International Journal of Pharmaceutical research and Applications
Volume 11, Issue 2, Mar-Apr 2026, pp:742-749 www.ijprajournal.com ISSN: 2456-4494

Artificial Intelligence and Healthcare: Applications and Challenges

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Date of Submission: 01-04-2026 Date of Acceptance: 11-04-2026

Abstract
Artificial Intelligence (AI) applications in healthcare are diverse, impactful, and gradual. Ranging from outcome prediction using electronic health data to early detection scanning of radiological images. In healthcare, AI is reshaping diagnosis, treatment, and patient monitoring. It has significantly improved healthcare research and outcomes by producing more precise diagnoses and enabling more personalized treatments. Large volumes of clinical data are rapidly analyzed, enabling medical professionals to identify disease markers and trends that might otherwise go unnoticed. It promises better health outcomes for everyone by improving healthcare delivery. However, some ethical and legal issues must be predisposed to enhance its potential applications. In this article, we discuss the various applications of AI in healthcare, alongside the associated ethical and regulatory concerns.

Keywords: *AI, Health, Machine learning, Medical research, Regulations.*

I. Introduction

One of the primary objectives of the sustainable development agenda is to ensure excellent health for all (SDG 3). However, the currently available healthcare workforce is far below the required number, particularly in developing countries [1]. The emergence of powerful technologies is rapidly changing the global healthcare landscape [2]. Artificial Intelligence (AI) refers to the intellectual abilities (learning, thinking, and making decisions) of computers and other machines to mimic human cognition. It is a broad term encompassing machine learning (ML) algorithms and other cognitive technologies for human use (with speed and accuracy far beyond our capacity), including the medical sector [3]. Machines are being increasingly utilized in the healthcare industry to evaluate patient data and forecast outcomes, which may make the jobs of physicians, nurses, and other healthcare professionals easier [4]. AI in healthcare can have multiple applications, including enhanced preventive care and improved quality of life, more accurate diagnoses and treatment plans, predicting, and tracking the spread of infectious diseases by analyzing large datasets (also known as Big Data), drug discovery, personalized medicine, and error reduction [5]. Hence, AI can play a crucial role in global public health as a tool for combating epidemics and pandemics [6-9].

In the early 21st century, AI emerged as a major transformative force, facilitating innovation and efficiency in various fields. AI is a convergence of increased computational power, large datasets, and improved machine learning algorithms, which can potentially solve many of the most important problems facing the healthcare industry, from operational efficiency and individualized therapy to accurate diagnosis and patient care management. AI may streamline several procedures in healthcare settings. AI automation frees up time for healthcare providers to focus more on patient care by handling administrative tasks, such as insurance claim processing and appointment scheduling. This enhances the overall patient experience while also increasing operational efficiency. AI can evaluate X-rays and MRIs, often identifying diseases like cancer at an earlier stage, and may be able to diagnose diseases more rapidly and precisely than human radiologists [6 -13].

For instance, Google's DeepMind Health project demonstrates the ability to detect eye conditions from retinal scans with precision comparable to that of human specialists. Artificial intelligence-powered chatbots and virtual health assistants offer round-the-clock assistance and supervision, enhancing patient engagement and adherence to treatment plans. By anticipating how various medications will respond in the body, AI can help accelerate the drug development process by reducing the length and cost of clinical trials. Predictive analytics, which involves identifying trends in a patient's medical history and current

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Volume 11, Issue 2, Mar-Apr 2026, pp:742-749 www.ijprajournal.com ISSN: 2456-4494

health data to detect potential health concerns, enables healthcare professionals to deliver proactive, preventive care, ultimately improving patient outcomes and reducing healthcare costs [1, 6, 9].

The paradigm has shifted due to AI's integration into the medical industry would improve healthcare's accuracy, efficiency, and personalization. As AI technology continues to evolve, it is expected to play an increasingly significant role in healthcare, further consolidating its position as a vital tool in contemporary medicine. However, recent experiences suggest that AI can have significant ethical and legal implications [14]. Suggesting the need for a regulatory framework (i.e., Bioethical realms) [15]. In the following sections, we shall discuss AI's emergence, diverse roles, and regulatory needs in the medical sector.

