WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 1, 993-1007. Review Article ISSN 2277–7105

ARTIFICIAL INTELLIGENCE IN HEALTH CARE SYSTEMS

***Kattepogu Naga Kumari, Sakila Jayasri, Vinjamuri Glory Nissy, Hari Srija Bhanu Chiradala and Salman Raju**

Hindu College of Pharmacy, Guntur-522002, Andhra Pradesh, India.

Article Received on
15 November 2024,

Revised on 05 Dec. 2024,
Accepted on 26 Dec. 2024

DOI: 10.20959/wjpr20251-35135

***Corresponding Author**
Kattepogu Naga Kumari
Hindu College of Pharmacy, Guntur-522002, Andhra Pradesh, India.

ABSTRACT

The present study indicates that the Artificial intelligence (AI) has modified industries around the earth, and has the prospective to entire alter the field of healthcare. It has being able to investigate data on patient visits to the clinic, remedies, lab tests, and procedures performed, as well as data outside the health system. Such as web based social network, purchases made using charged cards, demographics, Internet search activity logs that contain valuable health information. Also you'll get a sense of how AI could transform patient care and diagnoses. In this study, we'll discuss the current and future applications of AI in healthcare with the goal of learning to bring AI technologies into the clinic safely and ethically. This study is designed for both healthcare providers and computer science professionals, offering insights to facilitate combination between the disciplines.

- Identify problems healthcare providers' face that machine learning can solve.
- Analyze how AI affects patient care safety, quality, and research.
- Relate AI to the science, practice, and business of medicine.
- Apply the building blocks of AI to help you innovate and understand emerging technologies.

Artificial intelligence (AI) is a powerful and disruptive area of computer science, with the potential to fundamentally transform the practice of medicine and the delivery of healthcare. In this further context, I outline recent breakthroughs in the application of AI in healthcare, describe a roadmap to building effective, reliable and safe AI systems, and discuss the possible future direction of AI augmented healthcare systems.

KEYWORDS: Artificial intelligence (AI), future applications of AI in healthcare.

INTRODUCTION

Healthcare systems around the world face significant challenges in achieving the ‘quadruple aim’ for healthcare: improve population health, improve the patient's experience of care, enhance caregiver experience and reduce the rising cost of care. Ageing populations, growing burden of chronic diseases and rising costs of healthcare globally are challenging governments, payers, regulators and providers to innovate and transform models of healthcare delivery.

Moreover, against a backdrop now catalysed by the global pandemic, healthcare systems find themselves challenged to ‘perform’ (deliver effective, high-quality care) and ‘transform’ care at scale by leveraging real-world data driven insights directly into patient care. The pandemic has also highlighted the shortages in healthcare workforce and inequities in the access to care, previously articulated by The King's Fund and the World Health Organization.

Workforce challenges in the next decade

By 2050, the gap between supply of and demand for staff employed by National Health Service (NHS) trusts could increase to almost 250,000 full-time equivalent posts. Based on the current trends and needs of the global population by 2050, the world will have 18 million fewer healthcare professionals (especially marked difference in the developing world), including 5 million fewer doctors than society will require. The increasing availability of multi-model data (genomics, economic, demographic, clinical and phenotypic) coupled with technology innovations in mobile, internet of things (IoT), computing power and data security herald a moment of convergene between healthcare and technology to fundamentally transform models of healthcare delivery through Artificial intelligence-augmented healthcare system.

Cloud computing is providing the computing capacity for the analysis of considerably large amounts of data, at higher speeds and lower costs compared with historic ‘on premises’ infrastructure of healthcare organizations. Indeed, we observe that many technology providers are increasingly seeking to partner with healthcare organizations to drive AI-driven medical innovation enabled by cloud computing and technology-related transformation.

WHAT IS ARTIFICIAL INTELLIGENCE?

Simply put, AI refers to the science and engineering of making intelligent machines, through algorithms or a set of rules, which the machine follows to mimic human cognitive functions, such as learning and problem solving.

