

# INTELLIGENT GLOBAL HEALTH CARE MEDIBOX

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**Abstract:** Nowadays for the majority of disorders, medications are the most basic form of treatment and prevention. With the use of the appropriate medication, many serious diseases can be treated and avoided. As a result, taking the medication at the prescribed time is necessary. There may be some bad impacts if a patient doesn't take his or her medications on scheduled time. To overcome this, a smart device called Medi Box encourages elderly people or patients to take their medicines on time. If the medication is not taken, the device will alert the caretaker. The box constantly verifies whether there are any medications left and notifies the caretaker accordingly. This device monitors the patient's health and alerts the caretaker in an emergency. Additionally, a set of parameters, including the patient's heart rate, temperature, and breathing rate, will be tracked using various sensors

**Keywords:** Medibox, Health care, Medicine, Dispenser, Health monitoring sensors.

## I. INTRODUCTION

Medicine consumption is becoming increasingly necessary in our daily lives, which was quite low in the past years. We can all agree that in the current generation, taking tablets for medical purposes has become essential. Since the beginning of the human condition, diseases have been developing, and it is crucial that they be treated in order to live a healthy life. Millions of different medications have been developed in the modern era to treat thousands of various disorders. Therefore, it is imperative that a person take medications in order to treat any form of illness. Doctors may recommend a few different medications to treat certain conditions. With advancements in medical science and technology, there is a need for efficient system which combines the new technology with medical science to improve healthcare. The fusion of novel advances in technology with healthcare provides large scope for improvements in the areas of patient care.

The main objective of our proposed system, is to ensure a user friendly design that the patients can use as a reminder alert to take their daily medications on time. This system ensures accurate time alert for the consumption of the medicines. The alert will be in both audio and visual form. For the audio we make use of a speaker and for the visual form we use a LED. Also the box always checks the availability of medicine and will intimate the caretaker about it. This device also keeps track of the health condition of the patient and informs the caretaker in case of emergencies. Also, Several parameters such as heart rate, the temperature of the patient, and respiratory rate, of the patient will be monitored using various sensors.

## II. LITERATURE REVIEW

[1] Many of old people live alone, some of them are suffering from disability, making it harder to take care of themselves. Any delay or ignorance such as forgetting to take medicines or even taking medicines at the wrong time may cause or raise potential health issue. It is also difficult for the nurses to know recent information regarding the number of pills remaining and the need to refill some medications. Therefore, there is an increasingly desperate need for something that can improve life quality for elderly people. For example, smart devices that are invented to detect vital signs of a person, or to send emergency messages to a healthcare professional when urgent help is needed, or to diagnose and determine the causes of certain diseases after ingesting into patients bodies.

In this paper, the design of a Smart Medicine Box (SMB), is introduced. The SMB can be used by either the patient or even by nurses who are taking care of a patient or older people. The SMB contains separate compartments that can be programmed for different user's needs. SMB helps the user or caregiver by specifying the required pill quantity, the exact time to take the pill each day, and the need to refill some pills. An application has been developed to support different categories of users such as patients who have either chronic diseases, old people who have scheduled medications, or nurses who take care of those patients.

[2] This paper presents a Smart Medicine Dispenser (SMD) prototype. The main purpose of this system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills, also reduce the risk of over or under dosing accidentally. Not taking medications correctly can have serious consequences such as delayed recovery, illness and even death. The smart medicine dispenser (SMD) could solve such problems by informing and alerting the patients to take the appropriate dose at the right time. Also, it provides direct communication between the patients and the caregivers as it will immediately notify the caregiver in case the patient missed his/her pill. In addition, SMD provides the user with a touch interface available as an application on their smartphone which will allow them to remotely manage and control pill schedules and usage data.

The main purpose of SMD system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills. It can also reduce the risk of over or under dosing accidentally. The smart medicine dispenser (SMD) could solve such problems by informing and alerting the patients to take the appropriate dose at the right time.

The proposed SMD system takes the idea of automated dispenser to the next level as it has some functionalities that are not included in any other automated dispensers. An account is provided for each patient and no one else can access it except the patient and the caregiver if the credentials were provided to him/her. Also, some statistics are provided about the pills taken with their alarms and the already existing ones. Online database of the users, pills and their alarms is also a great feature that helped in the design of the project. The alarms can be edited and created using an android application remotely through smartphones.

