Medical Shop Management

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Abstract

The Medical Shop Management project is designed to overcome the challenges faced by small pharmacies and clinics in managing medical inventory and patient refills. Many such establishments depend on manual methods or basic spreadsheets, which often result in stockouts, expired medicines, and missed patient refills. Medical Shop Management provides a secure, offline, and user-friendly solution that automates inventory management through barcode-based stock entry, batch-level tracking, and FEFO (First Expiry, First Out) dispensing. It generates timely alerts for low stock and nearing expiry medicines, ensuring uninterrupted availability of essential drugs. The system also enables automatic patient refill reminders, particularly for chronic patients, thus improving treatment compliance and healthcare outcomes. Unlike cloud-based systems, Medical Shop Management stores all data locally using encrypted databases and biometric authentication, ensuring privacy and security of sensitive medical information. Built using Flutter, the application runs seamlessly across Android and iOS devices, with potential for desktop support, making it adaptable for diverse healthcare environments. By combining automation, offline functionality, and strong security, Medical Shop Management enhances operational efficiency, reduces wastage, and strengthens patient care in resource-limited pharmacies and clinics.

Introduction

Efficient management of medicines and patient records is a critical requirement for small pharmacies and clinics. However, most of these setups still depend on manual registers or basic spreadsheets, which are prone to errors, stockouts, and wastage of expired medicines. Patients, especially those with chronic illnesses such as diabetes or hypertension, often miss refills due to the absence of proper reminder systems.While cloud-based healthcare solutions exist, they are costly, require constant internet access, and raise serious concerns regarding data privacy and security. For small, resource-limited clinics and pharmacies, adopting such systems is neither practical nor sustainable.

Medical Shop Management is designed to address these challenges by providing a secure,

offline-first, and user-friendly medical inventory and patient reminder system. The solution integrates barcode-based stock entry, batch-level expiry tracking using the FEFO (First Expiry, First Out) principle, and real-time alerts for low stock and near-expiry medicines. It also generates automated refill reminders for patients, ensuring better medication adherence. To safeguard sensitive healthcare data, Medical Shop Management uses encrypted local storage (SQLCipher) and biometric authentication, eliminating reliance on cloud servers. Built with Flutter, it supports Android and iOS devices, making it portable and accessible. By combining automation, strong security, and offline functionality, Medical Shop Management aims to enhance efficiency, reduce wastage, and improve the quality of healthcare services in small-scale pharmacies and clinics.

Literature Survey

Table 1: Summary of Literature Survey

Sr. No	Paper Title	Author Name	Year of Publication	Problem solved in this paper (Existing Problem Statement)	Technique used to solve problem (Existing Problem Solution)	Future Work (Future Scope)
1	Privacy and Security in Mobile Health (mHealth) Research	Arora et al.	2014	Lack of privacy-preserving practices in health apps	Review of privacy/security mechanisms	Apply local encrypted DB (SQLCipher) and OS-level secure storage
2	Effectiveness of Mobile Phone Text Messaging in Improving Medication Adherence	Sarabi et al.	2016	Unclear impact of reminder systems on patient adherence	Systematic review of SMS interventions	Standardize message timing/content; test in low-resource areas
3	Improving Refill Adherence in Medicare Patients With Tailored Messaging	Prayaga et al.	2018	Low refill adherence among Medicare/elderly patients	Tailored digital messaging and refill prompts	Integrate with pharmacy inventory and clinical workflows
4	Security Mechanisms of a Mobile Health Application	Bastos et al.	2021	Data privacy and security risks in mHealth apps	Multi-layer security: authentication, encryption, secure keys	Use lightweight encryption and biometric gating for offline apps

5	Text Message Medication Adherence Reminders: A Pilot Study	Luong et al.	2021	Patients missing medication refills and poor adherence	SMS-based refill/adherence reminders and monitoring via EHR	Scale to larger populations and integrate automated workflows
9	Management of Medicines Wastage, Returned Medicines and Disposal	Chong et al.	2022	Community pharmacists struggling with wastage and expired drugs	Qualitative study; recommends FEFO and proper disposal	Technology-enabled FEFO enforcement and predictive analytics
6	Mobile Phone Text Message Reminders for Type 2 Diabetes: Systematic Review	Belete et al.	2023	Poor adherence in Type 2 diabetes patients	SMS reminder interventions improving adherence	Combine reminders with pharmacy systems and refill automation
7	Medicines Wastage and Its Contributing Factors in Public Supply Chains	Guadie et al.	2023	High medicine wastage due to expiry and poor stock control	Field study identifying wastage causes; recommends FEFO	Deploy low-cost digital inventory tracking at facility level
8	Inventory Control Mechanism of the Pharmacy Store	Jaju et al.	2023	Inefficient manual stock control in pharmacies	Prototype digital inventory system with expiry tracking	Add barcode-based intake and automated alerts
10	Expired Medication Detection Information System using FEFO	Case Study Authors	2023	Difficulty in detecting expired medicines manually	FEFO-based detection system prototype	Integrate barcode scanning & offline encrypted storage