- AI's strength is in its ability to learn and recognize patterns and relationships from large multidimensional and multimodal datasets; for example, AI systems could translate a patient's entire medical record into a single number that represents a likely diagnosis.
- Machine Learning – one of the most common forms of AI that is a broad technique at the core of many approaches to AI o Neural Network – type of machine learning that is more complex than traditional machine learning.
- Deep Learning – type of machine learning that is the most complex form.
- Rule-Based Expert Systems – is a collection of 'if-then' rules which require human experts and knowledge engineers.

Advantages of AI in Healthcare

1. Improved diagnostics and precision medicine.
2. Streamlined administrative tasks and workflow.
3. Enhanced research and development.

Disadvantages of AI in Healthcare

1. Ethical concerns and data privacy issues.
2. Potential job displacement and human-AI collaboration challenges.
3. Reliability and trust issues in AI-driven decision-making.

WHAT IS THE WORK OF AI?

- The evolution of AI in healthcare, it is beneficial to understand how artificial intelligence works.
- Most current AI tools are considered "**Narrow AI**," which means the technology can outperform humans in a narrowly defined task.

THE ORIGINS OF AI

The phrase "artificial intelligence" was first coined in a **Dartmouth College conference proposal in 1955**. But the AI applications did not enter the healthcare field until the early 1970s when research produced **MYCIN**, an AI program that helped identify blood infections treatments. The proliferation of AI research continued, and in 1979 the American Association for Artificial Intelligence was formed (currently **the Association for the Advancement of Artificial Intelligence, AAAI**).

When Did AI Become Popular in Healthcare?

In both the 1980s and the 1990s, AI systems organized medical developments such as faster data collection and processing.

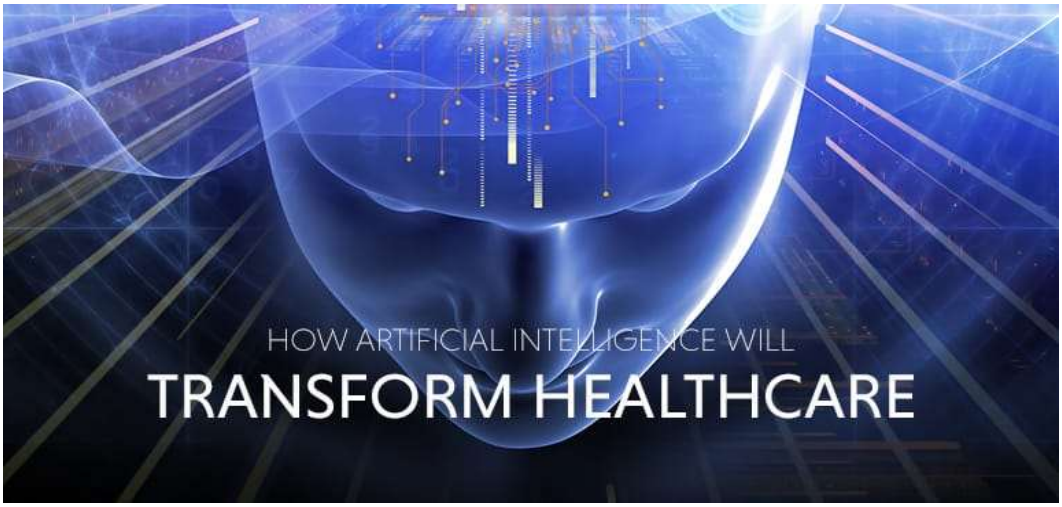
- Supporting more accurate surgical techniques.
- Creating quicker methods for gathering and analyzing data.
- Comprehensive DBA mapping and research.
- More thorough adoption of electronic health records.
- AI in the medical field began to gain substantial attention in the early 21st century, with significant advancements in technology and data analysis. This period saw a convergence of increased computational power, the availability of large datasets (Big Data), and significant improvements in AI-powered medical algorithms. The real turning point, however, came with the realization of how AI could address some of the most pressing challenges in healthcare, ranging from diagnostic accuracy to personalized treatment and operational efficiency.
- Statista reports that the AI healthcare market, which was valued at $11 billion in 2021, is expected to soar to $187 billion by 2030. This significant growth suggests that substantial transformations are anticipated in the operations of medical providers, hospitals, pharmaceutical and biotechnology companies, and other healthcare industry participants.

