



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 5, May 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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# Literature Survey on - Smart Medicine Dispensers

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**ABSTRACT:** Medication non-adherence is a significant problem that affects the effective management of chronic diseases and results in adverse health outcomes. Technology-based solutions, such as medication reminder systems and mobile applications, have been proposed to improve medication adherence. This literature survey paper aims to explore and analyze the current state-of-the-art in medication adherence technology and provide an overview of the existing systems, their limitations, and potential improvements. Ten research papers were reviewed, and their proposed solutions were analyzed. Our analysis reveals that many of the proposed solutions lack flexibility in medication management and do not provide assistance with non-severe medical problems. The findings suggest that there is a need for more comprehensive medication adherence solutions that can cater to a wider range of patients and provide timely assistance with medical problems.

**KEYWORDS:** IoT, Medicine-Dispenser, Medication-Compliance, Smart-Device, micro controller , App-Integration, Patient-Safety, Prescription Management.

## I. INTRODUCTION

The issue of medication adherence is a critical problem in managing chronic diseases and preventing adverse health outcomes. According to a survey conducted by the Centers for Disease Control and Prevention (CDC), missed medication causes 30 to 50% failure of chronic illness treatment, resulting in 125,000 deaths annually. To overcome this problem, researchers have proposed various technology-based solutions, including medicine dispensing systems and mobile applications. However, many of these proposed solutions have limitations, such as limited flexibility in medication management and lack of assistance with non-severe medical problems. In this literature survey paper, we aim to explore and analyze the current state-of-the-art in medication adherence technology and provide an overview of the existing systems, their limitations, and potential improvements.

## II. LITERATURE REVIEW

Shawn Benedict Kumar, et al. [1] proposed an IoT-Based Smart Medicine Reminder Device mobile application will be linked to a pillbox. The proposed IoT-Based Smart Medicine Reminder Device features pill weight measuring and algorithms to ensure its effectiveness. Weakness of this IoT-Based Smart Medicine Reminder Device is that it is not helpful for patients who are constantly forgetful as there are no audio remainder.

H.-W. Kuo, et al. [2] proposed a Pill Box based on an MCS-51 micro-controller was proposed; that pill box can send out medicine using a stepper motor at a scheduled time, but there was no provision to record the time when the patient actually took the medicine.

S.-C. Huang, et al. [3] proposed an Intelligent Pill Box (IPB) . The IPB is based on the medicine bag system, and the IPB sends a medicine bag out of the box at the appropriate time. If the patient does not take the medicine bag away, the IPB would notify the caregivers via Skype. The IPB system improves the interactivity between patient and caregivers, but it works well only if an internet connection is available.

T.L. Hayes, et al. [4] proposed an electronic pillbox called MedTracker, in the MedTracker, the time at which each lid was opened or

closed is recorded, and transmitted to PC via a Bluetooth link. However, the MedTracker does not provide any remind or confirm functions.

Panda, et al. [5] provided a medicine dispenser that has a compact design and has a cylindrical storage box with circular processing slots mounted on a stepper motor. The dispenser is controlled by a Raspberry-Pi that downloads the patient's



drug data from the main cloud server and is constantly connected to the internet for progress. The dispenser dispenses medication within the patient's reach and uses ultrasonic sensors to monitor used tablets. The network compares patient data with best needs and estimates recovery time. Patients can log in to the web application, search for a doctor, perform a physical examination, and add required medications to the printer.

The limitation is that the drug can only be removed manually if the machine makes a mistake.

Jyothis Philip .et.al[6] The proposed Automatic system uses a Servo Motor to dispense the pills accurately and a Centrifugal Pump to pour the water in the cup for taking the medicine. The dispenser is controlled by an Arduino Uno board, and the Real Time Clock module is used to keep track of the time and remind the user when it is time to take their medicine. The NodeMCU module is used to connect the dispenser to the internet, allowing caregivers and users to remotely monitor and control the dispenser's schedule and receive notifications in case of missed pill intake. Together, these components make the dispenser a reliable, affordable, and easy-to-use solution for medication management for the elderly.

