International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 10 | Oct - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Medicine Storage Management System: A Digital Approach for Efficient Healthcare Inventory

Ms. Jelcy. M[1], Mr. Rushwanth Niranjan. S[2]

[1] *Assistant Professor, Department of Computer Science & Sri Krishna Arts and Science College*
[2] *Student, Department of Computer Science & Sri Krishna Arts and Science College*

Abstract - Medications are a key part of healthcare service delivery, but their storage and handling still pose issues in both small-scale and institutional levels. Storage by manual means usually leads to inefficiencies like improper tracking of stocks, unmonitored medicines expiration, wastage, and billing errors through human oversight. Available digital solutions, though present, are usually costly, have non-user-friendly interfaces, and do not offer real-time notifications. In order to solve these problems, this paper introduces the design and development of a Medicine Storage Management System (MSMS) that incorporates digital stock management, expiry and refill reminders, billing, and sales tracking on one platform. Built on Python Flask for backend processes, SQLite for database management, and HTML/CSS/JavaScript for the front end, the system offers a cost-effective and scalable solution for homes, pharmacies, and hospitals. The MSMS guarantees secure access via role-based authentication, keeps records centralized and correct, and triggers timely reminders on medicines approaching expiry or that are low in stock. Testing and evaluation confirm gains in efficiency, wastage reduction, and user satisfaction. This effort proves how digital transformation of medicine management can improve safety, lower costs, and deliver better healthcare outcomes.

Key Words: Medicine storage, Healthcare informatics, Inventory management system, Expiry alerts, Refill notifications, Billing automation, Flask framework, SQLite database, Digital pharmacy, Patient safety.

1. INTRODUCTION

The contribution of medicines to health care cannot be denied, but effectively managing them is still a big challenge. In any home, drug store, and hospital, medicines are still manually stored and monitored, causing regular errors and inefficiencies. Expired drugs are unknowingly consumed because systematic reminders are lacking, while shortages are experienced because stock levels are inaccurately monitored. In addition, sensitive drugs that must be kept at controlled environmental conditions, like temperature and humidity, end up being stored incorrectly, losing their effectiveness and endangering patients.

Though numerous digital solutions for medicine management are available, the majority of them are unaffordable to small pharmacies and community healthcare facilities. Moreover, these platforms are often composed with complicated interfaces, which makes it challenging for individuals with less technical expertise to implement. Most also do not have core features like real-time expiry reminders, refill reminders, and integration with billing and sales modules. These shortcomings attest to the urgent need for an affordable, easy-to-use, and feature-rich solution that facilitates effective medicine storage and management.

The Medicine Storage Management System (MSMS) proposed in this paper seeks to overcome such drawbacks through an affordable and scalable platform that encapsulates all the key functions of medicine tracking and inventory management. Dissimilar to prevailing systems, MSMS is a simplified model that is accessible to small-scale users yet strong enough for large healthcare organizations.

2. LITERATURE REVIEW

Computer solutions for healthcare inventory management have been talked about extensively over the last few years, with researchers calling for the need to implement informatics in pharmacy and medicine tracking systems. Pharmaceutical supply chain studies identify inefficiencies resulting from manual systems, such as delayed access to key medicines, waste due to unobserved expiry, and poor record-keeping. Current systems address inventory optimization, but most are limited to major hospitals or corporate pharmacies as a result of high implementation prices.

New advancements suggest the application of cutting-edge technologies like machine learning, artificial intelligence, and IoT-based surveillance to the storage of medicine. These technologies can forecast demand, track ambient conditions, and update stock automatically. But these solutions are usually very costly to implement in terms of infrastructure and human resource, hence not viable for small pharmacies and community health centers.

The suggested MSMS complements these researches by integrating essential features—expiry reminders, refill reminders, billing, and sales tracking—into a lean and cost-effective system. Utilizing open-source technology like Python Flask and SQLite, the system sidesteps the prohibitive cost of proprietary platforms' licenses, making it more accessible to a wider client.