Many healthcare professionals recognize the transformative potential of AI but remain cautious about its application in clinical practice. While 83% of doctors in a recent study believe that AI will eventually benefit healthcare providers, 70% express concerns about its use in the diagnostic process. Despite these valid concerns, AI's ability to enhance patient outcomes warrants cautious optimism. Understanding both the benefits and limitations of AI, along with implementing proper safeguards, is crucial to fostering trust and confidence in its use within healthcare. AI is already reshaping the healthcare landscape by improving clinical decision-making and streamlining administrative processes. It allows providers to act proactively by detecting patterns across vast populations, leading to personalized care that boosts overall health outcomes. AI also offers significant benefits beyond direct patient care, aiding in research, population health management, and enhancing patient experience. While there are valid concerns about privacy and data security, new technologies and strict controls can help mitigate these risks, allowing healthcare providers to balance the benefits of AI with the need for data protection.

How AI is Reshaping Decision-Making:

Many healthcare professionals recognize the transformative potential of AI but remain cautious about its application in clinical practice. While 83% of doctors in a recent study.

AI will eventually benefit healthcare providers, 70% express concerns its use in the diagnostic process. Despite these valid concerns, AI's about ability to enhance patient outcomes warrants cautious optimism. Understanding both the benefits and limitations of AI, along with implementing proper safeguards, is crucial to fostering trust and confidence in its use within healthcare.



What are the current and future use cases of AI in health care?

AI can enable healthcare systems to achieve their 'quadruple aim' by democratizing and standardizing a future of connected and AI augmented care, precision diagnostics, precision therapeutics and, ultimately, precision medicine . Research in the application of AI healthcare continues to accelerate rapidly, with potential use cases being demonstrated across the healthcare sector (both physical and mental health) including drug discovery, virtual clinical consultation, disease diagnosis, prognosis, medication management and health monitoring. We describe a non-exhaustive suite of AI applications in healthcare in the near term, medium term and longer term, for the potential capabilities of AI to augment, automate and transform medicine.

AI today (and in the near future)

Currently, AI systems are not reasoning engines i.e., cannot reason the same way as human physicians, who can draw upon 'common sense' or 'clinical intuition and experience'. Instead, AI resembles a signal translator, translating patterns from datasets. AI systems today are beginning to be adopted by healthcare organizations to automate time consuming, high volume repetitive tasks. Moreover, there is considerable progress in demonstrating the use of AI in precision diagnostics (eg diabetic retinopathy and radiotherapy planning).

AI in the long term (>10 years)

In the long term, AI systems will become more *intelligent*, enabling AI healthcare systems achieve a state of precision medicine through AI-augmented healthcare and connected care. Healthcare will shift from the traditional one-size-fits-all form of medicine to a preventative; personalized, data-driven disease management model that achieves improved patient outcomes (improved patient and clinical experiences of care) in a more cost-effective delivery system.

