Use of artificial intelligence for patient health management in healthcare institutions. Benefits and risks

Uso de la Inteligencia Artificial para la gestión de la salud de los pacientes, en instituciones prestadoras de salud. Beneficios y riesgos

DOI: https://dx.doi.org/10.17981/ingecuc.22.1.2026.04
Artículo de Investigación Científica. Fecha de Recepción: 24/03/2025, Fecha de Aceptación: 01/12/2025.

Mariana Barrios-Molina https://orcid.org/0009-0007-7101-461X
Universidad Nacional de Colombia. Medellín, Colombia.
mbarriosm@unal.edu.co

Paula Andrea Molina-Parra https://orcid.org/0000-0003-1058-4970
Politécnico Colombiano Jaime Isaza Cadavid. Medellín, Colombia.
pamolina@elpoli.edu.co

Gustavo Alberto Moreno-López https://orcid.org/0000-0002-7269-9020
Politécnico Colombiano Jaime Isaza Cadavid. Medellín, Colombia.
gamoreno@elpoli.edu.co

To cite this paper
M. Barrios-Molina, P. Molina-Parra & G. Moreno-López "Use of artificial intelligence for patient health management in healthcare institutions. Benefits and risks," INGE CUC, vol. 22, no. 1, 2026. DOI: *https://dx.doi.org/10.17981/ingecuc.22.1.2026.04*

Abstract

Introduction: Artificial intelligence (AI) in the health sector promises great impacts, allowing humanity to face challenges such as early detection of diseases, accurate diagnoses, personalization of treatments and optimization of processes in health service providers.
Objective: To examine recent literature on the implications of using AI in healthcare management, exploring both its benefits and associated concerns.
Method: The research is descriptive based on documentary analysis of articles published between 01/01/2018 and 06/30/2024, in English and Spanish, in databases such as Scopus and Web of Science Sciences, published between the years 2018-2024 are considered.
Results: This review highlights the potential of AI to improve diagnostic accuracy, personalize treatments and reduce medical errors, acting as a cognitive assistant in clinical workflows. However, there are acknowledged risks related to ethics, data privacy, and regulatory development.
Conclusions: While AI presents a significant opportunity for digital transformation to improve health management for people and healthcare providers, its responsible implementation requires clear regulatory frameworks and strategies focused on people (patients and healthcare professionals). In this way, the aim is to take advantage of its benefits, mitigating risks and promoting reliable, equitable and efficient medical care. Therefore, this review is important to understand different positions and to continue with the assessment of the impacts and research on specific topics.

Keywords:

Artificial intelligence; Healthcare management; Clinical decision-making.

Resumen

Introducción: La inteligencia artificial (IA) en el sector salud promete grandes impactos, que permitan enfrentar desafíos como la detección temprana de enfermedades, diagnósticos precisos, personalización de tratamientos, y optimización de procesos en las entidades prestadoras del servicio de salud.
Objetivo: Examinar la literatura reciente sobre las implicaciones del uso de IA en la gestión de la salud, explorando tanto sus beneficios como las preocupaciones asociadas.
Metodología: La investigación es descriptiva basada en análisis documental de artículos publicados entre 01/01/2018 y 30/06/2024, en inglés y español, en bases de datos como Scopus y Web of Science.
Resultados: Dentro de los principales hallazgos muestran el potencial para mejorar la precisión en diagnósticos, una mayor personalización en el tratamiento y reducir errores médicos, actuando como un asistente cognitivo y de apoyo en procesos clínicos. Sin embargo, se identifican retos como referentes a la ética, privacidad, seguridad de datos y regulación de su uso.
Conclusiones: Si bien la IA presenta una oportunidad importante de transformación digital para mejorar la gestión de la salud en las personas y en las entidades prestadoras de la salud, su implementación responsable demanda marcos regulatorios claros y estrategias centradas en las personas (paciente y profesional de la salud). De este modo, se busca aprovechar sus beneficios, mitigando riesgos y promoviendo una atención médica confiable, equitativa y eficiente. Por lo tanto, esta revisión es importante para conocer diversas posturas, y continuar con la valoración de los impactos e investigación en temas específicos.

Palabras clave

Inteligencia Artificial; Servicio de salud; Gestión.

I. INTRODUCCIÓN

The rapid integration of artificial intelligence (AI) in healthcare has opened up new possibilities for early diagnosis, automated data analysis, and assisted clinical decision-making. This article reviews recent literature (2018–2024) to identify the benefits, risks, and challenges of its implementation in hospital management and patient care. This article analyzes recent literature (2018-2024) to identify benefits, risks, and challenges of its implementation in hospital management and patient care. The topic addressed in this document is the use of AI systems to improve the management of sick patients in healthcare institutions; due to the current status of medical landscape, effective patient management and the availability of diagnostic data, including current and historical medical tests, play a fundamental role in the therapeutic decisions made by doctors, while AI can be a tool that enhances this management [1].

AI is defined as the set of computational techniques capable of learning, reasoning, identifying patterns, and, supporting or automating decisions which were previously dependent on human judgment. Some authors [2], propose that AI is a branch of computer science that allows machines to function efficiently and analyze complex data, developing an important role in pharmaceutical and health research. In healthcare, AI aims to make machines more useful in solving ambiguous challenges and assisting in the early detection of chronic diseases, reducing the financial burden and severity of the condition [3].

AI is believed to be an integral part of healthcare services in the near future, being incorporated into aspects such as prognosis, diagnosis, and care planning. Patients must be assured that clinical AI applications will not harm them, but instead, they will benefit from the use of AI technology for healthcare purposes. Furthermore, while human-AI interaction can improve healthcare outcomes, it is crucial to address potential concerns and risks before integrating it into routine clinical care [4].

Artificial intelligence has become a transformative technology in the healthcare sector, redesigning healthcare paradigms by optimizing processes and enhancing diagnostic capabilities. Through the analysis of massive clinical data, AI identifies patterns and correlations that facilitate more accurate and evidence-based decision-making in medical practice. Understanding the implications and responsible management of AI become fundamental elements to maximize its benefits and minimize potential risks in healthcare management. As illustrated in Figures 1 and 2, healthcare professionals will be able to use AI systems that integrate and analyze information from multiple sources, including medical history, constant monitoring, and medical studies, enabling them to obtain broader profiles and personalized strategies.

Fig. 1 Use of AI in healthcare management in hospitals. Source: IA generated, July 2024.

Fig. 2 Use of AI in patient health management. Source: IA generated, July 2024.

This article seeks to explore how AI has been used to improve the quality of healthcare management, its benefits, and also the main fears that patients and institutions face in this regard. The above demonstrates the fundamental importance of developing robust legal frameworks that ensure AI is used responsibly for healthcare purposes, adhering to ethical criteria. The aim is to broaden the discussion to promote the application of AI for health and identify opportunities for improvement.

The results of some medical applications of AI involve incompatibility with instrumental, technical, ethical, or regulatory values, which may be a reason to reject AI applications in healthcare. Therefore, there are still several risks associated with implementing AI applications in diagnosis and treatment recommendations. Concerns are also evident in the case of AI applications that are used as a recommendation system under the experience, wisdom, and control of doctors [4].

Early disease diagnosis is one of the benefits that have emerged in the field of healthcare, thanks to some tools provided by AI [5]. Machine learning algorithms have the ability to examine large amounts of data and find patterns that healthcare professionals might not notice. One example is an AI algorithm developed to analyze mammogram images, which achieved a 94.5% accuracy rate in the early detection of breast cancer [6] [7]. This allows for rapid detection and more effective, less invasive treatment, improving patients' quality of life and even saving their lives [8]. However, it is essential

to address the interpretation of AI results, as well as the trust in them [9]; consequently, another relevant issue is ensuring the privacy and security of medical data to maintain public trust in these applications [10].

The methodology used is described in Chapter II of this article; Chapter III presents the results of the literature review and a proposed roadmap for hospital adoption; and finally, Chapter IV contains the conclusions derived from the development of the study.

