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MediCare+: A Web-Based AI-Assisted Platform for Medication Adherence and Comprehensive Health Monitoring in Elderly Patients with Chronic Diseases

Dr, Mrunal Pathak[1], Dr. Pritesh Patil[2], Rohit Patil[3], Sanskruti Pawar[4], Vinit Phasge[5]
Associate Professor, Department of Information Technology[1]
Assistant Professor, Department of Information Technology[2]
UG Students, Department of Information Technology[3,4,5]
AISSMS Institute of Information Technology, Pune, India
rohit.p.1725@gmail.com

Abstract: *Managing chronic illness in older adults goes far beyond prescribing the right medication—it demands consistent adherence to complex, multi-drug regimens while tracking evolving symptoms, fluctuating vital readings, and periodic physician consultations. In India, where more than 138 million people are over the age of 60 and that figure continues to rise sharply, the gap between what elderly patients need and what currently available digital tools offer is both wide and consequential. Most elderly patients still rely on handwritten prescription slips and loose pill organizers; when something goes wrong, neither patient nor caregiver has a reliable record to consult. This paper introduces MediCare+, a web-based platform built to address this problem through ten clinically grounded modules: patient profiling, longitudinal disease history, medicine management, dosage scheduling, daily consumption tracking, health vitals monitoring, symptom logging, doctor visit records, a unified calendar dashboard, and AI-driven adherence analytics. A weighted adherence scoring algorithm classifies each patient into one of three risk tiers in real time, giving caregivers and physicians an actionable signal rather than raw data. Role-based access ensures that every user—patient, family caregiver, or treating physician—sees precisely the information relevant to their responsibilities. Evaluated on a simulated cohort of thirty elderly patients managing between two and seven concurrent medications over a four-week period, MediCare+ demonstrated complete reliability in dose tracking, alert generation, and adherence computation. The platform directly addresses the documented absence of a unified tool that handles care coordination across all dimensions that matter in geriatric practice.*

Keywords: elderly healthcare, medication adherence, health monitoring platform, chronic disease management, symptom logging, caregiver coordination, AI-assisted analytics, geriatric care informatics, polypharmacy management, digital health systems

I. INTRODUCTION

The world is ageing rapidly, and healthcare systems everywhere are grappling with what that means in practice. According to the World Health Organization, the proportion of the global population aged over sixty is expected to nearly double between 2015 and 2050, reaching around 2.1 billion people—a shift that will fundamentally reshape chronic disease management services. In India, the picture is already pressing: the elderly population crossed 138 million in 2021 and is projected to approach 300 million by mid-century [1]. Conditions like type 2 diabetes, hypertension, coronary artery disease, chronic obstructive pulmonary disease, and chronic kidney disease will

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collectively affect hundreds of millions of older adults, most of whom require multiple medications taken multiple times daily over years or decades.

What makes this clinically difficult is not simply the volume of medication—it is the fragility of the systems elderly patients currently use to manage it. Walk into any outpatient clinic in India and you will find elderly patients clutching crumpled prescription slips, carrying plastic pill boxes with handwritten notes in fading ink, and depending on family members who are often employed elsewhere during the hours when medications are actually due. When such patients are admitted to hospital—sometimes precisely because of medication mismanagement—the treating team frequently cannot obtain a clear picture of what the patient was taking, at what dose, and since when. This information vacuum directly contributes to prescribing errors, dangerous drug interactions, and avoidable readmissions [2].

The situation is further complicated by cognitive factors. Mild cognitive impairment affects a meaningful proportion of adults over seventy. Even without formal cognitive decline, elderly patients managing multiple medications face a genuinely complex organizational challenge: different drugs taken at different times, some with food and some without, some that interact with each other, and all subject to change at every physician visit. A missed dose of antihypertensive medication may not cause immediate symptoms, making it easy to overlook—yet the cumulative effect of inconsistent adherence over weeks and months can be clinically severe.

Digital health solutions have shown real promise in this area. Randomized controlled trials and systematic reviews consistently demonstrate that structured medication reminders, combined with monitoring and caregiver engagement, improve adherence significantly compared to unassisted self-management [6]. The challenge is that most applications currently available were designed with a different user in mind: a younger, smartphone-savvy individual managing a single condition. These tools operate as single-purpose utilities rather than integrated care management platforms, and they rarely provide caregiver-facing features that account for the reality that elderly patients very often need assistance managing their healthcare.

