Personal View

Artificial intelligence and task shifting:Opportunities for strengthening health systems in Malawi

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Abstract

Low-income countries including Malawi face persistent challenges in health service delivery primarily due to a critical shortage of human resources for health (HRH). Artificial intelligence (AI) technologies are gaining traction as tools to support diagnosis, treatment monitoring and health systems efficiency. In this paper, we discuss the potential role of AI in supporting health workers through task-shifting strategies and explore circumstances under which AI-led diagnosis and monitoring could substitute for human providers in a safe, ethical, cost-effective and affordable manner. We highlight opportunities in areas with large service delivery constraints such as radiology, pathology, prevalent and chronic disease monitoring. We discuss the use of discrete choice experiments (DCEs) to investigate preferences of patients, providers, and policymakers on AI integration into healthcare. Finally, we outline policy implications for Malawi. While AI is not a panacea, we argue that it could be an important adjunct to the health workforce if strategically deployed, regulated, and aligned with health system priorities.

Introduction

Malawi, like many low-income countries, experiences severe shortages of health workers. With 1.4 doctors and 3.3 nurses and midwives per 10,000 people[1], the health system struggles to meet growing demands for preventive and curative care. At the same time, the burden of both communicable and non-communicable diseases is increasing[2], requiring not only timely diagnosis but also long-term consistent patient monitoring.

Artificial intelligence (AI), the field of computer science concerned with developing systems or algorithms that can perform tasks typically requiring human intelligence[3], offers opportunities to partially offset these challenges. Recent advances in machine learning, natural language processing, and digital health platforms have demonstrated the potential of AI-assisted systems to detect disease from images, monitor patient symptoms including remotely, and support clinical decision-making in resource-constrained settings[4].

While this is promising, the adoption of AI in healthcare raises important policy questions. For example, can AI serve as a supportive tool to extend the capacity of scarce health workers through task-shifting? If so, under what conditions could AI-led diagnosis and monitoring replace human involvement in a safe, ethical, affordable, and cost-effective way? Would AI led patient care be acceptable? How can policymakers and researchers best assess public and provider acceptability of such technologies?

This opinion paper explores these empirical questions and proposes a way forward for AI related research and policy development in Malawi. Given the existing and potential AI applications in the country (Table: 1), this is an opportune moment.

AI and task-shifting in Malawi

Task-shifting has been a key policy strategy in Malawi's health system, where nurses, clinical officers, and community health workers are empowered to deliver services traditionally provided by doctors[5,6]. Leveraging these initiatives, AI could serve as an additional layer of task-shifting, supporting health personnel in several ways.

First, AI can support clinical decisions. AI algorithms can analyze patient history, symptoms, and diagnostic results to generate differential diagnoses and treatment recommendations. This could help clinical officers or nurses make more accurate decisions. Second, AI can support diagnostics. With very few radiologists and pathologists in Malawi, AI-powered image recognition tools could assist in reading chest X-rays, cervical lesion images, or histopathology slides, timely providing results that can inform care delivery. AI could also support diagnosis for common illnesses of public health importance such as malaria and Tuberculosis (TB) given their structured and algorithmically tractable patterns e.g., malaria via rapid diagnostic tests and TB via smear analysis. Within labor wards, AI can be used to screen and monitor fetal distress, facilitating delivery of lifesaving obstetric interventions. Third, AI can be used to monitor care for individuals with chronic conditions through AI-enabled mobile health platforms that can track adherence to antiretroviral therapy, hypertension and diabetes management, allowing early identification and flagging of patients who require human review or additional support.

In this regard, AI would act as a "partner" rather than a replacement of human health providers, potentially reducing workload, freeing up time that can be allocated to other patients who need critical care thereby improving overall quality of care across disease conditions.

When could AI replace human providers?

In some settings, AI could act as the primary diagnostic or monitoring agent, with minimal or no human oversight. This may be appropriate in special situations including where there are extreme shortages of personnel, for example, in remote areas without specialists where AI diagnostic tools could provide the only available interpretation of chest X-rays or blood smears.

https://dx.doi.org/10.4314/mmj.v37i4.11

Table 1: Application of Artificial Intelligence in Malawi's healthcare system

Clinical area	AI application	Example / Site
Pediatric critical care	Continuous vital-sign monitoring with early-warning alerts	IMPALA monitors, Zomba Central Hospital (PICU)
Ophthalmology (malaria)	Automated malaria retinopathy detection	ASPIRE project, Queen Elizabeth Central Hospital (QECH)
Cervical cancer screening	Image-based VIA/AI grading (Cervimage)	Pilot at Thyolo District Hospital
Tuberculosis screening	Chest X-ray CAD for TB triage	High-potential for NTP mobile CXR vans; add-on to digital X-ray
Diabetic retinopathy (DR)	Automated DR grading for referral decisions	Fits existing DR screening camps; feasible extension at QECH
Maternal health / obstetrics	AI-guided basic obstetric ultrasound (view guidance + measurements)	District hospital ANC clinics; complements portable US programs
Primary care triage (IMCI/iCCM)	Symptom-image fusion triage & risk scoring at first contact	Build on iCCM/IMCI digital tools used by CHWs
HIV programs	ART loss-to-follow-up risk prediction & targeted outreach	Leverages EMR platforms (e.g., Baobab) at ART clinics
Pharmacy & supply chain	Stockout prediction & order optimization	Integrate with LMIS at district stores & facilities
Pathology (malaria & TB microscopy)	Automated slide image analysis for parasites/AFB	Microscopy units in district hospitals
Cardiology in primary care	AI ECG interpretation for arrhythmia & QTc flags	Out Patient Department (OPD)/ED triage; district hospitals
Dermatology	Skin lesion triage	HIV clinics & rural OPDs

