**Introduction to the project**

Pill Dispenser (Pill\_Spenser) is a group project conducted during the second year of the study in the course Embedded System Programming. The goal of the project is to implement a pill dispenser machine that dispenses medicine to patients every day. The programming language that is being used in the project is C language and has been built in the Pico SK environment. Raspberry Pi Pico WH, a microcontroller board plays a crucial role in the development of the project.

The automated pill dispenser assures persistent and accurate administration of daily medication. The machine has eight compartments, one of which is reserved for calibration and the other seven are for dispensing medication daily at the predetermined time each day of the week. To ensure constancy, a piezoelectric sensor is being used in the machine which verifies the state of pills being dispensed or not. The information regarding the number of remaining pills and dispensing logs are stored in the non-volatile memory of the machine which enables the gain of critical information in case of device failure or restarting of the device in the middle of the program. To make the device even more effective, the system has been programmed and designed to communicate with a server via the LoRaWAn network, aiding remote monitoring functionality. This allows healthcare workers to remotely monitor pill dispensing in real-time. (Länsikunnas, Keijo, Pill Dispenser, Project Documentation)

**Added Value & Benefits**

According to the National Coordinating Council for Medication Error Reporting and Prevention medication error has been defined as a “preventable event that may cause or lead to patient harm or inappropriate patient use while the medication is in the control of a patient, consumer, or healthcare professional.” (nursingprocess.org)

The United States Food and Drug Administration has reported receiving more than 100,000 reports of suspected medication errors each year in the United States. In most healthcare facilities, the preeminent cause of patient harm is due to medication errors such as: giving the wrong medicine to the wrong patients, forgetting to give the medicines, forgetting to medicine at the exact time and so on. Each year around 7000 to 9000 patients/people die because of a medication blunder in the United States. (nursingprocess.org)

So, we know, that medication administration and management can be very challenging and tiny mistakes can lead to bigger brunt or threats to one’s life. Having an automated device that can dispense pills correctly at the correct time with the accurate amount can provide significant benefits in medication management and administration. Such a device adds symbolic value to medication management by addressing the common challenges mentioned above such as missed doses, incorrect number of pills, wrong timing and manual tracking. This device dismisses the human flaws and ensures patient’s safety. Because of its capacity to communicate with servers via LoraWan and provide imperative information about the pill's status to the care provider/medical staff, it can ease their work, and monitoring can be done remotely.

The biggest beneficiaries of such devices could be also elderly people living independently on their own but who also require homecare assistance occasionally. Caregivers can remotely ensure that the medication has been dispensed to the patients and there are no missed medications or consumption of wrong medications.

According to studies, up to [60%](https://pubmed.ncbi.nlm.nih.gov/22510235/) of senior citizens have taken the wrong medicine, missed a dose, or consumed medications at the wrong time. Senior citizens who have had improper usage of their medications are [76%](https://www.medscape.com/viewarticle/501879#:~:text=Research%20shows%20that%20older%20adults,took%20all%20medications%20as%20prescribed.) more likely to have a long-term impact on their overall health than the ones who take their medicines properly. (herohealth.com)

So, having a device that keeps track of the medication, dispenses the right medicines at the right time of the day and facilitates remote real-time updates to the caregivers/healthcare workers seems like a reliable assistant, especially in elderly care. Such a device provides independence to elderly citizens and intensifies patient safety, efficient healthcare delivery and assurance to the caregivers/healthcare workers.

References:

Hero Health:

<https://herohealth.com/blog/medication-dispensing/benefits-of-automatic-medication-dispenser/>

Länsikunnas, Keijo. Pill Dispenser. Project Documentation 2024.

Nursing Process.Org : 25 Common Medication Errors in Nursing + How to Prevent Them

<https://nursingprocess.org/medication-erros-in-nursing.html>