Examples of AI in various health fields

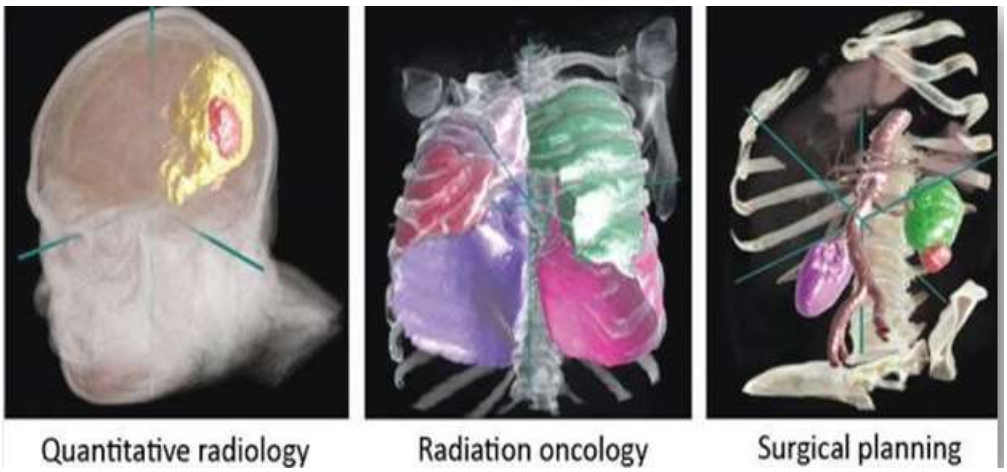
1) AI in Medical Diagnosis

Every year, roughly 400,000 hospitalized patients suffer preventable, with 100,000 deaths. In light of that, the promise of improving the *diagnostic* process is one of AI's most exciting healthcare applications. Incomplete medical histories and large caseloads can lead to deadly human errors. Immune to those variables, AI can and diagnose at a faster rate than most medical professionals.

Diagnostic imaging

The automated classification of medical images is the leading AI application today. A recent review of AI/ML-based medical devices approved in the USA and Europe from 2015–2020 found that more than half (129 (58%) devices in the USA and 126 (53%) devices in Europe) were approved or CE marked for radiological use.

We recognize that there are some exemplars in this area in the NHS (eg University of Leeds Virtual Pathology Project and the National Pathology Imaging Co-operative) and expect wide scale adoption and scale up of AI-based diagnostic imaging in the medium term. We provide two use cases of such technologies.

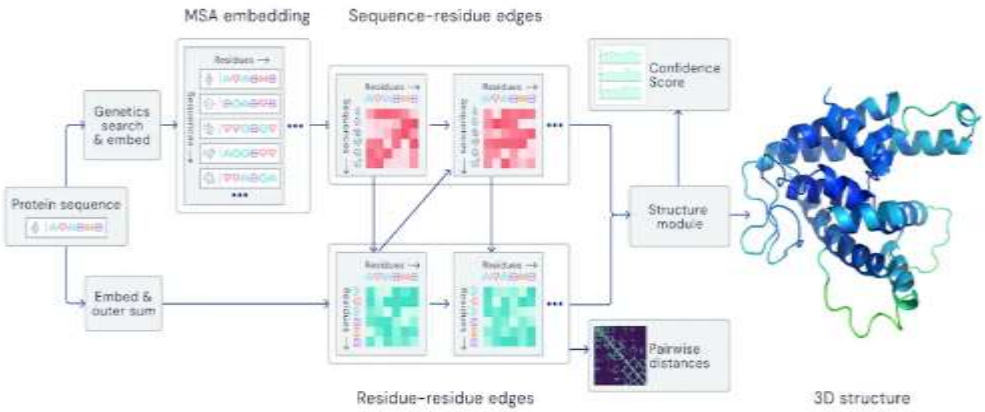


Diabetic retinopathy screening

Key to reducing preventable, diabetes-related vision loss worldwide is screening individuals for detection and the prompt treatment of diabetic retinopathy. Improving the precision and reducing waiting timings for radiotherapy planning. An important AI application is to assist clinicians for image preparation and planning tasks for radiotherapy cancer treatment.

A) Precision Therapeutics

To make progress towards precision therapeutics, we need to considerably improve our understanding of disease. Researchers globally are exploring the cellular and molecular basis of disease, collecting a range of multimodal datasets that can lead to digital and biological biomarkers for diagnosis, severity and progression. Two important future AI applications include immunomics / synthetic biology and drug discovery.