[3] With advancements in medical science and technology, there is a need for efficient system which combines the new technology with medical science to improve healthcare. The fusion of novel advances in technology with healthcare provides large scope for improvements in the areas of patient care. The main objective of this proposed system, is to ensure a user friendly design that the patients can use as a reminder alert to take their daily medications on time. This system ensures accurate time alert for the consumption of the medication. The alert will be in both audio and visual form. For the audio we make use of a buzzer and for the visual form we use a LED. Our proposed system uses Raspberry Pi 2 model B.

It also uses a novel technology, Internet of Things commonly known as IoT for the alert in the form of Email. IoT is a new generation of internet services that enables physical components to communicate with each other through the World Wide Web. It can be explained as a framework used to collect information from the perception devices such as sensors or mobile devices. It then forwards this information to the network layer after which, it is sent to the application layer. The IoT nodes need to be identified, and controlled and must have the ability to interact with humans or other devices within the Machine-to-Machine environment. It enhances the society's lifestyle as it can be implemented in a wide range of applications such as healthcare, smart cities, agriculture, home automation and many more.

[4] In this paper they have present a proof-of-concept for the solution of a problem of Adverse Drug Reactions (ADRs) due to human error. ADRs due to carelessness or human mistakes is very common in elder people or in people who are administered with multiple prescriptions for the day, but they face difficulty in tracking their medications over time.

This paper deals with the development of a Smart Medicine Dispenser to manage the very real problem of patients confusing the dosage and timing of their medications, particularly vulnerable patients or patients on numerous medications. They have devised a device named SMART MEDICINE DISPENSER (SMD) which will contain all the prescribed doses for a fortnight or a month and will dispense them at accurate timings.

This device will monitor the patient's medication habits and will also reduce the risk of overdose or taking the wrong medication. We have used the basic yet brilliant concept of electromagnetism in our design with compare to exiting product, and the components used are also easily available making SMD very inexpensive as compared to the current solutions in the market.

[5] The health and wellness sector is critical to human society and as such should be one of the first to receive the benefits of upcoming technologies like IoT. Some of the Internet of Medical Things (IoMT) are connected to IoT networks to monitor the day-to-day activities of the patients. Recently there has been attempts to design new medical devices which monitor the medications and help aged people for a better assisted living. In this paper, one such attempt is made to design a multipurpose portable intelligent device named MEDIBOX which helps the patients take their medications at the right time. This box is a proficient system which maintains the parameters like temperature and humidity in a controlled range recommended by the drug manufacturer and thus maintains the potency of the medicines even if the patient is travelling. Related to this, we have developed a Host Management System (HMS) which is capable of cloud-based installation and monitoring that stores and controls the MEDIBOX functionality for further analysis and future modification in design aspects.

In this paper, we have designed a new device MEDIBOX which aims at assisting a patient completely with a compact and user-friendly manner. It reminds the patient to consume the medications and provides a suitable storage condition for the drugs. Storage of medications intake details can assist the doctor for future references i.e. the effectiveness of drugs on the patient can be found through the history of medication intake helping him to prescribe accordingly to the patient. The medication details are also stored in a secure cloud along with its storage details.

[6] Population aging is a global issue and medication adherence is a major problem in health care sector. This paper proposes an autonomous medicine dispenser box that alleviates irregularities in taking prescribed medication at appropriate time. The main purpose of this system is to help patients primarily seniors, other vulnerable group that may need assisted care, and to switch from approaches dependent on human memory to automation with negligible supervision, hence reducing human efforts and preventing error prone tasks of giving wrong medicines at the wrong time in wrong amount. The system contains a programmable alarm system with an interactive UI and sends notifications about the medicine taken and supply of medicines.

The autonomous pill box designed aims at assisting a patient completely with a user friendly manner and reduces human efforts. The circular shape of the box will help in rotating the box and the dispenses the only pill required; the alarm and notification features will help in keeping the record of the medication and will greatly increase the medicine effectiveness.

[7] IoT is making strong inroads in the medical industry with the introduction of relevant sensors and devices. IoMT is a collection of medical devices connected to healthcare IT systems for different applications. The growth of IoMT has particularly impacted healthcare for the aged and disabled people, but not just limited to them. One such important activity is to help them to take medications on a daily basis without missing any dose. In the existing system, Pettier based medicine cooling system is implemented. It consumes more power for operating and the battery weight is increase and there is no compact size. It's not easy to carry the med box system.

