

# The Influence of Artificial Intelligence on Hospital Administration in Mozambique

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## ABSTRACT

This article aims to understand the influence of Artificial Intelligence (AI) on Hospital Administration and Management in Mozambique (HAM). To this end, the methodology employed was a literature review of articles on AI-related topics, conducted through searches in Science Direct, PubMed, Scopus, the website of the Mozambican Ministry of Health, and the libraries of the Faculty of Health Sciences at Zambeze University and the Faculty of Medicine at Eduardo Mondlane University. The main results concluded that Mozambican HAM does not apply AI tools, particularly those related to increasing productivity in sectors such as Predictive Maintenance, Bed Management, and Staffing Planning, due to high equipment installation and maintenance costs, precarious transportation, connectivity problems, and staff shortages.

Another important conclusion was that, in the literature review process on the subject, little material was found, as little is published, especially in the Mozambican context. Therefore, aware that this article does not cover the full scope of AGH, other aspects such as the application of AI in transport (ambulances), medication management, hospital logistics, competency-based accounting, and others, may constitute topics of interest

**Keywords:** Artificial Intelligence, Hospital Administration and Management in Mozambique

## INTRODUCTION

Artificial intelligence (AI) began to be debated approximately 70 years ago in developed countries; however, its remarkable performance as a topic of scientific, social, and economic interest emerged in the 2000s. Its insertion in developing countries, and its factual interest, emerged in the last 15 years. In Mozambique, the study of AI as a work tool for improving productivity has been developed frequently in areas such as Engineering. Only in the 2010s has there been a search to understand a little more about its functionality and applicability in the health sciences, especially in the clinical area.

It is in this sense, with the central objective of understanding the influence of AI on Mozambican Healthcare, that this article emerges, since the literature is almost entirely grey. To facilitate understanding of the purpose, the article was structured in such a way as to allow the reader to comprehend the topic, primarily organized by a set of literature on AI and its connection to understanding AI in healthcare in general, and in particular, its influence on Mozambican Healthcare. This organization was made possible through a methodology consisting of a review of recent literature, which allowed us to conclude, in general, that Mozambican Healthcare does not apply AI tools, especially those related to increasing productivity in sectors such as Predictive Maintenance, Bed Management, and Staffing Planning.

## METHODOLOGY

Considering the objectives of this study, a bibliographic review of articles on the topic of AI was applied methodologically. The databases included Science Direct, PubMed, Scopus, the website of the Mozambican Ministry of Health, and the libraries of the Faculty of Health Sciences at Zambeze University and the Faculty of Medicine at Eduardo Mondlane University. This allowed us to explore articles in the context of AI in for-profit business organizations, as well as in health institutions.

In general, using inclusion criteria, even without including an exhaustive list of all published studies, we listed articles on AI from the years 2016 to 2025. This qualitative approach allowed for a descriptive and exploratory analysis, capable of providing an academic critique of the systemic, institutional, and political barriers to the adoption of AI in Mozambican healthcare.

## Problem Statement

Starting from the premise advanced by Graham *et al.* (2020), according to which we are at a critical point in the fourth industrial era (following the mechanical, electrical, and internet eras) known as the "digital revolution," characterized by a fusion of types of technology, elaborating on Artificial Intelligence (AI) in healthcare reveals that several studies have been discussing it, focusing on direct medical care, setting aside other assumptions in the management process and AGH Parikh *et al.* (2019), even though the direct medical care process is included in the hospital administrative management structure.

In Mozambique, studies on AI in healthcare also address aspects related to, for example, telemedicine, new forms of surgical intervention through AI, and others. However, literature on the use of AI, for example, in the management of product stocks, in the management of hospital beds, and other related areas, is almost non-existent, judging by the bibliographic review carried out in this study. It is in these terms that it becomes fundamental to try to understand: what is the influence of Artificial Intelligence on AGH in Mozambique?

## Concept and theories about Artificial Intelligence

According to Brunette *et al.* (2009), the real perception of the existence of AI emerged at a conference in July 1956 at Dartmouth College, where AI was expressed as the digital revolution. Several leaders in the field were present, namely John McCarthy, Marvin Minsky, Oliver Selfridge, Ray Solomonoff, Trenchard More, Claude Shannon, Nathan Rochester, Arthur.

Therefore, as can be seen, AI is not as new as it seems, since it has been around for a long time, to the point that Spector (2006) argues that it is an objective that predates the nominal establishment of its field in 1956.

However, considering the perspectives above, it can be deduced that AI has its foundations dating back approximately 70 years.

