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IEEE Computer Society Nigeria Chapter

Proceedings of the 36th iSTEAMS Accra Bespoke Multidisciplinary Innovations Conference

Ethical Implications of Artificial Intelligence in the Healthcare Sector

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ABSTRACT

This research paper examines the ethical implications of AI in healthcare, covering the benefits and risks of using AI in healthcare services and provision. The paper highlights the applications of AI in healthcare, which can improve efficiency and accuracy of providing healthcare services by health professionals. The benefits of AI cover reducing the need for human intervention and increasing productivity through automation, delivering personalised experiences by recommendations, assisting with informed decision-making by providing real-time data analysis and insights, predicting outcomes or identifying potential threats, improving healthcare and overall customer satisfaction. The paper highlights the ethical implications of the use of AI in healthcare, including privacy and security, bias and discrimination, transparency and explainability, responsibility and accountability, informed consent and human interaction and empathy. The paper recommends that as AI becomes more prevalent in healthcare, establishing clear guidelines for responsible use, and maintaining the importance of human interaction and empathy in patient care, enhances healthcare outcomes while safeguarding patient rights and welfare. Continued research and development of the ethical implications of AI in healthcare for low-income countries as further work can promote the ethical use of AI in healthcare worldwide.

Keywords: Artificial Intelligence, Ethics, Ethical Implication, Healthcare, Privacy

Proceedings Citation Format
Amedior, N.C. Nutifafa Cudjoe Amedior (2022): Ethical Implications of Artificial Intelligence in the Healthcare Sector. Proceedings of the 36th iSTEAMS Accra Bespoke Multidisciplinary Innovations Conference. University of Ghana/Academic City University College, Accra, Ghana. 31st May – 2nd June, 2023. Pp 1-12 https://www.isteams.net/ghanabespoke2023 dx.doi.org/10.22624/AIMS/ACCRABESPOKE2023P1

I. INTRODUCTION

1.1 What is Artificial Intelligence?

Artificial intelligence (AI) can be described as "a field of study that combines computer science, engineering and related disciplines to build machines capable of behaviour that would be said to require intelligence were it to be observed in humans.

Some of these behaviours include the ability to visually perceive images, recognize speech, translate language, and learn from and adapt to new information (United Kingdom: authority of the house of lords, 2018). AI employs a variety of techniques and methods, including those from arithmetic, logic, and biology, as well as other disciplines (Berg, 2018). The ability of modern AI systems to progressively make sense of various and unstructured types of data, such as natural language text and photos, is a key characteristic of these technologies (Berg, 2018). Machine-learning has proven to be the most successful type of AI in recent years and serves as the underlying approach of many of the applications currently in use (Berg, 2018). Machine-learning allows systems to discover patterns and derive its own rules when it is presented with data and new experiences, rather than following pre-programmed instructions (Berg, 2018; (United Kingdom: authority of the house of lords, 2018).).

1.2 Use and benefits of Artificial Intelligence

Business, healthcare, education, finance, transportation, entertainment, and manufacturing are just a few of the industries where artificial intelligence (AI) has a wide range of applications. AI can be used to automate tasks and enhance business decision-making, analyse patient data to diagnose diseases and create treatment plans, detect fraud and analyse credit risk in transactions, curate individualised lesson plans and interactive learning experiences, analyse traffic patterns and change traffic lights to relieve congestion, optimise manufacturing processes, and enhance product quality (O'Keefe et al., 2020; Ransbotham et al., 2021). AI provides the benefits of reducing the need for human intervention and increasing productivity through automation, delivering personalised experiences by recommendations, assisting with informed decision-making by providing real-time data analysis and insights, predicting outcomes or identifying potential threats, enhancing artistic creativity, improving healthcare and overall customer satisfaction (Nadimpalli, 2007; Naim, 2022; O'Keefe et al., 2020; Ransbotham et al., 2021; Yeasmin, 2019). Overall, AI has the power to revolutionise a wide range of industries and enhance the standard of living for people globally.