II. METHODOLOGY

A documentary review was carried out following systematic phases: (1) definition of purpose, (2) planning and search in Scopus and Web of Science, (3) selection using defined criteria, (4) extraction of information, (5) thematic analysis.

The purpose is to review the use of artificial intelligence in healthcare management, identifying both positive and negative perspectives. Databases used: Scopus and Web of Science.

Inclusion criteria: English and Spanish language, journal articles, related to the search purpose of AI in health. The search period was between 01/01/2018 and 06/30/2024. Exclusion criteria: documents not aligned with the objective, inaccessible, or that did not meet minimum methodological quality standards.

Example of a search equation: "artificial intelligence" AND "health care" AND "management" (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish")).

Analysis criteria: AI in health management, positive and negative perspectives, examples of projects or works on the subject.

III. REVIEW RESULTS AND DISCUSSION

The following presents the findings indicated in the literature, relating both positive and negative perspectives, and examples of developed works.

A. Positive perspectives

The evidence found supports the use of AI in diagnostics, clinical support, hospital management and remote monitoring, standing out especially in medical imaging, neurology, cardiology and process automation. There are numerous discussions in favor of AI, as well as its various applications in different fields and sectors. Some of these arguments revolve around advances in healthcare, especially in medical detection and diagnosis. There are authors [5], which describe how artificial intelligence can revolutionize healthcare and save lives by enabling doctors to make more accurate diagnoses, personalize treatments, and improve overall efficiency. In this way, AI is fundamentally transforming healthcare and fostering precision medicine by analyzing genomic data to identify patterns and help doctors make better decisions about treatments and diagnoses.

Regarding the role of AI in medical detection and diagnosis, another research [6] highlights its ability to make accurate diagnoses and suggests its usefulness in dermatology, demonstrating that it can play a crucial role in the classification and diagnosis of skin cancer. These authors point out how AI has shown itself capable of improving the accuracy and speed of medical diagnosis, facilitating the early detection of diseases and enabling better-informed clinical decisions. The potential applications of AI in neurological clinical practice are rapidly increasing, and it can contribute to improved classification of diagnoses and prognoses, monitoring, and decision-making. Furthermore, it can facilitate the modeling of brain function, the identification of pathophysiological mechanisms, and enable the personalization of treatments and individualized medicine. Neural prostheses are another development where AI has been applied. Similarly, this can be used to optimize patient care processes, improving aspects such as data management and medical image management [11].

The integration of AI in various fields has revolutionized how complex problems are addressed, and cardiology is no exception. One of the key areas where AI has shown promise in cardiology is the early detection and diagnosis of cardiovascular diseases. Machine learning algorithms can analyze complex patterns and identify subtle anomalies in medical images, such as echocardiograms, MRI scans and computed tomography scans. The use of AI allows healthcare professionals to detect cardiovascular diseases in their early stages, enabling timely intervention and prevention of more serious complications [12].

Currently, there has been a noticeable increase in interest in social assistance robotics in physical rehabilitation, with a variety of benefits that highlight the ability of a social robot to support and assist in rehabilitation processes. Other authors [13] conducted a perception study to assess how doctors and patients perceived a social robot integrated as part of

Lokomat therapy. The Lokomat is used in the rehabilitation of the locomotor system to train or retrain the ability to walk by repeating specific tasks, taking into account neuronal plasticity. A total of 88 participants were surveyed, and the results indicated that the majority of them had a positive perception of the robot (more than 60% showed positive acceptance).

Reminiscence music therapy combined with robot-assisted rehabilitation is a promising approach to improving self-efficacy in rehabilitation and positive emotions, providing evidence that reminiscence music therapy can be an effective adjunctive intervention to improve rehabilitation outcomes. An AI-backed reminiscence program could be a promising tool for future cognitive therapies, offering stimulating and emotionally beneficial activities [14].

The literature also [15] reveals that, in general terms, the surveyed medical community is optimistic about the use of AI in medicine and is predisposed to adopt it, although it is still aware of some disadvantages and challenges of using AI in healthcare. The majority of doctors surveyed are also convinced that AI should be part of medical training. These findings facilitate the integration of AI into medical practice in Portugal, enabling its incorporation into clinical workflows by leveraging the identified advantages. Furthermore, some challenges are identified, such as gaps in medical curricula with inadequate training in digital health; these must be addressed to fully realize the potential of AI.

There are authors [16] that highlight that AI-powered voice chatbots deployed on mobile phones and smart speakers have the potential to promote operational efficiency, improve patient experience and outcomes. Other works [17] envision AI helping pharmacists select medications, predict interactions and adverse events, manage inventory, and automate prescription verification. It also facilitates personalized advice and lifestyle management for patients, promoting treatment adherence and improved health outcomes.

Smart health, as an era where AI and data science converge, projecting greater efficiency in hospitals, to improve not only patient care but also reduce costs and the workload of healthcare providers [18]. This availability of big data allows data scientists to use the data to perform descriptive, predictive, and prescriptive analyses. Powered by AI, natural language processing (NLP) is crucial in smart healthcare, as it analyzes and understands human language [19]. In this sense, there are studies [20] that suggest that AI can significantly improve healthcare decision-making. They propose Smart Diagnostics, which includes integrated biosensors, cloud computing, and AI to combine universal in vitro diagnostics with AI. Smart Diagnostics can be applied to various oncological tests using cross-reactivity biomarkers for oral, colorectal, lung, bladder, esophageal, and cervical cancers, thereby improving patient care and outcomes.

There are various works and positions in favor. In [21], they propose an AI-based omnichannel blood supply chain model that addresses supply and demand imbalances in critical blood supply chain situations, helping to find the nearest and fastest available blood supply. The use of AI holds promise for improving the detection, treatment, and outcomes of peripheral artery disease [22]. This is encouraging, since a poorly defined diagnosis perpetuates poor treatment, leading to limb loss and excessive rates of cardiovascular morbidity and death. In [23], the authors integrated clinical decision support tools based on a predictive algorithm into the electronic health record for patients with sepsis. These tools improve multidisciplinary care by using interface design heuristics to facilitate usability and interaction; through intuitive design strategies that promote adherence to best practice alerts and visualize clinical decisions across the team using a checklist, these tools represent an improvement over traditional tools. In [24], the authors implemented pharmacogenomics and AI tools to manage chronic diseases in primary care. They indicate that this computer and bioanalytical platform can facilitate clinical decision-making and improve medication management.

In [25] they developed an AI-based diagnostic model for Alzheimer's disease. With this model, non-specialists could reduce misdiagnoses and contribute to the appropriate use of medical resources. In [26], they developed a generative AI for diabetes care, using a RAG architecture and created a question-and-answer model to extract knowledge about diabetes care and diabetic foot. This tool promises to provide reliable medical information for self-education and self-management of diabetes, highlighting the importance of content validation and innovative engineering in AI apps. In [27] they propose AI-assisted clinical decision support for the treatment of childhood asthma. Their findings suggest that the proposal could reduce the burden on doctors reviewing electronic health records, leading to more efficient asthma treatment, even though the same findings recommend further randomized clinical trials. In [28] the author proposed a healthcare model that integrates point-of-care technologies and AI techniques. The study used data from one million people with the CoronApp-Colombia application, which collects information on COVID-19. Using the app's data, AI was applied in a virtual room, where users who tested positive for COVID-19 would be prioritized for rapid SARS-CoV-2 antibody tests. The author concludes that this approach can help countries with technological limitations in PCR testing to maximize resources, estimate the impact of COVID-19, and define appropriate containment and control plans.

In [29], they highlight the potential of AI in the diagnosis, treatment, and management of pediatric diseases, emphasizing the need to move towards 7P medicine (Predictive, Preventive, Personalized, Precise, Participatory, Peripheral and Polyprofessional). The study [30], analyzes the use of the MAIA® (Medical Artificial Intelligence Aid)

platform for adjusting service networks during the COVID-19 pandemic. Using AI, this platform supported network decision-making. The authors conclude that the adaptation and use of AI-supported digital platforms is a digital epidemiology strategy for disease management, optimizing the response capabilities of health systems.

