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MEDIASSIST: AI-POWERED SMART MEDICATION MANAGEMENT SYSTEM – A SURVEY

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ABSTRACT

Medication non-adherence remains a major healthcare problem because patients frequently miss doses, misunderstand prescription instructions, or fail to manage refills and schedules correctly, which affects treatment outcomes and increases healthcare burden. [5] *Recent research shows that artificial intelligence can improve medication management through reminder systems, prescription interpretation, patient-friendly instruction generation, conversational assistance, and multimodal healthcare interaction.* [5][10] *This survey paper reviews recent studies relevant to the proposed project, MediAssist: AI-Powered Smart Medication Management System, by analyzing mobile reminder applications, AI-based prescription decoding, prescription-direction simplification, and multimodal healthcare assistant platforms.* [6][8][10] *The reviewed literature indicates that existing systems are often fragmented, with separate focus on reminders, inventory tracking, OCR-based prescription understanding, or general medical consultation, while few works integrate these capabilities into a single patient-centered platform.* [5][6][10] *The survey identifies key research gaps in personalization, accessibility for elderly users, multilingual support, caregiver collaboration, privacy, and real-world validation.* [5][6] *Based on these findings, the paper argues that a smart medication management system should combine reminders, medication tracking, prescription interpretation, simplified instructions, adherence*

monitoring, and AI-assisted interaction in a unified architecture aligned with current journal-based research trends. [5][8][10].

KEYWORDS: Artificial Intelligence, Medication Management, Medication Adherence, Prescription Decoding, OCR, NLP, Reminder System, Healthcare Chatbot.

1. INTRODUCTION

Medication adherence is a foundational requirement for effective treatment, especially for patients with chronic diseases who must follow repeated and time-sensitive dosage schedules over long periods. [5][6] Studies referenced in the attached literature describe how forgetfulness, misunderstanding of instructions, complex regimens, low health literacy, and weak follow-up support continue to reduce adherence and worsen patient outcomes. [5] These issues create a strong need for digital systems that not only remind patients to take medicine, but also help them understand prescriptions, track medication stock, and communicate clearly with caregivers and healthcare providers. [5][6][8]

Artificial intelligence has created new opportunities for solving these problems through personalized reminders, voice interfaces, natural language processing, OCR-based prescription interpretation, and conversational healthcare support. [5][8][10] The attached base paper on MediAssist presents a multimodal AI healthcare assistant that integrates conversational AI, speech recognition, image analysis, health information access, and medication information retrieval within a unified platform. [10] However, the broader literature shows that medication-specific systems and general healthcare assistants are still often developed separately, which leaves an opportunity to design a focused AI-powered smart medication management system that combines the strengths of both streams of research. [5][6][10]

This survey paper reviews the most relevant attached papers and synthesizes their methods, features, findings, and limitations to support the proposed major project topic, “MediAssist: AI-Powered Smart Medication Management System.” [6][8][10]The goal is to identify current technological directions and research gaps that justify a unified, intelligent, and user-centered medication management platform. [5][10].

1.1 Need for Smart Medication Management

Traditional reminder methods such as alarms or manual pill logs are often insufficient because they do not adapt to patient behavior, explain prescriptions clearly, or support caregivers with meaningful adherence data. [6] The reviewed systematic study on AI in

medication management highlights that reminder systems, OCR-based prescription decoding, and NLP tools have shown promise, but many solutions remain isolated and fail to provide a complete end-to-end medication workflow. [5] This makes a smart system necessary, one that can transform prescriptions into understandable instructions, schedule reminders, monitor adherence, and provide conversational assistance in real time. [5][8]

1.2 Objective of the Survey

The objective of this survey is to examine how the attached papers contribute to the design of an AI-powered smart medication management system and to identify the most suitable ideas for inclusion in the proposed MediAssist project. [5][6][8][10] The survey focuses on reminder systems, adherence support, prescription simplification, multimodal interaction, and integration challenges. [5][6][10]

2. LITERATURE SURVEY

The attached papers cover multiple but related research directions, including medication reminder applications, AI-based adherence support, prescription decoding and simplification, and multimodal healthcare assistants. [5][6][8][10] Together, these works provide a useful foundation for understanding how an intelligent medication management system can be designed. [5][10]

