

**REVIEW****Leveraging Artificial Intelligence And Modern Digital Technologies For Improved Healthcare Delivery In West Africa**Mensah M<sup>1</sup>, Boateng J<sup>2\*</sup>, Opoku S<sup>1</sup>, Kwawukume SB<sup>2</sup><sup>1</sup>Department of Community Health, Family Health University College Teshie-Accra, Ghana<sup>2</sup>Department of Medicine, Family Health Hospital Teshie-Accra, Ghana**\*Corresponding Author: Jeffrey Boateng****Address: Department of Medicine, Family Health Hospital, Teshie-Accra, Ghana.****Phone: 0559383906, E-mail: drjeffreyboateng@gmail.com****Abstract**

The potential of Artificial Intelligence (AI) and modern digital technologies to revolutionize healthcare delivery in West Africa is worth mentioning. AI and Digital Health Technologies (DHT) have shown potential in cost reduction, improved access to healthcare services, diagnostics, decision-making and improved quality of healthcare. Electronic health records, mobile health, and big data analytics can improve access to care and resource allocation. However, challenges such as limited infrastructure, funds, and data availability need to be addressed for successful

deployment of AI and DHT in healthcare across West Africa. To benefit from AI projects in Africa, it requires local governments efforts to create specific funds and agencies for the project to ensure sustainability and long-term impact. The constructive collaboration between AI and digital technologies offers a transformative path toward improved healthcare delivery in West Africa. While obstacles remain, concerted efforts by stakeholders can maximize their potential and pave the way for improved health systems and healthcare delivery.

**Keywords:** Artificial intelligence, e-health technologies, healthcare delivery, electronic health records.

**Introduction**

Digital technology can play a significant role in achieving sustainable human development worldwide.<sup>1</sup> In 2015, global leaders from all countries joined the United Nations and agreed on 17 goals called the Sustainable Development Goals (SDGs), to provide a roadmap for the achievement of world peace and human prosperity by 2030.<sup>2,3</sup> SDG 3, is aimed at ensuring healthy lives and promoting well-being for all, and this can easily be achieved with the implementation of digital technology. With over a billion people, Africa is in a better position to manage its health challenges with

the use of digital technology, including Artificial Intelligence (AI). Digital health technology is an umbrella term. It includes Electronic Health Records, Magnetic Resonance Imaging (MRI), AI, Internet of Things (IoT), or Virtual Reality (VR), among others.<sup>4</sup>

This phenomenon is part of the digital transformation taking place globally. Digital transformation is the process of strategically adopting and integrating technology to change or enhance the performance, efficiency and effectiveness of operations within an organization or enterprise.<sup>6</sup> This transformation is rapidly and

fundamentally changing existing businesses and organizations' modes of operations. Healthcare transformation through technology is a core component of health reforms.<sup>5,6</sup> Currently, Information and Communication Technology (ICT) plays a pivotal role not only in enabling firms to achieve operational excellence but also in facilitating strategic competitive advantage. For example, AI uses a modern approach based on computer science to develop programs and algorithms that make devices intelligent and efficient to perform tasks that usually require skilled human intelligence.<sup>7</sup> The use of artificial intelligence in healthcare has the potential to assist healthcare providers in many areas of patient care.

The convergence of AI and modern digital health technologies facilitated this transformative era for the healthcare industry. This constructive collaboration between advanced computational capabilities and healthcare solutions has given rise to innovative approaches to diagnosis, treatment and patient care.<sup>8</sup> AI techniques have been applied in diverse domains of health care including drug discovery, medical imaging, personalized genetics, robots for surgeries, and provision of preventive support for elderly independent living. Sophisticated machine-learning methods have been employed to detect cancer through image analysis. For example, one of the advanced machine-learning techniques used for cancer diagnosis is Convolutional Neural Networks (CNNs). These networks are used to analyze medical images such as X-rays, MRI scans, or histopathology slides to accurately identify potential signs of cancerous growths or abnormalities.<sup>9</sup>

AI was first used in the field of medicine in the 1970s when systems based on Bayesian statistics and decision theory were used to diagnose and recommend treatments for glaucoma and infectious disease.<sup>1</sup> Global investments in Medical Artificial Intelligence (MAI) was projected to hit about \$6.6 billion by 2021 and it was anticipated that AI implementations in healthcare could help save \$150 billion in costs by 2026.<sup>1</sup> Africa stands poised to leverage the digital revolution in healthcare by utilizing technologies to address the increasing

disease burden and overcome significant challenges in infrastructure and environmental conditions. For instance, telemedicine platforms connecting remote communities with healthcare professionals can improve access to medical expertise and facilitate timely diagnosis and treatment.