II. Artificial Intelligence and Healthcare

AI will enable the healthcare system to be smarter, quicker, and more effective, benefiting millions of patients globally while reducing provider costs and improving patient outcomes. With its Watson artificial intelligence system, IBM led the way in utilizing AI in healthcare. It launched its healthcare-specific version of Watson in 2011, built on natural language processing [16]. Besides IBM, AI technologies are being developed daily for the healthcare industry by companies such as Apple, Microsoft, and Amazon. Healthcare personnel can utilize AI to enhance medical records management, save time, reduce costs, and make informed decisions based on accurate information [2].

Expert systems built using 'if-then' rule variants were the most common AI healthcare technology in the 1980s. However, as the number of rules increases (exceeding several thousand), they conflict with each other and become ineffective. Furthermore, changing the rules becomes tedious if the domain (or knowledge area) undergoes significant changes. Various electronic health record systems (EHRs) offer a set of rules with their software. Machine learning (ML) has gradually taken over the role of this rule-based approach. ML (an example of AI) has greatly improved the healthcare sector. Large volumes of clinical data may be swiftly processed by machine learning algorithms, which can spot trends and make more accurate predictions about patient outcomes. Using ML to diagnose diseases (finding previously undetected correlations between diseases and changes in vital signs), drug discovery and development enable medical professionals to precisely identify ailments and tailor therapies to the requirements of specific patients (i.e., precision medicine). This needs clinical data and medical images for training, with established outcomes, and is referred to as 'Supervised Learning'.

Deep learning (DL) algorithms are used for speech recognition as a subset of natural language processing (NLP, a form of AI). NLP enables computers to interpret and use human language. Through improved diagnosis accuracy (extracting useful information from health data), streamlined clinical procedures, and more personalized services, such as predicting potential health risks based on historical health data and managing massive amounts of complex data, NLP improves patient care in the healthcare industry. AI based on DL can automate drug discovery or diagnostics, detect diseases more quickly, and provide individualized treatment regimens. The following are some critical AI technologies used in healthcare (Table 1). AI-based "brains" for robots and RPA integration for image identification are examples of how these technologies are combined and integrated.

Table 1. Some examples of critical AI technologies used in the healthcare sector [2, 17, 18].

Name of the Technology	Uses
ML (Neural Networks, DL)	ML is a statistical technique for fitting models to data and 'learning' by training models with data. In healthcare, the most common application of traditional ML is in predicting the treatment protocols that will succeed for a patient based on various/attributes of the patient and the treatment context (i.e., Precision Medicine). It requires a training dataset for the known outcome variable (e.g., onset of disease) (i.e., Supervised Learning). The Neural Networks determine whether a patient will acquire a particular disease. DL detects clinically relevant features in imaging data undetectable by the human eye, such as recognizing potentially cancerous lesions

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Volume 11, Issue 2, Mar-Apr 2026, pp:742-749 www.ijprajournal.com ISSN: 2456-4494

	in radiology images.
NLP	NLP can be applied to speech recognition, text analysis, translation, and other language-related tasks. It employs two primary approaches: statistical and semantic NLP. Statistical NLP requires a large body of language from which to learn, is based on deep-learning neural networks, and has enhanced recognition accuracy. NLP helps create, understand, and classify clinical documentation and research publications. It can analyze unorganized clinical notes, prepare reports, transcribe patient interactions, and conduct conversational AI.
Rule-Based Expert Systems	They have been widely employed in healthcare for 'clinical decision support' purposes.
Physical (surgical) Robots	Surgical robots enhance surgeons' ability to visualize and create precise, minimally invasive incisions, stitch wounds, and more. Gynecologic surgery, prostate surgery, and head and neck surgery are some examples of robotic surgery.
Robotic Process Automation (RPA)	RPA uses computer programs on servers. It structures digital tasks for administrative purposes, integrating workflow, business rules, and a 'presentation layer' with information systems. They may be used for repetitive tasks, such as prior authorization, updating patient records, or billing and coding. Combined with image recognition, they can extract data from faxed images to input into transactional systems.

