



ARTIFICIAL INTELLIGENCE AND HEALTH SECTOR – GS II AND III MAINS

Q. Artificial Intelligence (AI) has emerged as a groundbreaking technology transforming numerous industries, and healthcare is no exception. Bring out the impact of Artificial Intelligence in the health sector. (15 marks, 250 words)

News: *Behind Singapore's widespread AI adoption in public health*

What's in the news?

- Singapore is one of the major adopters of AI in healthcare in the world, particularly in areas such as disease detection and improving patient outcomes.
- What drives this significant feat is an effective collaboration among healthcare stakeholders, especially between providers and the Ministry of Health, whose vision of an interconnected health system predicated by digital technologies is carried out by its national health technology agency, Synapxe.

Key takeaways:

- Artificial Intelligence (AI) has emerged as a groundbreaking technology transforming numerous industries and healthcare is no exception.

Artificial Intelligence (AI):

- Artificial Intelligence (AI) is a simulation of human intelligence into a computer machine so that it can think and act like a human.
- AI systems are designed to simulate or replicate human cognitive abilities, such as perception, reasoning, learning, and problem-solving.
- AI rely on algorithms and computational models to process and analyze large amounts of data, extracting patterns and making predictions or decisions based on that information.

Applications of AI in Healthcare:

1. Disease Diagnosis:

- Machine learning algorithms can analyze patient data, including symptoms, medical records and genetic information, to identify patterns and predict diseases.

2. Medical Imaging:

- AI can assist in the interpretation of medical images such as X-rays, CT scans, MRIs and mammograms to detect abnormalities, tumors, or other signs of diseases with high accuracy.

3. Personalized Treatment Plans:

- By considering a patient's medical history, genetic information and current condition, AI systems can recommend the most effective treatment options and dosages.



4. AI Powered Virtual Assistants and Chatbots:

- They can provide patients with 24/7 access to medical information, answer questions about symptoms, medications and provide healthcare guidance.

5. Drug Discovery and Development:

- AI can accelerate the process of drug discovery by analyzing vast amounts of biological and chemical data.

6. Remote Patient Monitoring:

- AI-enabled devices can collect and analyze real-time patient data, such as vital signs, activity levels, and sleep patterns, allowing healthcare providers to remotely monitor patients.

7. Robotics and Surgery:

- AI-powered robots can assist surgeons during complex procedures by providing real-time feedback, precision, and enhanced visualization.

Current State of AI healthcare in India:

- India is one of the few developing countries leading the way on AI in health. Data and AI in healthcare have the potential to add \$25-\$35 billion to India's GDP by 2025.
- As per the Indian AI Healthcare Market 2019-2025 report, AI in the Indian healthcare industry is estimated to grow at a CAGR of 50.9% during the forecast period.
- Indian start-ups are continuing to refine and prioritise increased personalised medical care by using AI tools. Some of the AI healthcare start-ups in India that are reshaping the industry are as follows.
 - **HealthifyMe:** Harnesses AI to provide personalised diet and fitness information and coaching.
 - **Dozee:** Contactless health monitors that enable early detection of any health deterioration.
 - **Niramai:** Early-stage detection of breast cancer.
 - **Tricog:** Offer virtual cardiology services to distant clinics.

Risks and Challenges with AI in Healthcare:

1. Data Privacy and Security:

- The use of AI in healthcare involves the collection, storage, and analysis of sensitive patient data. Protecting this data from unauthorized access, breaches, and misuse is crucial.

2. Bias and Discrimination:

- AI systems learn from data and if the data used to train these systems is biased or unrepresentative, it can lead to biased outcomes and unequal treatment.

3. Lack of Transparency:

- Many AI algorithms, such as deep learning models, operate as "black boxes" where it is challenging to understand how they arrive at specific conclusions, which can make it difficult to trust and validate AI systems in critical healthcare decisions.

4. Limited Regulation and Standards:

- Clear guidelines and regulations are needed to address issues related to data usage, algorithmic accountability, validation, and safety.



5. Integration with Existing Healthcare Systems:

- Integrating AI technologies into existing healthcare systems can be complex and challenging.

6. Liability and Accountability:

- Determining liability and accountability in cases where AI systems are involved in medical decisions or errors can be complicated.

7. Over Reliance on AI:

- While AI can augment healthcare practices, it should not replace human expertise and judgment entirely.
- There is a risk of overreliance on AI systems, which could lead to medical errors or missed diagnoses if human oversight and critical thinking are neglected.

WAY FORWARD:

ICMR Guidelines for AI Use in the Health Sector:

Indian Council of Medical Research (ICMR) issued a guiding document - "The Ethical Guidelines for Application of AI in Biomedical Research and Health care", which outlines 10 key patient-centric ethical principles for Artificial Intelligence (AI) application in the health sector.

- **Accountability and Liability Principle** - It underlines the importance of regular internal and external audits to ensure optimum functioning of AI systems which must be made available to the public.
- **Autonomy Principle** - It ensures human oversight of the functioning and performance of the AI system. Before initiating any process, it is also critical to attain consent of the patient who must also be informed of the physical, psychological and social risks involved.
- **Data Privacy Principle** - It mandates AI-based technology should ensure privacy. and personal data protection at all stages. of development and deployment.
- **Collaboration Principle** - It encourages interdisciplinary, international collaboration and assistance involving different stakeholders.
- **Safety and Risk Minimization Principle** – It aimed at preventing "unintended or deliberate misuse", anonymized data delinked from global technology to avoid cyber-attacks and a favourable benefit-risk assessment by an ethical committee among a host of other areas.
- **Accessibility, Equity and Inclusiveness Principle** - It acknowledges that the deployment of AI technology assumes widespread availability of appropriate infrastructure and thus aims to bridge the digital divide.
- **Data Optimization** - Poor data quality, inappropriate and Inadequate data representations may lead to biases, discrimination, errors and suboptimal functioning of the AI technology.
- **Non-Discrimination and Fairness Principles** - In order to refrain from biases and inaccuracies in the algorithms and ensure quality AI technologies should be designed for universal usage.
- **Trustworthiness** - In order to effectively use AI, clinicians and healthcare providers need to have a simple, systematic and trustworthy way to test the validity and reliability of AI technologies. In addition to providing accurate analysis of health data, a trustworthy AI-based solution should also be lawful, ethical, Reliable and valid.