## **Strengthening Healthcare Systems with Artificial Intelligence and Digital Health Technologies**

Strengthening healthcare systems is a critical step to ensure quality healthcare for all individuals. It involves a range of activities aimed at improving the capacity of healthcare systems to provide essential health services, including preventive care, diagnosis and treatment.<sup>8</sup> This includes investments in infrastructure, human resources, and technology, as well as, policy and regulatory reforms to improve the efficiency and effectiveness of healthcare delivery. Ultimately, strengthening health systems can help to improve health outcomes, reduce health disparities and promote sustainable development.

African governments are increasingly setting strategies and allocating funding for digital health, as well as shaping regulations and policies around it, and exploring opportunities to expand digital health adoption.<sup>1,8</sup> Examples include Africa CDC's Digital Transformation Strategy, which aims to make Africa CDC an informatics savvy institution and support African Union Member States in their digital health efforts and National eHealth strategies such as the Kenya National eHealth Policy 2016-2030, Ethiopia's Information Revolution Strategic Plan 2018-2025 and Malawi National Digital Health Strategy 2020-2025.<sup>9</sup> By expanding the use of digital health tools, African health systems could realize up to 15 percent efficiency gains in 2030. The adoption of electronic and web-based District Health Information Management System II (DHIS2) in over forty countries in Africa has replaced manual and paper-based health information management.<sup>10</sup>

West African governments and their relevant stakeholders are increasingly prioritizing healthcare in their governance strategies as they recognize

healthcare as a key sector for social and economic development. Therefore, several steps undertaken by healthcare delivery institutions such as the use of electronic health records for data management is highly commendable. For instance, in Ghana, the Light-wave Health Information Management System (LHIMS) has been implemented to manage patient data electronically by the Ministry of Health. Additionally, the use of digital solutions, such as telemedicine and AI-powered systems, can improve healthcare access and efficiency, especially in remote and underserved areas. Governments are also encouraging the use of digital tools in areas like disease surveillance for early detection and containment of infectious diseases.<sup>9</sup> Nevertheless, the application of AI for health and medicine in Africa faces some challenges. These challenges include lack of large clinical datasets for training AI models.<sup>1</sup> To address this, AI developers need to focus on solutions that can be easily deployed on smartphones, which are more accessible to health workers across the continent. The next challenge is that, the regulatory landscape of AI in healthcare in Africa is diverse and fragmented, indicating that significant works are required to ensure a safe and effective implementation of AI in healthcare in Africa.<sup>9,11</sup> Ultimately, to ensure health system improvement, the establishment of strong monitoring frameworks to safeguard prudent utilization of government resources, planning, accounting, auditing, monitoring, and evaluation at all levels are needed.

Finally, capacity building and training of health professionals can support the training of healthcare professionals through virtual simulations, e-learning platforms, and skill-building applications. This is vital to address the shortage of healthcare workers and ensure the retention of a well-trained workforce.

## **Benefits of Digital Health Technologies and Artificial Intelligence**

### *Precision Medicine, Diagnostics and Patient Safety*

AI-driven changes enhance the accuracy and sensitivity of diagnostic medical imaging, guide

researchers in constructing cohorts for clinical trials, and bolster cybersecurity efforts to ensure digital and physical safety of patients and healthcare systems.<sup>12,13</sup> AI systems can assist healthcare providers in making more informed decisions by providing evidence-based recommendations. An instance is the IBM Watson Health. Watson Health offers various AI-powered solutions designed to assist clinicians in decision-making processes. Watson Health for Oncology analyzes medical literature, clinical trial data, and patient records to generate personalized treatment recommendations for cancer patients based on the latest evidence and guidelines. This can contribute to better diagnosis and treatment planning, leading to improved health outcomes. Errors are also reduced using Electronic Health Records (EHR) in Laboratories and Radiology.<sup>13</sup>