It is natural that it evolves over time; therefore, for Graham *et al.* (2020), AI is broadly defined as a machine or computational platform capable of making intelligent decisions.

Therefore, the fact that it makes intelligent decisions does not necessarily mean that it is the most assertive, so its assessment, analysis, and understanding require, in part, human intervention. In this sense, Brunette and Flemmer (2009) argue that, throughout the fifty years in which AI has been a defined and active field, there have been several bibliographic surveys that have always drawn attention to human intervention to avoid the extrapolation of AI tools in organizations.

It can be inferred that the field is extraordinarily difficult to synthesize, either chronologically or thematically. This is why Brunette and Flemmer (2009) state that the reason for this is that there has never been a wave of efforts that led to a recognized achievement in the analysis of AI as an antidote to well-being.

However, despite this, there is a considerable body of literature that the novice must master before attempting to deal with what has so far proven to be a multi-headed monster. The incorporation of new knowledge about AI still shows the great need to delve deeper into the subject, fundamentally in the field of AGH (Analysis and Human-Centered Research).

Considering the difficulty in proceeding chronologically with AI, and also considering the approach raised by Brunette and Flemmer in 2009, it becomes evident that no study will be definitive of the essence of AI. Even so, one should never stop seeking new approaches to it, especially for novices.

Moreover, alluding to the approach brought by Spector, who stated that, for example, it would have been reasonable in the 17th century, when Leibniz wrote about reasoning as a form of calculation, to think that the process of creating AI would have to be something like the process of creating a water wheel or a pocket watch: first understand the principles, then use human intelligence to conceive a project based on those principles, and finally, build a system according to the project.

That is, it is a process that is densely in process and progress.

It is worth remembering that, in recent years, AI has become an emerging trend in different areas: science, business, medicine, the automotive industry, and education. It has recently become a very popular topic in the field of management science and marketing, although, paradoxically, work on its development in other fields of science has been continuously underway for more than half a century, as we mentioned earlier regarding its genesis.

Based on the above, Jarek *et al.* (2019) argue that over the years, AI has appeared and disappeared from the spotlight depending on the level of its advancement and the increase in its potential applicability. The interest and broad discussion about AI are caused by the first large-scale commercial applications, which demonstrated its potential and capabilities.

It is evident that AI technology has always been an intrusively implicit topic, that is, even if organizations do not want to adopt it, they feel obliged to do so at the risk of excluding themselves from the rational and flexible decision-making process.

Therefore, the approaches of Castro and New (2016) are called upon for this reflection, as they unequivocally state that AI is already having a major positive impact on many different sectors of the global economy and society. For example, humanitarian organizations have been using intelligent chatbots to provide psychological support to refugees, and doctors have been using AI to develop personalized treatments for cancer patients.

However, the benefits of AI, as well as its likely impact in the coming years, are widely underestimated by policymakers and the public (Castro & New, 2016). Furthermore, a counter-narrative that AI raises serious concerns and justifies a cautious regulatory approach to limit the harm it could cause has gained prominence, although it is erroneous and detrimental to social progress.

Therefore, given that AI has been used in various sectors of society, it is essential to consider all the nuances in the application and use of AI, especially in healthcare, which is the next topic.

### **Artificial Intelligence in Healthcare**

According to Hosny and Hugo (2019), AI has demonstrated great progress in the detection, diagnosis, and treatment of diseases. Deep learning, a subset of machine learning based on artificial neural networks, has enabled applications with performance levels close to those of trained professionals in tasks such as the interpretation of medical images and the discovery of pharmaceutical compounds.

Therefore, from a clinical point of view, there are elements that elucidate that AI has indeed revolutionized several aspects, which is why, Hosny *et al.* (2019) argue, that unsurprisingly, most AI developments in healthcare meet the needs of high-income countries (HICs), where most research is conducted.

On the other hand, there is little discussion about what AI can bring to medical practice in low- and middle-income countries (LMICs), where labor shortages and limited resources restrict access to and quality of care.

AI can play an important role in combating global health inequalities at the individual patient, healthcare system, and population levels if clinical and administrative aspects are combined. However, challenges in developing and implementing AI applications must be addressed before widespread adoption and measurable impact (Hosny *et al.* 2019).

However, AI, as measured by the arguments above, highlights the fact that, above all, it must be taken into account that in a process of implementing and/or including AI in the institution, it must be oriented towards solutions and not towards generating problems, if a widespread adoption process is not observed.

That is why, according to Sahni and Carrus (2023), it should always be considered that AI in business sectors must respect the large amounts of structured and quantitative data, and the computer algorithms, and that the essence of AI involves training based on discrete results, because, at the health level, qualitative information, such as clinical notes and patient reports, is generally more difficult to interpret, and the multifactorial results associated with clinical decision-making make algorithm training more complex. Another challenge is integrating AI results into the already complex clinical workflow.