AI-driven drug discovery

AI will drive significant improvement in clinical trial design and optimization of drug manufacturing processes, and, in general, any combinatorial optimization process in healthcare could be replaced by AI.

B) Precision medicine

New curative therapies

Over the past decade, synthetic biology has produced developments like CRISPR gene editing and some personalized cancer therapies. However, the life cycle for developing such advanced therapies is still extremely inefficient and expensive.

Six principles to ensure AI works for the public's benefit.

1. Protecting autonomy
2. Promoting human safety and well-being
3. Ensuring transparency
4. Fostering accountability
5. Ensuring equity
6. Promoting tools that are responsive and sustainable

AI in Healthcare Data Management

Highly valuable information can sometimes get lost among the forest of trillions of data points. Additionally, the inability to connect important data points slows the development of new drugs, preventative medicine and proper diagnosis. Because of its ability to handle massive volumes of data, AI breaks down data silos and connects in minutes information that used to take years to process. This can reduce the time and costs of healthcare administrative processes, contributing to more efficient daily operations and patient experiences.

AI in Robotic Surgery

Hospitals use AI and robots to help with everything from minimally invasive procedures to open heart surgery. Surgeons can control a robot's mechanical arms while seated at a computer console as the robot gives the doctor a three-dimensional, magnified view of the surgical site.

AI in Scanning and Ultrasound Technology

AI can assist clinicians in taking a more comprehensive approach to disease management, better coordinate care plans, and help patients to better manage and comply with their long-term treatment programs, in addition to helping providers identify chronically ill individuals who may be at risk of an adverse episode. By examining the metadata in a document, artificial intelligence may classify it using more sophisticated optical character recognition (OCR)techniques. This is the best technology that has automated file scanning, document classification, and precise processing.

Electronic Health Records

Electronic health records (EHR) are crucial to the digitalization and information spread of the healthcare industry. Now that around 80% of medical practices use EHR, the next step is to use artificial intelligence to interpret the records and provide new information to physicians.

For example, the term heart attack and myocardial infarction mean the same things, but physicians may use one over the over based on personal preferences. NLP algorithms consolidate these differences so that larger datasets can be analyzed. Another use of NLP identifies phrases that are redundant due to repetition in a physician's notes and keeps the relevant information to make it easier to read. Other applications use concept processing to analyze the information entered by the current patient's doctor to present similar cases and help the physician remember to include all relevant details.

Diagnosis of Blood Related Disorders

When it comes to early diagnosis of potentially blood related disorders, artificial intelligence is a huge asset. Doctors are now able to check for dangerous compounds and germs in blood samples, such as Staphylococcus, E. coli, etc., at a far faster rate than they could with manual scanning thanks to AI enhanced microscopes.

For the machines to learn how to locate the dangerous bacteria, researchers examined more than 25,000 pictures of blood samples. With the use of AI, the robots were able to learn to recognize these bacteria in the blood and predict their existence.

AI in Telemedicine

The increase of telemedicine, the treatment of patients remotely, has shown the rise of possible AI applications. AI can assist in caring for patients remotely by monitoring their

information through sensors. A wearable device may allow for constant monitoring of a patient and the ability to notice changes that may be less distinguishable by humans.

AI Can Help Connect Disparate Health Care Data

One benefit the use of AI brings to health systems is making gathering and sharing information easier. One example is diabetes. According to the Centers for Disease Control and Prevention 11.6% of the US population has diabetes. Patients can now use wearable and other monitoring devices that provide feedback about their glucose levels to themselves and their medical team.

AI can help providers gather that information, store, and analyze it, and provide data-driven insights from vast numbers of people. Using this information can help healthcare professionals determine how to better treat and manage diseases.

Companies Using Ai in Health Care

These are some of the companies paving the way for healthcare innovation by applying AI technology.

EliseAI

Elise AI specializes in conversational AI solutions. In the healthcare space, Elise AI offers AI-powered technology that can automate administrative tasks like appointment scheduling and sending payment reminders. Its AI capabilities engage patients across SMS, voice, email and web chat formats.