III. Applications of AI in Healthcare

AI is employed in healthcare in various ways, including the development of new drugs, assisting with procedures, and responding to patient inquiries. In the future, it will play a transformative role in processing healthcare data, disease diagnosis, developing treatments, and preventing disease onset. AI's fundamental function has been in disease diagnosis and treatment. However, combining AI for diagnosis and treatment, whether rule-based or algorithmic, with clinical processes and EHR systems has proven challenging to implement [2]. Most EHR software on the market is standalone, only covering a small portion of care, and requires substantial integration or the use of third-party vendors' capabilities. Large amounts of health data, ranging from genetic data to clinical study results and medical records, are now available, necessitating a quick and precise analysis. The improved ML algorithms, increased access to data, reasonably priced hardware, and the advent of 5G communication technologies have all contributed to the growing adoption of AI in healthcare. The US market for AI in healthcare was valued at $11 billion in 2021, and it is expected to reach $187 billion by 2030. Table 2 outlines a few examples of AI uses in the medical field [18]:

Table 2: Some examples of AI applications in the healthcare sector [18].

Task	**Perceived change**
Administrative workflow	AI-based automation of tasks, such as data entry, billing, claims processing, and appointment scheduling, will enable healthcare providers to focus more on patient care, maintain budget efficiency, and facilitate coding and information sharing between departments.
Virtual nursing assistants	Around-the-clock access to answer support that is provided usually by nurses (AI virtual nurse assistants). AI-powered chatbots, apps, or other interfaces can answer questions about medications, forward reports to doctors, and help patients schedule a visit with a physician. Thus, it enables clinical staff to devote more time to patient care, where human judgment and interaction are most crucial.
Dosage error reduction	A study reported that 70% of patients don't take insulin as prescribed. An AI-powered tool can flag errors in how patients administer insulin

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	pens or inhalers.
Less invasive surgeries	AI-enabled robots may perform sensitive surgeries to reduce blood loss, infection risk, and post-surgery pain.
Fraud prevention	The use of AI will reduce fraud in insurance claim settlement.
Disease diagnosis	It quickly reviews health records, medical imaging, and test results by reducing human error.

Nearly 83% of patients reported poor communication between patients and medical providers as a severe issue. Speech recognition, NLP, and predictive analytics can potentially improve patient-provider communication. It can provide more detailed information about a patient's available treatments, enabling the healthcare professional and patient to engage in a deeper dialogue and make informed decisions together. AI diagnosis has the potential to save treatment costs by up to 50% and improve health outcomes by 40%. DL can enhance the prediction of breast cancer risk. However, we must train an AI algorithm on a significantly larger dataset (millions or more images). Moreover, hardware excluded, an algorithm can be replicated for free. An ML algorithm may also determine when a human expert is needed. For example, a hybrid human-AI model yielded better results in diagnosing cardiomegaly in chest X-rays. Similarly, DL has outperformed skilled medical professionals in identifying skin cancer.

Health and fitness trackers and applications (Apps) are becoming increasingly popular for monitoring and evaluating health information (real-time data sets), which may be instantly shared with physicians to keep an eye on health problems and alert patients. ML and DL algorithms could analyze large data sets, helping patients make better clinical and other decisions. AI is also useful in detecting and tracking infectious diseases such as malaria, COVID-19, and tuberculosis. Patients can monitor their blood sugar levels using wearable technology and other devices.

The usage of AI can increase drug safety. For instance, the company SELTA SQUARE utilizes pharmacovigilance (PV), a legally required discipline, to identify and disclose the side effects of drugs, evaluate, comprehend, and avert these effects. However, it requires considerable work and attention to detail, starting with data from the clinical trial stage and continuing through the drug's entire lifecycle. This helps make medicines safer for people worldwide. Such an application may eliminate the need for in-person testing of potential medicinal substances, saving a significant amount of money. The enormous expenses associated with traditional discovery approaches can be significantly reduced by utilizing computers to execute high-fidelity molecular simulations. Additionally, it may generate novel therapeutic compounds from scratch and/or forecast toxicity, bioactivity, and other properties of molecules.

IV. Challenges Against the Use of AI in Healthcare

The increased use of AI in healthcare has raised several ethical and regulatory concerns [17, 20]. Concerns include potential bias, a lack of transparency, data privacy issues related to AI model training, and liability and safety concerns [18]. Since ML is used for decision-making, it is based on the data used to train the algorithms. It is imperative that the data used be unbiased and ethically sourced [21].