In the healthcare field, the role of AI in improving clinical judgment has received the most attention, with a particular focus on prognosis, diagnosis, treatment, clinical workflow, and the expansion of clinical expertise. Specialties such as radiology, pathology, dermatology, and cardiology already use AI in the image analysis process. In screening radiological examinations, for example, up to 30% of radiology clinics that responded to a survey indicated that they had adopted AI by 2020, and another 20% indicated that they planned to start using AI in the near future (Drazen and Kohane, 2023).

It is shown, from the previous view, that the implementation of an AI process is irreversible at the healthcare level, so the monitoring of the implementation must be understood by the entire structure, whether clinical or administrative. Naturally, this requires structured monitoring that must also take into account, as Schwalbe and Wahl (2020) point out, the simultaneous advances in information technology infrastructure and mobile computing power.

A number of fundamental questions have been raised about AI-driven health interventions and whether the tools, methods, and safeguards traditionally used to make ethical and evidence-based decisions about new technologies can be applied to AI.

The above statement is consistent with a study presented by Teeple and Navathe (2019), which concluded that AI is gaining ground in clinical practice; however, due to its reliance on historical data, which is based on the generation of biased data or biased clinical practices, AI can create or perpetuate biases that can worsen patient outcomes. However, by implementing AI strategically and carefully selecting the underlying data, algorithm developers can mitigate AI bias. Addressing bias can allow AI to reach its full potential, helping to improve diagnosis and prediction while protecting patients.

## Types of AI in Healthcare

According to Drazen and Kohane (2023), two types of AI have generally been pursued in the healthcare field, namely:

First, **machine learning**, which involves computational techniques that learn from examples rather than operating based on predefined rules, and

Second, **natural language processing**, which is the ability of a computer to transform human language and unstructured texts into machine-readable structured data that reliably reflects the intent of the language.

However, regarding the typicality of AI in healthcare, the two elements that stand out justify the need to once again seek to understand that the implementation of an AI process necessarily involves the appropriation of the entire work team to achieve success, due to the fact that it involves computational techniques that learn from examples.

Underlying this is the interpretation that, when it is intended to associate AI with the management of institutions, one must always pay attention to the assumptions involved, and it is in these terms that the following section will address AI in AGH.

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**Hospital Administration and Management and Artificial Intelligence**

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According to Drazen and Kohane (2023), the environment in which some healthcare organizations operate often leads them to focus on short-term financial results, to the detriment of investing in innovative long-term technologies, such as AI, as these can ensure better efficiency, effectiveness, and work efficacy.

Therefore, healthcare organizations that prioritize innovation link investment decisions to the “total mission value” (Drazen and Kohane, p. 2, 2023), which includes financial and non-financial factors, such as quality improvement, patient safety, patient experience, healthcare professional satisfaction, and increased access to healthcare.

Therefore, AI must be associated with organizational identity or organizational culture, because, as Malik and Solaiman (2024) argue, around the world, ‘smart hospitals’ are growing in number, using technology integrated with AI in the hospital’s internal network to improve care, outcomes and efficiency, which can only be realistic if everyone is involved with the being of the institution.

At this point, it is important to make a distinction between AI used for AGH and AI used for clinical purposes. According to Malik and Solaiman (2024), the former refers to the implementation of AI technologies to optimize administrative processes, increase operational efficiency and improve decision-making in non-clinical areas.

A segunda envolve o uso da IA para apoiar os processos de tomada de decisão e otimizar tarefas administrativas diretamente relacionadas ao cuidado e tratamento do paciente.

While both forms of AI are relevant to HGA, this chapter focuses primarily on the former, exploring the administrative context in which these technologies exist for healthcare professionals working daily and their legal implications.

From the above, it is clear that AI can be used in HGA in various sectors; however, according to Malik and Solaiman (2024), the most notable for HGA are the following:

***Predictive Maintenance***

A medium to large hospital contains between 5,000 and over 10,000 different types of medical equipment, such as magnetic resonance imaging (MRI) machines, computed tomography (CT) scanners, X-ray machines, and ventilators, which are essential for the diagnosis and treatment of patients.

Consequently, these devices are expensive and require regular maintenance throughout the product lifecycle, contributing to additional costs. Even with maintenance, these medical devices are subject to unexpected failures, resulting in delays in patient care, additional costs, and potential damage to the devices themselves.