MediCare+ was developed to address these gaps directly. It is a web-based platform, accessible on any device without requiring app installation, that integrates ten modules covering the complete care management cycle. The system is designed with the elderly user's experience as a primary constraint: large text, high contrast, simplified navigation, and an interface that does not assume prior digital literacy. At the same time, it provides caregivers and physicians with the detailed, longitudinal data they need to identify problems early and coordinate care effectively.

II. LITERATURE REVIEW

A. Scope and Consequences of Medication Non-Adherence

The literature on medication non-adherence in elderly populations is extensive and consistent in its conclusions. The World Health Organization's landmark 2003 report estimated that only fifty percent of patients managing chronic conditions in high-income countries take their medications as prescribed, with rates considerably lower in resource-limited settings. Osterberg and Blaschke [3] documented that non-adherence accounts for up to half of all treatment failures and is associated with approximately 125,000 deaths annually in the United States alone—figures that, when extrapolated to the Indian context with its much larger elderly population and greater reliance on informal care, suggest an even more substantial burden.

In the Indian setting specifically, Misra and Khurana [4] found that more than sixty percent of elderly patients managing diabetes missed at least one prescribed dose every week, with forgetfulness identified as the primary reason in nearly three-quarters of cases. Balkrishnan [5] demonstrated that consistent medication adherence in elderly patients with hypertension reduced the incidence of stroke and myocardial infarction by twelve to twenty percent over a five-year horizon. The Cochrane review by Haynes and colleagues [6], synthesizing evidence from seventy-eight randomized trials, confirmed that multi-component interventions—those combining reminders, adherence monitoring, and self-management support—consistently outperform single-component approaches. MediCare+ operationalizes exactly this kind of layered intervention.

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B. Digital Health Platforms for Elderly Care

A systematic review of forty-five mHealth interventions by Akter and Ray [7] found that platforms providing integrated care coordination—where medication records, vitals monitoring, and caregiver communication are unified in a single system—produced significantly better adherence outcomes than standalone reminder tools. Their analysis identified three recurring structural gaps in existing applications: the absence of multi-disease tracking for patients managing several conditions simultaneously, the failure to integrate medication records with physiological monitoring data, and the neglect of caregiver-facing workflows. Each of these gaps maps directly onto a design requirement that MediCare+ addresses.

Demiris and colleagues [8] found that daily summary views combined with exception-based alerts—notifications that fire only when something unusual happens—generated the highest satisfaction and sustained engagement among elderly users. This finding shaped MediCare+'s calendar dashboard design. Sharifi et al. [9] demonstrated statistically significant improvements in HbA1c and blood pressure control through programs combining structured SMS reminders with daily vitals logging, providing direct empirical support for MediCare+'s paired reminder and vitals tracking architecture.

C. Electronic Records and Clinical Decision Support

Bates and colleagues [11] documented a fifty-five percent reduction in preventable adverse drug events following the introduction of computerized physician order entry in hospital settings. However, their study also noted that these gains largely disappear after hospital discharge, as patients return to paper-based management and the information continuity that electronic systems provide is broken. MediCare+ is designed to extend that continuity into the post-discharge and outpatient setting. Krist and colleagues [12] found that patients who actively engaged with health portals to track their own readings demonstrated measurably better chronic disease control—suggesting that the act of recording and reviewing one's own data has independent therapeutic value.

D. Comparative Analysis with Existing Applications

Table I presents a side-by-side comparison of MediCare+ against five representative tools currently available—MedHelper, CareZone, Medisafe, Apple Health, and MyTherapy—across eleven clinically relevant features. The comparison reveals a consistent pattern: existing applications handle individual components of medication management adequately, but none combines disease history tracking, AI adherence scoring, symptom logging, doctor visit records, and role-based access control within a single platform. MediCare+ is the only system in the comparison that delivers all features, and the only one specifically designed to serve the distinct but complementary needs of patients, caregivers, and physicians from within the same interface.

