

# Smart Pill Boxes

## Introduction

This paper reviews the existing smart pill boxes in the market and the sensing technology used on the pill boxes. The sensors on the pill boxes record the opening of the boxes and monitor how much of a medication is left in the box. The smart pill box therefore reminds the patient to take the medication on time and thus solves the problem of low medication adherence, which is a serious question in medical treatment [1].

## Commercial Applications

### Vitality's GlowCaps

GlowCap is a smart cap produced by Vitality that fit on regular pill bottles and is cellular-connected to a mobile app called DeviceConx Mobile Application and the Vitality Medication Adherence Portal [2]. When it is time for patient to take medication, the GlowCap will glow to remind the patient. If the patient forgot to take the pill, GlowCap will call the patient's phone to increase the level of adherence. By recording the opening of the pill box, GlowCap has the adherence information of the patient and can share the information to clinicians through the Adherence Portal. GlowCaps cost \$10 per cap and a \$15 per month subscription. Studies show Vitality's GlowCaps have an adherence rate of 99% [3].

### Adhere Tech's smart pill bottle

The smart pill bottle is a product from Adhere Tech and it constantly monitors the amount of medication inside the bottle, which helps people to track adherence and prevent accidental overdose. Like GlowCaps, smart pill bottle also has the cellular connectivity and it transmits the adherence information of the medicine in the bottle to the doctor and family in the form of a text message or phone call. Thus the adherence level of the patient will increase. Adhere Tech partners with hospitals and pharmaceutical companies to provide the pill bottle. Therefore consumers can't access to the product

directly and the cost of the bottle is unknown. A research has shown that the smart pill bottle increases the adherence rate to 90% [4].

## **Underlying Technology**

Vitality's GlowCap and Adhere Tech's smart pill bottle share the same goal of reminding the patients to take the pill and increase adherence rate, but the technology used are different. GlowCap is a smart cap fit on a regular pill bottle and therefore the sensors are only implemented on the cap. When the patient takes a pill he needs to open and close the cap. The sensors record the change of the cap and therefore track the adherence rate of the patient.

Adhere Tech's smart pill bottle uses touchscreen technology, which senses the amount of medication in a bottle using capacitance. Different from those on GlowCap, the sensors in the smart pill bottle are implemented in the bottle's walls between plastic. When different amount of medication remain in the bottle the sensors will measure various readings of capacitance and thus accurately measure the number of pills [5].

## **Building Blocks for Implementation**

The building blocks of a smart pill box include the software component and hardware component [6]. The hardware component is composed of the pill box and the sensors implemented on the box. To control the sensor and transmit the data collected, a microcontroller and the cellular connectivity are needed. Mobile phone applications are used to process and analyze the data.

## References

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