1.3 Investment Trends in Artificial Intelligence

Artificial intelligence (AI) is a rapidly growing field reflected by the continuous investment in the sector that has the potential for economic gains, projected at a $15.7 trillion contribution to the global economy by 2030 (Murphy et al., 2021). Heavy investing in AI startups are coming from venture capital firms, reaching record levels with a majority of these investments going to early-stage startups (Tricot, 2021). Corporate investment is going heavily into AI, this happens through either acquisitions of startups or investing in their in-house AI initiatives (Babina et al., 2020; Wiggers, 2023). Alphabet, Google's parent company, has made AI acquisitions including DeepMind and Kaggle; Microsoft also made a 2019 $1billion investment in OpenAI (Feiner, 2019). AI-focused Investment funds are also a growing trend in the AI field. These targeted investment funds provide investors with exposure to the AI market to invest specifically in AI startups and technologies (International Banker, 2022). Governments globally are also not missing out on the chance to invest in AI, heavily investing in AI research and its development. The US government and European Union have set up an initiative and fund respectively to support AI research and development (European Commission, 2021). AI-related companies are increasingly going public, with 2020 having Snowflake, Palantir, and Unity are among some high-profile AI companies that went public, this also provides retail investors and public markets with opportunities to invest in the AI market (Voronova & Lukina, 2022).

1.4 Healthcare

The term "healthcare" refers to procedures and services concerned with the identification, mitigation, and treatment of diseases and injuries as well as the maintenance and promotion of one's physical and mental well-being (Endeshaw, 2021). Doctors, nurses, pharmacists, therapists, and other allied health professionals among others can all deliver healthcare. Hospitals, clinics, outpatient facilities, long-term care facilities, and homes can all be used to give healthcare services (Rutala & Weber, 2019).

Medical technologies and apparatus, such as prostheses, medical imaging systems, and diagnostic tools, can also be included in healthcare services (De Maria et al., 2020).

The goal of healthcare is to improve and maintain the health and wellbeing of individuals and communities, by preventing and treating illnesses and injuries, and promoting healthy lifestyles (Darzi et al., 2023). Access to healthcare is considered a basic human right, and efforts are made to ensure that healthcare services are available and affordable to all individuals, regardless of their background, income, or geographic location (Da Silva, 2023).

Figure 1: Artificial Intelligence in Healthcare (Thompson, 2019)

1.5 Artificial Intelligence Applications in Healthcare

The potential use of artificial intelligence in health care delivery spans planning, resource allocation, research, clinical care, patient-facing applications, health administration and public health (Berg, 2018). Examples of artificial intelligence use in healthcare include and not limited to:

1) Imaging AI technologies assisting radiologists to automatically localise and delineate the boundaries of anatomical structures to concentrate on images that are most likely to be abnormal;
2) AI used in tandem with digital pathology can contribute to predicting disease diagnosis and prognosis as well as evaluating disease severity and outcome with similar level of accuracy to that of pathologists;
3) Emergency medicine can benefit from AI to improve patient prioritisation during triage;
4) AI tools in the area of surgery overcome surgical decision challenges of making biassed, error and preventable harm by using diverse sources of information such as patient risk factors, and anatomic information to make diagnoses and predict response to treatment;

5) AI has a big potential to help people manage their chronic illnesses and illnesses that affect the elderly. Medication administration, diet modification, and health device management are all examples of self-management activities. By monitoring physical space and falls, home monitoring offers the potential to improve ageing at home and boost independence;
6) In cardiology, AI improves the diagnostic capacity of echocardiography in identifying diseases such as asymptomatic left ventricular dysfunction and silent atrial fibrillation;
7) The application of AI in nephrology has a use of a deep learning model for ultrasound kidney imaging that non-invasively classifies chronic kidney disease with the potential to aid diagnosis of kidney cancer thereby reducing the global burden of kidney diseases;
8) Neuropsychiatry has in development artificial intelligence tools for digital tracking of depression and mood to lend support to mental health patients and to mitigate the effects of a paucity of health personnel dedicated to mental health conditions (European Parliament. Directorate General for Parliamentary Research Services., 2022).

1.6 Ethics of Artificial Intelligence in Healthcare

The ethical implications of AI in healthcare are complex and multifaceted. Key concerns include issues related to privacy, transparency, bias, and accountability. For example, the use of AI in healthcare requires access to large amounts of sensitive patient data, raising concerns about privacy and data security (Rigby, 2019). Additionally, AI systems can be opaque, making it difficult to understand how they arrive at their decisions, which can raise questions about transparency and accountability (Prakash et al., 2022). Finally, AI systems can be biassed, leading to inequitable treatment of certain patient groups (Karimian et al., 2022).

