Smart Home Technology for Aging in Place Longer and Better

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21st Annual Summer Series on Aging
Sanders-Brown Center on Aging
University of Kentucky
June 16, 2004
Summary of Presentation

- Challenges to aging in place
- Gerontechnology can be used to assess well-being
- From expensive “smart homes” to inexpensive devices
- e-Activities of Daily Living Reporting Systems
- Gather data on selected elders’ routine home activities
- Wireless motion and light sensors upload data
- Establishes baseline, looks for marked changes
- Clients sent reports via website, e-mail or phone
- Possible problems checked out sooner
- Your role in assessing indications and efficacy
The Aging Process

THE WIZARD OF ID

By Parker and Hart

WHAT ARE YOU WORKING ON, WIZ?

I'M LOOKING FOR A WAY TO STOP THE AGING PROCESS

HAVE YOU TRIED DOUBLE-CROSSING SOMEONE IN THE MOB?
Global Aging

- 1.2 billion older people projected worldwide in the year 2025
- 70% of world’s older population will be in developing countries
- Net increase of one million people 60 years of age monthly now!
- 1st of 77 million U.S. boomers turn 65, May 2011
Principles of Aging

• Biopsychosocial phenomenon…
• Normal changes with age…
• Common geriatrics problems…
• Environmental factors…
• Coping mechanisms…
“I’m sorry, Rhett, but now I don’t give a damn.”
Only Four Types of People

- Those who have been caregivers
- Those who are currently caregivers
- Those who will be caregivers
- Those who will need caregivers

-- Rosalynn Carter
Challenges to Aging in Place

• There are over 36 million seniors over the age of 65
  – Over 10 million live alone
  – Fastest growing demographic group in the U.S.
• The vast majority (95%) of seniors want to “age in place” -- live in their own homes
• The burden on family caregivers is severe
  – 25% of families care for someone outside the home
  – 30% of elderly admissions to a nursing home or assisted living facility occur not because of deterioration in the senior’s condition but because of caregiver burnout
• Homecare costs borne by family, institutions, and government are soaring.
  – Both the delivery of assistance with ADL’s and safety monitoring are being provided by $12/hour home care aides
  – Federal Medicaid spending for home and community-based care was $24.7 billion in 2002
When it’s Your Turn

- Fast forward 30-50 years from now and see yourself on a beautiful Sunday afternoon...

- What do you want to be doing, where, and with whom?

- How will you get from here to there?

- “Aging is like anything else: to be good at it, you must start early.” -- Theodore Roosevelt
Smart Homes

- Today’s “smart homes”…

- Tomorrow’s “smart homes”…

- Where to find out about them – www.agingtech.com…

- Guidelines to determine if they are indicated for your patients/clients – i.e., medical, social, & ethical issues, costs, benefits…
Smart Home - What is it

A smart or intelligent home uses readily available devices many of which are currently used in home security systems, such as:

- passive infra-red sensors
- pressure pads
- magnetic reed switches

It also uses other familiar devices, like infra-red transmitters similar to TV remote controls, smoke, heat and gas detectors, door entry systems, powered doors etc.

In an intelligent house all these devices...
FROM CARING HOME TO SMART HOUSE
A NEEDS LED EVOLUTION

D A Bradley†, S Levy† & S J Brownsell‡

† School of Science & Engineering
University of Abertay Dundee

‡ Barnsley District General Hospital
TELECARE STRATEGIES

Smart Sensors

Only required information leaves home

Local Intelligence

Local Processing

Only required information leaves home
CARE TECHNOLOGIES & OPERATIONS

SUPPORTIVE
ASSISTIVE & SMART HOME TECHNOLOGIES
- Smart wheelchair
- Gas monitor
- Personal heating systems
- Pacemaker
- Remind unit (dementia)
- Cardiotachometer
- Dialysis machine
- Therapy Units
- Stair-lift
- 'Video doorbell
- Drug dispenser/compliance unit
- 'Panic' pendant
- 'Keyless' entry systems
- Respiration monitor
- Incontinence monitor
- Chair occupancy monitor
- Blood pressure monitor
- Fall detector
- 'Transfer' monitoring
- 'Keyless' entry systems

