Artificial Intelligence in Health Care: A Human Centered Revolution

Sreekumar Ramachandran[a], Jayesh Suresh[b]

a. Department of General Surgery, Government Medical College Idukki; b. Consultant, Vascular Surgery, Pran Hospital, Thiruvananthapuram*

ABSTRACT

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Artificial Intelligence (AI) is rapidly transforming the landscape of health care by enhancing diagnostic accuracy, personalizing treatments, accelerating drug discovery, and improving administrative efficiency. This article explores the evolution of health care from its empirical origins to the current AI-driven revolution, emphasizing how AI technologies—such as machine learning, natural language processing, and robotics—are augmenting human capabilities across the medical field. Applications in medical imaging, predictive analytics, telemedicine, and robotic surgery demonstrate AI's potential to increase accessibility, reduce costs, and improve patient outcomes. However, the integration of AI into health care also raises ethical concerns, including data privacy, algorithmic bias, accountability, and job displacement. The authors advocate for a balanced, human-centred approach to AI, where technology empowers health care professionals rather than replaces them. The article concludes that the future of medicine lies in collaborative human-AI partnerships, aiming to deliver faster, smarter, and more equitable health care for all.

Keywords: Artificial Intelligence, Human Centered Revolution, AI in health care

*See End Note for complete author details

Health care is one of the most critical aspects of human existence. It has started as the herbal remedies and empirical treatment. Then, with the invention of antibiotics, anaesthesia and advanced surgical techniques, medicine has continuously evolved to save lives and improve human well-being. Dr. Morton and Dr. John Collins Warren (1778-1856) made revolution on October 16, 1846 with the first successful surgical procedure performed under anaesthesia.[1] In 1928, Dr.Alexander Fleming discovered Penicillin, thereby revolutionised medical field and he was awarded Nobel Prize in 1945.[2] In 1912, Dr. Alexis Carrel was awarded Nobel Prize for his contributions in vascular anastomosis.[3] Meanwhile, the global populations grow, diseases became more complex, and health care costs increased and the global medical system faces pressure due to decreased man power and scarcity of innovations. Into this scenarios, comes artificial intelligence (AI), a technological advancement that is reshaping the entire medical field. AI is transforming how we diagnose, treat, and prevent diseases. It is offering hope for faster cures, better patient outcomes, and more accessible care for all. The article deals with what exactly is AI in health care, how is it being used and what does it mean for the future of medical field and humanity?

UNDERSTANDING AI IN THE CONTEXT OF MEDICINE

McCarthy defines artificial intelligence as the science and technology of creating intelligent machines, especially intelligent computer programs. The discipline is related to the task of using computers to understand human intelligence. This includes learning from data, recognizing patterns, reasoning, and even making decisions. In health care, AI can process millions of records in mere seconds. This makes it particularly valuable in medicine, where time is often the difference between life and death.

TYPES OF AI AND THE USES IN MEDICAL FIELD

AI is not a single technology but a family of tools and methods.[4-6] From machine learning to natural language processing and neural networks, each branch of AI contributes to improving medicine in unique ways. AI can be classified on the basis of capabilities as

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Corresponding Author:
Dr. Prof. Sreekumar Ramachandran, HOD, General Surgery, Government medical College Idukki;
President, Vascular Society of India

a. Narrow AI (Weak AI): AI systems designed to perform a specific task or a set of tasks. These systems are specialized and do not possess general intelligence.
b. General AI (Strong AI): AI that can understand, learn, and apply intelligence across a wide range of tasks, similar to human intelligence.
c. Super intelligent AI: An advanced form of AI that surpasses human intelligence in every aspect, including creativity, problem-solving, and social interactions.

In medical field, we can use general intelligence AI. Most jobs in the hospital profession needs empathy, responsibility and accountability. This prevents an AI-only equipped hospital, unlike many industries. Let us go through the areas where AI can enhance the productivity in human work.

- **Medical Imaging and Diagnosis**

Medical imaging is central to diagnosis of diseases. Interpretation of X-rays, MRIs, and CT scans can be subjective, time-consuming, and prone to human error. AI-powered systems, trained on millions of images, can detect patterns and make an accurate diagnosis from images. What makes this revolutionary is not only accuracy but its speed and accessibility. In rural areas where radiologists are scarce, AI-enabled imaging tools can guide general practitioners for initial prompt management of diseases. Still a human has to be there to take responsibility and accountability. The radiologist or the general practitioner has to confirm the diagnosis. Therefore AI can decrease the work load and increase accessibility, it cannot completely replace the human work. Legally, the clinician/ radiologist will be responsible for the judgement and decision making.

- **Drug Discovery and Development**

The process of creating a new drug traditionally takes 10–15 years and millions of rupees. AI is dramatically cutting down time. AI can help in designing new drug molecules according to the structure of proteins and other molecules in our body. It can help in simulation of how molecules interact with human proteins. A well-known example is Google Deep Mind Alpha Fold,[7] which has revealed millions of intricate 3D protein structures, an achievement that has accelerated biomedical research worldwide.

