Project Proposal
Innobit Challenge 2019
Victoria Junior College

Problem *"Description of the problem we are solving"*

How can we improve medication adherence in the elderly?

According to the Committee on Ageing Issues in Singapore, the proportion of elderly will increase from 8.4% in 2005 to 18.7% in 2030. The majority of these elderly people are required to consume numerous medication to deal with the symptoms of their health issues on a daily basis. However, knowing which medication to take and when to do so might be too complicated for them, and this might result in **medication avoidance** - where they either take the wrong dosage of medication, a completely different medication, or not take them at all.

According to Straits Times, most elderly people take up to 20 different medications and sorting out which medication to take may be extremely confusing especially for them. **Thus, medication adherence may be a serious issue especially if the elderly are living alone**. In the case of elderly residing in an environment where family support is absent, there is a greater chance of **sustained condition of chronic diseases** due to the fact that 50% of these patients with the chronic diseases do not take medicine as prescribed.[1] For chronic diseases that require long term consistent treatment, low medication adherence usually leads to unexpected drug-related side effects, poor clinical outcome and increased medical costs.

Research has also shown that medication adherence is essentially for self-management of chronic diseases.[2] Thus, our team feels that this is a pertinent issue - especially in our society and its future - that requires us to take action to **improve medication adherence.** This can potentially reduce the number of early deaths, greatly reduce the social health care costs, and ultimately, improve the standards of living and quality of life for the elderly.

Proposed Solution *"Details on our proposed solution and how it would solve the problem"*

Details of our solution.

Our proposed solution consists of an **automated medicine dispenser** powered by the micro:bit. The medicine dispenser first requires a caretaker to fill the necessary pill compartments up with pills according to the day of the week and time of day at which the medication has to be taken. At the designated day and time, the medicine dispenser would release the pills inside the compartment which corresponds to the aforementioned designation of day and time, along with a ringing sound and red light flashing which only stop once the pills have been taken. This process would continue each day of the week.. Exactly one week later, the caretaker will recalibrate the dispenser and refill the pill compartments. This cycle repeats.

This would help improve medication adherence in 2 important ways. Previously, the elderly had to peel open the individual aluminium wrappings of a multitude of pills at a particular day and time, which they have to keep track by themselves. They might have severe difficulty in take the pills, which is highly likely as having to take 20 different medications can be very **tedious, confusing and difficult**. However, with our medicine dispenser, all the required pills will be dispensed automatically at a set time. **The process of taking medication will become much easier**. Therefore, medication adherence will improve.

Secondly, the ringing and flashing of the LED lights and sound buzzer after the dispensal would **alert and remind the elderly**. The elderly would have **difficulty in remembering** the times at which they need to take the medication, or the fact that they have to take medication at all. They might forget to take the pills at all or falsely assume that they have already taken the pills when, in actuality, they have not. However, with our medicine dispenser, the elderly would be reminded to take the pills everyday, as switching off the buzzer and lights would require them to be

---

[1] Sabaté E. Adherence to Long-Term Therapies: Evidence for Action. Geneva: World Health Organization Press; 2003.
[2] Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. J Psychosom Res. 1999;47(6):555–567.

near the device and consequently, the medication. They will be **much less likely to miss doses**. Therefore, medication adherence will improve.