4.1. Ethical Considerations

For the conscientious and ethical use of AI in healthcare, we must consider when to apply AI, how to use AI appropriately and responsibly, and how to avoid unethical behavior. Ethically, AI should be used if it promotes health and is cost-effective, and both the patient and the doctor agree on the best course of action for using AI. Other concerns include [19]:

1. Does AI software support the principle of the best outcome for patients with the least intervention?
2. Are there published studies to support these claims?
3. Is there a legal regulation surrounding its use?
4. Is informed consent necessary

The doctor who uses AI must attend the following:

1. Is there a legal regulation surrounding its use?
2. Who is accountable if unwanted effects occur while using AI?
3. How to manage data obtained while using AI.

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If there is a lack of regulatory policy, patients need to be informed about how their data is/will be used and the application of AI-based decision-making. For instance, when AI is used to reduce costs rather than improve patients' health, or when doctors have a conflict of interest. The very nature of AI algorithms, which operate on complex neural networks, poses formidable challenges to explaining them to patients and professionals. This undermines the accountability and potential risks associated with AI systems for healthcare professionals who rely on them. As the use of AI in healthcare accelerates, the legal and ethical questions are becoming increasingly critical. Table 3 presents some of the unethical concerns regarding the use of AI in healthcare [19-21].

Table 3: A list of unethical concerns regarding the use of AI in healthcare [19, 21 - 23].

Concern	Explanation
Algorithmic bias and fairness	AI relies on historical data for training and, therefore, is susceptible to biases present in the data, which can result in disparities in diagnosis, treatment recommendations, and patient outcomes. Race, gender, socioeconomic status, and geographic location-related biases may exacerbate existing healthcare disparities, perpetuating inequities and undermining the principle of justice in healthcare delivery. To overcome this, a multifaceted approach encompassing diverse representation in dataset curation, algorithmic transparency, ongoing monitoring, and proactive mitigation strategies is needed.
Conflict of interest	The doctor must disclose his/her interests unrelated to the patient's health (i.e., research or economics) that may affect his/her professional judgment. The financial motive (to commercialize developed AI applications) may compromise the doctor's reasoning in decision-making. By favoring his/her interest over patients, s/he may violate fiduciary duties. The law expects medical professionals to act solely in the best interests of patients, prioritizing their interests over their own. This could be achieved by avoiding the doctor's direct involvement, or by disclosing it to patients before treatment or research and allowing them to decide whether it is acceptable to them or not.
Misuse of AI software	Doctors must recognize the risks associated with the use of AI software. Hence, it should alert patients and monitor the systems to avoid harm. Additionally, economic and social changes resulting from the use of AI systems may harm vulnerable communities.
Breach of data privacy	Patients must be fully informed about how the data gathered by an AI system is processed and used. Since the value of health data can be in the billions of dollars, selling patient data for profit is considered unethical. At any point, the patients may withdraw their data and request its deletion. AI health applications may risk data privacy by sharing patient data with doctors, friends, and family members, who owe no legal responsibility.

4.2. Regulation of AI applications in healthcare

The regulatory frameworks are paramount in safeguarding patient interests, promoting responsible AI innovation, and ensuring accountability across the healthcare ecosystem. The application of AI in healthcare is new. The rapid pace of technological advancement often outpaces the development of regulatory standards, creating a regulatory lag that leaves ethical concerns unaddressed. Thus, we lack standard rules, processes, and guidelines for entrepreneurs, companies, and startups. Legally binding AI rules and guidelines are necessary, especially for the clinical applications of the technology. Industries, academic institutions, and civil society organizations should also contribute to the development of ethical guidelines. The World Health Organization (WHO) has outlined the ethical issues surrounding the use of

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AI in healthcare in a report titled "Ethics & Governance of Artificial Intelligence for Health." The paper provides guidance on how healthcare practitioners can effectively utilize technology while maintaining accountability and responsiveness to the communities and individuals they serve. As a result, it also lists associated hazards and provides six agreed-upon guidelines to ensure that AI serves the interests of society [19, 22, 25].