The complexity and cost associated with more elaborate systems led to the development of a new portable device in this paper named as "MEDIBOX" – an intelligent medication dispensing device. It is designed to help the elderly people who often forget to take their medications or take the wrong pills or dosage. It also helps people who used to travel frequently. Hence, we proposed a multipurpose, portable IoT-enabled MEDIBOX which is used purposely to address those pertinent issues. MEDIBOX is designed to alert the patient at the right times along with the right dosage in prescription. Along with reminding a patient about medication it should be ensured that drugs are consumed without degrading their potency. Storage is an important aspect of the total drug control system, so in the design of MEDIBOX an appropriate environment is created to maintain the drug efficacy. The history of medications a person consumed is very important, so the consumption details are uploaded to the cloud for further medical reference. MEDIBOX is also capable enough to alert its user about their next appointment with the doctor. Ambient Assisted Living (AAL) encompasses technical systems to support elderly individuals in their daily activities to allow an independent and safe lifestyle as long as possible. MEDIBOX is focused on assisting the elderly and patients in adhering to the medications regularly without fail, thus helping them to avoid any future difficulties. The details of the consumed medicines with specific time interval are saved on a secure cloud that can be used for further analysis.

[8] IoT is the progression of ultra-automation technology. The maintenance should be less and it performs as very high immense level and it connects the all device by using the internet. Its new and progressive elements bring ultrachanges in the dispatch of stocks, goods, and services, and the civil, economic, and political impact of those changes are unique identifiers with an ability to alteration of data without interaction of human to human, human to computer.

This project works on helping people for taking medicines in time without any human interaction. A Dispenser will deliver the medicines according to the schedule given by the cloud app or mobile app with these medicines we need to provide a glass of water for every consignment. An alert system which in place will give a person to alarm after dispensing medicine and water, then it will be noted down the timings when a person has consumed his or her medicine. In this concept with the help of IOT devices they were able to deliver medicines on time to the user at right time. Along with this we are dispensing water to consume the pills. They have tracked water and pill consumption using a presence sensor. They can improvise the solution using more sensor and integrating with watch.

[9] The wellbeing and health area is basic to human culture and all things considered ought to be one of the first to get the advantages of up and coming innovations like IoT. A portion of the Internet of Medical Things (IoMT) is associated with IoT systems to screen the everyday exercises of the patients. As of late there has been an endeavor to plan new therapeutic gadgets which screen the meds and help matured individuals for a superior helped living. In this paper, one such endeavor is made to plan a multipurpose compact smart gadget named MEDIBOX which enables the patients to

take their drugs at the correct time. This container is a capable framework which keeps up the parameters like temperature and mugginess in a controlled range suggested by the medication producer and in this manner keeps up the intensity of the meds regardless of whether the patient is voyaging. Identified with this, we have built up a Host Management System (HMS) which is fit for cloud-based establishment and checking that stores and controls the MEDIBOX usefulness and patient's body parameters for further examination and future alteration in structure perspective.

In this paper, they have structured another gadget MEDIBOX which goes for helping a patient totally with a conservative and easy to understand way. It reminds the patient to devour the meds and gives a reasonable stockpiling condition to the medications. Capacity of prescriptions consumption subtleties can help the specialist for future references for example the adequacy of medications on the patient can be found through the historical backdrop of prescription admission helping him to recommend as needs be to the patient. The drug subtleties are likewise put away in a safe cloud alongside its stockpiling subtleties and wellbeing checking sensors are additionally be added to the framework.

[10] Most of the time, complete adherence to prescribed medication is a big step towards recovery from either chronic or acute diseases, but patients often are unaware of the adverse effects that could arise from inconsistency in adherence. The inability of patients to adhere to prescription can affect the potency of some effective therapies known to treat many conditions, and passive compliance may result in the development of resistant to the drug causing a need for treatment modification. Shockingly, more than half of the drugs prescribed for patients with chronic conditions like diabetes and hypertension were found not to be taken as recommended. Adherence is so important because it can assist clinicians in successful supervision of evidence-based treatment of patients; therefore this paper presents an overview of medication adherence, non-technology and technology-based approaches, and lessons for developing countries.

This paper performed a detailed review of medication adherence and ICT, the challenges and the use of varieties of technology to support patients and prescribing physicians in providing complete healthcare, with respect to intervention based on abidance to medication regimens. The diseases that have received the most attention based on our review were identified and findings suggest that if low-income countries can adapt some of these technologies into managing patient's adherence, starting with health education of patients', breaking the barriers created by proximity, and cost of visits hospital visits, recovery from many of the prevalent diseases can be improved through electronic prescription and mobile reminders.

