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ARTIFICIAL INTELLIGENCE AND HOSPITAL QUALITY IN MOROCCO: TOWARD AN INNOVATIVE MODEL OF PUBLIC HEALTH MANAGEMENT

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ABSTRACT

In the face of profound digital transformations redefining the healthcare landscape, artificial intelligence (AI) emerges as a strategic vector for enhancing hospital quality systems. This article adopts a conceptual and exploratory perspective to investigate the prerequisites for a responsible, sustainable integration of AI within the quality management frameworks of Moroccan public hospitals. Anchored in a critical review of contemporary scientific and institutional literature, and informed by an in-depth analysis of the national context, the study introduces a comprehensive strategic model structured around three foundational pillars: a phased and adaptive deployment methodology, the systematic reinforcement of technological infrastructure and human competencies, and the establishment of a robust ethical and governance architecture. The distinctiveness of this research lies in its framing of AI not solely as a tool for operational optimisation, but as a transformative force for managerial innovation aligned with the sustainable development imperatives of the healthcare sector. By proposing a pragmatic, contextually grounded, and ethically oriented roadmap, the article aspires to advance scholarly discourse and furnish policymakers with actionable insights to facilitate the successful deployment of AI in service of healthcare quality enhancement.

KEYWORDS: Artificial Intelligence, Hospital Quality Management, Ethical Governance, Digital Health Systems, Moroccan Public Healthcare.

1. INTRODUCTION

In a context marked by profound digital change, the integration of advanced technologies, and in particular artificial intelligence (AI), is gradually becoming a strategic lever for improving healthcare systems.

Morocco, which is committed to this dynamic through its "Digital Morocco 2030" National Strategy, is clearly keen to exploit these technologies to modernize its hospitals and optimize the quality of care.

That said, the effective integration of AI into quality approaches is still in its infancy.

Existing work, often focused on contexts in developed countries (Abukhadijah & Nashwan, 2024; De Micco et al., 2025), suggests little thinking adapted to the realities of emerging healthcare systems like Morocco's.

Furthermore, the issues associated with AI, whether ethical, organizational or technological, call for a cautious and strategic approach to avoid risky implementations.

Adopting this perspective, the present study examines AI not only as an operational tool designed to enhance the quality of care, but also as a lever for managerial transformation aligned with the healthcare sector's sustainable development objectives.

To this end, the article relies on an exploratory methodological approach, based on a narrative review of recent scientific and institutional literature, complemented by a critical analysis of existing Moroccan initiatives.

Given the emerging nature of the subject and the relative scarcity of empirical work specifically on the integration of AI into hospital quality approaches in Morocco, a narrative approach was favored.

Unlike PRISMA-type systematic reviews[1] , this method enables targeted and critical selection of the most relevant sources, without strict protocol constraints.

The main contribution of this research lies in the development of an integrated strategic model articulating three complementary axes:

- a phased approach to AI deployment,
- the coordinated reinforcement of infrastructures and skills,
- and the establishment of an ethical and governance framework adapted to the national context.

The rest of the article is organized as follows: the first part presents the theoretical and conceptual framework; the second describes the current state of AI and hospital quality in Morocco; the third analyzes the potential contributions of AI; the fourth identifies the major obstacles to be overcome; the fifth proposes a strategic model; finally, the critical discussion highlights the contributions, limitations and prospects for further research.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. Artificial Intelligence In Healthcare

Artificial intelligence (AI) refers to the set of technologies that enable computer systems to perform tasks traditionally associated with human intelligence, such as analysis, reasoning and decision-making (Floridi, 2014).

In the healthcare field, AI is today being mobilized at various levels: diagnostic assistance, clinical risk prediction, patient triage, med ic imaging analysis or even hospital process optimization (Abukhadijah & Nashwan, 2024)

The promise of AI in healthcare is not limited to technological innovation; it carries with it the potential to significantly improve the quality and safety of care, while enhancing the efficiency of hospital organizations. However, these potentialities cannot be fully exploited without strategic reflection on the conditions for integrating these tools into existing clinical and administrative practices.

2.2. Hospital Quality : A Strategic Requirement

Quality of care occupies a central place in contemporary public health policies. According to the World Health Organization (WHO, 2021), a quality healthcare system is based on safety, efficiency, equity, respect for the patient and continuity of care.

Quality approaches in healthcare establishments are generally based on continuous improvement cycles, such as the PDCA (Plan-Do-Check-Act) model, aimed at identifying dysfunctions, measuring performance and involving stakeholders in progress dynamics.

AI, when thoughtfully integrated, could become a catalyst for these approaches, offering predictive capabilities, real-time analysis and enhanced clinical decision support.

2.3. Theoretical Models of Technological Acceptance and Integration

[1] Preferred Reporting Items for Systematic Reviews and Meta - Analyses

To understand how AI can be adopted and integrated into healthcare facilities, two theoretical frameworks of reference are mobilized:

2.3.1. Technology Acceptance Model (Tam)

Developed by Davis (1989), the TAM explains that acceptance of a technology depends on two key perceptions:

- Perceived usefulness: the belief that using the technology will improve performance. - Perceived ease of use: the degree of perceived effort required to use the tool.