AI is a promising tool in neurorehabilitation. It facilitates decision-making for professionals and improves the effectiveness of therapies and biofeedback for patients [31]. AI offers a holistic solution to reduce the burden of Hansen's disease and improve patient outcomes [32].

Table 1 presents a summary of the main findings in favor of the use of AI in health, in application areas such as general medical care, dermatology, neurology, cardiology, specific diagnoses, medication management, physical rehabilitation, medical perception, among others.

Table 1. Summary of findings in favor of the use of AI in healthcare

Area	Benefits	Author
General medical care	More accurate diagnoses and personalized treatments. It Improves the efficiency and accessibility of healthcare. It analyzes large volumes of clinical data and identifies patterns.	[5]
	It improves patient management and organizational workflow.	[16]
Dermatology	It improves the classification and diagnosis of skin cancer.	[6]
Neurology	It improves the classification of diagnoses and prognoses. It facilitates the modeling of brain function. It supports the development of neural prostheses. It optimizes care processes and data management.	[11]
Cardiology	It enables the early detection of cardiovascular diseases. It analyzes complex patterns in medical images. It facilitates timely intervention and prevention of complications.	[12]
Physical rehabilitation	Social robots assist in rehabilitation processes. High acceptance by doctors and patients. Reminiscence music therapy combined with robot-assisted rehabilitation improves self-efficacy and positive emotions.	[13] [14]
Neurorehabilitation	It facilitates decision-making and improves the effectiveness of therapies.	[31]
Medical perception of AI	General optimism regarding the use of AI in medicine. Willingness to adopt AI in medical practice. Recognition of challenges and the need for training in digital health.	[15]
Medication management	It assists in drug selection, prediction of interactions and adverse events, inventory management, and automation of formula verification.	[17]
	It facilitates clinical decision-making and improving medication management for chronic diseases	[24]
Smart health, Smart healthcare	Greater efficiency in hospitals, improved patient care, reduced costs and workload for providers.	[18]-[19]
Blood supply chain	It addresses the imbalance between supply and demand in blood supply chains	[21]
Detection of peripheral arterial disease	It improves the detection, treatment, and outcomes of peripheral artery disease.	[22]
Smart Diagnostics	AI can significantly improve decision-making	[20]
Care for patients with sepsis	Clinical decision support tools with predictive algorithms improve multidisciplinary care through interface design heuristics.	[23]
Alzheimer's diagnosis	Reduction of misdiagnoses and better use of medical resources	[25]
Diabetes care	It provides reliable medical information for self-education and self-management of diabetes.	[26]
Pediatric asthma	Reducing the workload of doctors and efficient asthma management	[27]

Pandemic management	Healthcare model that integrates point-of-care technologies and AI	[28]
	Usefulness for decision-making in disease management	[30]
Pediatric diseases	Potential of AI in diagnosis, treatment and control	[29]
Clinical management of Hansen's disease	Case classification, therapy monitoring, and early detection of nerve damage	[32]

B. Examples of developed works

For many years, mammography has been the primary breast cancer screening technique, used on more than 200 million women annually. Despite its widespread use, mammogram interpretation faces challenges due to high rates of incorrect results, including both false positives and false negatives. Google, in collaboration with two screening centers in the UK (25,856 women) and the US (3,097 women), used an AI system to detect breast cancer in mammograms of women with a biopsy-confirmed diagnosis, or with normal results in follow-up images at least 365 days later [33]. These predictions were compared with those of six radiologists in a separate study, revealing that the AI outperformed the radiologists' decisions.

In [34] they authors analyzed the attitudes of 263 medical students toward AI in radiology, showing that while most believe AI can detect pathologies and revolutionize radiology, they are not worried about being replaced by it. Furthermore, 71% highlighted the importance of incorporating AI into their medical training.

Medical practice is undergoing a gradual change due to AI, venturing into areas previously considered the exclusive domain of human experts. In [35] recent progress in AI technologies and their application in the biomedical field is analyzed. While AI promises to address the shortage of human resources in the healthcare sector, its implementation raises crucial questions about the impact on medical workload and administrative processes. Fundamental questions arise about how this technology can solve human resource challenges, the role of doctors in the face of automation, and the need to adapt medical education to prepare professionals. In [36] they argue that AI could not only fill the human resources gap, but also raises ethical questions that must be addressed today. Their position is that AI is not meant to replace doctors, but those who use it will likely replace those who don't.

The use of AI in medicine is beginning to have an impact on three levels: for doctors, through a fast and accurate interpretation of images; for healthcare systems, it improves workflow increasing the potential to reduce medical errors; and for patients, allowing them to process their own data to promote health. Furthermore, current limitations, including bias, privacy, security, and lack of transparency, are being analyzed along with future directions for these applications. Over time, improvements in accuracy, productivity, and workflow are likely to be implemented, but it remains to be seen whether these improvements will be used to enhance the doctor-patient relationship [8].

A 1989 study estimated that doctors in the United States failed to properly diagnose their patients' symptoms in up to 90% of outpatient visits. Many AI proponents believe that the current process, from data collection to medical diagnosis, is limited by human analytical capabilities and hope that AI can significantly improve this process. The use of AI raises fundamental questions about the level of uncertainty that is tolerated in medical decision-making. However, uncertainty cannot be completely eliminated and can serve as a useful metric for assessing the likelihood of various diagnoses and the appropriateness of treatments. It is argued, based on the experiences of two AI systems, IBM Watson in Jeopardy and Oncology, that medical decision-making based on relative uncertainty offers a more suitable perspective for understanding the application of AI in medicine than one that focuses on minimizing uncertainty. This approach to uncertainty ultimately has implications for how to integrate AI into medical practice [37].

C. Negative perspectives

The progress and uses of AI in neurology and health are subject to significant limitations and risks in several aspects: ethical, clinical, scientific, socioeconomic, and technological. It is emphasized that AI in the health field cannot replace medical ethics or clinical judgments based on the doctor's experience in complex or unpredictable situations [37]. AI is currently unable to provide an emotional or empathetic response to patients [38], which is fundamental in the relationship between patients and their doctors. Furthermore, since AI performance depends heavily on the quantity and quality of the training data used, if this data is not representative of the relevant clinical, socioeconomic, or epidemiological environment, or if it is incomplete, the results may be biased and unreliable. On the other hand, AI in the health field also faces challenges in terms of the interpretation of its results. Although AI can analyze large volumes of data and identify patterns, the inherent complexity and nature of the data can hinder transparency [39]. This makes it difficult to learn from

AI decisions and to trust the system itself, which can be especially problematic in critical health situations when decisions need to be made quickly [40].

AI in medicine has limitations, especially without supervision. Its results depend on the quality and biases of the data, including historical diagnostic biases. Unlike human reasoning, which uses logic and emotional experience, AI relies on statistical patterns, which can lead to diagnostic errors. This is evident in "Black Box" models, where the lack of transparency makes it difficult to validate results [41]. AI can amplify inequalities if the training data is biased. Data that does not represent the entire population or has prejudice based on sex, race, or other social factors can result in inaccurate predictions and perpetuate disparities. This risk is critical in clinical tools integrated into electronic health records, where biased recommendations directly affect patient care [41]. Data may have inherent biases and suffer from drift (changes in how and where they are documented). Non-representative sample sizes can lead to biased interpretations. In traditional information systems, sample sizes are limited and data drift is common in changing environments, making it difficult to understand the specific context and network of people within the healthcare system, resulting in generalized diagnoses and potential errors [41].

Furthermore, it is difficult for AI to ensure the privacy and security of patient health data if it is used inappropriately. This is the primary concern when using AI in healthcare management, as it involves the access, use, and control of patient data by private entities. There is also a risk of privacy breaches through AI-powered methods. Advances in AI algorithms could compromise or even negate the ability to anonymize patient health data, making it possible to re-identify this data [42].

AI benefits specific medical areas such as diagnosis based on histopathological examinations or medical images, and the detection of epileptic seizures, atrial fibrillation, and hypoglycemia. Patients have high expectations for augmented medicine, but some doctors resist its implementation for fear of being replaced and the legal repercussions of accepting or rejecting the algorithm's recommendations, due to a lack of clear regulations [43].