Evidation

Evidation's mobile app supports users' health through rewards and education content. It also gives them the option of participating in health research for life sciences companies, government agencies and academic institutions. The company uses AI to support its research partners, developing solutions for applications like notifying users who report flu systems and are in the right geographic location about how to join a clinical trial for a flu treatment.

Cohere Health

Cohere Health uses AI and machine learning to revolutionize prior authorization processes to ensure patients can access care swiftly. Through its Cohere Unify Platform, health plans can proactively create data-driven care paths, leading to pre-approval for services. By integrating real-time analytics, clinical intelligence and responsible AI, Cohere aligns patients, healthcare providers and health plans.

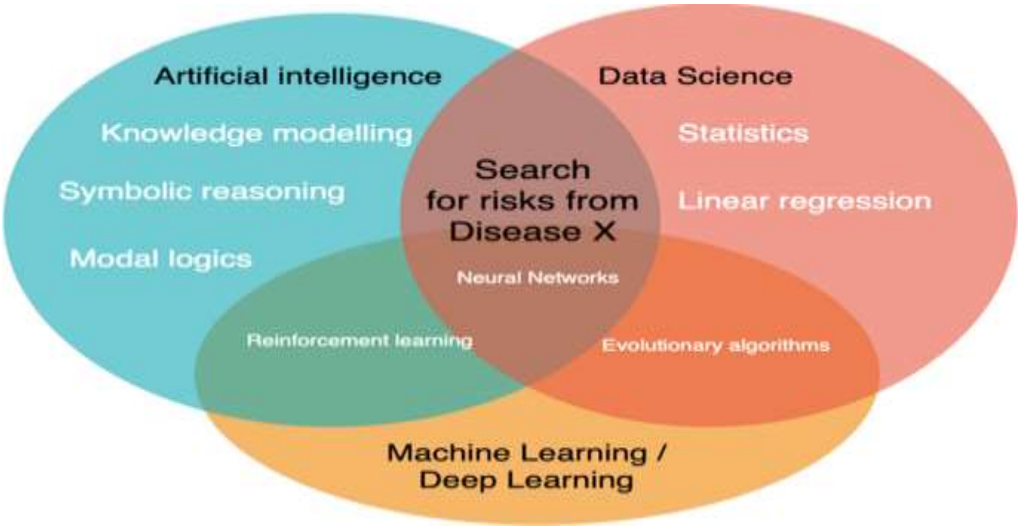
Machine Learning

Machine learning, a key component of AI used in healthcare, has significantly reshaped healthcare by enhancing medical diagnosis and treatment. By processing vast amounts of clinical data, algorithms can identify patterns and predict medical outcomes with unprecedented accuracy. This technology aids in analyzing patient records, medical imaging, and discovering new therapies, thus helping healthcare professionals improve treatments and reduce costs.

Natural Language Processing

Natural language processing (NLP) is a form of artificial intelligence that enables computers to interpret and use human language. This form of AI used in healthcare is reshaping the healthcare industry. NLP is being used in a wide range of health data applications, such as improving patient care through better diagnosis accuracy, streamlining clinical processes, and providing more personalized services.

