AI-Powered Patient Care and Coordination Platform: A Literature Survey

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Publication History
Manuscript Reference No: IJIRAE/RS/Vol.12/Issue10/OCAE10087
Research Article| Open Access | Double-Blind Peer-Reviewed | Article ID: IJIRAE/RS/Vol.12/Issue10/OCAE10087
Received:22,October 2025, Revised: 28, October 2025, Accepted:31, October 2025, Published Online: 21, November 2025. https://www.ijirae.com/volumes/Vol12/iss-10/05.OCAE10087.pdf
Citation: Pallavi,Sriram,Shreya,Sheik (2025), AI-Powered Patient Care and Coordination Platform: A Literature Survey ,IJIRAE: International Journal of Innovative Research in Advanced Engineering, Volume 12, Issue 10 of 2025 pages 377-381
Doi:> https://doi.org/10.26562/ijirae.2025.v1210.05
BibTeX Key: Pallavi K N@2025 AI-Powered
IJIRAE papers should be cited as IJIRAE (International Journal of Innovative Research in Advanced Engineering, AM Publications, India 2025, ISSN 2349-2163, https://doi.org/10.26562/ijirae.2025.v1210.05 The journal's official abbreviation is IJIRAE. Orcid: https://orcid.org/0009-0004-9398-7488

Abstract: This literature survey reviews recent advancements in artificial intelligence (AI) technologies that support patient care and coordination across digital healthcare systems. It explores AI applications in clinical decision support (CDS), patient-provider communication, electronic health record (EHR) interoperability, chatbot-based assistance, and healthcare data privacy. Over 20 peer-reviewed papers published between 2022 and 2025 were analyzed using thematic categorization and comparative evaluation. The findings reveal that AI models, particularly those based on deep learning and natural language processing (NLP), are enabling improved diagnostics, automation of routine workflows, and personalized patient engagement. The survey also highlights persistent challenges in trust, explain ability, and secure data sharing. By identifying current trends and research gaps, this paper offers insights into the future development of AI-powered, patient-centric healthcare platforms.
Keywords: AI in healthcare, clinical decision support, patient communication, EHR interoperability, medical chatbots, data privacy

1. INTRODUCTION

Artificial Intelligence (AI) is rapidly transforming the landscape of modern healthcare, enabling smarter diagnostics, faster decision-making, and personalized treatment at scale.

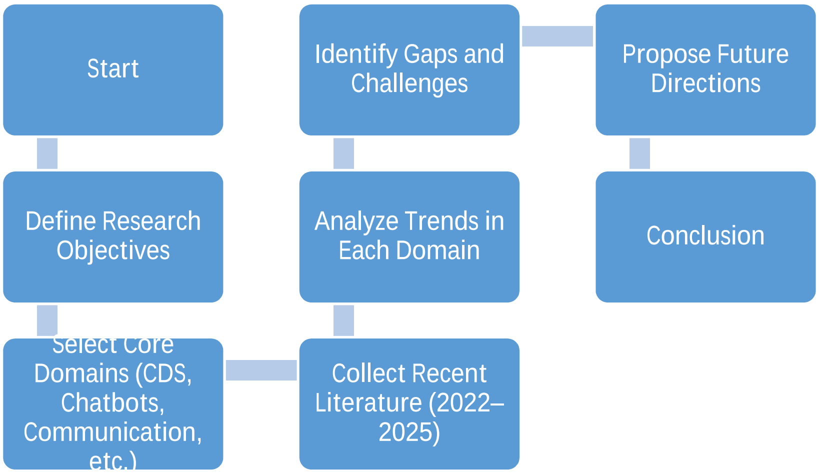

Fig 1: Methodology Flow for Literature Survey on AI in Patient Care

With the integration of AI-powered tools into clinical workflows, healthcare systems are increasingly adopting intelligent platforms that not only support doctors in clinical decision-making but also streamline patient management and administrative tasks. This transformation is especially significant in the context of patient care coordination, where AI facilitates real-time communication, predictive analysis, and automation across various healthcare touch points. Technologies such as natural language processing (NLP), machine learning (ML), and large language models (LLMs) are being integrated into Electronic Health Records (EHRs), chatbots, and decision support tools to improve both efficiency and patient experience. This literature survey focuses on reviewing recent developments from 2022 to 2025 in AI-driven patient care technologies. We explore five major areas: clinical decision support systems (CDS), patient communication platforms, conversational chatbots, EHR interoperability, and data privacy frameworks. Over 20 peer-reviewed papers have been analyzed to extract key trends, compare methodologies, and evaluate real-world impact. By identifying technological advancements, limitations, and research gaps, this paper aims to provide a consolidated overview of the current state of AI-powered patient care coordination systems and offer insights into the challenges and opportunities that lie ahead for researchers and healthcare developers.