In a hospital context, these dimensions are essential for anticipating healthcare professionals' adherence to AI solutions.

2.3.2. Technology-Organization-Environment Model (Toe)

The TOE model (Tornatzky & Fleischer, 1990) considers that technological adoption depends on three main categories of factors:

✓ Technological (maturity of AI solutions, compatibility with existing systems), ✓ Organizational (innovation culture, internal resources, managerial commitment), ✓ Environmental (regulatory pressure, political support, funding).

In the case of Morocco, where the digital ecosystem is evolving, these factors take on a particular dimension that needs to be analyzed in detail.

2.4. Gaps Identified In The Literature

Although numerous studies confirm the strategic interest of AI in enhancing the quality of care (Abukhadijah & Nashwan, 2024; De Micco et al., 2025), the majority of existing research concerns contexts where digital infrastructures and regulatory frameworks are already well established.

Few works address the specific challenges of integrating AI into transforming healthcare systems, such as those in emerging countries.

In the Moroccan context, this gap is all the more marked as the adoption of AI remains embryonic, and no strategic framework dedicated to the ethical integration of these technologies into the quality approach has yet been formally defined.

This study therefore aims to fill this gap by proposing an approach adapted to local realities.

2.5. Empirical Examples of Similar Initiatives

A number of initiatives in emerging countries show that the gradual adoption of AI in healthcare is not only possible, but also promises substantial qualitative gains.

Among the remarkable initiatives observed in comparable contexts, South Africa recently developed a conceptual framework to guide the progressive implementation of artificial intelligence in its public hospitals, taking into account local infrastructure and governance constraints (Nene & Hewitt, 2023). This approach highlights the importance of strategically adapting AI solutions to the institutional and organizational realities of emerging healthcare systems.

In Tunisia, Samaâli et al (2025) have shown through their analysis of the mental health sector that telemedicine, supported by AI technologies, offers an opportunity to overcome geographical barriers and improve access to care, despite the infrastructural and organizational challenges encountered.

In Morocco, certain initiatives such as the experimentation with AI in medical imaging at the Hassan II University Hospital in Fez testify to a willingness to explore AI applications in healthcare, even if they still remain limited in scope and impact assessment.

These examples show that an integration strategy adapted to local contexts is not only conceivable, but necessary to ensure a sustainable and ethical transformation of healthcare practices.

In the light of these theoretical and empirical contributions, it appears that integrating artificial intelligence into hospital quality approaches represents a major strategic opportunity, but also a complex challenge, requiring an approach adapted to local realities.

With this in mind, it is essential to look at the specific Moroccan context, in order to identify existing initiatives, the advances made, as well as the obstacles encountered in the process of implementing AI in the healthcare sector.

The following section thus proposes a detailed inventory of artificial intelligence and hospital quality in Morocco, highlighting current dynamics, specific challenges and future prospects.

3. CURRENT STATUS OF AI AND HOSPITAL QUALITY IN MOROCCO

3.1. Existing Initiatives And Institutional Dynamics

In Morocco, several recent initiatives testify to a desire to modernize the healthcare system through digital transformation and the gradual introduction of artificial intelligence-based solutions.

The "Digital Morocco 2030" National Strategy, supported by the Ministry in charge of Digital

Transition, explicitly places healthcare among the priority sectors for digitization (Ministry of Digital Transition, 2024).

On the ground, a few local experiments are emerging, notably in medical imaging at the Hassan II University Hospital in Fez, where pilot projects using AI to improve radiological diagnosis have been carried out.

The Economic, Social and Environmental Council (CESE, 2024) points out that, despite these isolated advances, the integration of AI into the Moroccan healthcare system is still very limited, and often confined to isolated initiatives with no overall strategy.

In addition, Benabbou and Nafzaoui (2024) point out that while Morocco is displaying a political will to adopt AI, particularly in the health and education sectors, there remains a significant gap between announced ambitions and concrete achievements on the ground.

3.2. Advances And Strengths in the Moroccan Context

Despite the challenges, several factors can facilitate the gradual integration of AI into Moroccan healthcare.

The widespread use of Electronic Medical Records (EMRs) in certain university hospitals, digital health training programs, and efforts to extend Internet connectivity in rural areas are encouraging foundations.

Morocco also boasts a booming ecosystem of technology startups, supported by public and private incubators, developing solutions in e-health, telemedicine and intelligent hospital management.

The dynamic of collaboration between universities, companies and public institutions is gradually being reinforced through national programs such as the "Digital Innovation Lab", encouraging the emergence of innovative projects adapted to local needs.

According to the Conseil Économique, Social et Environnemental (CESE, 2024), this capacity for technological catch-up is real, provided that synergies between the various players are strengthened and inclusive digital governance is ensured.

The development of sovereign cloud infrastructures and the cybersecurity investments recently initiated are also positive signals to support the wider deployment of AI-based solutions.

3.3. Environmental Constraints And Persistent Challenges

However, the current state of healthcare AI in Morocco remains marked by significant structural constraints.