Gleiston GUERRERO-ULLOAA, et.al [7] The proposed system presents a medicine dispenser which takes help of an application which help to schedule medicine intake time. To develop this system authors have followed the Test-Driven Development Methodology for IoT-based Systems i.e. (TDDM4IoTS), which is an appropriate agile methodology for the development of IoT-based systems. Besides, the overall system performance will be evaluated after encrypting the whole patient database and face detection images inside the Raspberry Pi, so as to improve patient privacy.

**IoT Based Medicine Dispenser**

Aditya Patil 1, et.al [8] The design and execution of a medical dispenser machine that uses RFID tags as permission cards and an Arduino Mega board as the primary controller are covered in this article. The Arduino Integrated Development Environment (IDE) and embedded C are used to programme the system. By scanning RFID tags, showing the user's name, and requesting the password before continuing, it offers user authentication. One type of medication may only be distributed by the dispenser at once, and the system notifies the administrator when refills are required. The brochure also lists the system's benefits and drawbacks, including the absence of power supply in rural locations but also its mobility and ease of installation. It is regarded as an adaptable and straightforward method for providing affordable basic healthcare to remote places.

C. H. Patil, et.al [9] The article suggests a prototype of an Internet of Things-based medication dispenser with a finger print authentication system that links people, systems, and gadgets to make it easier for patients with chronic illnesses to interact with hospitals, clinics, homes, and shelters. Pill dispensers that alert patients when it's time to take their medication have been created with the use of gadgets like the Raspberry Pi 3, DHT 11, infrared, LCD, and GSM modules. The plan prevents overdosing, underdosing, or missing tablets while preserving contact between the patients and carers and notifying them when the prescription is due.

**III. CONCLUSION**

We have evaluated a total of 15 papers. Among these papers, we conducted a comparative analysis of 10 of them. This involved a thorough examination of the similarities and differences between these 10 papers, with the goal of identifying key trends and patterns in the field of study.

Our comparative analysis was conducted using a variety of methods, including close reading of the texts, coding of key themes and concepts, and synthesis of findings. We analyzed each paper in terms of its research question, methodology, data collection and analysis techniques, and overall findings.

Paper	Number of	Portable	Microcontroller	Web/Application	Design	Biometric	Camera	RFID
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No.	users				Complexity			
1]	Single user	Yes	Arduino Mega	No	Moderate	No	No	No
2]	Single User	Yes	MCS-51	No	Moderate	No	No	No
3]	Single User	No	Raspberry pi	Yes	Complex	No	No	No
4]	Multi User	No	Raspberry pi	Yes	Easy	No	No	No
5]		Yes	Arduino Uno	Yes	Complex	No		No
6]	Single User	No	Arduino Uno	Yes	Complex	Yes		No
7]	Multi User	Yes	18LF252 PIC microcontroller	No	Moderate	No		Yes
8]	Single User	Yes	Arduino Mega	No	Easy	Yes		Yes
9]	Single User	Yes	Raspberry Pi 3	Yes	Moderate	Yes		No
10]	Single User	Yes	Arduino	Yes	Easy	No		No

Fig – Comparative Study of Papers

It is important to carefully consider both the advantages and disadvantages of any decision or action, in order to make informed and responsible choices. Here are key advantages and disadvantages

Paper No	Advantages	Disadvantages
1	Device features pill weight measuring and algorithms to ensure its effectiveness.	There is no reminder device provided.
2	Efficient Microcontroller.	No provision to record the time when the patient actually took the medicine.
3	If the patient does not take the medicine bag away, the IPB would notify the caregivers via Skype.	Requires continuous Internet Support.
4	The time at which each lid was opened or closed is recorded.	No liquid medicine is supported.
5	Design of the model is Compact and has a cylindrical storage box.	Drug can only be removed manually if the machine makes a mistake.
6	Centrifugal Pump to pour the water in the cup for taking the medicine.	Complex model design.
7	Application & Face detection support. Keeps track of time.	Complex model design.
8	Uses RFID cards as Permission Tags	No pill weight measuring or such system.
9	Fingerprint Authentication provided.	No RFID Tag provided.
10	Uses Zigbee for WSN.	No user authentication was provided in the system.

Fig – Advantages and Disadvantages

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SJIF Scientific Journal Impact Factor

Impact Factor: 8.423



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