main applications of AI in healthcare are:

### I. Transformative Diagnostics<sup>(5-7)</sup>

One of the most profound impacts of AI in health sciences lies in its ability to revolutionize diagnostics. Traditional diagnostic methods often rely on time-consuming processes and may be limited by human error. Conversely, AI offers a

paradigm shift by leveraging machine learning algorithms to analyze vast datasets quickly and accurately. For instance, Google's DeepMind has developed AI systems to detect diabetic retinopathy and breast cancer from retinal and mammography images, respectively.

#### A. Imaging and Radiology

In radiology, AI algorithms have demonstrated remarkable proficiency in image interpretation. From detecting subtle anomalies in medical imaging to predicting disease progression, AI has the potential to expedite diagnosis and provide invaluable insights. For instance, AI-driven analysis of medical scans can significantly enhance the early detection of conditions such as cancer, allowing for timely intervention and improved prognosis. Indian examples in this field are Mumbai-based Qure.ai, which develops AI-powered medical imaging solutions. Niramai, headquartered in Bangalore, has developed Thermalytix, a technology utilizing thermal imaging and AI algorithms to analyze patterns in breast tissue temperature, thereby detecting potential abnormalities associated with breast cancer.

#### B. Pathology and Laboratory Medicine

AI is also making substantial strides in pathology and laboratory medicine. Automated analysis of pathology slides and laboratory test results can significantly reduce turnaround times and enhance precision. This not only accelerates the diagnostic process but also reduces the likelihood of human error, ensuring more reliable results. For instance, IBM's Watson for Oncology utilizes AI to analyze large volumes of medical literature, clinical trial information, and patient records to suggest personalized cancer treatment options. By considering the unique genetic makeup of each patient's tumor, such systems can identify targeted therapies that may yield better outcomes than conventional treatments.

### II. Personalized Treatment Strategies

The era of one-size-fits-all medicine is giving way to personalized treatment strategies, and AI is at the forefront of this revolutionary shift. By harnessing the power of big data and predictive analytics, AI can analyze individual patient data to tailor treatment plans that are more effective and carry fewer adverse effects. Bangalore-based company Practo offers an AI chatbot for personalized health assistance.

### **A. Drug Discovery and Development**

AI accelerates the drug discovery process by sifting through vast datasets to identify potential drug candidates. This data-driven approach allows researchers to target specific biological mechanisms with greater precision, expediting the development of novel therapies. Additionally, AI enables the identification of patient subgroups that may respond more favorably to certain treatments, paving the way for targeted therapies. Companies like Atomwise and Benevolent AI are utilizing AI for drug discovery.

### **B. Treatment Optimization**

In the realm of treatment, AI contributes to the optimization of therapeutic approaches. By continuously analyzing patient data, AI systems can adapt treatment plans in real time, accounting for individual responses and adjusting medications or interventions accordingly. This dynamic approach enhances treatment efficacy while reducing side effects, marking a significant departure from conventional static treatment regimens. For example, IBM Watson for Oncology provides personalized treatment recommendations for cancer patients.

### **III. Enhanced Patient Care**

Beyond diagnostics and treatment, AI is redefining the patient care experience. From remote monitoring to predictive analytics, these technologies empower healthcare providers to deliver more proactive, patient-centered care.

#### **A. Remote Patient Monitoring**

Taking the help of AI in remote patient observation systems allows healthcare providers to track patients' health parameters in real-time. This proactive approach enables early intervention in case of deteriorating health, reducing hospital readmissions and enhancing overall patient well-being. Patients, too, benefit from increased autonomy and a sense of security, knowing that their health is being actively monitored. Companies like Apple, with its Apple Watch and Fitbit, incorporate AI to provide health insights to users. Nightingales is an Indian name working in such data analysis.

#### **B. Predictive Analytics for Preventive Care**

AI's predictive analytics capabilities extend beyond diagnosis and treatment to anticipate potential health risks. By analyzing retrospective patient data and detecting patterns, AI can predict the likelihood of future health issues, enabling healthcare professionals to implement preventive measures. Predible is an Indian platform working in this field. This proactive stance not only improves patient outcomes but also contributes to the overall efficiency of the healthcare system.

### **Ethical Considerations and Challenges<sup>(6-8)</sup>**

As we celebrate the transformative potential of AI in health sciences, it is imperative to address the ethical considerations and challenges that accompany these advancements. The following issues are critical to the adaptation of AI in healthcare:

#### **A. Data Privacy and Security**

A vast amount of sensitive patient information is analyzed by AI systems. This raises concerns about data privacy and security. Robust safeguards must be in place to protect patient confidentiality and prevent unauthorized access to health information. Striking a balance between harnessing the power of data and safeguarding patient privacy is crucial for the ethical deployment of AI in health sciences.

#### **B. Algorithmic Bias and Fairness**

The development and training of AI algorithms require diverse and representative datasets to avoid biases. If algorithms are trained on datasets that lack diversity, they may inadvertently perpetuate existing disparities in healthcare. Addressing algorithmic bias is essential to ensure that AI applications in health sciences are fair and equitable, benefiting all patient populations.

#### **C. Human-AI Collaboration**

While AI brings unprecedented capabilities to healthcare, it is essential to maintain a balance between technology and human expertise. The collaborative integration of AI as a tool to support healthcare professionals rather than replace them is crucial. Continuous training and education are necessary to equip healthcare providers with the skills to interpret and utilize AI-generated insights effectively.

Efforts are being made globally to address these challenges. European countries, USA, and Asian collaborations are underway to develop stringent regulations to emphasize the importance of transparency, informed consent, and the right to explanation when AI systems are involved in decision-making processes.

In 2018, the Indian government released a draft National Strategy for Artificial Intelligence with the aim of positioning India as a global leader in AI research, development, and adoption. National Institute of Transforming India (NITI) Aayog, the premier policy think tank, proposed initiatives such as the National Program on AI, creating AI research institutes, and establishing data trusts to facilitate responsible data sharing. The Personal Data Protection Bill 2019 seeks to establish a framework for data protection and empower individuals with control over their personal data. Indian Council of Medical Research (ICMR) published "Ethical

Guidelines for Application of Artificial Intelligence in Biomedical Research and Healthcare, 2023". These inherent ethical challenges in the adaptation of AI are to be addressed by everyone involved in the healthcare sector.

### Conclusion

Integrating artificial intelligence into health sciences represents a transformative leap toward more efficient, personalized, and patient-centered care. The examples mentioned above illustrate how Indian companies are leveraging AI to address various healthcare challenges, from improving diagnostic accuracy and disease screening to enhancing patient care and remote monitoring. As we embrace the potential of AI, it is incumbent upon the healthcare community to navigate ethical considerations, ensuring that these technological advancements are harnessed responsibly and equitably. By doing so, we embark on a journey toward a future where AI and health sciences synergize to redefine the standard of care, ultimately improving the well-being of individuals and communities worldwide.

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### ORCID

Suchita V Dabhadkar  0000-0001-8023-4824

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