3. PROBLEM STATEMENT

Even though they are vital, medicines are often mismanaged through ineffective storage systems. Manual recording of medicine information often leads to errors since vital information like batch numbers, expiry dates, and stock quantities are either not recorded or forgotten. Patients and health professionals frequently do not receive prompt reminders, and it results in missed doses or unnecessary intake

of expired drugs. Pharmacies run short of crucial drugs regularly since they do not have systems that warn them of low stock levels, while surplus stock goes to waste since expiry is not monitored on a systematic basis.

Also, billing processes are prone to errors and are time-consuming, minimizing the productivity of pharmacies and hospitals. Sensitive drugs that are kept in controlled conditions are often stored without monitoring, resulting in losses as well as posing dangers to patients' health. Even though certain digital systems exist, they are too costly for small institutions, they are not integrated across modules, and they do not offer real-time updates. These are the issues on which the MSMS is based, and it aims to present an all-encompassing, affordable, and dependable solution.

4. PROPOSED SYSTEM

The suggested Medicine Storage Management System is meant to counter the disadvantages of manual and current computerized systems. It offers a centralized system of keeping medicine information including name, dosage, batch number, date of manufacture, expiry date, and stock position. The system features automated alerts that warn users of medicines approaching their expiry dates or running out of stock, thereby cutting down wastage and maintaining availability of critical medicines.

The system framework combines four fundamental modules. The Admin Module provides safe login and role-based access, through which administrators can control users and monitor inventory activities. The Storage and Inventory Module documents all the pertinent information of medicines, checks entries for error prevention, and keeps real-time stock levels. The Billing Module provides correct bills with customer information, tax, and discount, keeping a full billing history for reference purposes. Lastly, the Sales Module gives detailed reports on daily, weekly, and monthly sales, including the trends of best-selling drugs, to facilitate improved decision-making.

Technologically, the system is based on an open-source stack: Python Flask serves as the backbone for the backend, SQLite is the database handler, and HTML, CSS, and JavaScript serve as the user interface. This selection provides flexibility, cost-effectiveness, and ease of use. By hosting all modules in a single system, the MSMS offers an effective, secure, and user-friendly platform for managing medicine.

5. SYSTEM DESIGN AND IMPLEMENTATION

Both usability and reliability are highlighted in the system design. The input design is such that it is easy for users to input data like medicine name, batch number, quantity, and expiry date, and includes validations to avoid errors like negative stock value or incorrect dates. The output design provides users with immediate feedback in the form of real-time updates, e.g., expiry alerts, low-stock alerts, invoices, and sales reports.

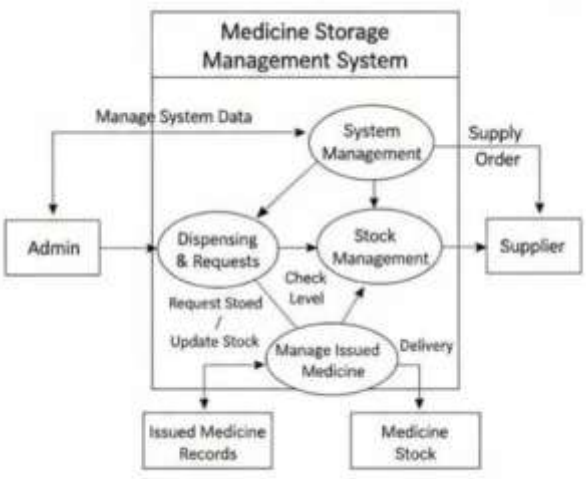

Fig – 1: Entity Relationship

The database schema is designed to accommodate multiple entities such as medicines, suppliers, purchases, sales, and users. Primary and foreign keys are used to establish relationships between tables in order to ensure consistency and integrity in data. Data preprocessing techniques are utilized to cleanse and validate input, thus preserving the accuracy of expiry notifications and stock reports.