ANC= Antenatal Care; AFB=Acid-Fast Bacilli; ASPIRE=Auto-Detection Software for Plasmodium Infection in Retinal Exams; ART=Antiretroviral Treatment; CHWs= Community Health Workers; ECG=Electrocardiogram; ED=Emergency Department; EMR=Electronic Medical Records; iCCM=Integrated Community Case Management; IMCI=Integrated Management of Childhood Illness; IMPALA=Innovative Monitoring in PAediatrics in Low-Resource settings: an Aid to save lives; LMIS=Logistic Management Information System; NTP=National TB program; PICU=Pediatric Intensive Care Unit; TB=Tuberculosis; US=Ultra Sound; VIA= Visual Inspection with Acetic Acid.

Another scenario where AI could replace humans is for diseases with clear diagnostic patterns e.g. malaria via rapid diagnostic tests interpreted with AI and TB via chest X-ray screening. Finally, when the costs of training and retaining scarce medical specialists is far higher than deploying AI tools, AI could provide a more affordable alternative as cost considerations would favor automation.

A word of caution though, replacing humans entirely carries risks such as limited ability to interpret nuanced patient clinical presentations, ethical concerns over accountability, and potential resistance from both health providers and communities.

Economic efficiency and affordability

Malawi spends about $39 per capita on health annually[7], limiting the fiscal space for high-cost technologies. Therefore, comprehensive cost-effectiveness analyses comparing AI-enabled task-shifting versus traditional care are needed to ensure AI interventions deliver real value for money in low-income settings like Malawi.

The efficiency of AI compared to human health workers would depends on several factors. Key among them is upfront costs compared to recurrent costs. WhileAI systems may require substantial initial investment (infrastructure, devices, training, data storage) it is likely to have lower recurrent costs compared to salaries. Economies of scale would also make AI more cost-effective when deployed large scale across health facilities to lower per-unit costs and integrated into existing health system platforms to exploit economies of scope. In contrast, AI induced misdiagnosis or algorithmic bias could result in delayed appropriate care, leading to downstream costs as well as litigations.

Role of discrete choice experiments (DCEs)

To inform policy, it is essential to understand preferences of stakeholders regarding AI in healthcare. DCEs are a valuable method for eliciting such preferences[8]. They allow researchers to present hypothetical scenarios where patients, health workers, or policymakers choose between options with different attributes (e.g., accuracy, cost, human involvement, accessibility).

To capture demand-side views, patients could be asked for theirpreferences for AI-led diagnosis versus traditional consultations, especially in rural areas where AI application is likely to be deployed. Front-line health workers (doctors, nurses, clinical officers, community health workers) could be assessed for their acceptability of AI as a task-shifting partner and conditions under which they would trust AI recommendations. Policymakers and payers at Ministry of Health and district health offices could be appraised to assess trade-offs between affordability, accuracy and workforce motivations.

Such studies, which can quickly be done using cross sectional design and at affordable costs, could generate valuable evidence on the social and economic acceptability of AI integration, informing policy decisions, investment choices and HRH strategies in the country.

Policy implications for Malawi

Policy barriers may impede the adoption of promising health initiatives[9]. Accordingly, this section highlights several critical policy considerations that warrant careful attention to promote uptake of AI based applications in the health sector. First, there is need for regulation and accountability. This would necessitate development of clear frameworks to define liability for any adverse events when AI systems are used in patient care. Second, AI should not be viewed as a substitute for workforce development but as a complementary tool that can relieve workload pressure and enhance productivity.This calls for guidelines on how AI can be integrated into HRH planning and deployments. Third, strong systems for data protection, privacy, and ethical use are essential, underscoring the need for data oversight and governance. Fourth, for safe and sustainable AI adoption, health workers would require training so they can effectively interact with AI tools. Thus, health workers capacity building will be crucial. Fifth, AI facilitated work force productivity and deployments should not exacerbate inequalities, therefore marginalized populations such as those in rural areas should be prioritized. Finally, AI monitoring and evaluation would be essential. Therefore, AI implementations should include rigorous monitoring of outcomes, costs, acceptance, as well as unintended consequences.

Conclusion

AI-assisted patient care hold promises for addressing Malawi's health system challenges, particularly the shortage of human resources. While AI can complement task-shifting strategies by supporting junior doctors, nurses and clinical officers, its role as a replacement for human providers must be carefully circumscribed to specific conditions and contexts where safety, affordability, and efficiency are assured.

DCEs and other empirical studies can help capture preferences of patients, providers, and policy makers, guiding decisions on where AI adoption is most appropriate. For Malawi, the goal should not be to replace health workers but to build a hybrid model where AI strengthens the existing workforce, improves service delivery and contributes to universal health coverage.

Acknowledgment

The motivation for this article stems from my direct involvement in evaluating the costs, cost-effectiveness, and affordability of three distinct AI-based health interventions in Malawi. The first is ASPIRE, a graphics-based artificial intelligence application developed to support the detection of malaria-specific retinopathy, which has been piloted within health-facility ophthalmic services. The second is the IMPALA monitoring system, a continuous vital-sign monitoring technology designed to improve the management of critically ill children at selected District and Mission Hospitals in the country. The third is CervImage, an AI-assisted tool for cervical cancer screening, planned for implementation at Thyolo District Hospital. Together, these interventions highlight both the promises and the challenges of applying AI solutions in resource-constrained health system settings.

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