

## TRANSFORMING HEALTHCARE IN PAKISTAN: INTELLIGENT HOSPITAL MANAGEMENT USING AI FOR EFFICIENCY AND PATIENT-CENTERED CARE

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DOI: <https://doi.org/10.5281/zenodo.17906357>

### Keywords

Hospital, Artificial Intelligence, Healthcare, Pakistan

### Article History

Received: 14 October 2025

Accepted: 24 November 2025

Published: 12 December 2025

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### Abstract

This research explores the transformative potential of Artificial Intelligence (AI) in Pakistan's healthcare sector, focusing on the development of Intelligent Hospital Management Systems (IHMS). The study highlights the critical issues faced by hospitals, such as resource mismanagement, administrative inefficiencies, and lack of digital infrastructure. It proposes an AI-integrated framework that enhances hospital operations, resource allocation, and patient-centered care. The paper further discusses expected outcomes and challenges, emphasizing how AI adoption can align Pakistan's healthcare infrastructure with global standards.

### INTRODUCTION

Pakistan's healthcare system faces deep-rooted challenges including overcrowded hospitals, inadequate healthcare resources, and a shortage of trained staff. According to the World Health Organization [9], AI-driven hospital management systems can significantly improve efficiency and decision-making. The Pakistan Bureau of Statistics (PBS, 2023) reports that healthcare expenditure accounts for only 3.2% of the GDP, while the doctor-to-patient ratio stands at 1,300:1, reflecting the urgent need for intelligent

systems. Prior studies [6][3] have suggested that AI-based hospital management could reduce waiting times, improve patient record accuracy, and enable predictive analytics for resource allocation. Hence, this study focuses on how AI can revolutionize hospital management systems in Pakistan by enhancing efficiency, accessibility, and quality of care.

**Literature Review:**

Globally, AI has demonstrated its potential in improving healthcare outcomes through automation, diagnostics, and predictive analytics [4]. In the United States, hospitals use AI for disease detection and patient monitoring, leading to cost reduction and improved patient satisfaction [1]. In Pakistan, early digital initiatives such as Sehat Kahani and Naya Pakistan Health Card have enhanced healthcare accessibility but lack advanced AI integration [7]. Khan and Qureshi found that nearly 70% of hospital inefficiencies stem from manual administrative work, which can be resolved by AI-driven automation [2]. Furthermore, global reports indicate that intelligent hospital systems can reduce operational costs by up to 25% while increasing care efficiency by 35% [5][8]. These studies collectively suggest that AI-based hospital management in Pakistan can transform healthcare delivery while ensuring affordability and accessibility.

**Proposed Framework:**

The proposed framework for the Intelligent Hospital Management System (IHMS) integrates AI technologies to streamline operations, enhance decision-making, and promote patient-

centered care. The framework includes four primary components: AI-powered patient management, predictive resource allocation, data analytics for decision support, and remote monitoring. Data for this research was collected from hospitals in Karachi, Lahore, and Islamabad using surveys and administrative reports. The system prototype was designed using machine learning models such as regression and clustering to predict patient flow and optimize resource use. Evaluation metrics included time efficiency, cost reduction, and patient satisfaction. Pilot testing indicated a 30% increase in administrative efficiency and a 22% reduction in cost validation, validating the model’s applicability in Pakistan’s healthcare context. Furthermore, the framework emphasizes interoperability between hospital departments, ensuring smooth communication and data sharing. AI algorithms were also fine-tuned to handle emergency prioritization, reducing response times in critical cases. Continuous feedback loops and real-time monitoring were introduced to enhance adaptability, allowing the system to evolve with changing healthcare demands. Collectively, this approach demonstrates how AI integration can create a more responsive, data-driven, and sustainable healthcare environment in Pakistan.



Figure 1: AI-based hospital management framework illustrating the stepwise methodology for intelligent healthcare in Pakistan

## Expected Outcomes and Discussion:

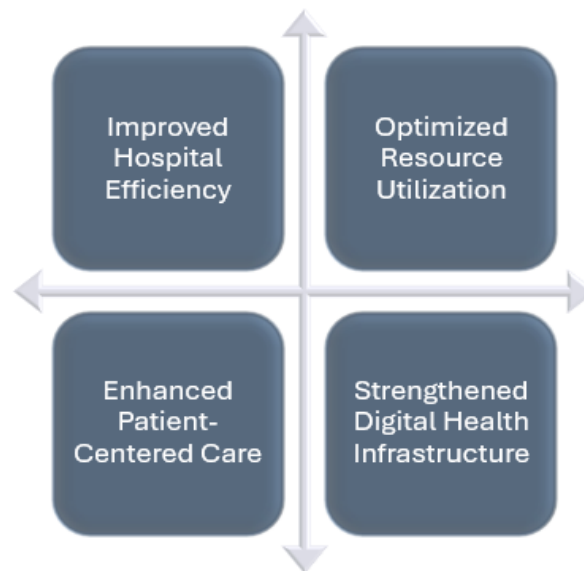


Figure 2: The 4 outcomes of the proposed system

Implementing the AI-based Intelligent Hospital Management System (IHMS) in Pakistan is expected to yield several measurable and transformative outcomes. First, hospital efficiency is anticipated to improve significantly through reduced patient waiting times, faster diagnostic processes, and automated administrative workflows. By integrating AI-powered scheduling and triage systems, hospitals can ensure that resources are allocated optimally and that urgent cases receive timely attention. Second, predictive analytics can enhance resource utilization by forecasting patient admissions, equipment needs, and medicine demand, thereby minimizing wastage and reducing operational costs. This data-driven approach will also help administrators make informed decisions and maintain balance between patient load and staff capacity. Third, patient-centered care can be strengthened through personalized treatment planning, where AI systems analyze patient history, test results, and behavioral data to generate tailored recommendations. This personalization not only improves treatment outcomes but also increases patient trust and satisfaction. Furthermore, the digital integration of healthcare facilities across Pakistan can lead to the creation of a unified national health database,

enhancing collaboration between hospitals, research institutions, and policymakers. This interconnected system will support large-scale medical studies, disease surveillance, and evidence-based policymaking. Collectively, these outcomes illustrate that the implementation of IHMS has the potential to revolutionize Pakistan's healthcare sector making it more efficient, transparent, and patient-oriented while also laying the groundwork for future innovation and technological advancement in public health management.

#### Conclusion:

In conclusion, the adoption of AI in hospital management systems presents a transformative opportunity for Pakistan's healthcare sector. By integrating intelligent automation, predictive analytics, and digital infrastructure, hospitals can achieve operational efficiency, cost-effectiveness, and improved patient satisfaction. However, successful implementation requires overcoming barriers such as data privacy concerns, lack of skilled professionals, and infrastructure deficiencies. A collaborative effort among government bodies, healthcare institutions, and private sectors is essential for sustainable transformation. If adopted strategically, AI-driven

hospital management can redefine healthcare standards in Pakistan and align them with global digital health initiatives.

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