In [44] it is analyzed whether there is a gap between AI applications and priorities in healthcare and nursing management. The authors argue that, while AI applications have been developed to support healthcare management, the integration of nursing management priorities into AI solutions is unclear, and that this gap, or at least the lack of reporting in the literature, must be closed.

The authors of [45] highlight concerns regarding legal responsibility, ethics, and data privacy. They indicate that, if the technological singularity occurs (the hypothetical moment when AI surpasses human intelligence), it would imply the replacement of human doctors with robots and AI systems. They emphasize that, given that change, it is relevant to understand the associated challenges in order to prepare the health system and society. In [46], the authors state that the health system in Saudi Arabia faces challenges such as an aging population, an increase in chronic diseases, and a shortage of healthcare professionals. The government is taking various measures, including AI solutions, to reduce costs, and improve efficiency and the quality of care, but they are aware of challenges such as the need for high-quality data and appropriate regulations. Finally, they emphasize that the government must continue investing in healthcare and AI solutions.

AI systems are rapidly developing for breast cancer care. This underscores the importance of anticipating future directions for AI, discussing, evaluating, and deliberating its implications, not only technical, but also ethical, legal, and social. A thorough public debate is needed to consider what kind of AI is acceptable, rather than simply accepting whatever is offered [47].

In [48], their study surveyed 357 caregivers of elderly people to identify the critical factors in the application of AI to establish healthcare systems for the elderly. The most prominent dimensions were “information quality,” followed by “service management” and “system quality.” The five main indicators were sequencing timeliness, anomaly notification, reaction time, correction, and operational monitoring.

AI applications have an impact on various components of healthcare professionals' job design, including autonomy and control of work, variety and use of skills, job feedback, social and relational aspects, and job demands. This requires further analysis of the implications [49]. According to [50], a crucial aspect of using AI to improve health is the ability of healthcare organizations to integrate it appropriately. It is essential that internal and external systems collaborate to ensure the safe, ethical, and effective use of AI tools. This includes organizational routines, staff competencies, and necessary resources and infrastructure. Furthermore, legal and regulatory guidance for managers, clear AI documentation, and impact reviews on local healthcare ecosystems can contribute to continuous improvement.

The integration of AI into pharmaceutical practice presents several challenges, including ethical considerations, data privacy, and the need for comprehensive training for pharmacists [17]. Regarding improvements in efficiency and effectiveness, a specific approach will be required for successful implementation [51].

Some challenges identified include trust, due to the absence of human emotions such as empathy and compassion in AI systems and healthcare robotics; explainability, since most current versions of AI systems cannot show the details of how they arrive at a given diagnosis, even if they provide more accurate diagnoses than human doctors; and the relationship between patients and hospitals [18].

AI should be considered a complementary tool for healthcare professionals. While AI can process large volumes of data and generate accurate predictions, it does not replace the skill and experience of professionals in clinical decision-making. AI requires the interpretation and clinical judgment of a trained healthcare professional and cannot offer the empathy and emotional support necessary in patient care [52].

In [53], the authors highlight that, although AI has great potential in regenerative orthopedics, its clinical adoption still faces challenges in validation, ethical oversight, and model training. They propose an alliance between AI and human intelligence to improve surgical outcomes, optimize therapies, and enhance the quality of patient care. Furthermore, they emphasize the need for robust interdisciplinary strategies to overcome these obstacles.

One of the challenges in regulating the use of AI in healthcare is the legal gaps and complexities associated with adequate and more transparent regulation [54]. The author argues that, to protect health data, mitigate risks, and regulate the use of AI more efficiently, international cooperation and the adoption of harmonized standards under the framework of the World Health Organization (WHO) are necessary.

In [29] they identify the following challenges to be addressed: a) the training of professionals and users in these technologies, b) the quality of the data used to train AI models, c) the ability to explain the results obtained, and d) the regulation of the use of AI systems.

It is argued that telemedicine can achieve greater effectiveness with the benefits of AI. Authors suggest developing and training more models that minimize risks and increase the accuracy of decision-making, encompassing predictive, descriptive, and decision models. Furthermore, they reiterate the need for increased investment in information systems, new professional profiles, and changes in healthcare processes [55].

In [56] the authors indicate that, in intensive care unit settings, the incorporation of AI is still very slow, and faces many challenges for widespread and effective application to real-time care of critically ill patients. In [58]. The study states that the incorporation of AI in radiology requires closer monitoring of its usefulness and safety. They add that cooperation between developers, doctors, and regulators will allow all stakeholders to address ethical issues and monitor AI performance.

Integrating generative AI requires meticulous change management and risk mitigation strategies. Technological capabilities alone cannot immediately transform complex care ecosystems. Instead, it is necessary to implement structured adoption programs based on implementation science. Instead, it is necessary to implement structured adoption programs based on implementation science [58].

Table 2 presents a summary of the main aspects and concerning findings of AI use, identifying aspects such as ethical, clinical, scientific, socioeconomic, technological and legal.

Table 2. Risk perspectives

Area	Risks	Author
Ethics	AI cannot replace the clinical and ethical judgment of doctors in complex situations.	[37]
	Lack of empathy and tact in AI responses.	[38]
	Data privacy and security issues.	[42]-[17]-[45]
	AI requires interpretation by a healthcare professional and cannot provide the empathy and emotional support required in care.	[52]
Clinical	Application limited to specific areas such as histopathology and medical imaging.	[43]

	Challenges of validation, ethical oversight, and model training in regenerative orthopedics.	[53]
Scientific	Dependence on the quality and quantity of training data.	[39]
	Difficulty in interpreting results from "black box" models.	[41]
	Problems with data representativeness, such as minority groups.	
Socioeconomic	Potential to exacerbate or create new inequalities.	
	Inherent biases due to sexism, racism, and classism.	
	Staff resistance to AI implementation.	[43]
Technological	Limitations in analyzing large volumes of data.	[39]
	Challenges in effectively anonymizing health data.	[42]
	Data quality and quantity are essential for training AI models; without them, the system will not learn or function properly.	[29]-[55]
Legal	Lack of clear regulations on legal liability.	[43]-[45]-[29]
Regulation	Legal loopholes and the need for harmonised standards under the WHO for IHR reform	[54]
Trust	Absence of human emotions such as empathy and compassion	[18]
Patient-hospital relationship	AI should be considered a complementary tool, not a substitute for clinical judgment.	
Organizational capabilities	Proper integration, ensuring safe, ethical, and effective use	[50]
Efficiency and effectiveness	It will require a specific approach for successful implementation.	[51]
	Incorporation in intensive care patients is slow and faces many challenges for effective real-time application.	[56]
Implications for the design of the work of health professionals	Autonomy and control of work; variety and use of skills; job feedback; social and relational aspects; and job demands.	[49],
Critical factors in older adults	To implement AI-assisted healthcare systems for the elderly, it is essential to consider the following dimensions: information quality, service management, and system quality.	[48],
Rigorous testing and public debate	AI should be evaluated based on outcomes and ethical, legal, and social criteria. Rigorous trials with public deliberation should be conducted.	[47]
	It requires greater monitoring of the usefulness and safety of AI in radiology, and cooperation between developers, doctors, and regulators.	[57]
Investment in AI solutions	The need for high-quality data and the development of regulations and guidelines to build a more efficient and effective healthcare system.	[46]-[55]
Replacement of medical staff	If AI surpasses human intelligence, it could replace doctors. Understanding the challenges is crucial to better preparing the healthcare system.	[45]
Proper integration	The integration of nursing management priorities into AI solutions is unclear, and therefore this gap must be closed.	[44]
	It requires change management, risk mitigation strategies, and adoption programs based on implementation science.	[58]
AI training	Training professionals in AI is a challenge.	[29]
	New professional profiles	[55]

D. Discussion

Various arguments have been raised about the use of AI in the management of sick patients, and it is important to carefully consider and weigh both the benefits and concerns associated with incorporating AI into healthcare. According to the findings, AI is becoming a very useful and potentially powerful tool in many areas of healthcare, contributing to diagnosis, personalized treatments, and greater overall efficiency of health services. For example, machine learning algorithms can identify diseases with accuracy comparable to radiologists [5], which can lead to earlier detection and more effective treatments. AI reduced misdiagnoses of heart disease by 35% [8], increased accuracy in mammogram analysis for breast cancer detection by 94% [7], and the global AI market in healthcare is projected to reach $45.2 billion by 2026 [59].