TABLE I: Feature Comparison of MediCare+ Against Leading Existing Applications

Feature	MedHelper	CareZone	Medisafe	Apple Health	MyTherapy	MediCare+
Disease History Tracking	✗	✗	✗	Partial	✗	✓
Medication Reminders	✓	✓	✓	Partial	✓	✓
Health Vitals Logging	✗	Partial	✗	✓	Partial	✓
Symptom Logging	✗	✗	✗	✗	✓	✓
Doctor Visit Records	✗	Partial	✗	✗	✗	✓
Caregiver Access	✗	✓	✓	✗	Partial	✓

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Stock / Refill Alerts	✓	✓	✓	✗	✓	✓
AI Adherence Scoring	✗	✗	✗	✗	✗	✓
Calendar Dashboard	Partial	✓	Partial	✗	✓	✓
Role-Based Access Control	✗	Partial	Partial	✗	✗	✓
Elderly UI Optimization	✗	Partial	✗	✗	Partial	✓

III. SYSTEM ARCHITECTURE AND METHODOLOGY

A. Architectural Overview

MediCare+ is built as a single-page web application using React 18 and Vite, with a custom CSS design system developed around the specific accessibility requirements of elderly users: font sizes that remain readable on standard smartphone screens without zooming, contrast ratios that exceed WCAG AA guidelines for users with age-related visual decline, and touch targets large enough to be reliably activated without precise fine motor control. The application follows a three-tier architecture separating the presentation layer, the application logic layer, and a cloud-hosted data layer. This separation allows each layer to be updated, scaled, or replaced independently, which is particularly important as the platform evolves toward wearable integration and machine learning-based risk scoring.

Role-based access control is enforced at the application logic layer rather than merely at the interface level. The system recognizes three distinct user roles—patient, caregiver, and physician—each configured with access permissions tailored to their clinical responsibilities. Caregiver accounts carry the most extensive read-write access, reflecting that caregivers are often the primary operators of the system on behalf of the patient. Physician accounts have read-only access to all clinical records, enabling them to review a complete medication and symptom history at the point of consultation without being able to modify records generated by the care team.

B. Module Descriptions

The ten modules that constitute MediCare+ were designed as an integrated whole rather than as separate features. Each module addresses a distinct clinical need, but they share a common data model that allows information entered in one module to automatically populate or inform another. Table II summarizes each module's clinical function and principal data fields.

TABLE II: MediCare+ Modules — Clinical Functions and Key Data Fields

Module	Clinical Function and Key Data Fields
Patient Profile	Stores demographic data, blood group, known allergies, emergency contacts, caregiver details, and insurance information.
Disease History	Maintains a longitudinal record of all diagnosed chronic and acute conditions with onset year, severity classification, and treating physician notes.
Medicine Management	Records brand name, generic name, formulation, strength, dosage frequency, food instructions, prescribing doctor, therapeutic purpose, current stock count, and refill due date.
Dosage & Schedule	Derives and displays time-stamped medication schedules from registered medicine records; supports morning, afternoon, evening, and bedtime slots.

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Daily Consumption Tracker	Allows patients or caregivers to mark each scheduled dose as taken, skipped, or missed; builds the longitudinal adherence record used by the scoring engine.
Health Vitals Log	Captures blood pressure, blood glucose, pulse rate, oxygen saturation, body temperature, and weight with date and time stamps; displays trend graphs.
Symptom & Discomfort Log	Provides a curated checklist of twenty common geriatric symptoms; records severity, timing relative to medication intake, duration, and whether care was subsequently sought.
Doctor Visit & Prescription	Archives complete consultation records including diagnosis, prescription modifications, investigations ordered, and next scheduled appointment.
Calendar Dashboard	Presents today's dose schedule, overdue alerts, upcoming appointments, and health risk flags in a single home-screen view.
Reports & AI Analytics	Aggregates weekly adherence scores, stock-level warnings, vitals trend summaries, and risk stratification flags into a downloadable report.

The interconnection between modules is central to MediCare+'s clinical value. When a physician visit record is entered with a prescription change, the system automatically updates the Medicine Management module, which in turn revises the Dosage and Schedule module and resets the Daily Consumption Tracker for the new regimen. When stock drops to the alert threshold, the Calendar Dashboard immediately surfaces a warning. These linkages mean the platform functions as a genuine care coordination system rather than a collection of independent logging tools.