1.7 Purpose of this paper

This research paper examines the ethical implications of AI in healthcare, covering the benefits and risks of using AI in healthcare services and provision. The paper draws on relevant literature to highlight key challenges and offer recommendations for future work in this area. The paper also considers the responsibility of healthcare professionals, technology developers, and policymakers in ensuring that AI is used ethically in healthcare.

2. RELATED LITERATURE

The study conducted a comprehensive search of the academic databases to gather and evaluate information from peer-reviewed articles that explored the ethical implications of artificial intelligence in healthcare. The search terms employed were 'artificial intelligence' or 'artificial intelligence in healthcare' combined with 'ethics' and ‘ethical implications of AI in healthcare’. The study focused on articles published between 2019 and 2023, this was to get recent and relevant literature on AI. Murphy et al. (2021) examines the ethical considerations surrounding the use of AI in healthcare, particularly on carer robots, diagnostics, and precision medicine. The literature highlights concerns regarding privacy, trust, accountability and responsibility, and bias, but largely ignores the ethics of AI in public and population health, and in low- and middle-income countries (LMICs). The review concludes that while AI holds promise for improving health systems, its introduction should be approached with caution and further research is needed to ensure its development and implementation is ethical for everyone, everywhere.

European Parliament: Directorate General for Parliamentary Research Services (2022) provides an overview of the potential benefits of artificial intelligence (AI) in healthcare, including improving diagnosis and treatment, increasing efficiency, and optimising resource allocation. However, it also highlights the clinical, social, and ethical risks associated with AI in healthcare, including errors and patient harm, bias and health inequalities, lack of transparency and trust, and data privacy breaches. The report proposes mitigation measures and policy options to minimise these risks, including stakeholder engagement, transparency, clinical validation, and education and training.

Prakash et al. (2022) reviews the ethical concerns and legal framework surrounding the application of artificial intelligence (AI) in healthcare. The authors conducted a search of electronic databases and identified 16 articles that met their inclusion and exclusion criteria. They found that while AI has the potential to revolutionise medical practice, there are numerous ethical and legal issues that need to be addressed. The study emphasises the need for a multifaceted approach involving policymakers, developers, healthcare providers, and patients to develop a feasible solution to mitigate these concerns.

Rigby (2019) discusses the current and potential use of artificial intelligence (AI) in healthcare and the ethical complexities it brings. While AI can improve the efficiency of healthcare delivery and quality of patient care, it also raises concerns about patient privacy and confidentiality, informed consent, and patient autonomy. The article addresses some of the ethical dilemmas that arise when AI is used in healthcare and medical education, including balancing the benefits and risks of AI technology and the role AI can play in medical education. It also explores legal and health policy conflicts that arise with the use of AI in healthcare. The article concludes that there is a need for more dialogue on these concerns to improve physician and patient understanding of the role AI can play in health care and to develop a realistic sense of what AI can and cannot do.

Abdullah et al. (2021) explores the bioethical implementation of AI in medicine and ophthalmology, and classifies ethical issues into six main categories: machine training ethics, machine accuracy ethics, patient-related ethics, physician-related ethics, shared ethics, and roles of regulators. The review suggests that attention to the various aspects of ethics related to AI is important, especially with the expanding use of AI, and that solutions to ethical problems are multifactorial.

Karimian et al. (2022) examined the ethical issues surrounding the increasing use of artificial intelligence (AI) in healthcare. The review identified five ethical principles that should be considered when designing or deploying AI in healthcare: respect for human autonomy, prevention of harm, fairness, explicability, and privacy. However, the study found limited consideration of these ethical principles in most retrieved studies, with the principle of prevention of harm being the least explored. The review also noted a lack of practical tools for testing and upholding ethical requirements across the lifecycle of AI-based technologies, as well as a lack of perspective from different stakeholders.

Nasim et al. (2022) discusses the importance of ethical considerations in AI design and implementation. It presents statistics on AI incidents and areas where unethical use of AI has been identified, such as language and computer vision models, intelligent robots, and autonomous driving. The paper also highlights various forms of ethical issues, including incorrect use of technology, racism, non-safety, and malicious algorithms with biasness. Data collection has helped identify AI ethical issues based on time, geographic locations, application areas, and classifications.