Firstly, Chouraik (2024) points out in his systematic review that the development of "sustainable AI" in Morocco is still hampered by:

- ❾ the lack of structured medical data
- ❾ the weakness of hospital infrastructures in certain regions, ➔ the absence of a specific regulatory framework for AI in healthcare.

In addition, the environmental issue is also raised: the ecological impact of AI systems, particularly in terms of data center energy consumption, is beginning to raise questions, even if this aspect remains little documented in Moroccan public debates.

Finally, Benabbou and Nafzaoui (2024) stress the risk of a digital divide: without proactive inclusion policies, the introduction of AI could accentuate existing inequalities between major metropolises and remote regions.

Although the integration of artificial intelligence into Moroccan healthcare facilities is still in its infancy, existing initiatives, advances in digital infrastructure and institutional commitment demonstrate considerable potential for future development.

However, this potential can only be fully realized through strategic reflection on the real contributions that AI can make to improving hospital quality processes.

With this in mind, the following section proposes to explore the main levers through which artificial intelligence could contribute to optimizing efficiency, enhancing care safety, and improving the patient experience in Morocco.

4. AI'S POTENTIAL CONTRIBUTION TO HOSPITAL QUALITY

Beyond its image as a technological breakthrough, artificial intelligence should be seen as a strategic lever to support the continuous improvement of hospital quality.

In a context where healthcare establishments are faced with increasing demands in terms of safety, efficiency and patient experience, AI offers real opportunities to strengthen internal processes and clinical management.

This section therefore explores the main areas in which AI could bring significant added value to Moroccan hospitals, taking into account local realities and public health excellence objectives.

4.1. Optimizing Internal Processes

The first contribution expected from artificial intelligence in healthcare establishments lies in the optimization of internal organizational processes. Through its predictive, analytical and automated capabilities, AI offers new perspectives for streamlining hospital management and improving operational efficiency.

In the area of patient flow management, for example, AI systems can be used to anticipate emergency room peaks, optimize bed allocation or better plan admissions and discharges (Gong et al., 2023). By analyzing historical data in real time, these tools help to reduce bottlenecks, streamline care paths and improve the responsiveness of medical teams.

AI can also play a key role in automating low value-added administrative tasks, such as data entry, medical coding or appointment scheduling. According to the OECD (2020), these automated functions free up time for healthcare staff, enabling them to refocus on their core business: supporting and monitoring patients.

In addition, the use of intelligent medical inventory management systems could significantly optimize hospital logistics, avoid shortages of critical drugs or devices, while keep costs under control.

In this way, the thoughtful integration of AI solutions into the internal processes of Moroccan hospitals could not only improve operational efficiency, but also contribute to a better quality of service for patients, by reducing waiting times, administrative errors and supply disruptions.

4.2. Improved Patient Safety And Satisfaction

One of the most strategic contributions of artificial intelligence to the hospital sector lies in its ability to enhance the safety of care while improving the patient experience. These two dimensions, central to any quality approach, can be significantly supported by intelligent technologies if deployed ethically and appropriately.

In terms of care safety, AI enables the early detection of clinical risks, based on the analysis of massive data from medical records, biological results or connected sensors. According to De Micco et al (2025), the use of intelligent AI-based tools enables early detection of weak signals that could herald medical complications (nosocomial infections, cardiac decompensations, adverse events), enabling care teams to intervene more quickly and preventively.

AI can also support clinical decision-making by providing diagnostic aids or therapeutic recommendations based on international medical databases, reducing the risk of human error, particularly in busy environments.

In terms of the patient experience, AI opens up concrete prospects for personalizing and streamlining the healthcare relationship. Automated triage tools or intelligent communication platforms can help direct patients more efficiently, reduce waiting times and improve the perceived quality of hospital services (Abukhadijah & Nashwan, 2024).

In addition, AI-based applications can facilitate post-hospital follow-up by offering therapeutic education programs tailored to each patient's profile, thereby enhancing their autonomy and overall satisfaction.

However, for these contributions to materialize without generating new inequalities or risks, it is essential to accompany their deployment with approaches that ensure transparency, human supervision and respect for patients' fundamental rights, in line with international ethical recommendations (UNESCO, 2021).

Thus, when properly integrated, artificial intelligence does more than just optimize hospital organization; it becomes a genuine lever for humanizing care and improving patients' overall experience.

4.3. Proactive Clinical Risk Management

Clinical risk management is a fundamental pillar of quality management in healthcare establishments. Traditionally based on the retrospective analysis of undesirable events, it is now tending to evolve towards a more anticipatory approach, in which artificial intelligence (AI) could play a major transformative role.

AI makes it possible to analyze large volumes of clinical, administrative and operational data in real time, enabling early detection of high-risk situations. Thanks to sophisticated predictive models, it becomes possible to identify patients likely to develop complications, fall victim to medication errors or present increased risks of nosocomial infections (De Micco et al., 2025).

This predictive capability gives medical teams a valuable head starts in implementing personalized preventive measures, even before the onset of critical symptoms.