[11] MediSmart is an IOT based smart medicine box which reminds the patient to take their prescribed medicine. It provides an android application with an easy to use, user interface where user can enter their details, which forms a bridge between the end user and MediSmart. The end user needs to fill and update their personal details and the details of medicine prescriptions in each field via an Android app. The user needs to sign up to the application if they are not registered. If they are already signed up, the end user can directly login and perform further activities.

This paper summarizes the implementation of MediSmart with IoT based technologies. It provides a solution to the idea of smart medicine box which reminds the end user to take the medicine on time using various audio and visual alert systems. It also specifies the name of tablets prescribed that would guide the end user to follow the prescription. All these functionalities work via an Android application (version 2.1.1.) connected to an Arduino UNO (version 1.0) through Wi-Fi connection. Also, the user details can be updated via the application. MediSmart not only takes care of the end user's health but also safety. It provides a functionality of the SOS button which informs the respective doctor or caretaker about the end user's exigency. MediSmart is an ever-evolving project and has a lot of room for improvement.

[12] MEDIBOX - IOT Enabled Patient Assisting device which helps the patients take their medications at the right time. This box is a proficient system which maintains the parameters like temperature and humidity in a controlled range recommended by the drug manufacturer and thus maintains the quality of the medicines. MEDIBOX takes control on alerting patient to take medicines, by giving voice alert and led indication for right medicines, avoids wrong medications at wrong time. And also confirms the medicine taken by patient with timings, if patient avoids taking medicine at correct time it sends IOT alert to care taker in order to take control over that situations confirms patients from not to skip medicine. In this paper, the design of a MediBox has been introduced. This MediBox contains separate portions that can be programmed for different user's needs. MediBox helps the users or take care person by specifying the required medicine quantity. MediBox takes control on alerting patient to take the medicines by giving voice alert and patients can take their medications at the right time.

[13] The design of an IoT based medication system is established and it can be used by patients as well as caretakers in sequence to monitor and ensure that the correct amount of each medicine is being taken at the exact time. This provides audio communication to aware the user when a confirmed medicine is to be taken. Furthermore, a software application is used to send messages and email alerts to the patient and the caretaker.



The main reason behind this proposed design is to provide a user friendly interface for independently living people to use this gadget as a reminder alert for taking their medicines daily on mean time. The proposed design comprises of four main parts: circuitry, cooling system, battery and pulse sensor . The circuitry is incorporated with simple sensors in the hardware modules. The Peltier cooling system comprises of cooling module along with heat dissipation units. The rechargeable battery is used for power supply to all the components in the gadget. The pulse sensor and a Wi-Fi module are used to calculate pulse and store for future uses.

[14] This paper aims at designing a dispenser which is non-invasive in nature and which is cost effective. In the Automatic Medicine Dispenser (AMD), when it is time to take the medicine, the device can either be designed to release the premeasured dose into a small compartment which can be easily opened, or can manually be sorted into small compartment by the patient's caretaker upon which the patient is notified when it is time. The patient is notified usually through a loud alarm signal. If the patient doesn't take the medication out of the dispenser within a specified time, it would send out more loud signals to catch the attention of the patient.

This product is designed to make sure that the quantity and timing of the pills to be dispensed can be controlled and monitored using an app, which makes things easier for everyone, including for children who work abroad. Also, it offers clear contact between the consumer and parental figures as it will immediately notify the guardian in case the patient has missed pill intake. Furthermore, SMD provides the customer with a touchscreen that can be accessed as an application on their cell phone, enabling them to monitor and control the timetables and use information remotely.

[15] The core of this paper is to present an example of use for a growing technology, which is Internet of Things, with an explicit, complete design and implementation of a custom prototyping embedded system capable to automatically dispense pills in the right dose at given intervals. We've designed the system for use at home and in hospitals by children, adults, the elderly and even by people with visual impairments. The system has been designed to give access to monitor and control through a phone application with no monthly subscription. The user controls the system using the application and on-board keys to set the distribution range of the pills and the number of pills per interval. Also, alerts are sent when the pills were not removed from the tray.

[16] In this paper they have designed a pill dispenser, it is a device which gives medicine to be taken at time. These devices are very useful to take proper medication at ease. Automatic dispenser has separate compartments for each pill which can be dispensed at required time with required number of each pill. IOT is used to for the build of the device. Microcontroller is the heart of the device which controls various operations of the device. The stepper motor and the servos are controlled by the microcontroller through motor controller. The microcontroller is connected to the cloud through a WI-FI module, by which all the data is upload to and downloaded from cloud. GSM module is used to send alert messages to the caretaker about the pills taken or not so that they can manually remind the patient in case they didn't take the pill. The remote access via cloud is being made secure with secure login and encrypted data storage. The user must provide username and key to access data in the cloud. The device then decrypts the encrypted data and utilizes it.