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 systems collect a significant amount of personal health data that could be exploited in the wrong hands. Data privacy is crucial. Adequate security protocols should be implemented to prevent sensitive patient data from being misused for malevolent intent. Accuracy and patient safety are also significant issues. AI systems need to be trained to identify trends in patient data, comprehend the relationships between various diagnoses and therapies, and provide personalized recommendations for each patient. Medical practitioners may find it more challenging to integrate AI with existing IT systems, which requires a thorough understanding of how current technologies function to ensure smooth operation. The successful integration of AI in healthcare depends on obtaining the respect and confidence of medical professionals. Doctors must believe that the AI system offers trustworthy guidance that won't mislead them. This means that to ensure the AI system employs reliable, current medical research, transparency is crucial, and doctors should be aware of how the AI system makes decisions [26].

Regulatory guidelines are essential for pre-market assessment, post-market surveillance, generating real-world evidence, and continuous monitoring of algorithm performance. Pre-market evaluation involves assessing the safety, efficacy, and performance of AI algorithms through rigorous testing, validation, and clinical trials. The dynamic nature of AI systems necessitates ongoing monitoring and adaptive regulation to detect adverse events, algorithm drift, and emerging risks in real-world settings. The frameworks should also address the challenges of interoperability, data sharing, and cross-border collaboration to facilitate the seamless integration of AI technologies into global healthcare ecosystems. Harmonizing regulatory standards, promoting data exchange protocols, and fostering international collaboration are essential steps toward unlocking the full potential of AI in improving healthcare access, quality, and equity on a global scale.

Since AI does not have the same legal standing as humans, in the event of any mishap, it may be impossible to determine who is legally responsible for the incident: OpenAI, the treating hospital, or the patient. OpenAI has published comprehensive usage guidelines, security standards, and fundamental bylaws to address these worries. The unrestricted use of ChatGPT and other similar tools is also a concern, as they take no responsibility for the content produced. Thus, we are unsure who bears responsibility for misguided or improper advice that has caused harm. Clear regulations and legal restrictions are necessary to assign responsibilities in such cases, thereby protecting users. Despite its ability to deliver accurate and efficient information, AI-based healthcare lacks the human touch and empathy, which are vital in healthcare [27].

4.3. Open-source and closed-source AI systems

Diagnostic errors, including late diagnoses, often result in loss of life and disability and place a serious financial burden on the healthcare system. AI may serve as a trusted diagnostic aid in challenging medical cases. Open-source AI (i.e., tools with their source code publicly available and that can be tweaked and modified by anyone) and closed-source AI differ in several important ways. First, open-source models can be downloaded and run on a hospital's private computers, keeping patient data in-house. In contrast, closed-source models operate on external servers, requiring users to transmit their private data to these servers. The open-source model may be more appealing to information officers, hospital administrators, and physicians; however, data moving outside may have serious consequences. In the case of open-source models, medical and IT professionals can modify these models to address unique clinical and research needs, whereas closed-source tools are more difficult to tailor. Closed-source AI developers (e.g., OpenAI and Google) host their own models and provide traditional customer support, while open-source models place this responsibility on the users. Closed-source models are relatively easy to integrate with electronic health records and hospital IT infrastructure.

Recent findings suggest that open-source AI tools (e.g., Llama 3.1 405B) are becoming

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Volume 11, Issue 2, Mar-Apr 2026, pp:742-749 www.ijprajournal.com ISSN: 2456-4494

increasingly competitive and could offer a valuable alternative to proprietary closed-source models (e.g., GPT-4). They are highly advanced and powerful healthcare systems that utilize AI. For making predictions, both sources rely on a vast number of datasets, including textbooks, peer-reviewed research, clinical decision support tools, anonymized patient data, test results, scans, and confirmed diagnoses, which are used to train AI algorithms. By scrutinizing this immense amount of information at high speed, the algorithms learn patterns. When presented with a new clinical scenario, AI models compare the incoming information to the data used to train them and propose possible diagnoses. Compared to the 64% accuracy of GPT-4, Llama made a correct diagnosis in 70% of cases and ranked the correct choice as its first suggestion 41% of the time, compared with 37% for GPT-4 [28].