- **Personalized Medicine**

Every patient is unique. Two people with the same diagnosis may respond very differently to the same treatment. Traditional medicine often follows a "one-size-fits-all" model, but AI is enabling precision medicine. Precision medicine, known as "personalized medicine" is an innovative approach to tailoring disease prevention and treatment that takes into account differences in people's genes, environments, and lifestyles.[8] For instance, in oncology, AI helps oncologists select targeted therapies based on a patient's genetic mutations, minimizing side effects while maximizing effectiveness. Similarly, AI-driven genetic analysis is being used to predict risks for hereditary diseases, allowing preventive action long before symptoms appear.[9]

- **Virtual Health Assistants and Telemedicine**

The rise of AI powered Chat bots and virtual assistants is transforming patient interaction. These tools answer common health questions, schedule appointments, remind patients to take medications, and even monitor symptoms.

This is especially valuable in communities, where access to doctors is limited. The AI assistant can provide guidance, flag emergencies, or connect them with the nearest doctor. Such innovations can democratize health care, making it accessible to millions who would otherwise be excluded.

- **Predictive Analytics and Public Health**

Predictive analytics.[10] a branch in the domain of advanced analytics, is used in predicting the future events. It analyses the current and historical data in order to make predictions about the future. By analysing massive amounts of health data, AI can forecast disease outbreaks, hospital admission rates, or which patients are at high risk for complications. Hospitals can use predictive AI to manage resources.

- **Robotic-assisted surgery**

Robotic-assisted surgery is another area where AI is making strides. Systems like the da Vinci Surgical System allow surgeons to perform minimally invasive operations with greater precision and control. AI enhances these systems by guiding surgeons in real-time, reducing the chances of error.

- **Image Guided Interventions/ Procedures**

AI can assist the conduct of image guided interventions by enhancing accuracy and safety through real-time image analysis, robotic control, and path planning. AI algorithms analyze medical images (like CT scans) to identify target locations and generate precise trajecto-

ries for needles, while robotic systems execute these plans with enhanced stability and precision. This integration reduces procedure time, minimizes damage to healthy tissue, and expands the range of procedures that can be performed with greater ease and success.[11]

- **Hospital Administration**

Beyond the operating room, AI automates routine hospital tasks such as billing, appointment management, and record-keeping, allowing medical staff to focus more on patient care rather than paperwork.

BENEFITS OF AI IN HEALTH CARE

a. The advantages of AI go far beyond technological marvels—they directly improve human lives.

b. Safety and Efficiency- Diagnoses that once took weeks can now be made in minutes.

c. Cost Reduction-By automating tasks and optimizing resources, AI lowers overall health care costs.

d. Increased Accuracy-AI reduces diagnostic errors, one of the leading causes of preventable deaths.

e. Accessibility- AI brings expert-level health care to rural communities.

f. Empowering Professionals - Doctors and nurses can focus on human-centered care while AI handles repetitive tasks.

CHALLENGES AND ETHICAL CONCERNS

As promising as AI is, it also presents challenges that must be carefully managed.

a. Data Privacy and Security: Medical data is among the most sensitive information about a person. Storing and analyzing such data with AI raises concerns about breaches, misuse, or exploitation. Ensuring strict privacy protections is non-negotiable.

b. Bias in Algorithms: AI is only as good as the data it learns from. If the training data reflects biases, the AI may produce unfair outcomes. For instance, if an AI diagnostic tool is trained primarily on data from Western populations, it may misdiagnose patients from other ethnic groups.

c. Trust and Transparency: Patients and doctors must be able to understand how AI reaches its conclusions. Transparent and explainable AI models are essential in medicine.

d. Job Displacement and Professional Concerns: Some fear that AI might replace doctors or nurses. While AI will certainly automate certain tasks, it is more likely to act as a partner rather than a replacement. However, health care professionals will need training to adapt to these new tools.

e. Regulation and Accountability: Who is responsible if an AI system makes a wrong diagnosis? The developer, the hospital, or the doctor who relied on it? Clear laws and guidelines are needed to address accountability. This makes the entire system directly dependant on humans. Human beings can only be accountable and responsible under current laws. India does not have any AI specific law.

THE FUTURE OF AI IN HEALTH CARE

Looking ahead, the future of AI in health care is both exciting and challenging. Here are some trends likely to shape the next decade:

- Wearable Devices and Continuous Monitoring – AI-powered smartwatches and biosensors will provide real-time health data, detecting problems before they escalate.
- Preventive Health Care – Instead of treating illnesses after they occur, AI will help prevent them by identifying risks early.
- Global Health Equity – With mobile AI tools, even remote villages could have access to diagnostic services once reserved for top hospitals.
- Human-AI Collaboration – The doctor of the future will likely work hand-in-hand with AI assistants, blending empathy with intelligence.

Figure 1. **WHO Approach On Ai For Health**[12]

CONCLUSION

Artificial Intelligence is not just a technological trend, it is a revolution that is redefining health care at every level. From early disease detection to personalized treatments, from robotic surgery to predicting global pandemics, AI is shaping a future where medicine is faster, smarter, and more accessible.

Yet, with this promise comes responsibility. Ethical concerns, data privacy, and the risk of bias must be addressed to ensure that AI serves humanity fairly. The ultimate goal is not to replace doctors, but to empower them and allowing them to focus on what truly matters: the human connection. The future of health care will not be human versus machine, but rather human and machine together. In this partnership lies the potential to achieve what medicine has always strived for: a healthier, longer, and more dignified life for all.

END NOTE

Author Information

1. Prof. Sreekumar Ramachandran, HOD, General Surgery, Government medical College Idukki; President, Vascular Society of India
2. Dr. Jayesh Suresh, Consultant, Vascular Surgery Pran Hospital, Thiruvananthapuram

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