IEEE Student Engineering Team Challenge 2024: "Science and Health Technology"

HUG SMART STICKER: ENHANCING PERSONALIZED INTELLIGENT MEDICATION MANAGEMENT FOR COMMUNITY-DWELLING OLDER ADULTS WITH AN AIOT INTERVENTION

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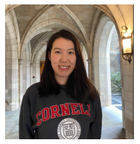



INTRODUCTION

Medication and dietary supplement usage are prevalent in community-dwelling older adults. However, medication or dietary supplement non-adherence is a challenge, as are risks of **misuse, abuse, and diversion (MAD)**. Due to the increased prevalence of progressive deficits in cognition among community-dwelling older adults, the ability to plan, organize, and execute medicine-management behaviors is further compromised, leading to an increased risk of unintentional non-adherence, medication errors, and preventable medication-related hospitalizations. HUG Smart Sticker is a personalized intelligent medication and dietary supplement management system promoting informed and safe medication usage for community-dwelling older adults. This Artificial Intelligent of Things (AIoT) intervention records users' medication usage in real-time, reports the latest alerts or potential side effects, and reminds users to ensure the safe usage of medications. With its unique **3R features (Record, Report, Remind)** and aging user-friendly interface, the HUG Smart Sticker offers a tailored approach to medication and supplement management, empowering older adults to take control of their health and well-being.

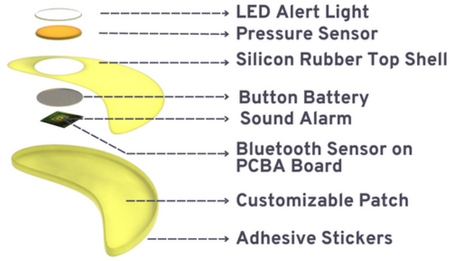
PROBLEM STATEMENT

For older adults, managing prescription regimens can be incredibly difficult and time-consuming. A result of this burden is that rates of medical non-adherence, or failure to follow prescription dosage regimens, range anywhere from 25-50%. This results in patients either taking too many or too few doses of medication during a given period. Non-adherence is estimated to be the primary contributing factor to 10% of the ~35 million annual hospitalizations in the US, meaning that medical non-adherence is responsible for nearly 3.5 million annual hospitalizations. These hospitalizations alone cost the healthcare system between **$100-289 billion** per year. Non-adherence is further estimated to contribute to **~125,000** deaths annually.

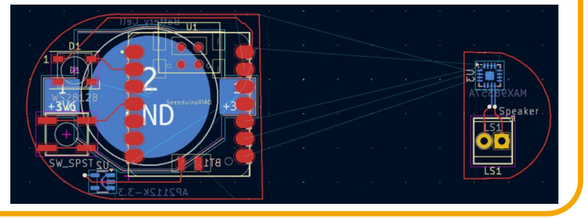
RECORD × **REMIND** × **REPORT**



HARDWARE MODULE

HUG Smart Sticker Prototype Look and Explosion Image of the Inner Functions. The AIoT-based Sticker is designed as a two-arm intervention composed of an intelligent sticker and of digested alerts for promoting informed and safe dietary supplement usage. To achieve precise monitoring of users' medication or dietary supplements usage, we conducted extensive testing on various sensor types, including accelerometer, proximity sensor, and button sensor. Through multiple rounds of rigorous testing, we determined that the pressure sensor exhibited the highest level of accuracy and provided the best user experience among all the sensors evaluated. We also tested different types of visual, audio, and Bluetooth/WiFi data transmission sensor.

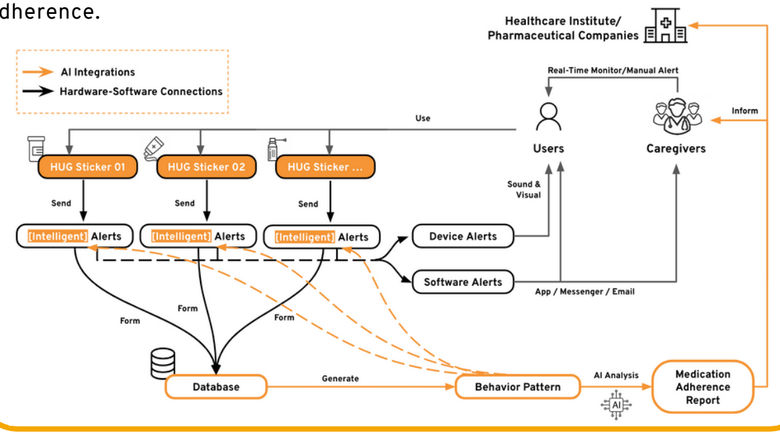


RESULTS & IMPACTS

HUG Smart Sticker designs to remove barriers and empower older adults, their family/friend caregivers, and providers who care for them to reduce their risk of nonadherence and the negative consequences, therefore reducing the burden on providers and costs to the community. It offers **intelligent alerts and reminders** to assist users in effectively managing their medication usage. Moreover, these predicted behavior patterns can be shared with clinical professionals and healthcare institutes/pharmaceutical companies, enabling them to gain insights into medication adherence.

HUG SMART STICKER AIOT PIPELINE

AIoT system is a combination of Artificial Intelligence (AI) and the Internet of Things (IoT) that facilitates the connection of physical objects and equipment. This integration empowers these entities with perception, cognition, and communication capabilities. Building upon users' data points, the HUG Smart Sticker will utilize AI algorithms to anticipate and predict users' future medication adherence behavior and patterns. This data-driven predictive feature will contribute to a more personalized and patient-centric approach, ultimately promoting community-dwelling older adults' better medication adherence.



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