V. CONCLUSIONS

Recently, tech visionary Bill Gates opined that many doctors may lose their jobs within a decade due to the impact of AI. Over time, we are becoming increasingly digital, creating numerous revolutionary new technologies. AI is utilized in healthcare for various purposes, including prognostic indicators, disease patterns, and therapeutic interventions. The options seem limitless and are growing and diversifying, ranging from precision medicine catered to individual genetic profiles to predictive analytics for early illness identification. If used wisely and incorporated responsibly into the current health infrastructure, AI may serve as a trusted diagnostic aide to enhance the accuracy and speed of diagnosis. It will need to confront new ethical and legal concerns to be generally accepted. This encompasses various issues, including patient safety and accuracy, data privacy and security, training algorithms to identify patterns in medical data, integrating AI with existing IT systems, persuading doctors to adopt the technology, and ensuring compliance with all relevant legal requirements. Ensuring AI is incorporated into routine clinical practice is the biggest obstacle to deploying technology in healthcare. It will enable medical professionals to focus more on tasks that require the highest level of cognitive function. The healthcare providers who refuse to adopt the potential of AI will ultimately lose out. Globally, India hosts the third-largest tech startup ecosystem (approx. 35000 in 2024). However, the majority of them operate in consumer app-driven ‘shallow tech.’ To fulfill its ambition of being a global technological powerhouse, the country must focus on the ‘deep tech’ sector (high-stakes, crucial field technologies), which is challenging and money-intensive, requires greater focus, and advances science and engineering capabilities, besides having a long gestation and maturity period. Currently, India spends 0.7% of its GDP on Research and Development (R&D), compared to 2.4% and 3.5% in market leaders such as China and the USA. Quantitatively, this investment is highly insignificant, considering the larger size of these economies, which are many times bigger than that of India. More so, the private sector (i.e., industry) of the country rarely invests in R&D (hardly one-third of the total investment), which is not new. Historically, our industries have been more interested in importing innovation than investing in R&D, a step that has been detrimental to their own growth.

Acknowledgments
US thanks the Dean DMIMS, Nagpur, for providing facilities.

1. Davenport T, Kalakota R. The potential for artificial intelligence in healthcare. *Future Healthcare Journal.* 2019; 6 (2): 94-98.
2. Bajwa J, Munir U, Nori A, Williams B. Artificial intelligence in healthcare: transforming the practice of medicine. *Future Healthcare Journal*. 2021; 8 (2): e188–94.
3. Alowais SA, Alghamdi SS, Alsuhebany N, et al. Revolutionizing healthcare: the role of artificial intelligence in clinical practice. *BMC Medical Education.* 2023; 23: 689. doi.org/10.1186/s12909-023-04698-z.
4. Secinaro S, Calandra D, Secinaro A, Muthurangu V, Biancone P. The role of artificial intelligence in healthcare: a structured literature review. *BMC Med Inform Decis Mak.* 2021; 21: 125, doi.org/10.1186/s12911-021-01488-9.
5. Davenport TH, Kirby J. *Only Humans Need Apply: Winners and Losers in the Age of Smart Machines.* New York: Harper Business, 2016.
6. Meskò B, Drobni Z, Bényei E, Gergely B, Gyorffy Z. Digital health is a cultural transformation of traditional healthcare. *Mhealth.* 2017; 3: 38.
7. Panch T, Szolovits P, Atun R. Artificial intelligence, machine learning and health systems. *J Glob Health.* 2018; 8(2): 020303.
8. Tran BX, Vu GT, Ha GH, Vuong Q-H, Ho M-T, Vuong T-T, et al. Global evolution of research in artificial intelligence in health and medicine: A bibliometric study. *J Clin Med.* 2019; 8(3): 360.