Aamina Banu, Nuha, and Wijesiriwardana presented a systematic review of AI in medication management and prescription interpretation using the PRISMA framework and studies published between 2012 and 2025. [5] Their review found measurable progress in OCR for prescription decoding, NLP-based medication applications, and AI-assisted reminder systems, while also emphasizing gaps in personalization, accessibility for elderly and low-literacy users, and real-world deployment. [5] This paper is highly relevant because it directly surveys the same problem space as the proposed MediAssist medication management project. [5]

Wong and Hazalila developed MedCare, an Android-based medicine reminder application with reminder management, medicine inventory, guardian notification, and medication history features. [6] Their work shows that practical medication adherence support benefits from combining reminder scheduling with inventory management and caregiver connectivity, though the application is primarily rule-based and mobile-app oriented rather than AI-driven. [6] This makes MedCare a strong reference for core functional modules of the proposed project. [6]

Catindoy and co-authors proposed a Medication Reminder and Tracker Application aimed at improving adherence through dosage scheduling, guardian linkage, analytics, refill reminders, and user-friendly interaction. Their results indicate positive usability and user satisfaction trends, and they specifically underline the value of guardian monitoring and weekly reporting in medication tracking applications. The study is useful for understanding user-facing design expectations and caregiver-assisted workflows.

Li et al. introduced PharmMT, a neural machine translation system for simplifying physician-authored prescription directions into patient-friendly language using more than 530,000 paired prescriptions. [8] The model achieved a BLEU score of 60.27 and pharmacists judged 94.3% of the simplified directions as usable as-is or with minimal edits, demonstrating that AI can significantly reduce ambiguity in prescription instructions. [8] This paper is especially important for MediAssist because prescription understanding is a major challenge in medication management. [8]

The attached base paper by Awais et al. presented MediAssist as a multimodal AI-powered healthcare assistant that integrates text, voice, and image inputs with conversational AI, disease prediction, medication information retrieval, appointment scheduling, and health record support. [10] The system reported 92% symptom recognition accuracy, 88% disease prediction precision, and 94% user satisfaction, indicating that multimodal interfaces can increase accessibility and engagement in healthcare systems. [10] Although the base paper is broader than medication management alone, it provides a strong architectural basis for integrating medication modules into a wider AI healthcare platform. [10]

2.1 Comparative Analysis of Reviewed Papers

Paper / Year of Publication / Publication Location	Main Focus	Key Contribution	Limitation Relevance to Project
MediAssist: A Multimodal AI-Powered Healthcare Assistant for Comprehensive Medical Consultation and Diagnosis Support 2025 India	Multimodal AI healthcare platform	Integrates text, voice, image, symptom analysis, medication information retrieval, and scheduling	Broad healthcare scope, not focused only on medication adherence. Base paper for integrated MediAssist concept.
AI in Medication Management and Prescription Interpretation: A Systematic Review 2026	Review of AI methods in medication management	Covers OCR, NLP, reminders, usability, research gaps	Limited real-world implementation evidence. Helped identify AI modules for our system.

Sri Lanka			
Medicine Reminder Application: MedCare 2024 Malaysia	Android medicine reminder app	Reminder alerts, guardian notification, inventory tracking	Minimal AI functionality. Inspired reminder and stock management modules.
Medication Reminder and Tracker Application 2023 Philippines	Reminder and tracking system	Refill alerts, weekly reports, guardian linking	Lacks advanced AI integration. Useful for adherence monitoring design.
PharmMT: A Neural Machine Translation Approach to Simplify Prescription Directions 2023 United States	Prescription text simplification	Converts complex medical instructions into simple language	Only text simplification, no reminder features. Useful for prescription explanation feature.
Medical Prescription Analysis Using Machine Learning 2025 Thailand	Prescription OCR and medicine extraction	Uses ML to analyze prescriptions and identify medicines	OCR accuracy depends on handwriting quality. Useful for prescription upload module.
Smart Home Medication Reminder System 2017 Croatia	Smart reminder system at home	Automated medication alerts in smart home environment	Hardware dependent system. Inspired alert automation logic.
Smart Medicine Box System 2018 Lebanon	Smart medicine storage and reminders	Pillbox alerts, schedule management	Requires dedicated hardware. Useful for adherence concepts.
A Context-Aware Reminder System for Elders Based on Fuzzy Linguistic Approach 2012 International Journal	Elderly reminder intelligence	Personalized context-aware reminders for older adults	Focused only on reminders. Helped for smart reminder customization.
Medication Management Apps: Usable by Older Adults? 2017 United States	Usability of healthcare apps for elders	Evaluates accessibility and user experience for seniors	No AI or automation features. Helped in designing simple user-friendly UI.

