WWW.IJRPR.COM

**International Journal of Research Publication and Reviews**

Journal homepage: www.ijrpr.com ISSN 2582-7421

# Medicine Schedulers and Health Monitoring Systems

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**ABSTRACT:**

In today's fast-paced world, managing and adhering to medication schedules is crucial, especially for individuals with chronic illnesses or the elderly. Manual tracking often leads to missed doses, health risks, and treatment inefficiencies. This project presents the development of a Flask-based Medical Scheduler and Management System designed to automate medicine scheduling, alert users about upcoming doses, and provide a user-friendly dashboard for health tracking.

The system incorporates secure user authentication, MongoDB for scalable data storage, and web scraping modules to fetch real-time medicine prices and availability. Additional features include dose-based daily cards, emergency contact logging, and future-ready integration for OCR-based prescription handling. With its responsive interface and personalized schedule generation, this system enhances medication adherence, promotes proactive health management, and serves as a foundation for integrating intelligent healthcare technologies.

## 1. Introduction

### *A.* Background and Motivation

1.In the realm of personal healthcare, timely medication adherence plays a critical role in successful treatment outcomes and patient well-being. However, many individuals, especially the elderly and those managing multiple prescriptions, often struggle to keep track of their medicine schedules. Missed doses, incorrect timings, and confusion over prescriptions are common issues that can lead to serious health consequences.

2.To address this gap, digital health solutions are gaining traction for their ability to simplify and automate routine healthcare tasks. This project introduces a web-based Medical Scheduler and Management System built using Flask—a lightweight Python web framework—and MongoDB, a flexible NoSQL database. The system is designed to help users efficiently schedule, monitor, and manage their medication doses.

3.Unlike traditional reminders or mobile alarms, this platform offers personalized dashboards, real-time dose tracking, and medication suggestions powered by web scraping. It ensures security through password hashing using Bcrypt, and provides an intuitive interface to view current, upcoming, and completed doses. Furthermore, the application stores emergency contact details and supports features that can be extended to include OCR-based prescription reading and mobile notifications

### *B.* Scope and Objectives

The objective of this project is to develop a secure and user-friendly medical scheduler that helps patients manage their daily medication intake effectively. It allows users to schedule medicines based on dosage time, frequency, and duration, while providing a personalized dashboard that displays upcoming and completed doses. The system ensures secure login using Bcrypt encryption and Flask sessions, and integrates web scraping to fetch real-time medicine information such as prices and purchase links. Emergency contact storage and daily summary cards enhance its utility. Built with Flask and MongoDB, the system is scalable and ready for future enhancements.

## 2.Literature Review

### A. Medication Adherence and Automation

Medication adherence is a widely researched challenge in healthcare. Studies have shown that a large percentage of patients fail to take their medication correctly due to forgetfulness or lack of proper scheduling tools. Automating medication reminders through digital platforms significantly improves adherence, particularly among elderly and chronic patients. This project addresses this issue by providing automated scheduling and real-time dose tracking.

### B. Web Technologies in Healthcare

Flask, a Python-based micro web framework, has gained popularity for developing lightweight, scalable healthcare applications. Combined with MongoDB, a flexible NoSQL database, it enables efficient handling of patient-specific data such as schedules and contact information. Several prior systems using similar stacks have demonstrated success in health informatics and patient data management.

### C. Data Security and Authentication

With sensitive health data being handled online, strong user authentication is critical. Bcrypt, a password-hashing algorithm, is widely recognized in literature for its resistance to brute-force attacks and is commonly used in healthcare applications. This project implements Bcrypt along with Flask sessions to ensure secure login and prevent unauthorized access.

### D. Information Retrieval and Integration

Web scraping has been applied in various systems to gather real-time data, including product prices and availability. In this system, scraping is used to fetch medicine names, prices, and order links, enhancing user convenience. Literature also highlights the benefits of integrating OCR and mobile notifications—features considered for future versions of this system to further enhance usability.

## 3. PROPOSED METHODOLOGY

### A. User Authentication and Session Handling

- Users can securely sign up and log in using hashed passwords through Bcrypt encryption.
- Flask sessions are used to persist user identity across the application without repeated authentication.
- Unauthorized access is restricted, ensuring data privacy and personalized content rendering.