9. Yang X, Wang Y, Byrne R, Schneider G, Yang S. Concepts of artificial intelligence for computer-assisted drug discovery. *Chem Rev.* 2019; 119(18): 10520-94.
10. Shortliffe EH, Sepúlveda MJ. Clinical decision support in the era of artificial intelligence. *JAMA.* 2018; 320(21): 2199-2200.
11. Vial A, Stirling D, Field M et al. The role of deep learning and radiomic feature extraction in cancer-specific predictive modelling: A review. *Transl Cancer Res.* 2018; 7: 803-816.
12. Guo Y, Hao Z, Zhao S, Gong J, Yang F. Artificial intelligence in health care: Bibliometric analysis. *J Med Internet Res.* 2020; 22(7): e18228.
13. Choudhury A, Asan O. Role of artificial intelligence in patient safety outcomes: Systematic literature review. *JMIR Med Inform.* 2020; 8(7): e18599.
14. Naik N, Hameed BMZ, Shetty DK, et al. Legal and ethical considerations in artificial intelligence in healthcare: Who takes responsibility? *Front Surg.* 2022; 9: 862322. doi: 10.3389/ fsurg.2022.862322.
15. Char DS, Shah NH, Magnus D. Implementing machine learning in health care: Addressing ethical challenges. *N Engl J Med.* 2018; 378: 981-983.
16. Ross C, Swetlitz I. IBM pitched its Watson supercomputer as a revolution in cancer care. It's nowhere close, 2017. Stat, www.statnews.com/2017/09/05/watson-ibm-cancer [cited 2025 Oct 9].
17. Hussain A, Malik A, Halim MU, Ali AM. The use of robotics in surgery: A review. *Int J Clin Pract.* 2014; 68: 1376 -1382.
18. dos Santos BS, Steiner MTA, Fenerich AT, Lima RHP. Data mining and machine learning techniques applied to public health problems: A bibliometric analysis from 2009 to 2018. *Comput Ind Eng.* 2019; 1(138):106120.
19. Roganović J, Radenković M. Ethical use of artificial intelligence in Dentistry. In: Radenković M, editor. *Ethics-Scientific Research, Ethical Issues, Artificial Intelligence and Education*. IntechOpen, 2023. doi: 10.5772/intechopen.1001828.
20. Carter D. How real is the impact of artificial intelligence? *Bus Inf Surv.* 2018; 35(3): 99-115.
21. Rhem AJ Ethical use of data in AI applications. In: Radenković M, editor. *Ethics-Scientific Research, Ethical Issues, Artificial Intelligence and Education*. IntechOpen, 2023. doi:10.5772/intechopen.1001597.
22. Gerke S, Minssen T, Cohen G. Ethical and legal challenges of artificial intelligence-driven healthcare. *Artificial Intelligence in Healthcare.* 2020; 26: 295-336. doi: 10.1016/ B978-0-12-818438-7.00012-5.
23. Muth CC. Conflict of interest in medicine. *JAMA.* 2017; 317(17): 1812. doi: 10.1001/jama.2017.4044.
24. Dickens BM, Cook RJ. Conflict of interest: Legal and ethical aspects. *International Journal of Gynaecology and Obstetrics*. 2006; 92(2): 192-197.
25. Arellano L, Alcubilla P, Leguizamo L. Ethical considerations in informed consent. In: Radenković M, editor. *Ethics-Scientific Research, Ethical Issues, Artificial Intelligence and Education*. IntechOpen, 2023. doi:10.5772/intechopen.1001319.
26. Kleczyk EJ Importance of patient privacy in healthcare analytics research. In: Radenković M, editor. *Ethics-Scientific Research, Ethical Issues, Artificial Intelligence and Education.* IntechOpen, 2023. doi:10.5772/intechopen.100305.
27. Verghese A, Shah NH, Harrington RA. What this processor needs is a physician? Humanism and artificial intelligence. *JAMA.* 2018; 319(1): 19-20.
28. Buckley TA, Crowe B, Abdulnour REE, Rodman A, Manrai AK. Comparison of frontier open-source and proprietary large language models for complex diagnoses. *JAMA Health Forum.* 2025; 6(3): e250040, doi: 10.1001/jamahealthforum.2025.0040.

Databases assessed:

1. Northwest Pa Collegiate Academy accessed on 2024-03-04
2. University of South Africa (UNISA) accessed on 2024-03-29
3. RMIT University accessed on 2023-12-01 & on 2023-03-30
4. The University of Wolverhampton accessed on 2024-05-05
5. SP Jain School of Global Management accessed on 2023-10-20
6. Liverpool John Moores University accessed on 2024-02-13
7. www.ibm.com