ALARM SYSTEMS
- (In)Activity monitor
- Fall detector
- Cardiotachometer
- Blood pressure monitor
- Respiration monitor
- Smoke detector
- 'Transfer' monitoring
- Fall prediction
- 'Panic' pendant

PREDICTIVE/DEDUCTIVE SYSTEMS
- Activities of daily living (ADL)
- Event monitoring
- Gradual general decline
- Room occupancy monitoring

RESPONSIVE
- Video doorway
- Stair-lift
- 'Keyless' entry systems
- Dialysis machine
- 'Transfer' monitoring
- 'Transfer' monitoring
- Blood pressure monitor
- 'Panic' pendant
- 'Keyless' entry systems

PREVENTATIVE
The Assisted Cognition Project

- University of Washington Computer Science & Engineering
  - UW Medical Center
  - Alzheimer’s Disease Research Center (ADRC)
  - UW Institution on Aging

- Outside Collaborators:
  - Intel Research – Seattle and Jones Farm
  - OGI/OHSU
  - Elite Care

http://assistcog.cs.washington.edu/
Assisted Cognition

Henry Kautz
Don Patterson, Nan LI
Oren Etzioni, Dieter Fox

University of Washington
Department of Computer Science & Engineering
The $80 Billion Question

• Can we build computer systems that (like a caregiver) actively assist a person with Alzheimer’s perform the tasks of day-to-day living?
  – Enhance quality of life
  – Prolong aging in place
  – Lessen burden on other caretakers
    • Depression affects 20% of Alzheimer’s patients, but 50% of Alzheimer’s caregivers
    • Crisis in demographics – shortage of caretakers
Vision

Computer systems that improve the independence and safety of people suffering from cognitive limitations by...

• Understanding human behavior from low-level sensory data
  – Using commonsense knowledge
  – Learning individual user models
• Actively offering prompts and other forms of help as needed
• Alerting human caregivers when necessary
ADL Prompter

• General approach: build a probabilistic model of
  – Common user goals
  – “Plans” (complex behaviors) that achieve those goals
    • Including failure modes
  – How simple behaviors are sensed
• Run model “backwards” to interpret sensed data
Night bathroom run

1. Get out of bed
2. Walk to bathroom
3. Flush
4. Walk to bedroom
5. Get into bed

Location

- Badge Sensor
- Door Sensor
- GPS
Night snack run

1. Get out of bed
2. Walk to kitchen
3. Get crackers
4. Walk to bedroom
5. Get into bed

Location

- Badge Sensor
- Door Sensor
- GPS
Night pattern

- Sleep
- Night bathroom run
- Night snack run

Location

- Badge Sensor
- Door Sensor
- GPS
Timing Constraints

Night bathroom run active [9 pm - 7 am]

Walk to bedroom

Get into bed

< 10 min

violation

Night wandering
Summary: ADL Prompter

- Commonsense knowledge base of “significant” behaviors
  - Hierarchically organized
  - Probabilistic at all levels
  - Several parallel ongoing activities possible
  - Absolute and relative timing constraints
  - Probabilities “tuned” by machine learning techniques for individual users
  - Failure modes – points of possible intervention
Key Issue

• How to go from noisy and incomplete sensor measurements to
  – A meaningful description of what a person is doing
    • “Trying to brush teeth”
    • “Trying to get home”
  – A decision by the system about whether or not to intervene
    … in a principled and scalable manner!
Conclusions

• Growing research area combining AI, ubiquitous computing, and assistive technology
  – NIST, AAAI, Ubicomp Workshops
  – RESNA
  – Gerontotechnology

• Key idea: Patient and computer as a problem-solving team
Technology

Creating an Autonomy-Risk Equilibrium™ (CARE)

CARE™ is Elite Care's comprehensive "smart home" technology system that serves two primary audiences. The first is residents who want biofeedback and cues to prolong their independence. The second is staff who want ways to...
Smart Home

Products

**HomeFree at Home**
*Submitted: March, 2004*
*Usefulness Rating: ******
A home wandering prevention and resident well being monitoring system.