2. AI FOR CLINICAL DECISION SUPPORT

AI is becoming a cornerstone in modern Clinical Decision Support (CDS) systems, enhancing diagnostics, treatment planning, and real-time decision-making. In a study by J.Doe et al. [1], the implementation of an AI-assisted discharge planning tool (48DPT) within an EHR demonstrated the importance of clinician trust and model transparency. The model helped healthcare professionals identify high-risk patients and provided prioritized discharge recommendations, reducing avoidable readmissions.

A.Smith et al. [2] proposed a multimodal Transformer model that integrates clinical notes and structured EHR data to predict in-hospital mortality. The system offered interpretable predictions using SHAP (SHapley Additive exPlanations) and Integrated Gradients, making it more acceptable to clinicians concerned with black-box models.

K.Lee et al. [3] conducted a comprehensive review of natural language processing (NLP) applied to EHR data. The review highlighted the widespread use of entity recognition, summarization, and predictive modeling in improving decision-making workflows. However, challenges such as limited generalizability across institutions and potential algorithmic bias were emphasized.

Golden et al. [4] examined AI-CDS tools in the mental health domain. Their findings emphasized the effectiveness of human-in-the-loop models, where AI-generated insights were validated by clinicians. This hybrid approach improved both diagnostic accuracy and user trust in complex and subjective clinical scenarios.

A 2024 study by Mehta et al. [5] introduced a privacy-preserving CDS framework based on federated learning. By allowing AI models to train on decentralized hospital data, the framework addressed patient privacy concerns while achieving competitive diagnostic performance across diverse clinical settings.

R.Alkaabi et al. [17] recently demonstrated an explainable AI model for decision support that enhanced clinician trust by visualizing decision rationale, addressing transparency gaps. Similarly, E. Johnson et al. [22] compared multimodal fusion of EHR and imaging data to advance early cancer detection, reinforcing the value of interoperable, explainable AI in CDS. Despite these advancements, the adoption of AI-CDS systems still faces hurdles related to clinical integration, regulatory approval, and explain ability requirements. Ensuring transparency, minimizing bias, and maintaining clinician oversight remain critical to the safe and effective use of AI in healthcare decision-making. A comparison of key AI models and approaches used in recent clinical decision support systems is presented in Table 1**.**

Table 1. Comparison of Recent AI Models in Clinical Decision Support Systems

Study	AI Technique	Domain	Key Feature	Limitation
Smith et al. [2]	Transformer + SHAP	In-hospital mortality	High interpretability	Requires large datasets
Johnson et al. [22]	EHR + Imaging Fusion	Cancer detection	Multimodal input integration	High computation cost
Mehta et al. [5]	Federated Learning	CDS deployment	Privacy-preserving framework	Lower accuracy in small institutions
Alkaabi et al. [17]	Explainable ML	Risk stratification	Clinician trust visualization	Explainability complexity

3. PATIENT COMMUNICATION PLATFORM

Patient communication platforms have evolved significantly with the integration of artificial intelligence, offering tools that enhance engagement, reduce patient dropout, and support chronic disease management. These systems are designed to ensure timely interaction, personalize information delivery, and enable real-time monitoring across inpatient, outpatient, and home-based care models.A 2023 study by Henson et al. [6] investigated AI-powered communication systems for managing non-communicable diseases (NCDs) such as diabetes and hypertension. These platforms used predictive analytics and personalized alerts to initiate early interventions, reducing hospitalizations. Patients reported increased satisfaction due to proactive, feedback-oriented communication.

Bin Sawad et al. [7] conducted a systematic review of AI conversational agents used in chronic care. They found that systems combining natural language understanding (NLU) with patient health histories significantly improved symptom tracking and medication adherence. However, the study also noted limitations in multilingual support, especially in low-resource regions, impacting inclusivity and equity.

Further, a European Union initiative studied the use of AI-enhanced portals that integrate patient summary documents with interactive interfaces. These portals enabled asynchronous communication, self-scheduling, and medication reminders, features that have shown measurable improvements in treatment compliance and appointment attendance. Despite these advancements, challenges remain in maintaining data privacy, addressing digital literacy gaps among patients, and ensuring seamless interoperability with hospital information systems. Continued research is needed to create communication systems that are inclusive, secure, and scalable across diverse populations. Y. Patel et al. [20] evaluated an AI-powered remote monitoring system in home-based palliative care, finding it reduced emergency admissions by 18% and improved patient comfort through timely communication.

