Nursing Research in Dementia Care

Use of Technology

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Home Monitoring System
Nighttime Monitoring System
Safe Home Program

PI: Meredith Rowe, PhD, RN, FAAN
Home Monitoring System: Background

• Caregiver (CG) and Person with Dementia (PWD)
  – 44 million CGs providing $257 billion informal care
  – ADL and IADLs
  – Ongoing, continuous eyes-on surveillance to protect from unsafe events (even at night)
    • Falls & fractures
    • Exiting home

• CG have sleep fragmentation & lack of sleep
HMS Goal

• Monitoring system reliably alert CG when PWD left bed

• Goal:
  – ensure greater home safety
  – Correctly alerting CG when supervision needed
  – Prevent CG needlessly awakening --- improve sleep quality
Criteria for HMS

• Bed occupancy sensor
• Messaging caregiver at bedside
• Continuously able to identify PWD location
• Customized messaging: alarms, text, voice
• Different alarm levels: emergency/non emergency
• Ease of use system interface
Developed new technology

• CareWatch
  – Security system control panel
  – Wireless receiver
  – Motion sensors
  – Door opening sensors
  – Bed occupancy sensor

• Day and night use. Night mode set when PWD retires
Nighttime Monitoring

• Controlled clinical trial
• 49 CG of PWD
• Followed 1 year
• Mixed results
  – Improved quality of sleep
  – More awakenings
• Next step: Create ‘smart’ NM to learn PW’s nighttime habits (e.g., up to BR and back to bed)

Rowe 2010; Spring 2009
Safe Home Program (SHP)

• Suite of technologies to support CGs of PWD
  – Ongoing surveillance
  – Provide care
  – Prevent injuries
  – Improve home safety

• Tampa VHA Home Based Primary Care program

• Before/after trial

Rowe, AJADD in press
Ongoing Surveillance

• Motion sensor with remote alarm (driveway sensor product) – monitors activity outside home
• Wireless camera with handheld liquid crystal display (LCD), color & night vision
• Proximity range alarm
• Wireless home security system
Provision of Care

• Medication organizer
  – 4 daily alarms
  – Repeating reminder time, date and which dose
  – When next dose is due
Prevent Injuries

• Identification program
  – MedicAlert + Safe Return
  – Iron-on labels: 4 lines for PWD/CG names, telephone#s

• Locating technologies
  – Project Lifesaver: radio-frequency with ankle/wrist band transmitter

• Bed occupancy sensor
Improve Home Safety

- Dual function door security bar
- Touch pad key locks
- Door handle set
- Sliding door lock
- Grip-n-twist door knob cover
- Window sensor
- Dead bolt
Improve Home Safety

• Stove knob covers
• Carbon monoxide detector
• Smoke detector
Methods

• 60 PWDCG
• Initial home visit
  – Essential safety materials: ID, CO/smoke detectors, 30-day medication organizer (>7 meds/day)
  – Assessments for other technologies
• Follow up visits to assess acceptance & adoption over long term
Results

• Acceptance
  – Did not alter home appearance
  – Easier to monitor/surveillance
  – Alarms that sounded remotely at CG site
  – Met unique caregiving needs (e.g., getting lost, sleep disorders)
Results

• Less effective
  – Wireless camera with handheld LCD
  – Institutional look
  – New door-locking equipment
    • Invasive to home
    • Need for new home keys
    • Key codes difficult to remember
    • Difficulty adapting to new lock type
  – Majority of home safety not accepted
Results

• Gaps
  – Chair alarms
  – Integrate systems (bed occupancy plus exit alarm)
TigerPlace
Aging in Place

Marilyn Rantz, PhD, RN, FAAN
Vision

• Develop & implement new approach to long-term care of older adults
• Dramatically change way LCT delivered
• TigerPlace one of 4 pilots of Aging-in-Place
• New retirement community developed by the University of Missouri-Columbia in affiliation with Americare Systems, Inc.
Functional Decline

- Assess gait
- Detect falls
- Assess normal patterns
- Recognize pattern changes
- Detect acute illness onset
Integrated Sensor Network


Compliments M. Rantz:
http://extension.missouri.edu/extcouncil/resources/Rantz%20MU-eldertech.pdf
Sensors

- **Motion sensors**
  - Presence in a room
  - Specific activities
    - Over a shower detects bathing activity
    - In a cabinets and refrigerator detects kitchen activity
- **Bed sensor**
  - Pulse
  - Breathing
  - Restlessness