Research Gap

Existing studies and systems highlight the importance of medicine stock management, expiry tracking, and patient refill reminders, but several gaps remain unaddressed: 1. Reliance on Cloud Systems – Most available solutions depend on cloud storage, which raises privacy and security concerns. Small clinics lack trust in remote data handling. 2.Lack of Offline Functionality – Current inventory and reminder systems often fail without internet access, making them unsuitable for rural or resource-limited areas. 3. Limited Security Measures – Few systems provide encrypted local storage or biometric authentication, leaving sensitive medical and patient data vulnerable. 4.Inadequate Integration – Solutions usually address either inventory management *or* patient

reminders, but not both in a unified, user-friendly platform. 5. High Cost and Complexity – Commercial pharmacy software is often expensive, complex to use, and requires technical training, making it impractical for small setups. 6 Minimal Use of Automation – Features like barcode-based intake, FEFO-based dispensing, and intelligent expiry/low-stock alerts are rarely implemented in low-cost systems.

Thus, there is a need for a secure, offline-first, and affordable system that combines inventory automation, expiry/stock alerts, and patient refill reminders while ensuring strong data privacy and simplicity for small-scale healthcare providers.

Problem Statement

Small pharmacies and clinics often struggle with manual inventory management, leading to stockouts, expired medicines, and missed patient refills. Cloud-based systems raise privacy concerns, while limited resources prevent adoption of advanced technologies. These issues result in errors, wastage, and poor patient care. Therefore, there is a need for a secure, offline-first, and affordable system that automates stock tracking, expiry alerts, and patient refill reminders while ensuring data privacy through local encrypted storage and biometric authentication.

Conclusion

Medical Shop Management provides a secure, offline-first, and affordable solution for small pharmacies and clinics struggling with manual inventory management and patient refills. By integrating barcode-based stock tracking, FEFO dispensing, expiry and low-stock alerts, and automated patient refill reminders, the system reduces wastage and ensures better treatment adherence. With encrypted local storage and biometric authentication, it guarantees data privacy while remaining simple and user-friendly for non-technical staff. Overall, Medical Shop Management improves efficiency, enhances patient care, and offers a sustainable digital healthcare tool for resource-limited environments.

References

Luong, T., et al. (2021). *Text Message Medication Adherence Reminders: A Pilot Study*. Addresses missed medication refills using SMS reminders and EHR monitoring; future work suggests scaling to larger populations with automated workflows.

Sarabi, R., et al. (2016). *Effectiveness of Mobile Phone Text Messaging in Improving Medication Adherence*. Systematic review of SMS interventions; highlights need to standardize message timing/content and test in low-resource areas.

Prayaga, R., et al. (2018). *Improving Refill Adherence in Medicare Patients With Tailored Messaging*. Explores tailored digital messaging for elderly patients; future scope includes integration with pharmacy inventory and workflows.

Belete, A., et al. (2023). *Mobile Phone Text Message Reminders for Type 2 Diabetes: Systematic Review*. Demonstrates SMS-based adherence improvements; suggests combining reminders with pharmacy systems for automation.

Guadie, M., et al. (2023). *Medicines Wastage and Its Contributing Factors in Public Supply Chains*. Identifies causes of expiry-related wastage; recommends FEFO and low-cost digital tracking.

Jaju, R., et al. (2023). *Inventory Control Mechanism of the Pharmacy Store*. Proposes prototype digital inventory system with expiry tracking; suggests adding barcode-based intake and alerts.

Chong, C., et al. (2022). *Management of Medicines Wastage, Returned Medicines and Disposal*. Qualitative study recommending FEFO and proper disposal; highlights role of predictive analytics in future.

Case Study Authors (2023). *Expired Medication Detection Information System using FEFO*. Prototype for detecting expired medicines; proposes integration with barcode scanning and encrypted offline storage.

Bastos, P., et al. (2021). *Security Mechanisms of a Mobile Health Application*. Discusses multi-layer security including encryption and authentication; recommends lightweight encryption and biometric gating for offline apps.

Arora, A., et al. (2014). *Privacy and Security in Mobile Health (mHealth) Research*. Reviews existing privacy/security mechanisms; future scope includes encrypted databases (SQLCipher) and OS-level secure storage.