[17] The intelligent medication box proposed in this work have specialized features including six sub boxes which helps to organize six different pills, provides timely remainders for the patient or caretaker in an android application like hand-held devices like smartphone. This intelligent medication box contains bio-sensor for monitoring of temperature and heartbeat. Overdosage and improper intake of medicines may lead to serious issues in health of elderly people to avoid mis usage of medicines a simple authentication process either by the care taker or the patient himself is performed. The proposed medication is much safer as it clearly intimates about time, dosage, stock of medicine and sorts out different pills in correct sub boxes during the next fill by caretaker.

[18] The aim of this project is to develop an IoT based patient assisting device was implemented for monitoring the people to intake tablet periodically. The health and wellness sector is critical to human society and as such should be one of the first to receive the benefits of upcoming technologies like IoT. Some of the Internet of Medical Things (IoMT) is connected to IoT networks to monitor the day-to-day activities of the patients. Recently there has been an attempt to design new medical devices which monitor the medications and help aged people for a better assisted living. In this paper, one such attempt is made to design a multipurpose portable intelligent device named MEDIBOX which helps the patients take their medications at the right time and also to monitor the patient health through IoT.

In this paper, they have designed a new device MEDIBOX which aims at assisting a patient completely with a compact and user- friendly manner. It reminds the patient to consume the medications and provides a suitable storage condition for the drugs. Storage of medications intake details can assist the doctor for future references that is the effectiveness of drugs on the patient can be found through the history of medication intake helping him to prescribe accordingly to the patient.

[19] In this paper, they have designed a Smart Med Box features a particular device that contains embedded sensors in each compartment that not only transmits detected signals to website when the users are taking their pills but also receives a remind message back to the LCD screen by displaying words in it. The time set in RTC, at that time the speaker announces to take the medicine in morning pill box as voice message simultaneously LED glow in that compartment only.

As a result, that this smart med box is beneficial to patients who frequently forget to take their medications on time, as well as to persons who take numerous pills rather than fewer tablets. The Smart med box function will assist them in managing their pills. It can also assist blind persons because the speaker informs the user when to swallow the medicine. Thus, this technique is beneficial to all elderly and blind persons.

[20] In this paper they have designed an Internet of Things based smart patient health tracking system using an Arduino microcontroller. In this, pulse rate sensor is used to detect the heart beat and temperature sensor to read the temperature and sends the data to the cloud using internet. This information is also sent to the LCD display, so patient can easily know their health status. During critical situations to alert the doctor, the warning message is sent to the doctor's phone and at the same time buzzer turns to alert the care taker. The doctor can view the sent data by logging the specific website or IP address. Hence continuous patient monitoring system is designed.

In this project, microcontroller is used as a gateway for communication. This system puts forward a wise patient health monitoring system that uses sensors to trace patient health and uses internet to intimate their loved ones or concerned doctors in case of any emergency. The controller is additionally connected with a buzzer to alert the caretaker regarding variation in detector output. The sensors are connected to a microcontroller to trace the status of the patient which in turn is interfaced with LCD display furthermore as wireless local area network association so as to transmit alerts. If the system detects any changes in patient pulse rate or BP, the system automatically sends an alert to the doctor regarding the patient status over IoT and additionally shows the details of heartbeat, BP and temperature of patient, live over the cloud. So IoT based patient health monitoring system effectively uses internet to watch patient health status and save lives on time. For this reason, fast conditional medication may be simply done by this technique. This system is easy to setup and is capable of high performance and time to time response.

### **III. CONCLUSION**

As a result, we can infer that this Medi box aims to solve the problems faced by the Elder people and patients in their daily life. This can help elder people from the struggle of remembering what medicines to be consumed and reduce the work for their care takers. The system also tracks the heart rate, the temperature, and respiratory rate of the patient to ensure their health. This project will help all the patients and will make it easier for them to take medicine on prescribed time. We also attempted to keep track of the medicine and intimate the care taker about the medicine and the cost factor of this system is affordable for anyone. This work can be extended by adding an ECG sensor, which will help to provide the patient heart's rhythm and a suitable cooling system with less battery rating can make the system more compact and cost effective.

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