Smartphone Based Ambulatory Assessment of Health Risks: Literature Review

WAC, Katarzyna, TSIOURTI, Christiana
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**Personalized Healthcare**

**applications**
- medication compliance
- disease/epidemic outbreak tracking
- consultation
- state monitoring
- treatment
- vital signs monitoring
  → additional sensors & actuators can be attached

**Research Motivation**
- Worldwide: 6 billion mobile phone subscribers
  basic phone → feature phone → smartphone
- EU5 (FR, ES, DE, IT, UK)
  50% of mobile phone users have a smartphone
- US
  2013 - 56% of mobile phone users have a smartphone
  87% of smartphone owners access Internet/email on phone, 68% - daily
- Personal health & wellbeing (2012)
  69% adults track health, e.g., weight, diet, exercise, symptoms of disease
  35% went online to figure out a medical condition
  most frequent: food safety, info on drugs, pregnancy issues
  50% adults use their mobile phones to get health information
  20% adults have health specific app(s) on their mobile phone

**Physical Health**

**physical activity & nutrition**
- Shapiro’08, Cocosila’09
  TEXT2BFIT [Hebden’13]
- [Rodriguez’13]
- [deShazo’10]
- SapoFIT
- NutriCam [Rolo’10]
- E-Apps [Hebden’12]
- ENGAGED [Pellegrini’12]
- MyMealMate [Carter’12]

**posture & motion & fall risk**
- Anticipatory Postural Adjustments [Rigoberto’10]
- Fail Risk Assess. in Dual Task [Yamada’12]
- Shoulder Range of Motion Assess. [Shin’12]
- TEXT4Baby [Gazmararian’13]
- SMS-based sexual health educ. [Gold’10]

**screening & assessment**
- Skin cancer screening app [Lamel’12]
- Cervical cancer screening (camera) [Quinnely’11]
- labOnChip for cancer screen [Wang’11]
- labOnChip for genetic markers [Stedfeld’12]
- mobile microscope (e.g., parasites) [Zhu’11]
- teleUSG, FAST protocol [Crawford’11]
- Free flap assessment [Engel’11]
- Wound assessment [Sprigle’12]

**Mental Health**

**symptoms**
- Weaver’07 (colon cancer)
- pain [Sorbi’07]

**mood**
- MoodMap [Morris’10]
- EmotionSense [Lathia’13]
- Mappiness [McKeron’13]

**anxiety & stress**
- SMS for pre-diagnosis anxiety [Cheng’08]
- multimedia app [Riva’07]
- VR for pre-operational anxiety [Mosso’08]
- VR for general anxiety [Gorni’07]

**resilience & relapse prev**

**Challenges Ahead**

- Interrelated Challenges
  - Privacy, trust
  - Interoperability, standardization
  - Organizational issues
  - Legalization, liability
  - Business models
  → User acceptance challenge (short & long-term)
  Quality of Life & Quality of Experience & Quality of Service

- Towards mobile healthcare, i.e., ‘mHealth’
  - Technologically feasible for non-critical care cases
  - Inter/trans-disciplinary approach needed
  - User-centered design
  - Bridge the gap via an open, trustworthy dialogue
  - Encode implicit expectations & requirements
  - Innovation: "who’s turn is now"?
  - Innovating the intervention content
  vs. innovating the IT infrastructure

- mHealth Evaluation
  - Small number of participants, short time, design bias, no causality, ...
  - Beyond the Randomized Controlled Trial (RCT)

Dr. Katarzyna Wac
Christiana Tsiourti
Katarzyna.Wac@unige.ch
Christiana.Tsiouri@unige.ch
http://www.qol.unige.ch