However, traditional maintenance and condition monitoring methods for medical devices fail to easily detect component performance levels and provide insufficient warnings of impending failures. Current monitoring tools lack flexibility, leaving a wide range of equipment integrity issues unresolved.

Therefore, predictive maintenance involves using large data streams generated by the system to inform decisions about preserving a system's capacity and functionality by monitoring and controlling its operation in real time.

However, collecting and analyzing substantial amounts of time-sensitive data from individual hospital equipment separately to monitor equipment integrity and anticipate adverse events can be a rather complex exercise. To address this problem, healthcare institutions are exploring big data analytics, including machine learning (ML), cloud and edge computing technologies, and advanced data mining algorithms to monitor medical equipment.

Therefore, a predictive maintenance architecture based on AI-powered technologies allows medical devices to accumulate data from other devices scattered throughout the hospital, enabling each device to gain self-

awareness of its health status by comparing and learning from its own history as well as that of other similar devices.

### ***Hospital Bed Management***

Bed management is another critical aspect of HRM that directly impacts the quality of patient care, staff workload, and overall operational efficiency of healthcare. It involves monitoring patient flow in hospital wards to coordinate admissions, discharges, and transfers, and allocating beds according to specific patient needs.

Therefore, efficient and effective bed management improves patient outcomes, ensures prompt admission, and timely discharge to free up beds for new admissions. Achieving this efficiency, however, has been a challenge for hospitals, as exemplified by Malik and Solaiman (2024), according to whom Humber River Hospital in Toronto implemented AI to streamline the Emergency Room (ER) process using software, and was able to predict ER admissions two days in advance by processing real-time data from various hospital activities, including admissions, wait times, transfers, and discharges.

Therefore, the introduction of AI in bed management is a decisive factor for significantly improving some of the previously mentioned indicators, such as admission forecasting.

This does not mean that such AI applications are risk-free. Another example involved Kettering General Hospital, which conducted a case study to investigate AI techniques for improving bed allocation.

It was found that, although technology may be a better alternative to current inefficient bed registration and tracking systems, it presents its own challenges, including obtaining sufficient and good quality data that encompasses the complexity of patients' needs.

### ***Team Scheduling Planning***

A staff schedule (or rotation) consists of a schedule or list that assigns tasks or responsibilities to individuals in a rotating or sequential order.

To provide quality patient care while controlling costs, particularly in high-pressure environments such as intensive care and BS, ensuring adequate staffing levels balanced with the needs and preferences of the medical staff is crucial.

However, medical staff scheduling involves developing work schedules for healthcare professionals so that the hospital has sufficient staff to meet patient demand, ensuring that healthcare professionals receive adequate rest periods and training opportunities.

Although scheduling is a common problem for most organizations, the challenge is particularly significant in the healthcare sector, which requires its employees to work 24 hours a day. Common scheduling problems in a healthcare setting include understaffing, modifications to assigned schedules to accommodate the unpredictability inherent in patient care, personal preferences, unexpected last-minute demands, and potential role misalignment, such as those resulting from assigning more experienced staff to fill schedule gaps and cover for lower-level staff, even if they are not under their direct supervision. Current manual and self-managed scheduling methods are tedious and time-consuming, leaving little time for individualized patient care.

Therefore, integrating AI into existing work scheduling systems can substantially improve their performance, allowing hospitals to effectively balance staff availability with patient needs. In intensive care settings, AI-based systems are used to anticipate the workload of professionals in Intensive Care Units and BS, ensuring that workers with the appropriate skills are allocated to specific shifts.

Thus, AI-based optimization mechanisms can transform medical scheduling systems by analyzing the complex staffing needs across different departments and specialties in hospitals and generating schedules that carefully balance staff availability and satisfaction with patient needs.

### ***Clinical Decision Support (CDS)***

Considering the vast amount of patient data and their constantly changing needs, making informed clinical decisions is a challenge. Hospitals rely on CDS to improve healthcare delivery, assisting clinicians, staff, patients, or other individuals with person-specific knowledge and information, intelligently filtered or presented at appropriate times, to improve health and healthcare.

It is in this context that the entire hospital system, segregated into clinical, administrative, and nursing, must be aligned for better treatment of patient information, and AI can be one of the tools for the desired alignment.

A study conducted by Alves *et al.* (2024) stated that the potential benefits of AI in hospital management are balanced with significant challenges and concerns regarding its effective integration, which requires an approach to technical, ethical, and cultural issues, focusing on maintaining human elements in decision-making.