Compliments M. Rantz:
http://extension.missouri.edu/extcouncil/resources/Rantz%20MU-eldertech.pdf
Basic Sensors

Compliments M. Rantz:
http://extension.missouri.edu/extcouncil/resources/Rantz%20MU-eldertech.pdf
A Typical Sensor Network

- 11 motion sensors
- 1 bed sensor unit
- 1 stove temp unit
- 1 PC appliance

30 sensor networks installed since Oct., 2005

Average time: 2 years

Compliments M. Rantz:
http://extension.missouri.edu/extcouncil/resources/Rantz%20MU-eldertech.pdf
Preserving Privacy with Video

Compliments M. Rantz:
http://extension.missouri.edu/extcouncil/resources/Rantz%20MU-eldertech.pdf
Conclusions about Residents

- Elders take ownership of the sensor data
- Elders want control over who has access to their data
- Acceptance is related to need and perceived benefits.
- Privacy can be sacrificed for needs/benefits
- Elders tend to underestimate their own needs
- Elders care about the look of the technology
- Elders are willing to accept technology if it
  - Meets a need
  - Has an appropriate interface (address sensory limitations)

Interview Results on Silhouette Imagery

- Most participants liked the silhouette imagery
- They were less enthusiastic about the voxel data, as they could not see the usefulness
- Participants found the silhouette images to be protective of their privacy
- Participants wanted some control – ability to turn it off


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Robotics

Nursing-Engineering Collaboratives
Rush College of Nursing
U of Michigan
U of Pittsburgh
SUNY Stony Brook
Carnegie Mellon
Typology

• Assistive devices for disabilities
  – Smart wheelchairs
  – Prosthetic limbs

• Assistive devices for tasks
  – Lifting, carrying, laundry, putting away groceries, vacuuming

• Social and cognitive
  – Pet therapy
  – Communication
Assistive Robotics

• Feeding systems
  – Mealtime Partner
  – Neat Eater
  – SECOM MySpoon System

• Robotic arms (voice controlled)
  – Meal preparation, grooming

• Fetching items in home environment

• Powered W/C with robotic arms

• Challenging interface
Socially Assistive Robots

- Autonomous, interactive machines
- Aid with intellectual, social and emotional care
- Encourage physical activity
- Provide entertainment
- Offer companionship
- Generate safety reminders
- Facilitate intellectual stimulation
SARs with PWD

- Animal attention (ie pet therapy)
- Reminiscence therapy
- Attention
- Play
SAR Impact

• Early stages of development and study
• No long term studies
• Some evidence
  – Decrease stress/agitation
  – Improved mood
  – Worsening mood states
Robotic Technologies in Health Care: Controversies

• Robots could be useful:
  – Lifting (heavy) patients
  – Artificial limb providing mobility/function
  – Monitoring people in homes – delay NH

• Controversy with care robots: *replacing* people?
  – Can’t care about the person
  – Can’t take care of social and emotional needs
  – Violates fundamentals of privacy
  – Provide ‘fake’ care
No, robot: Japan's elderly fail to welcome their robot overlords

By Michael Fitzpatrick BBC News, Tokyo
February 3, 2011
Reactions to Robots
If you were to choose a robot for companionship, which one would you choose?
If you were to choose a robot for **companionship**, which one would you choose?

1.

2.

3.
If you were to choose a robot for **companionship**, which one would you choose?

1. 

2. 

3.
If you were to choose a robot for assistance in tasks (e.g., intruder alert), which one would you choose?

1.

2.

3.
If you were to choose a robot for assistance in tasks (e.g., way finding directions), which one would you choose?

1. 
2. 
3.
If you were to choose a robot for assistance in tasks (e.g., medication reminder, putting away groceries), which one would you choose?

1. 

2. 

3.
Older Adults’ Reactions to Robots

• Appearance
  – “Funny”, “Cute”, “Charming” (Paro, Mamoru, Eve)
  – “Toys for children” (Nao)
  – “Caricature of humans”, “False human”

• Function
  – Impacts perception of appearance

• Strong reluctance, ‘fear’ to replace humans

Wu, Fassert, Rigaud Archives Gerontology Geriatrics 2012
Conclusions

- World wide concern with aging demographics
- Increasing #s PWD
- Decreasing #s healthcare workers
- Technology to supplement
  - Therapies
  - ADL/IADL
  - Cognitive stimulation
  - Pet companionship
  - Safety monitoring
- Consider context of usage
- Needs of older adults