C. Adherence Scoring Algorithm

The core analytical engine of MediCare+ computes medication adherence through a two-level calculation. At the daily level, the system counts the number of scheduled doses marked as taken and divides by the total number of doses scheduled for that day:

Daily Adherence Score (%) = (Doses Taken ÷ Total Scheduled Doses) × 100

A dose marked as skipped by the patient with a stated reason is treated differently from a dose that is simply not recorded, allowing the algorithm to distinguish between intentional clinical decisions and genuine non-adherence. At the weekly level, the system computes a composite index as a recency-weighted average of the preceding seven daily scores, applying progressively higher weights to more recent days. Patients are then stratified into three risk tiers as shown in Table III.

TABLE III: Medication Adherence Risk Stratification Thresholds and Recommended Actions

Adherence Level	Score Range	Recommended Clinical Action
Good Adherence	80% – 100%	Continue current regimen; schedule routine monthly monitoring.
Moderate Adherence	50% – 79%	Trigger caregiver follow-up; investigate patient-reported barriers.
Poor Adherence	Below 50%	Immediate caregiver alert; escalate to physician review within 48 hours.

D. Low Stock and Refill Alert System

Each medicine record maintains a live stock counter decremented by one each time a dose is marked as taken. When stock reaches or falls below a configurable threshold—set at seven doses by default—a dashboard alert is displayed and a caregiver notification is triggered. The threshold is configurable because supply chains vary: patients in rural areas

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may need a two-week lead time to reach a dispensing pharmacy, while those near urban centers may manage with a shorter buffer. Refill due dates are tracked as a separate parameter, independent of the stock counter, to catch scenarios where a prescription renewal date falls before the supply runs out. A dual-trigger approach—one stock-based and one date-based—ensures that caregiver attention is drawn to supply issues through whichever indicator fires first.

IV. RESULTS AND ANALYSIS

A. Pilot Evaluation Methodology

MediCare+ was evaluated over a four-week period using a representative dataset constructed to reflect the clinical profile of elderly patients managed at a typical Indian outpatient facility. The dataset comprised thirty simulated patient records spanning five chronic disease categories: type 2 diabetes, hypertension, coronary artery disease, COPD, and chronic kidney disease. Concurrent medication counts ranged from two to seven per patient, deliberately spanning the full spectrum from relatively simple regimens to complex polypharmacy. Dose schedules included morning-only, twice-daily, three-times-daily, and as-needed configurations to test the scheduling engine under varied conditions. The evaluation assessed correctness and reliability rather than clinical efficacy in a trial sense, confirming that the system performs its intended functions correctly before deployment with real patients.

B. Evaluation Results

The system performed without failure across all evaluation parameters throughout the four-week period. The complete results are summarized in Table IV.

TABLE IV: MediCare+ Pilot Evaluation Results Summary

Evaluation Parameter	Result	Observation
Scheduled dose notifications	100%	All notifications processed without failure across 30-patient dataset.
Adherence score computation	100%	Correct tier classification for all simulated patient profiles.
Low stock alert accuracy	100%	Triggered reliably at the 7-dose threshold for every medicine.
Mean alert lead time before stock exhaustion	6.3 days	Adequate window for prescription collection and refill.
Appointment reminder accuracy	100%	Generated at the correct 7-day advance interval in all tested cases.
Symptom log data integrity	100%	All entries retained without loss across the 4-week pilot period.
Concurrent medications per simulated patient	2 – 7	Reflects real-world polypharmacy range for elderly chronic disease patients.

Several findings from the pilot are worth highlighting. The mean alert lead time of 6.3 days before projected stock exhaustion confirms that the alert system provides caregivers with adequate advance warning to obtain a refill without the patient experiencing a medication interruption. In clinical practice, even a two-day gap in antihypertensive or antidiabetic therapy can produce measurable deterioration in blood pressure or glucose control, so a nearly one-week buffer represents a meaningful safety margin.

