

Introduction

Wearable technologies may be beneficial in providing family caregivers valuable information on the safety, activity levels, or whereabouts of a patient. However, little is known regarding the perceived usefulness of such technologies for caregivers or the willingness of patients to share potentially sensitive health data in these interpersonal context.

Therefore, we developed a mobile caregiving application, called **Carebit** that uses the Fitbit application protocol interface (API) to share pertinent health data from a patient with his or her caregiver.

Background

- A major concern of elderly patients is being unattended in the event of an accident [1].
- Technological monitoring can reduce readmission to hospitals and the cost of care which would increase efficiency with healthcare resources [1].
- More than half of patients do not mind sharing their data with peers and clinicians, but after a year patients' concerns about privacy and security increased [2] [3].
- The Fitbit was deemed reliable in measurement and it also contains an accelerometer that can estimate activity levels [3] [4].
- A solution to privacy is to place control and ownership of personal data in the hands of the patient by allowing the patient to restrict some access from their caregiver [5].

Methods

- Developed a mobile application using Android Studio and the Fitbit API
- Created a working prototype to authenticate to Fitbit and show a patient's data from the last 24 hours:
 - 1) Last recorded activity, 2) Most recent heart rate reading, 3) Number of steps taken, and 4) Activity Levels
- Conducted a pilot study with 21 users to get feedback on the initial prototype. Participants were asked the questions shown to the right:

Carebit Interface Design



Initial Authentication

Caregiver Dashboard

Out-of-App Notification

Notification Settings

Initial Authentication

Allows Fitbit user (patient) to specify which information will be shared

Ensures that the patient is giving their consent to share their health data with a trusted caregiver

Caregiver Dashboard

Displays key vital statistics and activity levels over the last 24 hours

In-App Notifications are highlighted in **RED**

Out-of-App Notifications

When the caregiver is not logged into the app, a notification will be sent to the status bar

Emergency notifications may be implemented in the case medical attention is needed

Notification Settings

Based on user feedback, we propose adding the notifications above to the app

However, these settings have not yet been implemented in the app

Results

Perceived Usefulness

- 18 participants thought **Carebit** would be useful either now or in the future. Why?
 - Capability of patient to live independently
 - Monitoring loved ones from afar
 - Integration of technology & health to improve wellbeing
- 3 participants did not find **Carebit** useful. Why Not?
 - Emergency devices like LifeAlert already exist
 - Complexity of technology with elderly patients
 - No need if patient is severely prone to emergencies

Notifications Wanted

- Irregular heartrate, Low activity levels, Goal achieved, and Falls

"Blue Sky" Features

- Monitor blood sugar and/or sleep; Collect, save, and summarize previous data; Goal setting function; Alert medical response

Future Work

- Research the feasibility of the features suggested by participants (e.g., Fitbit's ability to detect a fall)
- Complete application development, including implementing notifications
- Run a full user study having family caregivers use Carebit to monitor a loved one

References

- [1] Scanail, C. N., Carew, S., Barralon, P., Noury, N., Lyons, D., & Lyons, G. M. (2006). A Review of Approaches to Mobility Telemonitoring of the Elderly in Their Living Environment. *Annals of Biomedical Engineering*, 34(4), 547–563. Web.
- [2] Boise, L., Wild, K., Mattek, N., Ruhl, M., Dodge, H. H., & Kaye, J. (2013). Willingness of older adults to share data and privacy concerns after exposure to unobtrusive in-home monitoring. *Gerontechnology: International Journal on the Fundamental Aspects of Technology to Serve the Ageing Society*, 11(3), 428–435. Web.
- [3] Chiauzzi, E., Rodarte, C., & DasMahapatra, P. (2015). Patient-centered activity monitoring in the self-management of chronic health conditions. *BMC Medicine*, 13, 77. Web.
- [4] Takacs, J., Pollock, C. L., Guenther, J. R., Bahar, M., Napier, C., & Hunt, M. A. (2014). Validation of the Fitbit One activity monitor device during treadmill walking. *Journal of Science and Medicine in Sport*, 17(5), 496–500. Web.
- [5] Pentland, A. (2004). Healthwear: medical technology becomes wearable. *Computer*, 37(5), 42–49. Web.

User Study Questions



Usefulness

If you were to use an app like this, what types of notifications would you want it to be able to give you?

Intelligent Notifications

If you were designing this app, what features would include in the app?

"Blue Sky" Exploration



Support for this work was provided by the National Science Foundation REU program under Award No. 1560302. Any opinions, findings, and conclusions and recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.