Challenges in Developing Remote Monitoring Technologies for Aging with and into Disabilities

Cesar E. Blanco
Alfred E. Mann Institute for Biomedical Engineering at the University of Southern California

AMI USC
ACCELERATING MEDICAL INNOVATION
Outline

• What are the Healthcare Needs of the Aging Population?

• A Solution for Aging into Disabilities that Affect Mobility
  
  Point-of-Care Mobility Monitoring Systems (PoCM-MS)

• Addressing the Challenges through Staged Prototype Development

• A Sneak Peak
Aging

*Our great success of the 20th Century*

The Longevity Dividend

- Refers to the economic benefits of ending aging and eliminating the associated health care costs.
- The Longevity Dividend has been defined as "the sum of health, social and economic benefits that result from slower aging."
Disability

Our challenge for the 21st Century

• Disability is a progressive process
  – The process is dynamic

• The disability state can be modified
  – Targeted simple, low-cost prevention, health maintenance, or continued functional recovery programs
  – Psychological, physiological, and environmental factors

Crimmins et al., 1994
What are the Healthcare Needs of the Aging Population?

• One in 6 adult Americans lives with a disability
• Higher risk for multiple chronic conditions
• People with disabilities are more likely to:
  – Report their health to be fair/poor
  – Have unmet health care needs than non-disabled peers.
• $400 billion is spent annually on disability-related health expenditures.

Eileen Crimmins, USC Davis School of Gerontology; Public Health Grand Rounds, Dec 18th, 2012
Societal Goal: Aging in Place

- Keep people in their homes longer
- Close the gap between evidence and practice
- What worries Seniors about the future?
  - Frustration at being immobile
  - Overall effects of frailty
  - Isolation
  - Autonomy

A Solution for Aging with Disabilities that Affect Mobility

- Develop a prototype Point-of-Care Mobility Monitoring System (PoCM-MS)
- Use smart phones, tablets, bluetooth devices and computer gaming technologies to create technology platforms for monitoring and rehabilitation
  - Personalized medicine
Schematic of a PoCM-MS

First Prototype to be developed for monitoring patients with Parkinson’s Disease
Parkinson’s Disease

• Approx. 500,000 cases in the US
  – 50,000 new cases per year
• Progressive neural degenerative disorder leading to the loss of dopaminergic neurons in the midbrain
• Symptoms include mobility disorders
  – Slowness of movement, tremor, rigidity and postural instability
• Pharmaceutical intervention to ameliorate symptoms
  – Serious adverse effects: nausea, dizziness, postural hypotension, etc
  – Long term use of L-DOPA results in motor complication including dyskinesias
• Deep Brain stimulation
Addressing the Challenges through Staged Prototype Development

1a,b

3-D Motion Sensing System for Interactive Gaming (MS Kinect)

2

Wireless Communication Device

Body Sensors

Use accepted clinical mobility performance tests to create tools for assessment in the clinical\(^{1a}\), home\(^{1b,2}\) and natural environments\(^2\)
A Sneak Peak
(Prototype Stage 1a)
Thank You

Carolee Winston, USC
Beth Fisher, USC
Yi-An Chen, USC
Yu-Chen Chung, USC
Giselle Petzinger, USC
Sara Mulroy, RLANRC
Mike Nichol, USC
Cyrus Shahabi, USC
Gerard Medioni, USC
Farnoush Banaei-Kashani, USC
Antonio Ortega, USC
Ruizhe Wang, USC
Luan Nguyen, USC
Joanne Kao, USC
Phil Requejo, RLANRC
Eric Wade, USC

Funded by: Southern California Clinical and Translational Science Institute