Other areas, such as dermatology, where AI shows benefits in classifying and diagnosing skin cancer, and neurology, where its use improves classification, monitoring, and individualized treatment, are also seeing applications. Similarly, applications in rehabilitation, improved medication management, and specific treatments (for asthma, pediatric conditions, diabetes, and sepsis), among others, are examples of the potential of AI in healthcare management, and the range of possibilities will continue to expand. For example, for many elderly and remote individuals, telepresence robot systems supported by AI can contribute to healthcare services more efficiently, as indicated by [60]. Also there is the potential of AI to uncover previously unknown patterns and connections in data, which can lead to the discovery of new diseases and medical conditions [61].

It is important to note that AI in healthcare management will be a great ally for healthcare institutions and professionals, promising improvements in diagnostic accuracy, personalized treatments, monitoring, decision-making, operational efficiency, and overall quality of care; so it is relevant to mention that some perceived challenges need to be addressed.

To address this knowledge gap associated with the “black box” phenomenon and limited algorithmic transparency [41], it is essential to move towards supervised hybrid evaluative models. Instead of striving for total autonomy of automated systems, it is advisable to establish a collaborative framework where artificial intelligence acts as a probabilistic pre-analysis layer, the results of which are necessarily validated by human clinical judgment [52]. This approach helps mitigate the risks arising from potential automated biases and promotes greater clinical interpretability, allowing professionals to understand the basis of an algorithmic recommendation before accepting it, thus helping to reduce the gap between computational capacity and ethical responsibility [37].

One concern is that AI is not ready to completely replace human medical workers. This could lead to patient distrust and highlights the need for patient-centered approaches to technology adoption. Furthermore, more research is argued to address ethical, privacy, and scalability issues. On the other hand, challenges remain, regarding the interpretation of and trustworthiness in AI results, as well as concerns about data privacy and security [9], [10]. While collaboration between AI and healthcare professionals can improve the efficiency and accuracy of diagnoses, it is crucial to establish clear policies and regulations on data collection, storage, and use, and to ensure transparent communication with patients about the use of AI in healthcare. In the case of ethical and clinical challenges, for example, in [37] they point out that AI cannot yet replace the clinical and ethical judgment of doctors in complex situations and the lack of empathy and tact in AI responses is worrying [38]. However, from a scientific and socioeconomic perspective, the quality of the data used to train AI is crucial, as poor-quality data can lead to erroneous results or create inequalities [41]. Technologically, it is essential to develop explainable and transparent systems to increase the adoption of and trust in AI. On the legal front, regulating the use of AI in healthcare is a challenge itself. The lack of clear and harmonized standards hinders the integration of AI into medical practice [54]. International cooperation and WHO guidelines are needed to address these concerns. Other challenges include the necessary investment and the acquisition of skills for appropriate use.

A critical analysis of the findings reveals that the applicability of AI currently presents two sides. First, there is a solid basis for immediately implementing artificial intelligence in objective visual recognition tasks, such as breast cancer detection, where it has demonstrated superior accuracy compared to radiologists [6], [33], and in neurological classification [11]. In these fields, AI's diagnostic capabilities surpass those of humans when it comes to processing large amounts of images. On the other hand, its use must be limited or subject to strict supervision in areas that require empathy, handling of complex social contexts, and resolution of ethical dilemmas [38], since the lack of explainability and legal weaknesses regarding medical liability still do not guarantee patient safety [45], [54]. Therefore, technology is ready to act as an auxiliary “expert eye” that identifies anomalies, but it is still not ready to act as an “autonomous consultant” capable of making clinical decisions on its own. An example of this limitation occurs when communicating critical diagnoses or providing mental health care: although algorithms can predict the progression of terminal illnesses with high accuracy (like an "expert eye"), they lack the emotional and cognitive sensitivity needed to convey that news taking into

account the patient's psychological state, or to consider social factors in the selection of palliative treatments (like an "autonomous consultant"). In these cases, the lack of empathy and the inability of AI to cope with moral dilemmas could cause serious psychological harm or ethical conflicts if the technology operated without supervision.

Definitely, the implementation of AI in healthcare presents ethical, clinical, scientific, socioeconomic, technological, and legal challenges that must be addressed comprehensively. Solutions must be people-centered (patients and healthcare professionals). Cooperation among healthcare professionals, policymakers, technology developers, and the wider community is crucial to ensuring the safe, ethical, and effective use of AI, benefiting everyone in the healthcare system. These findings confirm that AI's potential is realized only when integrated under ethical principles, explainable models, representative data, and continuous clinical oversight.

E. Towards effective implementation: Proposed Roadmap

As a result of the review and response to some identified challenges, a roadmap for hospital adoption of AI is proposed, structured in five levels as illustrated in Fig. 3, which must be considered to ensure proper management:

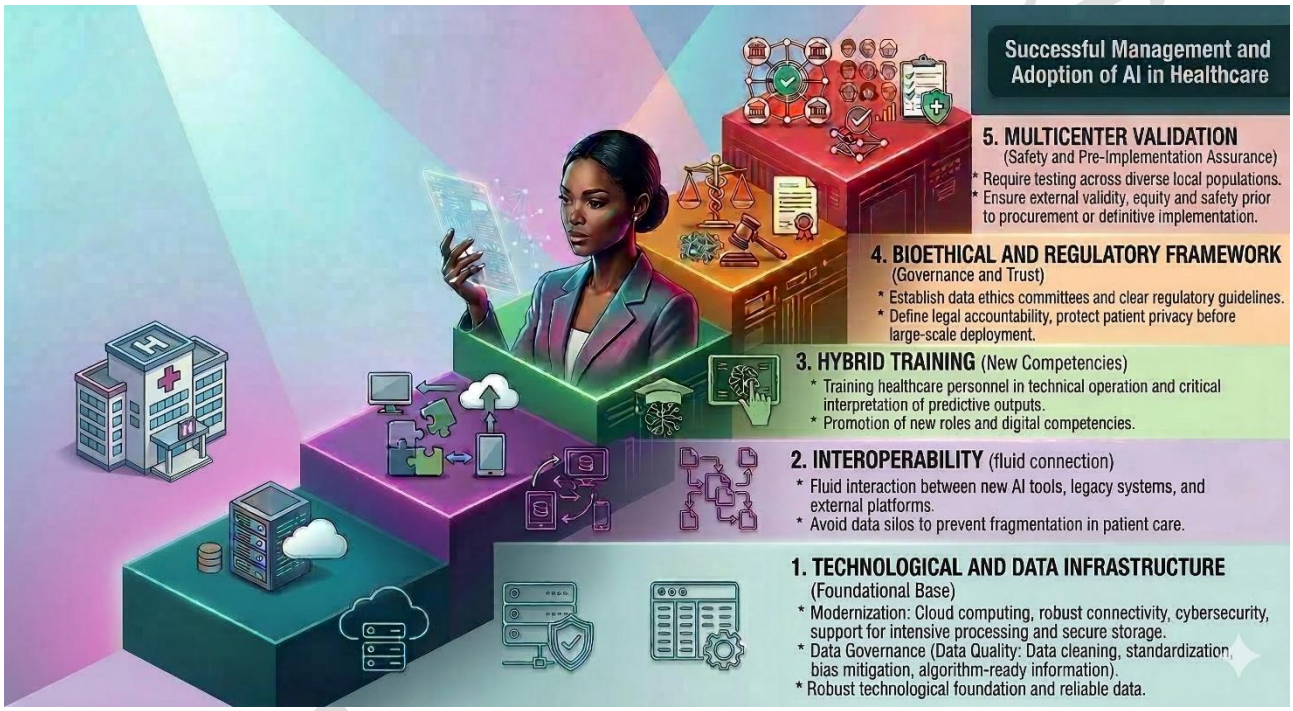

Fig. 3 Proposed Roadmap for the adoption of AI in hospitals. Source: IA generated, December 2025.