2.2 Synthesis of Findings

A clear pattern across the reviewed literature is that existing systems solve only parts of the medication management problem. [5][6][8][10] Some systems focus on reminders and tracking, some on prescription simplification, and some on broader healthcare conversation, but very few combine intelligent adherence support, prescription understanding, user personalization, and multimodal communication in one platform. [5][8][10] This observation strongly supports the need for the proposed MediAssist system to function as an integrated smart medication management assistant rather than a single-feature application. [5][10]

3. RESEARCH GAP

The surveyed papers collectively reveal several unresolved issues that are directly relevant to the proposed project. [5][6][8][10] First, many medication reminder systems rely on user-entered data and fixed reminders, which means they provide limited intelligence, weak personalization, and minimal adaptation to changing medication behavior. [6] Second, prescription interpretation tools such as PharmMT solve language simplification effectively, but they do not independently manage schedules, stock, adherence alerts, or caregiver interaction. [8]

The systematic review further notes that elderly users, low-literacy users, and multilingual populations remain underserved in current systems. [5] The base MediAssist paper addresses accessibility through text, voice, and image interaction, but its architecture is designed for general medical consultation rather than medication-focused adherence workflows. [10] Therefore, an important research gap exists in building a medication-centered AI platform that unifies prescription decoding, patient-friendly explanation, reminder generation, refill monitoring, caregiver support, and conversational assistance in a single deployable application. [5][8][10]

4. SYSTEM PERSPECTIVE FOR THE PROPOSED PROJECT

Based on the reviewed literature, the proposed MediAssist: AI-Powered Smart Medication Management System should include several tightly integrated modules. [8][10] These include prescription capture and interpretation, medication schedule generation, intelligent reminders, adherence logging, refill and stock monitoring, caregiver notifications, and conversational assistance through text or voice. [6][8][10] Such an architecture would directly address the fragmentation highlighted in the systematic review. [5]

A practical implementation can borrow the multimodal interaction and health-information structure from the base MediAssist paper, the inventory and guardian support concepts from MedCare and the tracker application, and the prescription simplification capabilities inspired by PharmMT. [6][8][10] In this way, the proposed project can move beyond a simple reminder tool and function as an intelligent adherence ecosystem that helps patients understand, follow, and maintain their medication regimen safely. [5][8][10]

4.1 Suggested Functional Modules

- User registration and secure profile management. [6][10]
- Prescription upload through image or text input, followed by OCR and instruction interpretation. [5][8]
- AI-generated simplified medication instructions for patient readability. [8]
- Smart reminder scheduling based on dosage, frequency, and treatment duration. [6]
- Medication stock and refill alert management. [6]
- Adherence dashboard with caregiver or guardian notifications. [6]
- Voice-based and chat-based interaction for accessibility. [5][10]

5. CHALLENGES AND FUTURE DIRECTIONS

Although AI-based medication systems are promising, the reviewed papers show that safety, privacy, explainability, and validation remain significant concerns. [5][8][10] Prescription-language simplification systems can still produce critical errors if numerical dosage or frequency information is altered incorrectly, and even strong automatic metrics may not fully capture clinical correctness. [8] Likewise, reminder applications may achieve usability, but they still require stronger security, better long-term adherence measurement, and more real-world testing across diverse patient groups.

Future work for MediAssist should therefore focus on multilingual support, elderly-friendly interfaces, clinician-in-the-loop validation, adaptive reminder intelligence, and privacy-preserving data management. [5][10] Integration with hospital systems, electronic prescriptions, wearable devices, and caregiver dashboards would further improve practical value and continuity of care. [6][10]

6. CONCLUSIONS

This survey reviewed the attached papers most relevant to the development of “MediAssist: AI-Powered Smart Medication Management System” and found that the strongest research foundation comes from combining medication adherence systems, prescription simplification tools, and multimodal healthcare assistants. [5][6][8][10] The literature shows that reminder-based applications improve scheduling and tracking, neural language systems can simplify prescription directions, and multimodal AI platforms improve accessibility and interaction quality. [6][8][10] However, the same literature also shows a persistent lack of unified systems that connect prescription understanding, intelligent reminders, refill support, caregiver monitoring, and conversational assistance. [5][8][10]

For this reason, the proposed MediAssist project is well justified as a next-step integrated solution in the medication management domain. [5][10] A carefully designed system that merges OCR, NLP, smart reminders, voice support, and adherence analytics can provide a more complete, patient-centered, and practically valuable platform than existing isolated solutions. [5][8][10]

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