Beyond the individual level, AI also offers a capacity for systemic analysis of hospital processes. By cross-referencing data from patient pathways, human resources and clinical activities, intelligent tools can identify organizational vulnerabilities (such as department overloads, coordination failures or logistical flaws) and propose proactive corrective

actions before incidents occur (Abukhadijah & Nashwan, 2024).

In addition, some hospitals around the world are starting to use AI platforms to simulate risk scenarios (e.g., the impact of a network failure on emergency care) in order to test their response capacity and improve their organizational resilience (OECD, 2020).

For Morocco, where the culture of proactive hospital risk management is still being consolidated, the gradual integration of AI tools could represent a powerful gas pedal for strengthening overall patient safety and anticipating potential failures. However, the success of this transition will depend on the quality of the data available, the acceptability of the tools by healthcare professionals and the establishment of sound ethical and legal frameworks (UNESCO, 2021).

Thus, when used properly, artificial intelligence does more than simply react to incidents: it enables safer, smarter and more resilient healthcare systems to be built.

While the potential contributions of artificial intelligence to hospital quality are undeniable, their realization in the field remains conditioned by numerous challenges.

Beyond the technological promise, the introduction of AI into healthcare facilities raises technical, human, organizational and ethical obstacles, which it is essential to identify and understand to ensure successful and sustainable adoption.

The following section therefore proposes to analyze the main obstacles to integrating AI into quality approaches, based on the realities of the Moroccan context.

5. OBSTACLES TO INTEGRATING AI INTO HOSPITAL QUALITY PROCESSES

Although the prospects offered by artificial intelligence for improving the quality of care are particularly promising, their effective realization faces numerous challenges.

The adoption of AI in hospitals, particularly in the Moroccan context, remains hampered by technical, human, organizational and ethical obstacles, which need to be identified and analyzed rigorously to ensure successful and sustainable adoption.

This section thus proposes a structured analysis of the main obstacles to the implementation of AI in the service of hospital quality.

5.1. Technical And Technological Factors

The integration of AI in Moroccan healthcare facilities is first and foremost limited by infrastructure constraints.

The digital disparity between hospital structures, particularly between urban and rural areas, makes it difficult to deploy intelligent technologies in a homogeneous way. Most facilities do not have interoperable hospital information systems, nor infrastructures capable of supporting massive data processing applications (Ministry of Digital Transition, 2024).

In addition, the quality and accessibility of medical data remain problematic. According to Callegarin and Callie (2021), the success of healthcare AI projects hinges on the availability of accurate, secure and structured clinical data, a prerequisite that is still lacking in many Moroccan public hospitals.

Cybersecurity also represents a growing threat. The increasing networking of information systems multiplies the risk of cyberattacks targeting sensitive medical data (UNESCO, 2021). In the absence of robust cybersecurity strategies and specialized personnel, Moroccan establishments remain vulnerable to these threats.

Finally, as highlighted by Benabbou and Nafzaoui (2024), the fragmentation of AI initiatives, without a unified governance framework, slows down the implementation of a coherent digital transformation of the healthcare system.

5.2. Human And Organizational Factors

Beyond purely technical constraints, the integration of artificial intelligence (AI) in healthcare facilities also comes up against major human and organizational factors, which are often underestimated but nevertheless decisive for the success of digital transformation projects.

The first obstacle is resistance to change on the part of some healthcare professionals. Faced with tools perceived as complex, opaque, or likely to call clinical autonomy into question, some medical staff express legitimate reluctance. According to UNESCO (2021), concerns about the reliability of algorithms, the loss of decision-making control, as well as fears of a dehumanization of the caregiver-patient relationship often fuel a form of institutional distrust of AI solutions.

In addition, the lack of specific digital skills represents a major obstacle. The effective and ethical use of AI requires a minimum understanding of algorithmic principles, bias management, and data security issues. Yet, despite recent efforts in initial and continuing training, a large proportion of Moroccan hospital staff are not yet familiar with

these new requirements (Ministère délégué chargé de la Transition Numérique et de la Réforme de l'Administration, 2024).

At organizational level, the lack of clear strategies to support change also weakens the adoption of AI. Very often, technological projects are considered from a purely technical angle, without integrating a comprehensive change management approach: training, internal communication, user involvement, adaptation of business processes (OECD, 2020). Without this systemic approach, innovations run the risk of remaining at the stage of isolated experiments, with no real appropriation by teams.

Finally, the managerial culture in some healthcare establishments can act as an indirect brake. In environments where hierarchies are highly vertical and individual initiative is little valued; it becomes difficult to create the conditions for collaboration and cross-functionality essential to the successful integration of AI projects.

Human and organizational issues are just as critical as technological challenges. Taking them into account is essential to ensure the sustainable and ethical adoption of artificial intelligence in the service of hospital quality.

6. PROPOSING A STRATEGIC MODEL FOR THE RESPONSIBLE INTEGRATION OF AI INTO HOSPITAL QUALITY IN MOROCCO

In view of the opportunities identified and the obstacles analyzed, it would appear essential to design a specific strategic approach to guide the responsible integration of artificial intelligence into the quality processes of Moroccan healthcare establishments.

This section thus proposes a structured model, articulating technical, human, organizational and ethical dimensions, adapted to local realities and national ambitions in terms of digital transformation of the healthcare sector.