1. **Technology and Data Infrastructure**: Integrating AI requires investment in both technological modernization (such as cloud computing, connectivity and cybersecurity) that allows for efficient processing and secure storage [20], [50], and ensuring the quality of clinical data, which has to be clean and standardized, avoiding bias and allowing algorithms to use it correctly [29], [41]. Without a solid foundation of technology and reliable data, advanced models cannot function.
2. **Interoperability**: To avoid fragmentation in healthcare, it is essential that AI solutions integrate seamlessly with existing, legacy, or external systems, facilitating information sharing [50].
3. **Training**: It is important that healthcare personnel receive training both in the technical use of the tools and in the critical interpretation of AI results, which fosters new roles and skills adapted to the digital environment [17], [55].
4. **Bioethical and Regulatory Framework:** Before large-scale clinical implementation, organizations should create ethics committees and establish clear regulations that define legal responsibility and safeguard patient privacy, anticipating potential legal risks [47], [54].
5. **Multicenter Validation:** Furthermore, testing of models in diverse local populations should be required to ensure external validity, equity, and patient safety before acquiring or implementing any solution [46], [53].

F. Limitations of the study

The methodological quality of the reviewed articles was not assessed, nor was a quantitative meta-analysis performed; the findings depend on the internal validity of the included studies. Future reviews could incorporate comparative statistical analyses and segmentation by type of AI used (ML, CNN, LLMs, PLN).

IV. CONCLUSIONS

Taking into account the benefits and challenges described in this article regarding the use of AI in health management, the following conclusions and recommendations emerge to further increase the use of these technologies, but with due mitigation of the corresponding risks.

First, it is important to emphasize that AI does not replace clinical judgment or empathy, but it can enhance them. Its adoption requires investment in infrastructure, training, transparent standards, and regulatory frameworks that protect patients and ensure technological equity.

Secondly, it is essential to ensure the integrity, confidentiality, and availability of personal and health data. Likewise, protection against potential cyberattacks is crucial. Therefore, it is important to guarantee the accuracy of the information provided by AI; this implies the need to standardize data protocols and formats. It is also relevant to ensure that AI-driven decisions are ethical and transparent in healthcare. This requires addressing biases in data and algorithms to guarantee equitable access and prevent discrimination. Therefore, it is necessary to establish a regulatory framework that ensures the safe and ethical use of AI and digital technologies in healthcare.

Similarly, it is necessary to train all healthcare personnel who use AI in their work. This will likely involve investing resources in technology and training, as well as acknowledging that the implementation of AI will bring about changes in job responsibilities and new roles. Implementing awareness-raising processes is fundamental to addressing any reluctance towards change. It is essential to ensure that digitalization and AI improve access to healthcare, benefiting vulnerable and underserved populations. Furthermore, it is crucial to foster effective collaboration between healthcare professionals and AI systems to achieve better and more reliable patient outcomes.

In summary, the appropriate implementation of artificial intelligence in healthcare offers significant opportunities. Developing a roadmap that addresses key issues such as infrastructure, interoperability, training, ethics, regulation, and validation will enable healthcare institutions to transform technological expectations into concrete clinical benefits, minimize risks, and ensure safe, equitable, and efficient services.

Future lines of research must focus on how to mitigate the risks associated with AI in health, with new methodologies to address the safe and ethical use of AI, and novel approaches or models to properly integrate AI into the workflow of the health system. It is also advisable to align with and review the ISO/IEC 42001 standard on artificial intelligence management systems. Other topics include integration with technologies such as IoT, blockchain, immersive technologies, digital twins, quantum computing, and the impacts and strategies framed within the Fifth Industrial Revolution (5IR), among others.

Finally, the future of AI use in healthcare is promising, and this review is important for understanding perceptions of its benefits, examples of developed works, and relevant precautions. This allows for continued impact assessments, research into specific topics, addressing challenges, and progress toward making AI safe, transparent, and equitable in healthcare management.

V. CRediT AUTHORSHIP CONTRIBUTION STATEMENT

M. Barrios-Molina: Research, methodology, and writing-original draft. **P. Molina-Parra:** Conceptualization, research, methodology, writing-original draft, writing-revision and editing. **G. Moreno-López:** Supervision, research, methodology, writing-original draft, writing-revision and editing.

VI. FINANCING

Review article derived from the research project titled: "*Impact of digital transformation on companies in Eastern Antioquia and proposal of a conceptual framework to advance towards the Fifth Industrial Revolution (5IR),* funded by "Politécnico Colombiano Jaime Isaza Cadavid". Starting year: 2024, ending year: 2026.

REFERENCES

[1] Q. T. L *et al.*, "Decentralized Management of Medical Test Results Utilizing Blockchain, Smart Contracts, and NFTs", *International Journal of Advanced Computer Science and Applications (IJACSA)*, vol. 14, núm. 8, Art. núm. 8, 54/30 2023, doi: 10.14569/IJACSA.2023.01408104.

[2] S. K. Bhattamisra, P. Banerjee, P. Gupta, J. Mayuren, S. Patra, & M. Candasamy, "Artificial Intelligence in Pharmaceutical and Healthcare Research", *Big Data and Cognitive Computing*, vol. 7, núm. 1, Art. núm. 1, mar. 2023, doi: 10.3390/bdcc7010010.

[3] R. Peete, K. Majowski, L. Lauer, & A. Jay, "Artificial Intelligence in Healthcare", en *Artificial Intelligence and Machine Learning for Business for Non-Engineers*, CRC Press, 2019.

[4] P. Esmaeilzadeh, T. Mirzaei, & S. Dharanikota, "Patients' Perceptions Toward Human–Artificial Intelligence Interaction in Health Care: Experimental Study", *Journal of Medical Internet Research*, vol. 23, núm. 11, p. e25856, nov. 2021, doi: 10.2196/25856.

[5] C. Domínguez-Alcón, M. Busquets Surribas, N. Cuxart Ainaud, & A. Ramió Jofre, "Tecnologías de cuidado y bienestar", en *Tecnologías y nuevas relaciones en el cuidado Fundadeps*, 3a ed., Barcelona: Col·legi Oficial d'Infermeres i Infermers de Barcelona (COIB), 2019, pp. 23–53. Consultado: el 16 de enero de 2025. [En línea]. Disponible en: https://fundadeps.org/recursos/Tecnologias-y-nuevas-relaciones-en-el-cuidado/

[6] A. Esteva *et al.*, "Dermatologist-level classification of skin cancer with deep neural networks", *Nature*, vol. 542, núm. 7639, pp. 115–118, feb. 2017, doi: 10.1038/nature21056.

[7] D. Zheng, X. He, & J. Jing, "Overview of Artificial Intelligence in Breast Cancer Medical Imaging", *Journal of Clinical Medicine*, vol. 12, núm. 2, Art. núm. 2, ene. 2023, doi: https://doi.org/10.3390/jcm12020419.

[8] E. J. Topol, "High-performance medicine: the convergence of human and artificial intelligence", *Nat Med*, vol. 25, núm. 1, pp. 44–56, ene. 2019, doi: 10.1038/s41591-018-0300-7.

[9] B. D. Mittelstadt, P. Allo, M. Taddeo, S. Wachter, & L. Floridi, "The ethics of algorithms: Mapping the debate", *Big Data & Society*, vol. 3, núm. 2, p. 2053951716679679, dic. 2016, doi: 10.1177/2053951716679679.

[10] J. Yam & J. A. Skorburg, "From human resources to human rights: Impact assessments for hiring algorithms", *Ethics Inf Technol*, vol. 23, núm. 4, pp. 611–623, dic. 2021, doi: 10.1007/s10676-021-09599-7.

[11] I. Gabilondo Cuéllar, "Limitaciones y desafíos de la inteligencia artificial en salud", *Kranion*, vol. 18, núm. 2, pp. 043–044, jun. 2023, doi: 10.24875/KRANION.M23000052.