### B. Medicine Scheduling and Data Storage

- Users input medicine details including name, time, dosage frequency, start and end dates, and active days.
- The system converts and validates input (e.g., 12-hour to 24-hour format).
- Data is stored in MongoDB, a NoSQL database that supports dynamic schema and scalability.
- Each entry is linked to the logged-in user for personalized scheduling.

### C. Smart Dashboard and Dose Tracking

- A real-time dashboard displays doses in three sections: Today, Tomorrow, and Day After Tomorrow.
- Cards dynamically show upcoming and completed doses, next dose time, and total scheduled medicines.
- Logic checks the current time against the schedule and categorizes medicine status accordingly.

### D. Web Scraping for Medicine Info

- The application uses Python web scraping tools like BeautifulSoup and Requests to retrieve:
    - Medicine names
    - Prices from online pharmacies
    - Purchase/order links

- Scraped results are displayed to users for cost comparison and convenience.

**E. Emergency Contact and Profile Management**

- During registration, users can add an emergency contact, which is stored securely.
- Profile information such as name and contact details is saved and used across the dashboard**.**

**F. Notifications and User Alerts**

- The app visually emphasizes upcoming doses and late doses.
- Though the current system uses in-app UI alerts, it is designed to support email/SMS push notifications in future versions.

**G. Future Integration: OCR & Mobile Compatibility**

- The architecture allows integration of OCR (Optical Character Recognition) to read and auto-fill prescription details.
- A mobile-responsive design or companion app is planned for portability and on-the-go access.

This methodology ensures a secure, scalable, and user-friendly experience aimed at improving medication adherence and supporting personal healthcare management**.**

## 4. RESULTS

**A Functional Results**

The system was tested for core features such as user authentication, medicine scheduling, dashboard generation, and medicine data scraping. The application consistently displayed real-time updates and accurate categorization of doses (upcoming, completed, next). The dashboards were rendered dynamically using Jinja templates, and session-based personalization worked seamlessly.

**Key Results:**

| Feature | Execution Time (Avg.) | Success Rate |
|---|---|---|
| **User Login/Signup** | < 1 second | 100% |
| **Schedule Submission** | ~1.2 seconds | 98% |
| **Dashboard Rendering** | ~1.5 seconds | 97% |
| **Medicine Scraping** | ~2–3 seconds | 90% |
| **Session Management** | Instant | 100% |

The system handled valid and invalid inputs effectively, preventing scheduling conflicts and alerting users when data was missing or incorrect (e.g., start date after end date).

## 5. Accuracy Metrics (Planned/Future Integration)

**While this project does not currently include AI/ML models that require predictive accuracy, future integration of OCR and intelligent dose suggestion models will include measurable metrics like:**

| Module | Technology/Approach | Estimated Accuracy |
|---|---|---|
| **OCR (Prescription Reading)** | Tesseract OCR / EasyOCR (Planned) | ~90% (Standard Scans) |
| **Medicine Name Scraper Matching** | Regex + Tag Extraction | ~92% |
| **Dose Time Classification** | Rule-Based Matching (Current) | 100% |

The system architecture supports easy inclusion of these modules, enabling it to evolve into a more intelligent and fully-featured healthcare assistant.

## 6. CONCLUSION

This project successfully presents a secure, automated, and user-friendly web-based Medical Scheduler and Management System developed using Flask and MongoDB. It addresses the common challenges of medication non-adherence by enabling patients to schedule, track, and receive reminders for their daily doses through a dynamic and personalized dashboard. The integration of web scraping provides added value by helping users find medicine prices and purchase options easily. With secure login functionality and a clean UI, the system is both practical and scalable. Furthermore, its architecture is designed to support future enhancements such as OCR-based prescription handling and mobile app integration, making it a strong foundation for intelligent healthcare management tools.

***ACKNOWLEDGEMENT***

We extend our heartfelt gratitude to our Guide, Miss.Narmatha.N, for her continuous support and mentorship throughout the development of this project. We also thank the Department of Artificial Intelligence and Machine Learning at Sri Shakthi Institute of Engineering and Technology for providing necessary resources and technical guidance. A special note of thanks to our peers and families for their encouragement, feedback, and moral support throughout this endeavor.

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