3. FINDINGS

Artificial intelligence (AI) has the potential to revolutionize healthcare by improving patient outcomes, reducing costs, and increasing efficiency. However, the use of AI in healthcare also raises ethical concerns that need to be addressed to ensure that patients are not harmed and that AI is used ethically.

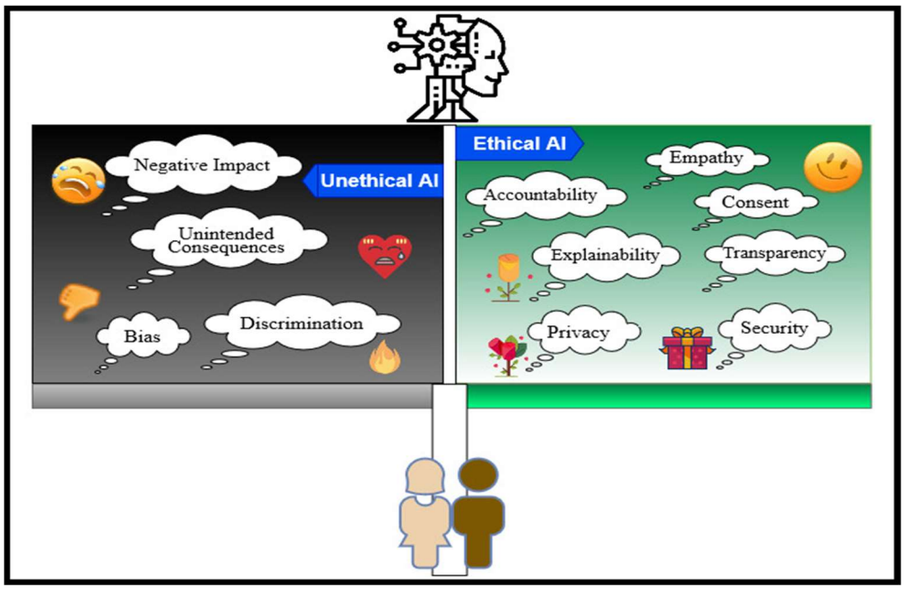

Figure 2: Ethical Crossroad of Artificial Intelligence

The following are the main findings of this research paper for some of the ethical implications of AI in healthcare:

I. Privacy and security: The importance of patient privacy in AI-based healthcare research is discussed in studies by Abdullah et al., 2021; Karimian et al., 2022; and Rigby, 2019. Researchers argue that patients should have greater control over their data and how it is used, while others explore current regulations and the need for obtaining patient consent before sharing information. In the USA, Health Insurance Portability and Accountability Act (HIPAA) allows sharing of protected health information for certain purposes without patient consent, while in the UK, patient consent is required for sharing information with any third party not involved in direct patient care (Karimian et al., 2022). Data privacy is important to protect against discrimination, mental health consequences, erosion of trust, and other harms. Confidentiality protection solutions include governmental regulations, technological advances, and cybersecurity measures. Data sharing can facilitate interoperability, scientific discovery, and equity in healthcare, but must be balanced with concerns about privacy and confidentiality. As healthcare providers collect and use more patient data to train AI algorithms, there is a risk of data breaches and the unauthorised use of personal health information. Patients need to trust that their data is being used ethically and that their privacy is protected.

II. Bias and discrimination: AI systems can replicate and even amplify existing biases and discrimination in healthcare (Ayling & Chapman, 2022). For example, if an AI system is trained on data that is biassed against a particular race or gender, it may produce biassed results. This can lead to unequal treatment and outcomes for different groups of patients. Discrimination can also occur when AI systems are used to make decisions

about patient care, such as diagnosing illnesses or recommending treatments (Abdullah et al., 2021). If an AI system is trained on data that reflects biases against certain groups, it may make decisions that are unfair or discriminatory towards those groups. This can lead to disparities in healthcare outcomes and a lack of trust in the healthcare system. This requires ongoing vigilance and a commitment to addressing bias and discrimination in healthcare.

III. Transparency and explainability: Patients and healthcare providers need to understand how AI systems make decisions in order to trust their results. AI systems need to be transparent and explainable, so that patients and providers can understand how they arrived at their conclusions. Transparency is crucial for ensuring accountability and trust in AI systems, particularly in healthcare where the consequences of AI errors can be severe. Transparent AI systems allow stakeholders to understand how decisions are made, what factors are taken into account, and how any biases or limitations are addressed (Abdullah et al., 2021; Rigby, 2019). Explainability is necessary for stakeholders, such as patients and healthcare providers, to understand how and why a decision was made, and to determine whether it was appropriate (Abdullah et al., 2021). It is important to ensure that AI systems are designed and implemented in a transparent and explainable way to promote trust, accountability, and ethical decision-making.