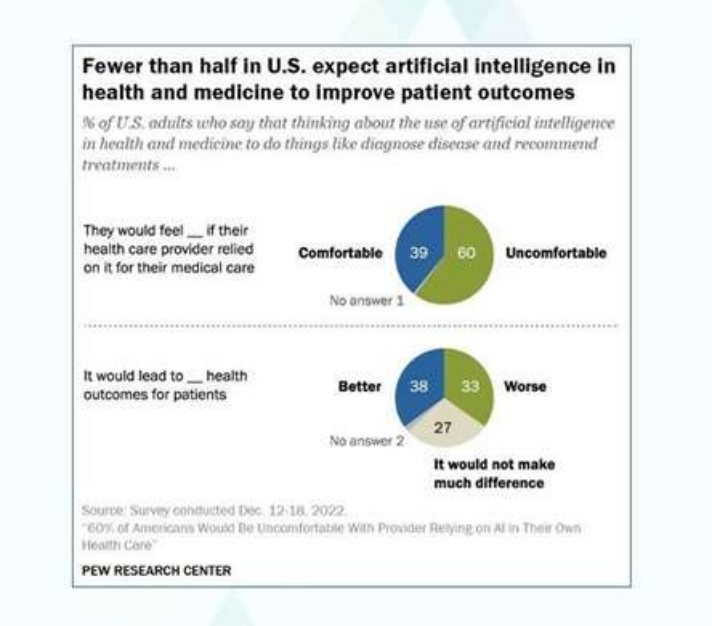
For example, NLP can be applied to medical records to accurately diagnose illnesses by extracting useful information from health data. Additionally, it can be used to identify relevant treatments and medications for each patient or even predict potential health risks based on past health data. Furthermore, NLP also provides clinicians with powerful tools for managing large amounts of complex data – something which would normally take much longer to do manually.



Atistical Analysis of Ai Use In Health Care

In a recent study, 11,004 US citizens were surveyed, and it was discovered that 6 out of 10 were uncomfortable about their healthcare professional using artificial intelligence (AI) to diagnose them or suggest treatments.

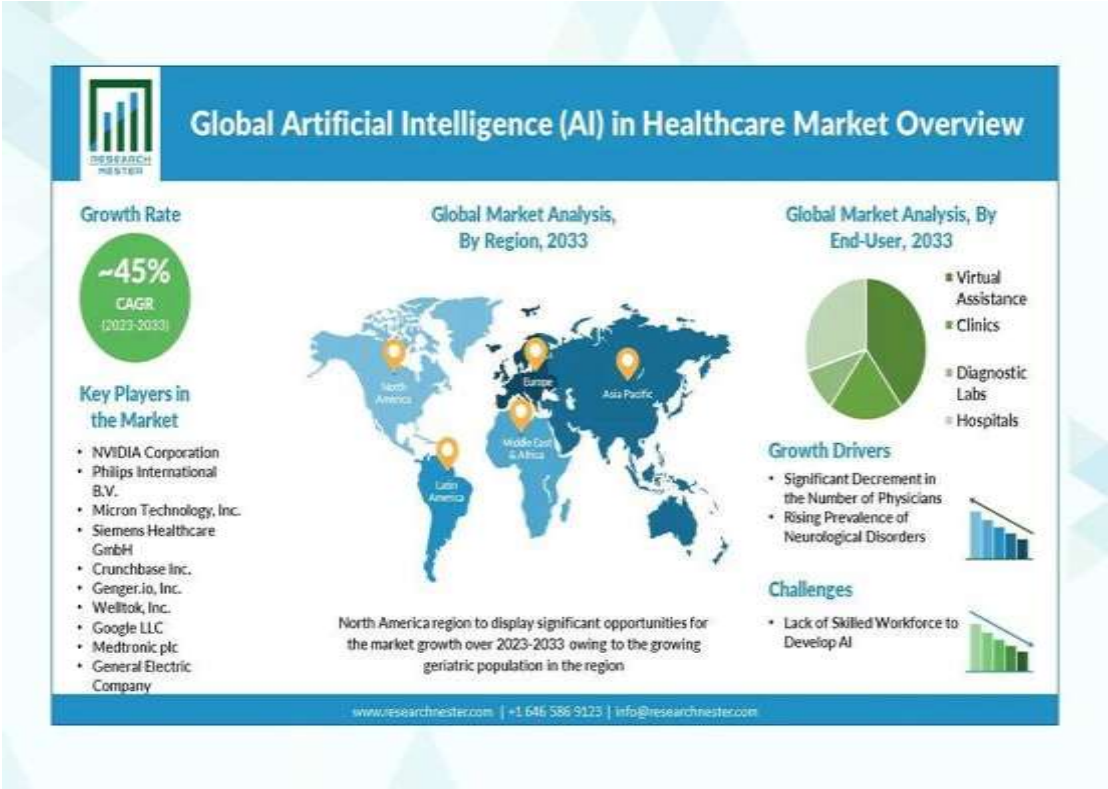
Around 60% of Americans believe AI will not lead to better health results.