[12] G. Ceballos & N. Nájera, "Inteligencia artificial en cardiología: transformando el panorama de la atención de salud cardiovascular", *Cardiovasc Metab Sci*, vol. 34, núm. 4, pp. 148–149, dic. 2023.

[13] D. Raigoso, N. Céspedes, C. A. Cifuentes, A. J. del-Ama, & M. Múnera, "A Survey on Socially Assistive Robotics: Clinicians' and Patients' Perception of a Social Robot within Gait Rehabilitation Therapies", *Brain Sciences*, vol. 11, núm. 6, Art. núm. 6, jun. 2021, doi: 10.3390/brainsci11060738.

[14] Q. Liu *et al.*, "Reminiscent music therapy combined with robot-assisted rehabilitation for elderly stroke patients: a pilot study", *Journal of NeuroEngineering and Rehabilitation*, vol. 21, núm. 1, p. 16, ene. 2024, doi: 10.1186/s12984-024-01315-y.

[15] A. R. Pedro, M. B. Dias, L. Laranjo, A. S. Cunha, & J. V. Cordeiro, "Artificial intelligence in medicine: A comprehensive survey of medical doctor's perspectives in Portugal", *PLOS ONE*, vol. 18, núm. 9, p. e0290613, sep. 2023, doi: 10.1371/journal.pone.0290613.

[16] T. Jadczyk, W. Wojakowski, M. Tendera, T. D. Henry, G. Egnaczyk, & S. Shreenivas, "Artificial Intelligence Can Improve Patient Management at the Time of a Pandemic: The Role of Voice Technology", *Journal of Medical Internet Research*, vol. 23, núm. 5, p. e22959, may 2021, doi: 10.2196/22959.

[17] D. S. Rammal, M. Alomar, & S. Palaian, "AI-Driven pharmacy practice: Unleashing the revolutionary potential in medication management, pharmacy workflow, and patient care", *Pharm Pract (Granada)*, vol. 22, núm. 2, pp. 1–11, may 2024.

[18] Y. Yang, K. Siau, W. Xie, & Y. Sun, "Smart Health: Intelligent Healthcare Systems in the Metaverse, Artificial Intelligence, and Data Science Era", *Journal of Organizational and End User Computing (JOEUC)*, vol. 34, núm. 1, pp. 1–14, 2022, doi: 10.4018/JOEUC.308814.

[19] B. Zhou, G. Yang, Z. Shi, & S. Ma, "Natural Language Processing for Smart Healthcare", *IEEE Reviews in Biomedical Engineering*, vol. 17, pp. 4–18, 2024, doi: 10.1109/RBME.2022.3210270.

[20] M. P. McRae, K. S. Rajsri, T. M. Alcorn, & J. T. McDevitt, "Smart Diagnostics: Combining Artificial Intelligence and In Vitro Diagnostics", *Sensors*, vol. 22, núm. 17, Art. núm. 17, ene. 2022, doi: 10.3390/s22176355.

[21] A. M. Ghouri, H. R. Khan, V. Mani, M. A. ul Haq, & A. B. Lopes de Sousa Jabbour, "An Artificial-Intelligence-Based omnichannel blood supply chain: A pathway for sustainable development", *Journal of Business Research*, vol. 164, p. 113980, sep. 2023, doi: 10.1016/j.jbusres.2023.113980.

[22] A. M. Flores, F. Demsas, N. J. Leeper, & E. G. Ross, "Leveraging Machine Learning and Artificial Intelligence to Improve Peripheral Artery Disease Detection, Treatment, and Outcomes", *Circulation Research*, vol. 128, núm. 12, pp. 1833–1850, jun. 2021, doi: 10.1161/CIRCRESAHA.121.318224.
[23] A. Fixler *et al.*, "Alert to Action: Implementing Artificial Intelligence–Driven Clinical Decision Support Tools for Sepsis", *TOJ*, vol. 23, núm. 3, pp. 222–231, 2023, doi: 10.31486/toj.22.0098.
[24] P. Silva *et al.*, "Implementation of Pharmacogenomics and Artificial Intelligence Tools for Chronic Disease Management in Primary Care Setting", *Journal of Personalized Medicine*, vol. 11, núm. 6, Art. núm. 6, jun. 2021, doi: 10.3390/jpm11060443.
[25] K. Fujita, M. Katsuki, A. Takasu, A. Kitajima, T. Shimazu, & Y. Maruki, "Development of an artificial intelligence-based diagnostic model for Alzheimer's disease", *Aging Med (Milton)*, vol. 5, núm. 3, pp. 167–173, sep. 2022, doi: 10.1002/agm2.12224.
[26] S. Mashatian *et al.*, "Building Trustworthy Generative Artificial Intelligence for Diabetes Care and Limb Preservation: A Medical Knowledge Extraction Case", *J Diabetes Sci Technol*, p. 19322968241253568, may 2024, doi: 10.1177/19322968241253568.
[27] H. Y. Seol *et al.*, "Artificial intelligence-assisted clinical decision support for childhood asthma management: A randomized clinical trial", *PLOS ONE*, vol. 16, núm. 8, p. e0255261, ago. 2021, doi: 10.1371/journal.pone.0255261.
[28] D. Montenegro-López, "Uso de tecnologías en el lugar de atención para el manejo de la pandemia por COVID-19 en Colombia", *Revista Panamericana de Salud Pública*, vol. 44, p. 1, ago. 2020, doi: 10.26633/RPSP.2020.97.
[29] B. Galdo *et al.*, "Inteligencia artificial en pediatría: actualidad y retos", *Anales de Pediatría*, vol. 100, núm. 3, pp. 195–201, mar. 2024, doi: 10.1016/j.anpedi.2024.02.006.
[30] L. E. Pino, J. Mejía, E. Borja, E. Largue, & I. C. Triana, "Uso de la plataforma MAIA® (Medical Artificial Intelligence Aid) para el ajuste de red de servicios durante la pandemia COVID-19 en el departamento de Magdalena, Colombia", *Infectio*, pp. 205–209, jul. 2022, doi: 10.22354/24223794.1048.
[31] A. Juárez Belaúnde & M. Murie-Fernández, "Nuevas tecnologías e inteligencia artificial en neurorrehabilitación", *KRANION*, vol. 18, núm. 2, p. 10823, mar. 2024, doi: 10.24875/KRANION.M23000056.
[32] P. D. Deps, R. Yotsu, B. C. R. S. Furriel, B. D. de Oliveira, S. L. de Lima, & R. M. Loureiro, "The potential role of artificial intelligence in the clinical management of Hansen's disease (leprosy)", *Front. Med.*, vol. 11, mar. 2024, doi: 10.3389/fmed.2024.1338598.
[33] S. M. McKinney *et al.*, "International evaluation of an AI system for breast cancer screening", *Nature*, vol. 577, núm. 7788, pp. 89–94, ene. 2020, doi: 10.1038/s41586-019-1799-6.
[34] D. Pinto dos Santos *et al.*, "Medical students' attitude towards artificial intelligence: a multicentre survey", *Eur Radiol*, vol. 29, núm. 4, pp. 1640–1646, abr. 2019, doi: 10.1007/s00330-018-5601-1.
[35] K.-H. Yu, A. L. Beam, & I. S. Kohane, "Artificial intelligence in healthcare", *Nat Biomed Eng*, vol. 2, núm. 10, pp. 719–731, oct. 2018, doi: https://doi.org/10.1038/s41551-018-0305-z.
[36] B. Meskó, G. Hetényi, & Z. Győrffy, "Will artificial intelligence solve the human resource crisis in healthcare?", *BMC Health Services Research*, vol. 18, núm. 1, p. 545, jul. 2018, doi: 10.1186/s12913-018-3359-4.
[37] V. Harish, F. Morgado, A. D. Stern, & S. Das, "Artificial Intelligence and Clinical Decision Making: The New Nature of Medical Uncertainty", *Academic Medicine*, vol. 96, núm. 1, 2021, [En línea]. Disponible en: https://journals.lww.com/academicmedicine/fulltext/2021/01000/artificial_intelligence_and_clinical_decision.31.aspx
[38] A. Kerasidou, "Artificial intelligence and the ongoing need for empathy, compassion and trust in healthcare", *Bulletin of the World Health Organization*, vol. 98, núm. 4, pp. 245–250, 2020, doi: 10.2471/BLT.19.237198.
[39] F. Wang, R. Kaushal, & D. Khullar, "Should Health Care Demand Interpretable Artificial Intelligence or Accept 'Black Box' Medicine?", *Ann Intern Med*, vol. 172, núm. 1, pp. 59–60, ene. 2020, doi: 10.7326/M19-2548.
[40] H. Chang & W. C. Cha, "Artificial intelligence decision points in an emergency department", *Clin Exp Emerg Med*, vol. 9, núm. 3, pp. 165–168, sep. 2022, doi: 10.15441/ceem.22.366.
[41] K. E. Trinkley, R. An, A. M. Maw, R. E. Glasgow, & R. C. Brownson, "Leveraging artificial intelligence to advance implementation science: potential opportunities and cautions", *Implementation Sci*, vol. 19, núm. 1, p. 17, feb. 2024, doi: 10.1186/s13012-024-01346-y.
[42] B. Murdoch, "Privacy and artificial intelligence: challenges for protecting health information in a new era", *BMC Medical Ethics*, vol. 22, núm. 1, p. 122, sep. 2021, doi: 10.1186/s12910-021-00687-3.
[43] G. Briganti & O. Le Moine, "Artificial Intelligence in Medicine: Today and Tomorrow", *Front. Med.*, vol. 7, feb. 2020, doi: 10.3389/fmed.2020.00027.
[44] Y. Chen, P. Moreira, W. Liu, M. Monachino, T. L. H. Nguyen, & A. Wang, "Is there a gap between artificial intelligence applications and priorities in health care and nursing management?", *Journal of Nursing Management*, vol. 30, núm. 8, pp. 3736–3742, 2022, doi: 10.1111/jonm.13851.
[45] A. Shuaib, H. Arian, & A. Shuaib, " The Increasing Role of Artificial Intelligence in Health Care: Will Robots Replace Doctors in the Future? ", *IJGM*, vol. 13, pp. 891–896, oct. 2020, doi: 10.2147/IJGM.S268093.