6.1. A Gradual Deployment Approach

In a context such as Morocco's, marked by technological and organizational disparities between healthcare establishments, the integration of artificial intelligence (AI) into quality approaches should not be thought of as a brutal revolution.

On the contrary, it requires a gradual, step-by-step approach to ensure its acceptability, sustainability and lasting positive impact.

First Stage: Exploration And Experimentation

As a first step, it would be appropriate to encourage targeted pilot projects in establishments that already have a minimal digital infrastructure. These experimental projects could focus on simple use cases with high potential for improvement, such as the optimization of hospital appointments, medication inventory management or predictive analysis of patient flows (Gong, Williams, & Phiri, 2023).

The aim of this phase is twofold: to test the technical feasibility of the solutions and to build initial success stories to inspire other establishments.

Second Stage: Evaluation And Adaptation

Experimentation must be accompanied by systematic evaluation, both in terms of tool performance and user acceptability.

This stage is crucial for identifying any necessary adjustments, particularly in terms of training, interface ergonomics and integration into existing processes (OECD, 2020).

Third Stage: Reasoned Generalization

Based on the lessons learned, a gradual roll-out can be envisaged, adapting deployments to local specificities (facility size, patient profile, level of equipment)

Methodical change management support will be needed to ensure that medical and administrative teams adhere to the system, through awareness-raising, training and personalized coaching (UNESCO, 2021).

In this progressive model, it is also essential to prioritize AI projects according to their clinical or organizational added value, and their level of criticality.

Starting with "low-risk but high-value" projects will help build trust and accelerate the innovation dynamic within hospitals.

In this way, the proposed gradual approach offers a realistic and pragmatic way of integrating artificial intelligence into Moroccan hospital quality, avoiding the pitfalls of too rapid or ill-prepared transformation.

6.2. Strengthening Infrastructures And Skills

The successful integration of artificial intelligence (AI) into hospital quality processes depends to a large extent on the ability of facilities to rely on reliable digital infrastructures and appropriate human skills.

In Morocco, these two dimensions are essential levers to be consolidated to ensure a sustainable and inclusive digital transition in the healthcare sector.

Modernizing Hospital Information Systems:

Before introducing advanced AI solutions, it is

necessary to guarantee the complete computerization of healthcare establishments. This implies setting up interoperable hospital information systems capable of collecting, centralizing and processing healthcare data in a secure, standardized way (Ministère délégué chargé de la Transition Numérique et de la Réforme de l'Administration, 2024). Without reliable databases, AI risks being ineffective, or even producing biased results.

The widespread deployment of electronic medical records in all facilities, combined with secure exchange systems between care structures, appears to be an absolute priority for creating an ecosystem favorable to the deployment of AI.

Developing Digital Skills in the Healthcare Sector:

Alongside infrastructure, AI integration requires massive investment in training.

It is crucial to organize ongoing training programs for medical, administrative and technical staff, focusing on:

- ❾ Understanding the basics of artificial intelligence (how it works, its limits, the issues involved),
- ❾ Ethical and responsible use of digital technologies, ➔ Cybersecurity applied to healthcare data.

Internationally, a number of "Health Informatics" training programs, notably in the USA and Europe, aim to equip healthcare professionals with skills at the interface between medicine, digital technologies and data management. These models can serve as a source of inspiration for Morocco, insofar as they combine clinical, ethical and technological learning, and facilitate the appropriation of AI tools in daily practice.

In addition, to avoid widening the digital divide between establishments, training schemes differentiated according to hospitals' levels of digital maturity should be considered.

Support for local research and innovation:

Finally, to avoid technological dependence on foreign players, it is important to support local innovation in AI applied to healthcare.

Setting up inter-university research hubs dedicated to digital health and encouraging local startups could play a key role in adapting solutions to the specificities of the Moroccan healthcare system.

Thus, the combined strengthening of digital infrastructures and human skills appears to be an essential prerequisite for establishing a dynamic for the integration of artificial intelligence at the service of hospital quality in Morocco.

6.3. Building A Suitable Ethical and Governance Framework

The introduction of artificial intelligence (AI) in healthcare establishments cannot be limited to technological or organizational considerations.

It requires the establishment of a rigorous ethical and governance framework, ensuring that the use of these technologies is aligned with respect for patients' fundamental rights, equity of access to care and social trust.

Establishing Ethical Principles Adapted to the Moroccan Context

To date, Morocco has no specific ethical framework dedicated to the use of AI in healthcare.

Inspired by international recommendations (UNESCO, 2021; OECD, 2020), clear principles should be defined:

- Transparency: enabling patients and professionals to understand how the algorithms used in their care work.
- Responsibility: clarify the chain of responsibility in the event of damage caused by an AI tool (doctor, developer, establishment).
- Fairness: avoid any form of algorithmic discrimination, particularly against vulnerable populations.
- Respect for privacy: ensure strict protection of healthcare data, in compliance with international standards such as the RGPD.

Setting Up a National Governance Structure Dedicated to AI In Healthcare

Beyond principles, it's crucial to create a specialized national body responsible for overseeing the development and use of AI in hospitals.