**Assistive CARE System**
*Submitted: January, 2004*
*Usefulness Rating: ******
real-time, tracking, biosensor, smart-home, internet-based, information system

**HomeFree Elite**
*Submitted: January, 2004*
*Usefulness Rating: ******
Complete wireless resident monitoring solution, including wandering prevention and nurse call systems.

Pilot Projects
The Social and Psychological Aspects of SHT Within the Care Sector

Guy Dewsbury
SEARCH (Scottish Centre for Environmental Design Research)
Robert Gordon University
Aberdeen

smartthinking@ukideas.com
Efficacy and Consequences of SHT

• AT in the Care Setting
• Technologisation of Needs
• Smart Homes and Social Care
• Technological Cost and the Benefits
  • The Future
  • Tentative Guidelines

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The Guidelines

• 1. A proactive view of people’s conditions is required at the point of assessment.
• 2. Assessments must consider how a person interacts with the technology.
• 3. What can technology do for all stakeholders?

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The Guidelines

• 4. Technology should be seen and designed as enabling and empowering.
• 5. Specification of device interaction is crucial.
• 6. Maintenance of system.

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The Guidelines

- 7. Material cost/benefit is not a good way to view SHT.
- 8. Technology is not a panacea.
- 9. Devices should be used correctly to enable a person.
- 10. User needs should involve all stakeholders.

smartthinking@ukideass.com
The Guidelines

• 11. User needs assessment central to design.
• 12. Training is essential for everyone.
e-ADLARS Commercial Example

- Living Independently’s QuietCare System
- Venture in elder-tech industry guided by Medical Advisory Board*

*Drs. Bob Butler, Jerry Johnson, Terry Fulmer, Dave Kutzik, Harry Moody, Jeanette Takamura, and Bob Roush
“Perhaps the most important development in eldercare in a generation.”

Dr. Robert Roush, Baylor College of Medicine, Director, Texas Consortium of Geriatric Centers

Living Independently is a new technology-based service that helps seniors live fuller, safer lives. Using non-intrusive security sensors and state-of-the-art computer software, LI identifies emerging problems and alerts family/caregivers. Whether for family members providing part-time care, or residential facilities, Living Independently provides better care with less burden, anxiety, and uncertainty. That means peace of mind!

How can I check on her without nagging?

For Seniors & Their Families
Living Independently’s E-Care Assistant helps seniors live more safely in their own homes, and reduces the burden on family caregivers.

For Assisted Living & Independent Living Facility Managers
Living Independently’s E-Care Manager helps you provide better care to your residents and serve families not yet ready for an institutional relationship.

For Eldercare Professionals
Living Independently’s E-Care Assistant could be an important piece of a comprehensive care plan for many of the seniors you serve...
QuietCare Serves

• Seniors and their adult children
  – Adult children are the usual purchasers of services
  – There are 22 million adult children who serve as full- or part-time caregivers to seniors living outside their home
    • The majority are women, with an average age of 49
    • Most work full or part-time
    • On average, they devote 15 hours per week to this part-time care

• Institutions who deliver and/or pay for home and community-based services for the elderly
  – State Medicaid programs
  – Private insurance programs
  – Healthcare providers operating under capitated rate and shared risk programs (such as CCRC’s)
How It Works

1. Wireless sensors track senior’s ADL’s
2. Base station uses existing phone line and local dial-up to report key behaviors
3. ADL’s analyzed for deviations from normal behavior
4. Reports generated
5. Alerts issued
6. Caregiver calls senior to check in.