Prototype
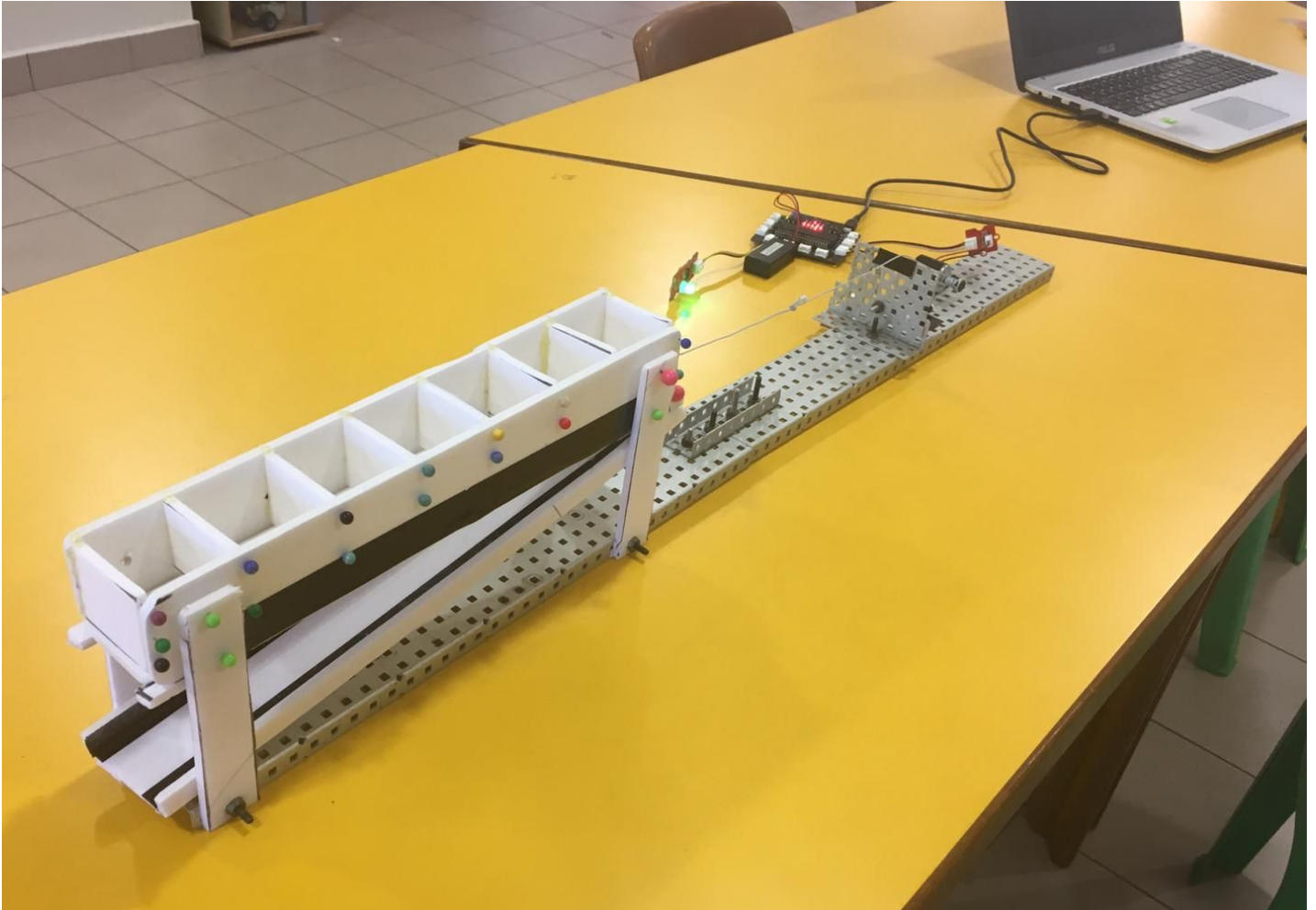
1. The styrofoam compartments hold the pills.
2. Below the compartments, there is a styrofoam slider which releases the pills upon motion.
3. The slider mechanism is connected to, and controlled by the DC Motor via a string.
4. The DC motor will be controlled by the micro:bit microcontroller.
5. The LED light and buzzer are also connected to it.

We can set the day and time at which the pills will be released by programming the micro:bit controller to send appropriate signals to the DC Motor (along with the LED and Buzzer).

The above photo shows only the internal pill dispensing mechanism, excluding the enclosure for the entire pill dispensing machine. We endeavour to build the enclosure for the exhibition and judging.

References:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5790098/#b10-ppa-12-175