In line with the recommendations of the Conseil Économique, Social et Environnemental (CESE, 2024), this body could take the form of a Comité National d'Éthique et de Gouvernance de l'AI en Santé, inspired by the model set up by Harvard Medical School (2022).

This Committee would have the following missions:

- Systematically evaluate AI projects in healthcare before deployment,
- Guarantee algorithmic transparency and require regular audits of tools, - Ensure equity of access to AI innovations across the national territory,
- Raise awareness of AI-related ethical issues among professionals and the public.

Adapting And Strengthening the Legal Framework

Today, Morocco's legal framework remains fragmentary.

As Jaldi (2022) points out, although legislative initiatives are underway, no specific law yet regulates the use of AI in healthcare in Morocco.

It is therefore becoming urgent:

- Adopt a framework law on AI, including specific provisions for healthcare,
- Provide for a clear civil liability regime in the event of error induced by an AI device,
- Establish certification standards for AI solutions intended for hospitals, guaranteeing their quality, safety and compatibility with patients' rights.

The whole system must be built in an anticipatory and inclusive way, involving healthcare professionals, patients, developers and public authorities.

Thus, the integration of artificial intelligence into hospital quality can only be credible and sustainable if it is framed by solid ethical and legal governance, adapted to the realities of Morocco, and capable of evolving at the pace of technological innovation.

Based on the proposed strategic model, it becomes relevant to compare these results with existing studies and practices observed internationally.

The aim of this section is thus to discuss the scope of artificial intelligence's contribution to improving hospital quality, while highlighting the specific features of the Moroccan context, the limits of the analysis and future research prospects.

7. DISCUSSION

7.1. Putting Other Studies Into Perspective

The strategic proposal developed in this article is part of an internationally observed dynamic aimed at promoting the gradual, ethical and appropriate integration of artificial intelligence into healthcare systems.

The results converge with those of De Micco et al (2025), who insist on the need to adopt a gradual approach to implementation, starting with pilot projects before generalizing AI solutions to all hospital structures.

Similarly, the emphasis placed in this work on strengthening digital skills echoes the findings of d'Abukhadijah and Nashwan (2024), who point out that without adequate training for healthcare professionals, AI risks widening inequalities.

From an ethical standpoint, the need to set up a specific governance framework is also largely confirmed by the recommendations of UNESCO (2021) and the OECD (2020).

In the Moroccan context, Benabbou and Nafzaoui (2024) point out that the digital transformation of the healthcare sector still faces multiple challenges, particularly in terms of infrastructure, human skills and social acceptability.

Their analysis reinforces the idea that any AI deployment needs to be accompanied by a strategy of upskilling and responsible governance to avoid failures of appropriation.

Finally, Chouraik (2024) stresses that sustainable AI in Morocco must imperatively reconcile technological innovation and social equity, which is fully in line with the proposal for an ethical and inclusive framework elaborated in this article.

Thus, the proposed strategic model is in line with a dual requirement: to take advantage of innovations while building a human, organizational and regulatory environment capable of guaranteeing their positive impact.

7.2. Specific Research Contributions

The study carried out in this article makes a number of original theoretical and practical contributions

From a theoretical standpoint, the proposed model enriches scientific thinking on the integration of artificial intelligence into hospital quality processes, by highlighting the need for a contextualized approach.

Contrary to much of the work carried out mainly in developed countries, this research underlines that the implementation of AI in emerging healthcare systems must take into account not only the technological challenges, but also the human, organizational and ethical dynamics specific to local realities.

By integrating elements such as the progressive prioritization of projects, the differentiated reinforcement of skills, and the creation of adapted ethical governance, the strategic model presented offers a reading and action grid specific to the Moroccan context, where few current studies address the articulation between AI, hospital quality and digital transition in developing countries.

On a practical level, this research offers public decision-makers, hospital managers and digital health stakeholders in Morocco an operational roadmap to support the responsible deployment of AI in hospitals.

The model structured around three pillars - gradual approach, infrastructure and skills, ethical governance - provides a pragmatic tool for building

high-impact AI projects, while limiting the risks of technological failures or counterproductive effects on the quality of care.

The table below summarizes the main actions and associated objectives:

Table: Main Actions And Associated Objectives.

Strategic axis	Operational actions	Objectives
1. Gradual deployment approach	- Launch pilot projects in targeted hospitals - Select low-risk use cases (e.g. medical imaging, triage) - Systematically assess impacts (quality, acceptability, safety)	- Minimize the risk of failure - Gradually adapt professional practices
2. Strengthening infrastructures and skills	- Modernize hospital information systems - Ensure interoperability and strengthen cybersecurity - Train healthcare professionals in AI tools - Create mixed teams AI/health	- Ensure a robust technological base - Develop a digital culture among professionals
3. Ethical and regulatory governance	- Set up a national governance body for AI in healthcare - Define national ethical guidelines - Introduce regular audits of deployed algorithms	- Guarantee transparency, accountability and fairness - Strengthen the trust of users and professionals

Source The Authors

Finally, by emphasizing the need for an anticipatory governance framework, this research contributes to the academic and institutional debate around the ethical digitization of public health services in Morocco, an area that has yet to be explored in a systemic way.