The correctness of adherence score computation across all patient profiles—including patients whose simulated records included dose skips with reasons, late entries, and mid-week prescription changes—confirms that the algorithm handles

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the edge cases likely to appear in real-world use. The complete retention of symptom log entries across the evaluation period addresses a concern that is clinically important but easy to overlook: symptom records are most valuable when reviewed retrospectively to identify patterns that preceded a clinical deterioration. A system that loses entries intermittently produces a false sense of security.

C. Usability Observations

Informal usability observations were gathered alongside the quantitative performance metrics. The large-font interface and simplified navigation structure were noted by caregivers acting as proxy users to be substantially easier to operate than comparable applications. The calendar dashboard's unified view of today's schedule, pending alerts, and upcoming appointments was identified as the highest-value feature by caregiver-role users, consistent with Demiris et al.'s finding [8] that consolidated summary views drive sustained engagement. Physician-role users noted the value of having a complete, chronologically ordered symptom and vitals history available at the point of consultation, describing it as comparable to a well-maintained patient diary—but organized and searchable rather than handwritten and incomplete.

V. SCOPE FOR FUTURE RESEARCH AND DEVELOPMENT

The current implementation of MediCare+ establishes a functional and clinically grounded foundation, and several directions offer substantial scope for extending its capabilities. The most impactful near-term extension would be integration with wearable devices—particularly smartwatches and continuous glucose monitors that are increasingly affordable in the Indian market. At present, vitals data must be entered manually, which introduces both documentation burden and the possibility of transcription error. Automated ingestion of blood pressure, pulse rate, oxygen saturation, and glucose readings from paired wearables would eliminate this burden and produce a more complete physiological record.

Machine learning-based predictive risk scoring represents the most clinically ambitious direction for future development. The current algorithm classifies adherence risk based on recent behavior, which is inherently reactive. A predictive model trained on longitudinal patterns of adherence, vitals, symptom frequency, and medication complexity could identify patients at elevated risk days or weeks before their adherence actually deteriorates, enabling genuinely preventive caregiver intervention. Multilingual support—particularly for Hindi, Marathi, Tamil, Telugu, and Bengali—would substantially expand MediCare+'s accessibility among elderly patients and caregivers with limited English proficiency. For a significant portion of the target population, the language barrier alone may be the primary obstacle to adoption.

Integration with national health infrastructure—specifically the Ayushman Bharat Digital Mission and hospital electronic medical record systems via HL7 FHIR standards—would enable bidirectional data exchange that could substantially reduce the documentation burden currently placed on caregivers and physicians. Finally, a prospective randomized controlled trial comparing medication adherence, hospitalization rates, and chronic disease biomarker control between MediCare+ users and a standard-care control group is necessary to establish clinical efficacy. The pilot evaluation reported in this paper demonstrates that the system works as designed; the clinical trial would demonstrate that it produces the health outcomes that motivated its development.

VI. CONCLUSION

The challenge of managing chronic illness in elderly patients is fundamentally a coordination problem. The clinical knowledge exists, the medications work when taken correctly, and the monitoring technology is available—but the systems that are supposed to bring these elements together in the hands of patients, caregivers, and physicians have not kept pace with the scale and complexity of the problem. Most available tools address one piece of the puzzle in isolation: a reminder application that does not link to disease records, a vitals tracker that does not communicate with

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the care team, a physician portal updated only during clinic visits. The patient who needs all of these things to work together has to assemble them from disparate applications that do not communicate with each other.

MediCare+ addresses this gap by building the complete care management cycle into a single, purpose-designed platform. The ten integrated modules—from patient profiling and disease history through to AI-driven adherence analytics—are not independent features but interconnected components of a system in which information flows from where it is generated to where it is needed. The weighted adherence scoring algorithm translates this information flow into actionable risk signals, and the role-based access architecture ensures that each user receives the information appropriate to their responsibilities without information overload.

The elderly patients who stand to benefit most from a platform like MediCare+ are precisely those who are least well served by existing digital health tools: patients managing multiple chronic conditions simultaneously, patients dependent on family caregivers who need consolidated information rather than scattered data, and patients in resource-limited settings where the gap between prescribed care and delivered care is widest. Closing that gap, one patient at a time, is what this platform is designed to do.

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