[46] A. Saeed, A. B. Saeed, F. A. AlAhmri, A. Saeed, A. B. Saeed, & F. A. AlAhmri, "Saudi Arabia Health Systems: Challenging and Future Transformations With Artificial Intelligence", *Cureus*, vol. 15, abr. 2023, doi: https://doi.org/10.7759/cureus.37826.
[47] S. M. Carter, W. Rogers, K. T. Win, H. Frazer, B. Richards, & N. Houssami, "The ethical, legal and social implications of using artificial intelligence systems in breast cancer care", *The Breast*, vol. 49, pp. 25–32, feb. 2020, doi: https://doi.org/10.1016/j.breast.2019.10.001.
[48] G. Huang, Y.-Z. Luo, & Z.-W. Qian, "Critical Factors in the Application of Artificial Intelligence to Establish Health Care Systems for Seniors", *RCIS*, vol. 65, pp. 51–59, jun. 2019, doi: https://doi.org/10.33788/rcis.65.4.
[49] A. Tursunbayeva & M. Renkema, "Artificial intelligence in health-care: implications for the job design of healthcare professionals", *Asia Pacific Journal of Human Resources*, vol. 61, núm. 4, pp. 845–887, 2023, doi: 10.1111/1744-7941.12325.
[50] L. L. Novak *et al.*, "Clinical use of artificial intelligence requires AI-capable organizations", *JAMIA Open*, vol. 6, núm. 2, p. ooad028, jul. 2023, doi: 10.1093/jamiaopen/ooad028.
[51] M. Klumpp *et al.*, "Artificial Intelligence for Hospital Health Care: Application Cases and Answers to Challenges in European Hospitals", *Healthcare*, vol. 9, núm. 8, Art. núm. 8, ago. 2021, doi: 10.3390/healthcare9080961.
[52] J. Vidal-Alaball, R. Panadés Zafra, A. Escalé-Besa, & A. Martinez-Millana, "The artificial intelligence revolution in primary care: Challenges, dilemmas and opportunities", *Aten Primaria*, vol. 56, núm. 2, p. 102820, feb. 2024, doi: 10.1016/j.aprim.2023.102820.
[53] M. Jeyaraman *et al.*, "Leveraging Artificial Intelligence and Machine Learning in Regenerative Orthopedics: A Paradigm Shift in Patient Care", *Cureus*, vol. 15, nov. 2023, doi: 10.7759/cureus.49756.
[54] R. Bouderhem, "Shaping the future of AI in healthcare through ethics and governance", *Humanit Soc Sci Commun*, vol. 11, núm. 1, pp. 1–12, mar. 2024, doi: 10.1057/s41599-024-02894-w.
[55] V. T. Mª Pilar & C. A. Mateu Hernández, "Cruzando el puente tecnológico de la telemedicina", *Atención Primaria Práctica*, vol. 3, p. 100117, dic. 2021, doi: 10.1016/j.appr.2021.100117.
[56] M. R. Pinsky *et al.*, "Use of artificial intelligence in critical care: opportunities and obstacles", *Critical Care*, vol. 28, núm. 1, p. 113, abr. 2024, doi: 10.1186/s13054-024-04860-z.
[57] A. P. Brady *et al.*, "Developing, purchasing, implementing and monitoring AI tools in radiology: practical considerations. A multi-society statement from the ACR, CAR, ESR, RANZCR & RSNA", *Insights into Imaging*, vol. 15, núm. 1, p. 16, ene. 2024, doi: 10.1186/s13244-023-01541-3.
[58] S. Reddy, "Generative AI in healthcare: an implementation science informed translational path on application, integration and governance", *Implementation Science*, vol. 19, núm. 1, p. 27, mar. 2024, doi: 10.1186/s13012-024-01357-9.
[59] İ. D. Kocakoç, "The Role of Artificial Intelligence in Health Care", en *The Impact of Artificial Intelligence on Governance, Economics and Finance, Volume 2*, S. Bozkuş Kahyaoğlu, Ed., Singapore: Springer Nature, 2022, pp. 189–206. doi: 10.1007/978-981-16-8997-0_11.
[60] J. Leoste, K. Strömberg-Järvis, T. Robal, K. Marmor, K. Kangur, & A.-M. Rebane, "Testing scenarios for using telepresence robots in healthcare settings", *Computational and Structural Biotechnology Journal*, vol. 24, pp. 105–114, dic. 2024, doi: 10.1016/j.csbj.2024.01.004.
[61] B. B. León-Gómez, E. Moreno-Gabriel, L. A. Carrasco-Ribelles, C. V. Fors, & L. Liutsko, "Retos y desafíos de la inteligencia artificial en la investigación en salud", *Gaceta Sanitaria*, vol. 37, p. 102315, ene. 2023, doi: 10.1016/j.gaceta.2023.102315.

Marian Barrios Molina. Received her degree in Administrative Engineering from the National University of Colombia in 2025. She currently works at Sura as a financial management analyst and is a master's student in Analytical Engineering at the National University of Colombia.

Paula Andrea Molina Parra. She holds a degree in Administrative Engineering, a master's degree in administrative engineering, and a Doctorate in Industrial and Organizational Engineering from the National University of Colombia, awarded in 2002, 2009, and 2017, respectively. She currently works as an associate professor in the Faculty of Administration at the Jaime Isaza Cadavid Colombian Polytechnic.

Gustavo Alberto Moreno López. He holds a degree in Electronic Engineering, a specialization in Telecommunications, and an M.Sc. in Engineering from the Pontifical Bolivarian University, in 1999, 2009, and 2011, respectively. He also earned a PhD in Engineering from the National University of Colombia, in 2020. He currently serves as a tenured professor in the Faculty of Engineering at the Jaime Isaza Cadavid Colombian Polytechnic.