Digital Interventions for Self-Management of Chronic Illnesses

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Self-Management of Chronic Illnesses

• Reducing healthcare costs, overcoming social stigma, and cultural differences

• Diabetes, depression, asthma, and heart condition are prevalent in both developed and developing countries

• A number of clinical and technological barriers need to be overcome to support self-management of chronic illnesses

• Requires understanding of personal and population level indicators (Sheth, 2017)

• Engagement with healthcare experts and local authorities in cities of Southampton and Manchester is key to this work!
Smart Cities and Wellbeing

- Requirement gathering and use-case formation: Part of HEALTH-I project with Cisco Smart City demonstrator, CityVerve (Manchester) and Southampton City Council (SCC)

Wellbeing in Smart Cities

- Air Quality Monitoring
  - Lamp Posts
  - • Use lamp posts for installation of air quality sensors
  - • Use data collected for reducing asthma symptoms

- Train Routes
- Parking

- Healthcare Service Management
  - Asthma
  - • Cars drive around car-parks to find space, causing more pollution
  - • Challenge is to monitor air quality around a car park at low cost
  - • Use of low-cost sensors and lighting system to collect data

- • Unavailability of real-time guidance for people with health conditions to avoid areas with pollutions that can trigger an attack
- • Lack of understanding on to what extent the improvement of air quality could reduce health risk and healthcare cost

Acknowledgements: CityVerve, Manchester (PETRAS user partner)
Health Service Management

Case of Asthma

- Real-time air quality/pollen interventions
- Draw baseline for interventions at population level
- Integrate air quality data, lung function data to provide therapies, self-management
- Develop insight into triggers, reduce cost of healthcare for vulnerable groups

Acknowledgements: CityVerve, Manchester (PETRAS user partner)
What We Have: Data Sources

- **Social Media Datasets** – Twitter, health social machines, other social media datasets
- **Open government datasets** – weather, geospatial datasets
- **Local datasets** about people’s behaviors, attitudes and preferences
- **U-BIOPRED** (Unbiased BIOmarkers in PREDiction of respiratory disease outcomes)
  - Asthma hand printing data
- **Sensor datasets about people and environments** from IoT Observatory and PETRAS community
What We Have: BreathEasy Application

- Cross-platform wellbeing mobile application
- Captures general wellbeing of patients on a daily-basis
- *Personal data* captured—username, password and their geo-location
BreathEasy: Wellbeing Questionnaire

1. [ ] More than normal

2. [ ] More than normal

3. [ ] Well
BreathEasy: Application Design

- Extends the UBhave framework for designing behavioral interventions (Hargood et al., 2014)
- Intervention for any behavioral condition can be designed using the framework
- An intervention can be loaded from a JSON file
- The mobile application is built using Apache Cordova and front-end using Ionic framework
An Example Intervention

GP Briefing

Questionnaire Prompt

Air Quality Prompt

Daily-basis

Medication prompt

GP De-briefing

Adapted from (Burnett, 2013)
Citizen engagement for crowd-sensing, design their privacy profiles, trust evaluation

Link personal parameters with environmental and other contextual data

Can “pollen robo” and “Pepper” talk to chat-bot what intervention is needed

Real-time observation and analyses of data and geospatial data visualizations, prescription patterns to understand public health
References


- Honkoop PJ, Simpson A, Bonini M, et al. MyAirCoach: the use of home-monitoring and mHealth systems to predict deterioration in asthma control and the occurrence of asthma exacerbations; study protocol of an observational study, BMJ Open 2017;7:e013935. doi: 10.1136/bmjopen-2016-013935


• Download BreathEasy application: https://play.google.com/store/apps/details?id=ac.soton.breatheasy&hl=en_GB