Therefore, AI should be seen as a powerful tool to support, not replace, human judgment in hospital management, promising improvements in efficiency, data accessibility, and analytical capacity. Preparing healthcare institutions with the necessary infrastructure and providing specialized training for managers is crucial to maximizing the benefits of AI while mitigating associated risks.

### **Artificial Intelligence and Hospital Administration and Management in Mozambique**

Through the literature review carried out, few studies exist on AI in Mozambique, which leads us to an assessment and analysis of AI in low-income countries, which can be cross-referenced and compared with the Mozambican reality, obviously glocalizing them.

In this sense, we find it necessary to bring the argument of Mrazek and O'Neill (2020), who estimate that significant investments in health technology, including those that use digital health and AI, contribute to reducing the gap in health services in emerging markets, given the potential of these new innovations to reach underserved patients.

The above statement is equated to the Mozambican reality, in which investments in technologies that allow the use of AI are still deficient. This is why, according to Matenga and Roda (2024), in Mozambique, AI is still a major challenge for all sectors.

Portanto, a IA, foi sendo estudada a cerca de 70 anos. Sendo algo considerado novo no seio Moçambicano, e sobremaneira ao nível da saúde, vale relatar sobre o estudo apresentado por Mahesse (2023), que mostrou que, através da IA, os profissionais de saúde melhoraram o diagnóstico precoce e preciso da pneumonia, contribuindo para melhores resultados clínicos e uma abordagem mais eficaz no tratamento da doença, pois, alcançou-uma precisão de 88% nas imagens extraídas.

Therefore, based on the above statement, it can be inferred that in the Mozambican national context, AI in AGH is still a kind of myth.

In Paucar *et al.* (2024), AI transformed AGH, improving operational efficiency and the quality of patient care. It improved the optimization of resource allocation, enabled a more efficient distribution of resources, and a reduction in waiting times.

However, it is understood that, for AGH, the application of AI can contribute to greater efficiency, considering the advantages listed by Paucar *et al.* (2024), and Mozambique can replicate this at that level.

However, Zuhair *et al.* (2024) argue that there are challenges that contribute to low adoption rates and the absence of standardized guidelines in the implementation of AI in health management in emerging countries, such as: the high costs of equipment installation and maintenance, poor transportation and connectivity problems, and lack of personnel, and that despite these challenges, AI presents a promising future in the area of health management.

As can be observed, studies related to AI in Mozambique focus primarily on the clinical component and in a superficial way. They do not address aspects related to AGH (Authorized Health Management) and the potential contributions it can bring.

A similar approach is seen in Cossa's (2022) statement that the implementation of a chatbot, integrated into a current social network, can help to better schedule appointments and improve waiting times, and this is the scope of AI.

Another study by Macamo (2022) concluded that, based on AI, blockchain, being a transparent system (since all participants can consult the transactions already carried out and recorded), reliable (since validation occurs through cryptographic methods and consensus among members), and highly available (since it operates on a peer-to-peer network with a database distributed among the network nodes), provides a new way to protect the system for sharing personal clinical records.

Therefore, it becomes even more evident that there is a lack of studies on AI in AGH in Mozambique; in other words, the literature on the subject is grey.

### **Concluding Remarks**

After reviewing the relevant articles on AI in AGH in Mozambique, a first conclusion is that AGH Mozambique does not apply AI tools, especially those related to increasing productivity in sectors such as Predictive Maintenance, as it allows medical devices to accumulate data from other devices dispersed throughout the hospital, enabling each device to gain self-awareness of its health status; Bed Management, as the implementation of AI allows for faster and more predictive admissions to the emergency room; and Staffing Planning, as rotating staff allows for cost control, particularly in high-pressure environments such as intensive care. The introduction of AI allows for the reduction of insufficient personnel, adjusts changes in assigned schedules to accommodate the unpredictability inherent in patient care, due to the high costs of equipment installation and maintenance, precarious transportation, connectivity problems, and staff shortages.

Another conclusion leads us to reflect that the implementation of an AI process in HGA in Mozambique necessarily requires the appropriation of the entire work team in order to achieve success.

However, despite gaining ground in clinical practice, and due to the dependence on historical data in clinical practice, which is based on the generation of biased data or biased clinical practices, AI can create or perpetuate biases that can worsen patient outcomes and thus affect HGA.

Finally, AI should be seen as a powerful tool to support, not replace, human judgment in HGA, promising improvements in efficiency, data accessibility, and analytical capacity.

And, during the literature review, no material related to the topic in question was found, as little is published, especially in the Mozambican context. Therefore, aware that this article does not cover the full scope of AGH, other aspects such as the application of AI in transport (ambulances), medication management, hospital logistics, competency-based accounting, and others, may constitute topics of interest.

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