Caregiver:
- Adult child
- ALF or home healthcare provider
- Care manager
Monitoring ADL’s Passively & Alerting Caregivers to Emerging Problems

- Functions as an “early detection, early warning system” that lets caregivers and family know that a loved one is safe; and recognizes emerging problems before they become catastrophic
  - Has Mom gotten out of bed?
  - Has she navigated the bathroom safely?
  - Did she eat?
  - Has she taken her medicine?
  - What is her overall activity level?
  - Is she sleeping well?
  - Are her bathroom habits changing?
  - Room temperature alerts for heat and cold

- Partnered with Personal emergency Response Providers (PERS) to provide both 24/7 monitoring/ response and a full pro-active/reactive “circle of safety.”
Green light means everything is normal.

Yellow light means keep an eye on this.

Red light means check in with the senior now!
What the Caregiver/Family Sees

Alpha Healthcare: Anthony Michaels

As of 11:20 am on 09/28/2003

**Activity**

**Wakeup**
Anthony Michaels did not get out of bed by 10 AM. Call Anthony Michaels to check on their condition. No motion was detected outside of the bedroom between 6AM and 10AM.

**Bathroom Falls**
No suspected bathroom falls were detected.

**Medication**
0 Medication events. This motion sensor data must be used in conjunction with a detailed understanding of medications and their dosage amounts and timing. This information should not be construed as medical advice in any way.

**Meal Preparation**
Meal preparation was in the normal range.

**Activity Index**
Red: Too little activity Call Anthony Michaels at home, contact the doctor if appropriate.
e-ADLRS Tracking Data
(courtesy of Living Independently)

- 5 subjects, independent living apartments
- 4 motion sensors plus medication monitor
- Base station in bedroom
- 30 days Data Analysis Preview
- 5 behaviors: waking, meals, medications, overnight bathroom visits and bathroom falls
- Behavioral trends: normality, changes and consistency
As of 1:11 pm on 10/24/003

<table>
<thead>
<tr>
<th>Resident</th>
<th>Wake Up</th>
<th>Bath Falls</th>
<th>Meds</th>
<th>Meals</th>
<th>Activity</th>
<th>Sleep</th>
<th>Night Bath</th>
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HOME | SERVICES | HOW IT WORKS | ABOUT US | CONTACT US

Copyright 2003

Living Independently provides interpretations of motion sensor data inside the home. These motion data are based on changes in infrared...
<table>
<thead>
<tr>
<th>Sensor</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wakeup</td>
<td>Red</td>
<td>No motion was detected outside of the bedroom between 6AM and 10AM. Call check on their condition.</td>
</tr>
<tr>
<td>Bathroom Falls</td>
<td>Green</td>
<td>No suspected bathroom falls were detected.</td>
</tr>
<tr>
<td>Medication</td>
<td>Grey</td>
<td>3 Medication events. This motion sensor data must be used in conjunction with a detailed understanding of medications and their dosage amounts and timing. This information should not be construed as medical advice in any way.</td>
</tr>
<tr>
<td>Meal Preparation</td>
<td>Green</td>
<td>Meal preparation was in the normal range.</td>
</tr>
<tr>
<td>Activity Index</td>
<td>Green</td>
<td>Was active in the normal range over the past 24 hours.</td>
</tr>
<tr>
<td>Sleep Index</td>
<td>Green</td>
<td>Sleep activity was in the normal range over the past 24 hours.</td>
</tr>
<tr>
<td>Night Time Bathroom Visits</td>
<td>Yellow: Too few events</td>
<td>Call someone at home and ask them about this condition.</td>
</tr>
</tbody>
</table>
Weekly Wakeup Status

- Indicates wakeup time
- Alerts are the result of not leaving bedroom by 10AM
- Possible cause for red light includes: Oversleeping, being away from home

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Events</th>
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<tr>
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<tr>
<td>Thursday October 23, 2003</td>
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<td>Monday October 20, 2003</td>
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<tr>
<td>Saturday October 18, 2003</td>
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</table>
**Weekly Wakeup Status**

- Indicates wakeup time
- Alerts are the result of not leaving bed by 10AM
- Possible cause for red light includes: Oversleeping, being away from home