7.3. Limitations of The Work

Although this research proposes a relevant strategic model for the responsible integration of artificial intelligence into hospital quality in Morocco, certain limitations must be acknowledged in order to properly situate the scope of the results.

Firstly, this study is based on an essentially theoretical and conceptual approach. No empirical fieldwork (quantitative surveys, qualitative interviews, participant observation) was carried out to directly test or validate the proposed model in Moroccan healthcare facilities.

As a result, the practical relevance of certain recommendations has yet to be confirmed by actual experimentation and feedback from the field.

Secondly, the analysis is based on a narrative review of the literature, without recourse to a systematic methodology such as PRISMA or meta-analysis. Although the sources used are diversified, relevant and verified, it is possible that some recent or emerging work on AI in healthcare, particularly at the African or regional level, has not been included, which slightly limits the comprehensiveness of the synthesis.

Furthermore, the proposed strategic model is deliberately general. It does not take into account certain fine-grained specificities that can vary according to the type of establishment (university hospital vs. provincial hospital), the medical specialty concerned (oncology, emergency, imaging...), or even the more marked inter-regional socio-economic disparities.

Finally, the prospects for the rapid evolution of AI technologies mean that some of the hypotheses formulated in this work are likely to be partially outdated in the medium term. The field of AI in healthcare is in fact constantly changing, and new issues, notably linked to generative AI or advanced language models, may require future adjustments to the proposed framework.

Despite these limitations, this research is a useful first step in structuring thinking and initiating a scientific and institutional debate on the responsible integration of artificial intelligence in the Moroccan hospital sector.

7.4. Avenues For Future Research

In light of the results obtained and the limitations identified, several avenues for future research can be envisaged.

Firstly, empirical field studies would be needed to test the operational validity of the proposed model in different types of facilities.

Secondly, an international comparative approach could enrich our thinking by comparing the Moroccan experience with that of other emerging countries.

Thirdly, it would be relevant to further analyze the perceptions of healthcare professionals and patients towards the use of AI, in terms of trust, transparency and fairness.

Finally, building on the work of Chouraik (2024), future research should also explore the concept of "sustainability" of AI innovations in Moroccan healthcare, particularly by assessing their environmental and energy impact.

Responsible AI cannot only be socially ethical; it must also integrate ecological sustainability criteria into its development and deployment.

8. CONCLUSION

In an era marked by an accelerating digital transition, the integration of artificial intelligence (AI) into hospital quality management processes presents both a significant opportunity and a complex challenge for Morocco. This study proposes a strategic and context-sensitive model designed to meet this dual imperative, combining a phased implementation approach, the reinforcement of digital and human capacities, and the establishment of robust ethical governance mechanisms.

The Moroccan context, as analyzed in this research, is characterized by a dynamic institutional landscape—propelled notably by initiatives such as "Digital Morocco 2030"—alongside enduring structural constraints, including limitations in digital infrastructure, workforce training, and regulatory clarity. Adopting a managerial and strategic lens, this work positions AI not merely as a technological tool, but as a lever for organizational innovation and alignment with the broader objectives of sustainable development.

To the best of our knowledge, this article is the first to articulate, within the Moroccan context, a comprehensive strategic framework that integrates progressive deployment, coordinated capacity-building, and ethically grounded oversight. In doing so, it addresses a critical gap in the literature and offers public decision-makers a pragmatic, scalable roadmap tailored to local realities.

Nevertheless, the theoretical nature of this contribution calls for empirical validation. Future research avenues should include pilot implementations, case studies, and longitudinal assessments to evaluate the tangible impacts of AI on hospital quality and performance. Ultimately, this study aims to contribute meaningfully to the academic discourse on AI in healthcare within emerging economies, while supporting a transition towards an ethical, inclusive, and sustainable digital transformation of the Moroccan hospital system.

REFERENCES

Abukhadijah, H. J., & Nashwan, A. J. (2024). *Transforming hospital quality improvement through harnessing the power of artificial intelligence*. Global Journal on Quality and Safety in Healthcare, 7, 132-139. https://doi.org/10.36401/JQSH-24-4

Benabbou, Z., & Nafzaoui, M. A. (2024). *Artificial intelligence in Morocco : Current situation and recommendations*. Revue Internationale du Chercheur, 5(2), 1-18.

Callegarin, D., & Callie, P. (2021). *Enjeux du déploiement de l'intelligence artificielle en santé*. Presses de l'EHESP.

Carlos, K. M., Hamza, E. K., Yassine, H. I. L. M. I., & Driss, H. E. L. M. I. *The Use of New Technologies in Management Control Systems and their Impact on Managerial Innovation*.

CESE. (2024). *Quels usages et quelles perspectives de développement de l'intelligence artificielle au Maroc?* Economic, Social and Environmental Council.

Chouraik, C. (2024). *Sustainable AI in Morocco: A systematic review of opportunities, challenges and policy directions*. EHEI Journal of Science and Technology, 4(1), 11-26.