IV. Responsibility and accountability: As AI systems become increasingly self-governing, it becomes more challenging to determine who is responsible and accountable for their actions. If an AI system makes an error, is it the healthcare provider, the system developer, or the AI system itself that should be held responsible? The use of AI in healthcare requires clear specification of tasks and conditions for responsible use, and human stakeholders must ensure that AI systems can perform those tasks under appropriate conditions. Human warranty, involving upstream and downstream supervision by patients, clinicians, and designers, can help ensure responsible use of AI technologies (World Health Organization, 2021). When something goes wrong, accountability mechanisms should be in place, including redress for individuals or groups affected by algorithmically informed decisions (World Health Organization, 2021). Responsibility in complex systems should be attributed among numerous agents, and a faultless responsibility model can encourage all actors to act with integrity and minimise harm (World Health Organization, 2021).

V. Informed consent: Informed consent is a crucial and integral part to the patient's experience in healthcare to give protection from harm, respect for autonomy, privacy protection and property rights concerning data and/or tissue (European Parliament. Directorate General for Parliamentary Research Services., 2022). Patients have the right to make informed decisions about their healthcare, but AI systems may make decisions based on complex algorithms that patients may not fully understand. Patients need to be informed about how AI is being used by healthcare professionals and technology developers in their care and given the opportunity to opt-out if they do not feel comfortable (Murphy et al., 2021).

VI. Human interaction and empathy: AI systems can provide valuable insights and recommendations, but they cannot replace the human touch and empathy that is essential to healthcare. AI systems should be used to enhance, not replace, human interaction. Abdullah et al., (2021) suggest that medical education and training programs should integrate empathetic skills and knowledge further, and that AI can be used to perform some tasks to give doctors more time to exercise empathy. Patients prefer doctors to be more empathic than machines, but the use of machines can still allow doctors to exercise empathy. AI algorithms use patients' data to give decision outputs about their health, which must be calibrated ethically and empathetically

(Abdullah et al., 2021). AI can develop "artificial affection" to empathise with patients, enhancing machine personhood, and serving two purposes: machines' ability to empathise with patients and their liability for harm inflicted by their actions (Abdullah et al., 2021).

The potential for AI to revolutionise healthcare is significant, but there are ethical concerns that must be addressed to ensure that patients are not harmed and that AI is used ethically. These ethical implications include privacy and security, bias and discrimination, transparency and explainability, responsibility and accountability, informed consent, and human interaction and empathy. It is important for patients to have confidence that their data is being used ethically, and AI systems must not perpetuate existing biases and discrimination. To promote accountability and redress, it is necessary for AI systems to be transparent and explainable. Informed consent is critical, and AI systems should be used to enhance rather than replace human interaction and empathy.

4. CONCLUSION

In conclusion, artificial intelligence (AI) is a rapidly growing field with a wide range of applications in various industries such as business, healthcare, education, finance, transportation, entertainment, and manufacturing. AI has the potential to revolutionise industries by reducing the need for human intervention, increasing productivity through automation, and providing personalised experiences. The investment in AI is increasing, with venture capital firms and governments investing in AI research and development. Healthcare is an industry where AI has a significant potential to enhance and optimise clinical care, patient-facing applications, health administration, and public health. AI can assist in detecting, diagnosing, and treating diseases, predicting disease diagnosis and prognosis, and evaluating disease severity and outcome. With the benefits that AI can provide to various industries and the continuous investment in the field, AI is poised to be a major force in shaping the future of the world.

The use of AI in healthcare has the capacity to transform the industry by enhancing patient outcomes, reducing expenses, and improving effectiveness. Nevertheless, it is essential to take into account the ethical consequences of AI implementation in healthcare to safeguard patient privacy and security, prevent partiality and discrimination, encourage transparency and comprehensibility, create responsibility and liability, and guarantee knowledgeable consent and human connection and empathy. It is crucial to strike a balance between the advantages and risks of AI in healthcare to guarantee its ethical use and protect the rights and welfare of patients. Ongoing exploration and innovation in this field are necessary to ensure that AI is utilised conscientiously and ethically in healthcare.