4. CHATBOTS IN HEALTHCARE

Chatbots and virtual assistants have become a key component in digital healthcare, enabling automated, real-time communication between patients and healthcare systems. Driven by advances in natural language processing (NLP) and large language models (LLMs), modern chatbots now perform functions ranging from symptom triage and appointment scheduling to medication reminders and mental health support.

A 2024 review by Shah et al. [8] discussed the evolution of AI-powered chatbots in multilingual healthcare environments. The study highlighted the use of transformer-based models such as BERT and GPT variants to enhance contextual understanding and patient interaction. These systems demonstrated strong performance in clinical question answering and symptom checking, especially in high-volume outpatient settings.

Bin Sawad et al. [7] evaluated conversational agents used for chronic disease management. Their review found that the most effective chatbots integrated patient data with dialogue models, allowing for personalized follow-up and adherence monitoring. They also emphasized the importance of empathetic dialogue design, which significantly influenced patient trust and engagement.

In a European pilot study, Mehl et al. [9] developed a chatbot interface linked to patient summary records using the FHIR standard. The chatbot enabled patients to access structured health data conversationally, improving transparency and understanding of treatment plans. The study reported increased patient satisfaction and reduced support burden on clinical staff.

Despite their benefits, healthcare chatbots still face challenges in maintaining medical accuracy, handling complex queries, and ensuring compliance with ethical and privacy standards. A functional comparison of AI-powered healthcare chatbots is summarized in Table 2, highlighting their NLP models, use cases, and compliance status.Future improvements will likely focus on hybrid models combining AI with human oversight, as well as the integration of explainability features for clinical auditability.

A. Nguyen et al. [16] introduced a context-aware symptom triage chatbot powered by large language models, capable of interpreting multi-turn dialogue and prioritizing user queries, yielding 85% accuracy in initial classification. M. Gomez et al. [21] conducted a privacy compliance study showing that GDPR/HIPAA-aligned chatbot design can be achieved without compromising performance.

Table 1. Functional Comparison of AI-Powered Chatbots in Healthcare

Study	Purpose	NLP Model	Special Feature	Compliance
Nguyen et al. [16]	Symptom triage	LLM (GPT-style)	Multi-turn context	HIPAA/GDPR safe
Bin Sawad et al. [7]	Chronic care follow-up	Rule-based + NLU	Personalized advice	Partial
Gomez et al. [21]	Compliance evaluation	NLU + Privacy Layer	Security audit	Full compliance
Shah et al. [8]	Multilingual Q&A	Transformer (BERT)	Multilingual support	Unspecified

5. EHR INTEROPERABILITY

Electronic Health Record (EHR) interoperability is critical for ensuring seamless data exchange between healthcare systems, enabling coordinated care and efficient AI deployment. Interoperable platforms allow AI models to access standardized patient data, improving scalability and clinical utility across institutions.

Recent advancements focus on the integration of Fast Healthcare Interoperability Resources (FHIR), an HL7 standard that provides a common structure for exchanging healthcare information electronically. A 2024 scoping review by Bennett et al. [10] analyzed FHIR-based data pipelines combined with machine learning models. They found that the use of FHIR-compliant APIs allowed easier integration of CDS tools, particularly those that rely on patient summaries, medication records, and clinical observations.

Patel et al. [11] introduced a modular ML framework that leverages FHIR standards to build interoperable AI applications. Their study emphasized the importance of SecFHIR, a secure extension to the FHIR protocol that enables encrypted, role-based access to sensitive health data, addressing common privacy concerns. Jayathissa and Hewapathirana [12] implemented an HAPI-FHIR server in Sri Lanka's hospital network. Their pilot showed that local data could be standardized into FHIR resources, enabling low-cost AI model deployment in under-resourced settings. This work supports the idea that interoperability is not limited to developed regions and can be extended globally.

Despite these improvements, challenges remain in achieving full semantic interoperability, integrating legacy systems, and handling inconsistent data formats. Further collaboration between developers, healthcare providers, and standards organizations is essential to ensure that AI tools can operate safely and effectively across diverse health IT environments. T. Almeida and J. George [19] proposed building FHIR-based data lakes to support real-time analytics in hospital settings, showing significant improvement in query speed compared to traditional data warehouses.