AI is revolutionizing diagnostic tools by analyzing vast amounts of data to provide faster and more accurate integration of patient information. This can lead to earlier disease detection and more personalized medicine. AI can also assist in decision-making through technologies like Clinical Decision Support System (CDSS), which can assist in managing workflow and provide real-time suggestions to healthcare professionals. AI systems can improve patient safety by evaluating data to produce insights, improve decision-making and optimize health outcomes.<sup>6,13</sup> They can assist in early detection of life-threatening diseases for prompt interventions by healthcare professionals.<sup>1</sup>

### *Efficiency and error reduction*

The use of AI and digital health tools in healthcare has the potential to realize significant efficiency gains, with up to 15 percent efficiency gains projected by 2030.<sup>10</sup> The healthcare landscape in West Africa is undergoing a transformative shift, driven by the combined forces of digital health technologies and artificial intelligence (AI). Strengthening health systems and improving health outcomes is particularly vital in rural areas where healthcare access is often limited. Data analysis using AI unlocks valuable insights from vast medical datasets. Predictive models can anticipate disease

trends, allowing for proactive interventions and resource allocation. Remote monitoring through wearables and AI algorithms enables early detection and management of chronic conditions.<sup>7</sup> Digital health technologies can overcome geographical barriers and improve access to healthcare services, especially in remote and underserved areas. Telemedicine, for example, allows patients to consult with healthcare professionals remotely, reducing the need for physical travel.<sup>14,15</sup>

### **Challenges and considerations in the adoption and use of Digital Health Technologies and Artificial Intelligence**

When integrating digital health technologies and artificial intelligence (AI) into healthcare systems, several challenges must be carefully addressed to ensure their effective adoption and use. Integration and compatibility as well as privacy and data security are fundamental challenges.

Integrating AI systems with existing infrastructure, software, and processes can be complex. Compatibility issues with legacy systems may lead to delays and increased costs. Therefore, a comprehensive integration strategy is essential for the seamless incorporation of AI technologies.<sup>16</sup> Change management is a critical factor. The adoption of AI technologies often necessitates significant organizational changes. Resistance to change, lack of employee buy-in, and cultural barriers can hinder the successful adoption and integration of AI into business processes. Therefore, effective change management strategies are crucial to ensure a smooth transition. Cost and return on investment are also key considerations. The implementation of AI systems may require substantial investments. It is essential for businesses to carefully evaluate the costs and benefits of AI to ensure a positive return on investment and long-term sustainability.<sup>6,16</sup>

Ethical considerations are paramount, as the use of AI in healthcare raises concerns regarding privacy, fairness, transparency, and accountability. Businesses must ensure that AI algorithms and systems are developed and deployed ethically,

safeguarding patient rights and data privacy.<sup>6</sup>

Ensuring the privacy and security of patient data is a critical consideration in the implementation of AI and digital health technologies. Regulatory requirements must be adhered to protect patient data and maintain data security. Finally, training and capacity building are essential for success.<sup>17</sup> Developing the necessary skills and expertise to effectively implement and manage AI and digital health technologies is crucial. Investing in training and capacity building will enable healthcare professionals to leverage these technologies optimally.

### **Conclusion**

In conclusion, evidence from the current study suggests that artificial intelligence and digital health technologies can strengthen health systems, improve health outcomes and address healthcare challenges in West Africa. Effective data management, better collaboration and patient inclusiveness, reduced cost, improved treatment modalities and outcomes, efficiency and error reduction are some benefits of the use of DHTs and AIs. While the adoption of digital health technologies and AIs in healthcare systems offers immense potential, it is essential to address these challenges and considerations to ensure their ethical, effective, and sustainable integration.

Therefore in order to address some of these challenges, it is recommended that governments and stakeholders in West Africa should prioritize investments in digital infrastructure including the provision of reliable internet connectivity, continuous capacity building and comprehensive training of health personnel, establishment of clear regulatory frameworks for the ethical use of AI in healthcare, foster collaborative partnerships between governments, technology companies and other stakeholders and the encouragement of research and innovation in AI-driven healthcare solutions tailored to the West African context to strengthen health systems and improve treatment outcomes.

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