5. RECOMMENDATION

Based on the discussion above, there are several recommendations that can be made to ensure the ethical use of artificial intelligence (AI) in healthcare for low-income countries. Firstly, it is important for policymakers and healthcare providers to prioritise the development of AI technologies that are specifically tailored to the unique healthcare needs and resource limitations of low-income countries. This includes investing in AI technologies that can assist in disease detection, diagnosis, and treatment, as well as improving health administration and public health services.

Secondly, it is essential to ensure that AI technologies used in healthcare are designed and implemented in a manner that is fair and unbiased. This includes avoiding the use of biassed algorithms that may result in discrimination against certain groups or individuals. To achieve this, it is necessary to ensure that AI algorithms are developed using diverse and representative datasets, and that they are continuously monitored and evaluated for fairness and impartiality.

Thirdly, there should be a focus on transparency and explainability in the development and deployment of AI technologies in healthcare. This means that healthcare providers should be able to explain how AI systems arrive at their recommendations or decisions, and patients should be provided with clear information on how their data is being collected and used. Fourthly, there is a need to establish clear guidelines and protocols for the responsible use of AI in healthcare, including ensuring that there is accountability and liability for any potential harm caused by AI systems. This includes developing robust cybersecurity measures to protect patient data from breaches or cyberattacks.

Finally, it is crucial to ensure that the use of AI in healthcare does not detract from the importance of human interaction and empathy in patient care. While AI can assist in improving efficiency and productivity in healthcare, it should not replace the role of healthcare providers in providing personalised and compassionate care to patients. In summary, the ethical use of AI in healthcare for low-income countries requires a concerted effort from policymakers, healthcare providers, and AI developers. By prioritising the development of AI technologies that are tailored to the unique healthcare needs of low-income countries, ensuring fairness and transparency in their development and deployment, establishing clear guidelines for responsible use, and maintaining the importance of human interaction and empathy in patient care, AI can be used to enhance healthcare outcomes while safeguarding patient rights and welfare.

6. FUTURE WORKS

As artificial intelligence (AI) continues to revolutionise healthcare worldwide, it is crucial to consider the ethical implications of its use in low-income countries. While AI has the potential to improve patient outcomes, reduce costs, and increase efficiency in these settings, it is imperative to ensure that it is used ethically and responsibly to protect patients' rights and interests. One of the primary ethical considerations for the use of AI in healthcare in low-income countries is the potential for bias and discrimination as training data will vastly differ from developed countries. AI algorithms must be designed and implemented in a way that avoids discrimination based on factors such as race, gender, and socio-economic status..

Patient privacy and security are also critical ethical considerations for AI in healthcare. Low-income countries may lack the infrastructure and resources to ensure that patient data is protected adequately. Thus, AI systems must be designed with robust security features to ensure that patient data is not vulnerable to cyberattacks or other breaches. Moreover, it is essential to obtain informed consent from patients before using their data for AI applications, and patients from low income countries must have the right and means to access and control their data at all times.

Human interaction and empathy are other important ethical considerations for AI in healthcare. AI may increase efficiency in healthcare delivery, but it must not replace human care and compassion. Low-income countries may face a shortage of healthcare professionals, but the use of AI must not result in neglecting the patient's emotional and psychological needs. The responsibility and accountability of healthcare providers, AI developers, and other stakeholders must also be established to ensure ethical AI use in healthcare. Regulations and guidelines must be put in place to guide the development, implementation, and evaluation of AI systems in low-income countries. The responsibility for any harm caused by AI must be assigned, and stakeholders must be held accountable for their actions.

Continued research and development in the ethical use of AI in healthcare in low-income countries is necessary. Studies must focus on the impact of AI on patient outcomes and healthcare delivery, as well as the ethical, legal, and social implications of its considering the unique challenges faced by low-income countries. The use of AI in healthcare in low-income countries present a range of benefits but must be done ethically and responsibly.

The ethical considerations of bias and discrimination, patient privacy and security, human interaction and empathy, and responsibility and accountability must be addressed. Continued research and development in this area is essential to ensure that AI is used responsibly and ethically in healthcare, protecting patients' rights and interests. The development of international guidelines and frameworks can promote the ethical use of AI in healthcare worldwide.

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