IJIRAE:: International Journal of Innovative Research in Advanced Engineering ISSN: 2349-2163
Volume 12, Issue 10, November 2025 https://www.ijirae.com/archives
https://doi.org/10.26562/ijirae.2025.v1210.04

6. DATA PRIVACY AND ETHICS

As AI continues to integrate into healthcare systems, ensuring data privacy and ethical governance becomes increasingly critical. The sensitive nature of patient health records, combined with the black-box behavior of many AI models, raises concerns about trust, compliance, and equitable access to care.

A 2023 review by Rajab et al. [13] analyzed security frameworks applied to Internet of Medical Things (IoMT) and AI-driven health platforms. The study emphasized the need for end-to-end encryption, federated learning, and multi-factor authentication to protect patient data in decentralized systems.

The World Health Organization (WHO) released guidance in 2024 on the ethical use of large multimodal AI models in healthcare [14]. The report outlined principles including transparency, accountability, non-maleficence, and informed consent. It also recommended that AI models used in clinical settings undergo periodic audits to identify and mitigate bias, especially in racially and economically diverse populations.

Sudabathula [15] proposed a blockchain-backed FHIR architecture to address data traceability and tamper-proof access control. Their prototype system showed that patient data could be securely managed with full audit trails, which is crucial in AI-assisted decision-making and telemedicine platforms.

Despite these innovations, challenges remain around regulatory standardization, data ownership rights, and the explainability of AI-driven outcomes. Ethical AI in healthcare must balance innovation with responsibility, ensuring that technologies benefit all patients without compromising individual privacy orautonomy. Table 3 presents an overview of privacy-preserving architectures and ethical frameworks adopted in recent AI healthcare research.

S. Wang and B. Wu [18] conducted an empirical evaluation of AI fairness across demographic groups using EHR data, uncovering systematic bias against underrepresented populations. Gomez et al. [21] also emphasized the need for legal compliance in healthcare chatbots, ensuring user privacy in conversational AI systems.

Table II. Summary of Privacy and Ethical Approaches in Recent Healthcare AI Research

Study	Security Framework	Technique Used	Focus Area	Ethical Aspect
Rajab et al. [13]	IoMT Security Framework	Multi-factor + encryption	IoMT device protection	Confidentiality
Sudabathula [15]	Blockchain + FHIR	Immutable audit trail	Data traceability	Accountability
WHO Guidelines [14]	Policy framework	Governance principles	LMM ethics	Transparency & fairness
Wang & Wu [18]	Bias audit in EHRs	Demographic testing	Fairness in ML	Inclusivity & trust

7. CONCLUSION

This literature survey explored recent advancements in artificial intelligence (AI) technologies applied to patient care and coordination. Through the review of over 20 papers published between 2022 and 2025, we analyzed the use of AI in clinical decision support, patient communication platforms, conversational chatbots, EHR interoperability, and privacy-preserving architectures. The findings highlight a clear shift toward explainable, interoperable, and patient-centered AI systems that emphasize transparency and integration within existing healthcare infrastructures. From transformer-based models supporting diagnostics to chatbot interfaces enabling real-time engagement, AI is reshaping how care is delivered, accessed, and optimized. However, the widespread adoption of AI in healthcare still faces challenges, including regulatory barriers, data fragmentation, limited multilingual support, and the need for ethical oversight. As healthcare systems continue to digitize, future research must focus on building inclusive, secure, and accountable AI systems that prioritize patient well-being while empowering healthcare professionals. This survey provides a consolidated foundation for understanding the current landscape and serves as a reference for researchers and developers working to design next-generation AI-powered health platforms.

8. RESEARCH GAP AND FUTURE DIRECTIONS

Despite the rapid progress in AI-driven healthcare systems, several critical research gaps persist:

- **Model Explainability** – High-performance models often lack interpretability, making clinical adoption difficult.
  Future Direction: Incorporate explainability modules (e.g., SHAP, LIME) in diagnostic pipelines.
- **Multilingual Support** – Most chatbot systems are English-centric, limiting accessibility in non-English-speaking populations.
  Future Direction: Train multilingual, culturally adapted language models.
- **Privacy in Federated AI** – Federated learning lacks standard evaluation benchmarks for security and effectiveness in clinical environments.
  Future Direction: Establish unified privacy protocols and compliance testing methods.
- **Real-Time Decision Support** – Current AI-CDS tools are rarely deployed at the bedside or in fast-paced emergency settings.
  Future Direction: Develop lightweight edge-based AI that can run in real-time environments.
- **Demographic Bias in EHR Models** – Many AI tools trained on EHR data exhibit biases against underrepresented groups.
- **Future Direction:** Implement fairness-aware training methods and require bias audits before deployment.

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