Daily Medication Reminder and Detection of Elderly Patients

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***Abstract*--Hospital provided drugs kit with individual packaging and information. The reminder use QR code to set administrative dosage and the timetable. The app prompts the elder through text and voice. Prototype utilizes Arduino platform, switch, and LED and Bluetooth module. The sensed user activities transfer to App of the mobile phone through the Bluetooth connection. The 3D printed prototype model and circuit work well with App during user's evaluation.**

I. INTRODUCTION

Near 48% of Medicare beneficiaries aged 65 years or older had at least three chronic medical conditions, and 21% had 5 or more. Multiple medications increased the risk for adverse drug events [1]. Special drug care for this population is a high priority. In [2], researchers evaluate the applicability of CPGs to the attention of older individuals with several comorbid diseases. Current CPGs for an older person with several comorbidities have undesirable effects. Patients with duplication of therapies induced dangerous drug-drug or drug-disease interactions. Diabetes Care depending on personal status. In [3], a significant portion of physician visits for older patients makes efficient screening for inappropriate drug use. The postprandial glycemia (PPG) are of paramount importance in diabetic glycemic control and the prevention of diabetic complications [4]. A proper diet, physical activity, and no more than 3g AG were required at any time about the challenge to achieve reductions [5]. Maintaining functional status is a cornerstone of care for elders. Incident mobility limitation may cause the cumulative dose or duration of exposure. The CNS medication use reveals a higher risk for older adults [6].

Hospital statistics in Taiwan also show that the elderly also suffer from a variety of chronic diseases, a high proportion of different drugs mixed and misuse may cause danger. Drugs kits provided by the hospital have own packaging tablets for preservation with a separate bag. If patient relocates the drug using personal drug packages, removing medications information may cause mixing and cross-interference.

Using pharmacist packed medicine has benefits of (1) name, usage, and dosages are apparent at a glance; (2) listed with drug side effects and treatment purposes; (3) user do not worry about the deterioration of drugs. Chronic patients receive a dose of about one month. Traditional plastic box kit needs to disassemble the drugs, and classified, re-arranged. A user may get wrong in this additional task.

II. DESIGN PROPOSAL

In design improvement phase, we focus on elderly suffering from more than one type of chronic disease. Design proposal retains the hospital's packaging avoiding drug re-splinter. A hinting and detecting App (Fig. 1) enabling older users to know when and what to take intuitively. Its features included:

- Intuition: By clipping the bag directly, the subjects classified by illness with medicine clip folder.
- Categories of medicine: design easy-to-understand graphics icon, which help seniors with low vision.
- Portability: Chronic diseases identified by the color of the LED on medicine clipper. Bag clip designed to accommodate a variety of chronic drugs.
- Remote Care: Through the App, one can pre-set the prompt (usually caregiver). Through detecting interconnected switches, the caregiver receives elder medication status remotely.

Through the bottom of the medicine bag rack with hooks and magnetic, the stand can install in living space. The magnetic force also enables drug bags to firmly fixed (Fig. 2).

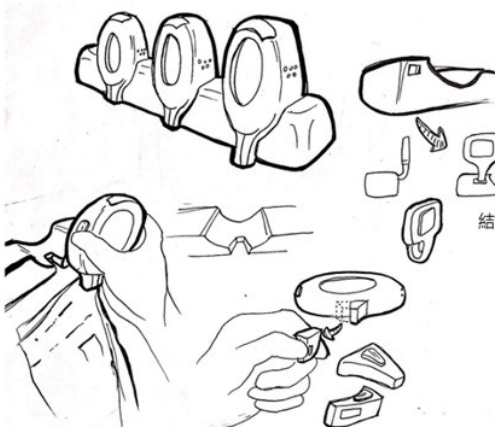

Fig. 1 Concept of medicine bag rack with hooks.

III. IMPLEMENTATION

We set administrative dosage by QR code on pharmacist instructions. Reminder re-order timing through the App and prompts the user through text or voice message. According to the flowchart (Fig. 3), the user knows the proper medication was taken at different time.

Fig. 2 The 3D model shows the rack and color indicator.

By combining electronic hardware, a low-cost multi-meter and a digital temperature monitor designed and demonstrated in [7] with Arduino platform. In [8], 3D printer support prototyping of hardware and chassis design. App Inventor and Arduino are building block based tools. The simplicity features enable designers to participate in programming and electronic module.

In physical design, one take account the connection between the electronic parts and the circuit board. There are three circuit boards, including Arduino board, Bluetooth, and switch LED circuit. We used CATIA to construct three-dimensional appearance model, and the 1:1 parts model with 3D-printing equipment. Then, parts and circuit assembled within the main chassis for functional testing (Fig. 4).

A friendly design needs to proceed with user study, through the appropriate visual design and operating procedure. While sensing of the switch in Arduino board, sometimes, a user accidentally touch the switch, therefore we confirm the drug usage by judging of time duration. The software interface process shown in Figure 3, we set the LED color associated with different diseases to avoid confusion. Then, schedule table access to activate hint message, pre/postprandial dosage also shown on display. After usage, the time-period of the switch–open is recorded and compared to verify the events. Later on, App will send a daily report to family members.

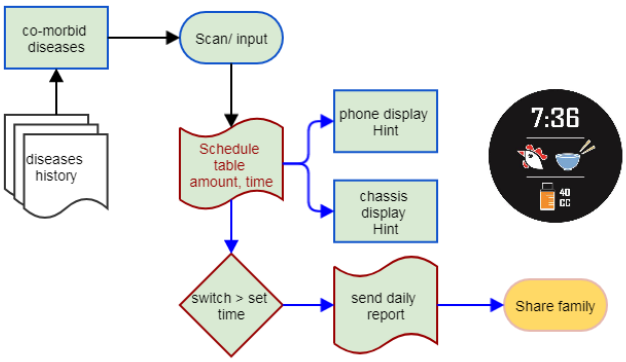

Fig.3 Interface icon and App software process.

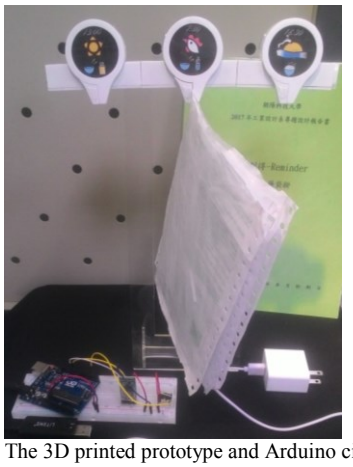

Fig. 4 The 3D printed prototype and Arduino circuit.

IV. Conclusion

Elderly suffer chronic diseases, different drugs mixed and misuse may cause danger. Hospital in Taiwan provided drugs kits with individual packaging and information. The design set administrative dosage with QR code; the reminder timetable and the App prompt the user through text or voice.

Arduino platform combine with App Inventor utilized in building circuit prototype. Through the appropriate visual design and operation procedure, the sensed user activities transfer to phone app through the Bluetooth connection. The LED color is different for individual diseases to avoid confusion. The 3D printed prototype and Arduino circuit work well during evaluation.

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