



Development of a Patient-Centered Mobile Health Information System for Medication Adherence in Elderly Populations Usability and Effectiveness Study

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Abstract

Medication non-adherence in elderly populations poses a significant risk to health outcomes, increasing hospitalization rates and healthcare costs. Digital health solutions have the potential to bridge this gap, but many fail due to poor usability, lack of personalization, and low engagement. This study presents the design, development, and evaluation of a mobile health (mHealth) information system tailored specifically for elderly users to improve medication adherence. Guided by user-centered design principles, the system features simple interfaces, personalized medication schedules, voice-enabled reminders, and caregiver integration. A 6-week pilot usability study involving 40 older adults was conducted, assessing adherence behavior, system satisfaction, and engagement metrics. Results showed a 35% improvement in medication adherence rates, high usability scores, and strong acceptance among users and caregivers. Findings support the feasibility of deploying intuitive, patient-centered mobile systems to tackle adherence challenges in aging populations.

Keywords: mHealth, Medication Adherence, Elderly, User-Centered Design, Mobile App, Healthcare Technology, Usability, Digital Health.

How to cite this paper: Eva Horváth. (2020) Development of a Patient-Centered Mobile Health Information System for Medication Adherence in Elderly Populations Usability and Effectiveness Study. *ISCSITR - INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN HEALTHCARE INFORMATION SYSTEM (ISCSITR - IJSRHIS)*, 1(1), 1–6.

URL: https://iscsitr.com/index.php/ISCSITR-IJSRHIS/article/view/ISCSITR-IJSRHIS_01_01_001

Published: 19th Apr 2020

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1. Introduction

Medication adherence is a cornerstone of chronic disease management, yet it remains one of the most challenging issues in elderly healthcare. According to WHO, nearly 50% of older adults fail to take medications as prescribed, leading to worsening health, avoidable complications, and increased hospital readmissions. Factors contributing to non-adherence include cognitive decline, complex regimens, forgetfulness, and lack of engagement with traditional reminder systems.

While mobile health technologies offer promising interventions, most are not designed with aging users in mind. Interfaces are often complex, text-heavy, or lack accessibility features. Moreover, limited digital literacy among older populations further widens the usability gap. This study addresses these challenges by developing and testing a patient-centered mHealth information system focused on simplicity, personalization, and engagement to support medication adherence in elderly users.

2. System Design and Features

The mobile health system, named **MediGuide**, was developed through iterative collaboration between designers, geriatricians, caregivers, and target users. Key design goals included accessibility, intuitive navigation, and multi-sensory feedback. The system includes:

- **Personalized Schedules:** Automatic syncing of prescriptions with color-coded daily task lists.

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- **Voice-Enabled Reminders:** Auditory alerts with natural language processing to support users with visual impairments.
 - **Caregiver Dashboard:** Real-time adherence tracking and feedback for family or health professionals.
 - **Gamified Motivation:** Simple “daily streaks” and positive reinforcement messages.
 - **Emergency Escalation:** Non-response alerts to caregivers after repeated missed doses.

Design prototypes underwent two rounds of usability testing with elderly focus groups, which led to refined fonts, larger icons, and a streamlined workflow requiring minimal screen taps.

3. Methodology

3.1 Participants and Setting

A total of **40 elderly participants** (aged 65–85) with at least one chronic condition requiring daily medication were enrolled from two community health centers. Inclusion criteria included ownership of a smartphone and basic cognitive function (MMSE > 24).

3.2 Study Protocol

Participants were provided with the MediGuide app on their personal smartphones and were observed over a **6-week period**. Baseline medication adherence was recorded using pill count reports and self-report surveys. The app usage was logged continuously. Follow-up assessments included:

- **Medication Adherence Rate (%)**
- **System Usability Scale (SUS) Score**
- **Perceived Usefulness (PU) and Ease of Use (PEOU)**
- **Caregiver Satisfaction Survey**

4. Results

4.1 Adherence Improvement

The average medication adherence improved from **61.3% at baseline to 82.7%** by the end of the study—an increase of over 35%. Participants with caregiver-linked accounts

showed higher adherence rates (86.5%) compared to those without (77.9%).

4.2 Usability and Engagement

The **mean SUS score was 84.6**, indicating excellent usability. Over 90% of participants reported that the app was “easy to use” and “helped them remember their medications.” Daily check-in rates remained consistent throughout the 6 weeks, indicating high engagement.

Caregivers praised the dashboard for its simplicity and usefulness in tracking loved ones' progress. Only 2 users discontinued the app, citing unrelated personal reasons.

Table 1: Summary of Outcomes from the 6-Week Usability Study

Metric	Pre-Study (Baseline)	Post-Study (6 Weeks)	Change
Average Medication Adherence (%)	61.3%	82.7%	+35% improvement
SUS Score (System Usability Scale)	-	84.6 / 100	-
Daily App Engagement Rate (%)	-	91.5%	-
Caregiver Satisfaction (1-5 scale)	-	4.6	-

5. Discussion

The study demonstrates that when thoughtfully designed with input from elderly users, mHealth systems can significantly improve medication adherence. Key success factors included personalized reminders, low-friction interfaces, and caregiver integration. Unlike generic reminder apps, MediGuide prioritized accessibility through large fonts, voice feedback, and simplified workflows.

However, limitations include the short follow-up period and relatively small sample size. Future studies should assess long-term adherence trends and consider integrating biometric monitoring (e.g., blood pressure, glucose levels) for broader chronic care

support.

6. Conclusion

This study confirms that patient-centered mHealth solutions can empower elderly individuals to better manage their medications. By addressing usability, personalization, and support systems, the MediGuide app improved both adherence and user satisfaction. As aging populations grow, such digital interventions can play a critical role in promoting independent living and reducing healthcare burden.

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