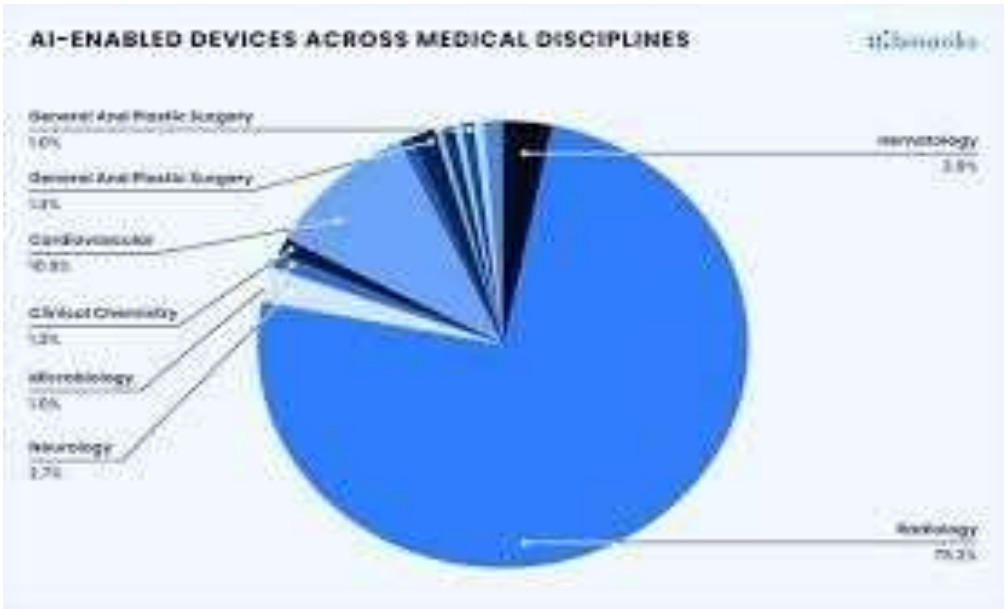
Although 38% of participants thought that utilizing AI would lead to better health outcomes, 33% disagreed, and 27% had no opinion.

Concerns about AI's potential to harm the relationship between patients and providers (57%) and its potential to compromise patient record security (37%) are also present**.**

When it comes to skin cancer screening, 65% of US adults say they would either definitely or probably want AI to be utilized.



28% of adults in the UK would prefer AI in healthcare if shown evidence of improved outcome 75.7% of radiologists believed that algorithmic outcomes based on AI were trustworthy.



CONCLUSION

Advances in AI have the potential to transform many aspects of healthcare, enabling a future that is more personalized, precise, predictive and portable. It is unclear if we will see an incremental adoption of new technologies or radical adoption of these technological innovations, but the impact of such technologies and the digital renaissance they bring requires health systems to consider how best they will adapt to the changing landscape.

For the NHS, the application of such technologies truly has the potential to release time for care back to healthcare professionals, enabling them to focus on what matters to their patients and, in the future, leveraging a globally democratised set of data assets comprising the 'highest levels of human knowledge' to 'work at the limits of science' to deliver a common high standard of care, wherever and whenever it is delivered, and by whoever. Globally, AI could become a key tool for improving health equity around the world.

A key to delivering this vision will be an expansion of translational research in the field of healthcare applications of artificial intelligence. Alongside this, we need investment into the up skilling of a healthcare workforce and future leaders that are digitally enabled, and to understand and embrace, rather than being intimidated by, the potential of an AI-augmented healthcare system.