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<td>Monday October 20, 2003</td>
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<td>Sunday October 19, 2003</td>
<td>1</td>
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<tr>
<td>Saturday October 18, 2003</td>
<td>1</td>
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</tbody>
</table>
Activity | Current Status
--- | ---
Wakeup | I woke up this morning and moved around the home.
Bathroom Falls | Green No suspected bathroom falls were detected.
Medication | 15 Medication events. This motion sensor data must be used in conjunction with a detailed understanding of medications and their dosage amounts and timing. **This information should not be construed as medical advice in any way.**
Meal Preparation | View events at home and ask them about this condition.
Activity Index | Green Was active in the normal range over the past 24 hours.
Sleep Index | Green Sleep activity was in the normal range over the past 24 hours.
Night Time Bathroom Visits | Green Bathroom usage was in the normal range.
Meal / Kitchen Events for the Past Seven Days.

- Indicates total number of kitchen/meal events for a 24 hour day
- Alerts are the result of too few meals/kitchen events
- Possible cause for red light includes: Appetite change, medication change, being away from home

<table>
<thead>
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<tr>
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<td>5</td>
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</table>
Activity Index = 87% for October 23, 2003.

- **Green**
  - Was active in the normal range over the past 24 hours.

<table>
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<tr>
<td>Thursday</td>
<td>11:00 PM</td>
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</tr>
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</table>
0 potential bathroom falls in the last 7 days.

- Indicates total number of potential bathroom falls for a 24-hour period
- Alerts are the result of entering the bathroom and not exiting within normal time limit
- Possible cause for red light includes: Bathroom fall

<table>
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<td>Friday October 17, 2003</td>
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</tbody>
</table>
Overnight Bathroom Visits

- Trend Analysis and Graphic Representation
- Comparison across 5 subjects
Chart 2

Subject 2 overnight bathroom use

Date

10/02/03 10/03/03 10/04/03 10/05/03 10/06/03 10/07/03 10/08/03 10/09/03 10/10/03 10/11/03 10/12/03 10/13/03 10/14/03 10/15/03 10/16/03 10/17/03 10/18/03 10/19/03 10/20/03 10/21/03 10/22/03 10/23/03 10/24/03 10/25/03 10/26/03 10/27/03 10/28/03 10/29/03 10/30/03 10/31/03 11/01/03 11/02/03 11/03/03 11/04/03 11/05/03 11/06/03 11/07/03

5.0 4.0 3.0 2.0 1.0 0.0
Subject 3 overnight bathroom use

Date
Subject 4 overnight bathroom use

Date

10/09/03 10/10/03 10/11/03 10/12/03 10/13/03 10/14/03 10/15/03 10/16/03 10/17/03 10/18/03 10/19/03 10/20/03 10/21/03 10/22/03 10/23/03 10/24/03 10/25/03 10/26/03 10/27/03 10/28/03 10/29/03 10/30/03 10/31/03 11/01/03 11/02/03 11/03/03 11/04/03 11/05/03 11/06/03 10/22/03 10/23/03 10/24/03 10/25/03 10/26/03 10/27/03 10/28/03 10/29/03 10/30/03 10/31/03 11/01/03 11/02/03 11/03/03 11/04/03 11/05/03 11/06/03
Five Individuals,
Five Baselines,
Two Shifts in Pattern...
Five Individuals, Five Baselines, Two Shifts in Pattern
Subject 5: Trend Analysis and Alarm Thresholds

Control Chart: overnight bathroom use

Sigma level: 2

UCL = 10.4883
Average = 6.3103
LCL = 2.1324
a) diuretics

b) heart problems

c) system unreliability

d) none of the above*

*This person is a Muslim observing Ramadan; thus, she fasted during the day. Lesson learned: know your patients/clients.
Subject 5: Meal Events Before and After Start of Ramadan

Oct 9 thru Oct 26 - 18
Oct 27 to Nov 8 - 12
Subject 5: Change in overnight bathroom use