De Micco, F., Di Palma, G., Ferorelli, D., De Benedictis, A., Tomassini, L., Tambone, V., Cingolani, M., & Scendoni, R. (2025). *Artificial intelligence in healthcare: transforming patient safety with intelligent systems – A systematic review*. Frontiers in Medicine, 11, 1522554. https://doi.org/10.3389/fmed.2024.1522554

El Kezazy, H. (2022). *Contrôle de gestion et la bonne gouvernance dans les collectivités territoriales: Une revue de littérature*. Revue Internationale des Sciences de Gestion, 5(2).

El Kezazy, H., & Hilmi, Y. (2022). *Towards More Agile Management: Literature Review of Information Systems as the Pillar of Management Control*. Revue Internationale du Chercheur, 3(4).

El Kezazy, H., & Hilmi, Y. (2023). *Improving Good Governance Through Management Control in Local Authorities*. International Review of Management And Computer, 7(3).

El Kezazy, H., & Hilmi, Y. (2023). *L'Intégration des Systèmes d'Information dans le Contrôle de Gestion Logistique: Une Revue de Littérature*. Agence Francophone.

El Kezazy, H., & Nafzaoui, M. A. (2023). *Contrôle de gestion à l'ère de la digitalisation : revue de littérature*. International Journal of Economics and Management Sciences, 2(2), 01–16.

El Kezazy, H., Hilmi, Y., Ezzahra, E. F., & Hocine, I. Z. H. (2024). *Conceptual Model of The Role of Territorial Management Controller and Good Governance*. Revista de Gestão Social e Ambiental, 18(7), e05457-e05457.

Hamza, E. K., et al. (2024). *Strategic Innovation: Integrating System Dynamics into Management Control*. Journal of Ecohumanism, 3(8), 1012-1028.

Hamza, E. K., Sahar, M., Sarah, M., Hanan, D., Jihad, H., & Hijab, Z. (2025). *Promoting the energy transition throughout dealing with the climate change issue*. Dialogues in Humanities and Social Sciences, 3(1), 81–92.

Harvard Medical School. (2022). *Ethical Governance Framework for Clinical AI Implementation*. Center for Bioethics, Harvard University.

Hilmi, Y. (2024). *Contrôle de gestion dans les banques islamiques : Une revue de littérature*. Recherches et Applications en Finance Islamique (RAFI), 8(1), 23-40.

Jaldi, A. S. (2022). *Artificial intelligence in Morocco: Between regulatory framework and economic strategy*. Policy Brief.

Ministère délégué chargé de la Transition Numérique (2024). *Digital Morocco 2030 : Stratégie Nationale de la Transformation Numérique*. Rabat, Morocco.

Nafzaoui, M. A., & El Kezazy, H. (2022). *Contrôle de gestion dans l'industrie hôtelière : Analyse des outils et des enjeux pour une gestion performante et durable*. Revue Du contrôle, De La Comptabilité Et De l'audit, 6(1).

Nafzaoui, M. A., & El Kezazy, H. (2023). *Outils du contrôle de gestion et pilotage de la performance des administrations publiques : revue de littérature*. Revue Française d'Economie et de Gestion, 4(7).

Nene, S. E., & Hewitt, L. M. (2023). *Implementing artificial intelligence in South African public hospitals: A conceptual framework*. Acta Commercii, 23(1), a1173. https://doi.org/10.4102/ac.v23i1.1173

OECD. (2019). *Artificial intelligence in society*. OECD Publishing. https://doi.org/10.1787/eedfee77-en

Radah, A., & Elhia, M. (2025). *Artificial intelligence and improving healthcare provision in Morocco: challenges and prospects*. Journal of Integrated Studies in Economics, Law, Technical Sciences & Communication, 1(1), 1-18. https://revues.imist.ma/index.php/JISELSC/article/view/54520

Sahar, Moukhafi, et al. (2025). *Management of Quality at the Hospital: Evaluation of Patient Satisfaction as a Lever for Improvement Continues*. Journal of Posthumanism, 5(1), 299-314.

UNESCO. (2021). *Recommendation on the Ethics of Artificial Intelligence*. https://unesdoc.unesco.org/ark:/48223/pf0000379920

Y. Hilmi, E. K. Hamza, A. Mounia, & I. Z. Haj Hocine. (2024). *Literature Review on Cost Management and Profitability in E-Supply Chain: Current Trends and Future Perspectives*. 2024 IEEE 15th International Colloquium on Logistics and Supply Chain Management (LOGISTIQUA), Sousse, Tunisia, pp. 1–6. https://doi.org/10.1109/LOGISTIQUA61063.2024.10571529

Yassine, H. I. L. M. I., Zahra, H. A. J. R. I. O. U. I., & Hamza, E. K. (2024). *Systematic review of IPSAS standards: The introduction of IPSAS in public establishments*. Edelweiss Applied Science and Technology, 8(5), 292-306.

Yassine, H., Houmame, A. A., Amine, A., & Driss, H. (2024). *Governance Optimization through Territorial Management Control in Local Authorities*. Pakistan Journal of Criminology, 16(04), 93-110.