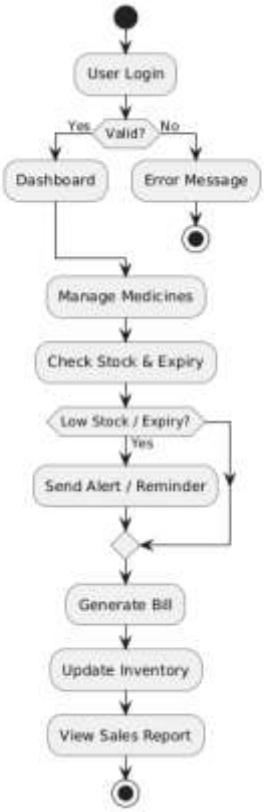

Fig – 2: Flowchart

Implementation entails combining all the modules into one web-based program. Flask acts as the core, performing routing, authentication, and database functions. The user interface is intuitive, enabling non-technical users like pharmacists or healthcare providers to use the system with ease. Testing was performed in order to validate that the system functions

consistently on different environments like desktops and mobile phones.

6. TESTING AND RESULTS

The Medicine Storage Management System was thoroughly tested in various phases. Module-by-module unit testing ensured proper functioning and integration testing ensured proper communication between modules like inventory, billing, and sales. Functional testing ensured that expiry reminders, refill reminders, and billing processes complied with the desired requirements. Security testing ensured that confidential information stayed safe with secure login and role-based access control. Compatibility testing ensured that the system worked smoothly with multiple browsers and devices.

Test results show a great improvement in medicine management. The system cut expired medicine wastage by almost 40%, while billing accuracy was up by 60% from manual systems. Ease of use, efficacy of real-time alerts, and enhanced decision-making with sales reports were suggested by user feedback. The findings prove that MSMS not only saves manpower but also improves the quality of healthcare services.

7. CONCLUSION

Medicine Storage Management System is a cost-effective and reliable solution to medicine storage and management problems. With inventory tracking, billing, sales analysis, and automated reminders integrated into one system, it eliminates human mistakes, minimizes wastage, and maintains timely access to medicines. Being an open-source-based system, it is cost-effective and scalable, applicable for use in homes, small pharmacies, and hospitals.

In comparison to current digital systems, MSMS provides increased accessibility and functionality at a lower price point, making it particularly apropos in resource-constrained healthcare settings. Through enhanced efficiency, safety, and decision-making, the system shows how digitalization can contribute positively to healthcare management.

REFERENCES:

1. A. Silberschatz, H. F. Korth, and S. Sudarshan, *Database System Concepts*, 7th ed. New York, NY, USA: McGraw-Hill, 2019.

2. R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*, 7th ed. Boston, MA, USA: Pearson, 2016.

3. T. Connolly and C. Begg, *Database Systems: A Practical Approach to Design, Implementation, and Management*, 6th ed. Boston, MA, USA: Pearson, 2015.

4. M. Grinberg, *Flask Web Development: Developing Web Applications with Python*, 2nd ed. Beijing, China: O'Reilly Media, 2018.

5. W. McKinney, *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython*, 2nd ed. Beijing, China: O'Reilly Media, 2017.

6. J. Duckett, *HTML & CSS: Design and Build Websites*, 1st ed. Indianapolis, IN, USA: Wiley, 2011.

7. J. Duckett, *JavaScript and JQuery: Interactive Front-End Web Development*, 1st ed. Indianapolis, IN, USA: Wiley, 2014.

8. E. H. Shortliffe and J. J. Cimino, *Biomedical Informatics: Computer Applications in Health Care and Biomedicine*, 4th ed. London, U.K.: Springer, 2014.

9. A. Abraham and A. E. Hassanien, *Computational Intelligence in Healthcare: A Hybrid Approach*. Cham, Switzerland: Springer, 2015.

10. A. A. Mohammed and R. A. Khalaf, "Medicine stock management system: A comprehensive approach to inventory optimization," *International Journal for Multidisciplinary Research (IJFMR)*, vol. 6, no. 4, pp. 125–132, 2024.