Can Technologies Match the Abilities of Human Caregivers? A model for research and practice

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Background
Most seniors prefer to live at home as long as possible, even when chronic disabling conditions make home life challenging. Caregivers are the heart of home care, with over 2 million informal (e.g., family member) caregivers in Canada. They contribute an estimated $25 billion of care to support individuals, often so that seniors can remain in their own homes (CIHI, 2010). When the informal caregiver is unavailable, there is a substantial risk of earlier transition to a residential care facility.

Purpose
Our objective is to develop a highly integrated suite of technologies that:
1. signal the need for intervention by detecting or predicting adverse events
2. deliver caregiver-like interventions

Home Care Support
Within the Island Health population receiving Home Care:
• 47% live alone
• 40% have a diagnosis of Dementia
• 22% have moderate or higher cognitive impairment
• 38% have experienced a recent fall
• 38% of caregivers express distress, anger or depression

Home care resources are limited. The result is a care gap that will increase as our population continues to age and demand grows (Turcotte, 2014).
• 461,000 Canadians need help or care that they did not receive
• 331,000 Canadians received only part of the help or care they needed

Technology can fill the care gap if:
• Systems of care support are flexible and person-centered
• Technologies are affordable, accessible and effective
• Ongoing assessment and support is provided since needs are dynamic and changing

Technology and Caregivers
Caregiving is a complex behavior for which humans are uniquely suited and technology is in its infancy. We believe that technology can supplement and, someday, stand-in for human caregivers. Still, sensor technologies already have great potential to support interventions that mitigate adverse events such as falls, wandering, and delirium (Mahoney, 2010; Kaye et al., 2011; Rantz et al., 2012; Rantz et al., 2013).

Currently, a variety of technologies exist to support individuals in their homes, including, automated medication dispensers, remote monitoring systems (e.g., CareLink Advantage), medical alert systems, GPS tracking devices and behavioural interventions (e.g., SimpleC Companion). Although helpful, these technologies operate in data silos that impede their potential utility.

Method
Our model (Figure 1) will use continuous measurement with passive home sensors along with a periodic burst of gold standard assessments to build three classes of algorithms for predicting risk of adverse events (e.g., delirium) in the home.

The algorithms will categorize an individual’s progression to provide a powerful new tool for decision-making (Figure 2).

Discussion
We have demonstrated the value of burst measurement design and multilevel models for falls prediction and have started toward home instrumentation to demonstrate the value of a tightly integrated village of technologies. Our approach will be extended to develop an automated caregiving system, where remote-monitoring sensors inform devices that provide intervention (effectors) mimicking intelligent human caregiving.

“In a world where dementia is on the rise and caregivers are unavailable or unable to meet the needs of individuals with dementia, technology can and should play an important role” .... (Kerssens, Slatter, & Monteiro, 2014)

References


Figure 1. Technology Integration Model

Figure 2. Predicting Trajectories of Change