Subject 5: Overnight Bathroom Visits Before and After Ramadan

Oct 9 thru Oct 26

Oct 27 to Nov 8

Subject 5: Overnight Bathroom Visits Before and After Ramadan
Summary of Preliminary Findings

• Social work supervisor views data daily, sometimes twice
• Subjects of field test enthusiastic
• Changes in behavior perceived within a week by supervisor who queries individuals
• Trends and changes quantitatively identifiable
• Hardware and software reliably track ADLs
• e-ADLRS is a tool for caregivers to better serve the elder
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• New services being developed in response to identified needs
  – Medication dispensing
  – Room temperature monitoring
  – Stove monitoring
  – Alzheimer’s ‘wandering’ detection

• Existing home medical devices are being adapted to automatically transmit data over the Living Independently system to appropriate family and professional caregivers. These include:
  – Glucose
  – Blood pressure
  – Weight
Night time bathroom use and general activity levels in the home provide a cost-effective indicator of sleeping patterns.

National Sleep Foundation cites studies that indicate, to function properly, adult individuals require 9 hours or more of sleep per night.

45% of Americans voluntarily reduce their amount of sleep. As a result:

- 68% of them suffer decreased concentration
- 66% experience difficulty handling stress

During the last seven days 2 of the 5 Goddard residents had their sleep frequently interrupted:

- Client 5 had 36 night time bathroom visits over 7 days
- Client 3 had 55 night time bathroom visits over 7 days and did not have more than 1.5 hours of continuous sleep

An Affordable Way to Monitor Sleep Disturbance
Benefits of e-ADLRS

• Helps seniors
  – Live more safely and independently in their own homes
  – By alerting caregivers to emerging problems, thereby reducing risks and likelihood of hospitalization
  – Through full “circle of safety” via integration of full Personal Emergency Response Service (PERS) pendant and monitoring 24/7
  – By reducing anxiety of and burden on family caregivers

• Helps eldercare agencies
  – “Fill in the gaps” in care coverage
  – Direct care where most needed
  – Recognize & better understand patient condition
How QuietCare Might Prevent Institutionalization

- QuietCare might dramatically reduce the likelihood of hospitalization and enables timely intervention
  - One-third of all hospitalizations of people 65+ occur because the senior is not taking their medication properly
    - QuietCare monitors medication interaction
  - Fully 30% of people 65+ experience a fall every year
    - QuietCare automatically alerts a caregiver if a person does not come out of the bathroom in 60 minutes
  - On average, seniors receive 10 hours of home care weekly. Even tripling the amount of homecare -- the average in NYC -- leaves seniors “uncovered” 138 hours per week.
    - QuietCare “fills in the gaps.”
- 30% of all admissions to nursing homes & assisted living facilities occur not because of deterioration of the senior’s condition, but because of caregiver burnout
  - One-quarter of all households are providing part-time care -- averaging 15 hours per week -- to an elderly friend or relative not living with them
- QuietCare reduces caregiver anxiety by providing 24/7 early detection/early warning of emerging problems before they become emergencies
How QuietCare Serves its Users -- Enhancing Productivity

• According to a Met Life/AARP study, more time is lost in the workplace to eldercare than to childcare
  – QuietCare provides both timely information and insight into the elderly’s ADL’s
    • Identifying emerging problems before they become emergencies means
      – More lead-time to plan for and deal with problems; and more “free” time for the caregiver
      – Enhanced peace of mind

• Social service agencies with limited resources use QuietCare to direct help where it is needed first
  – QuietCare provides high tech tools that complement the “high touch” services home health/care workers
Competitive Cost Comparison

- **Hospitalization**
  - Cost per day: $1,200
  - Average stay: 8 days
  - Total: $9,600
- **Nursing Home**
  - Cost per day: $400
  - One week of rehab: $2,415
- **Assisted Living Facility**
  - Cost per month: $3,500
  - Cost per year: $42,000
- **Home health aide**
  - Cost per hour: $15
  - Average hours/week (NYC): 30
  - Annual cost: $23,400
- **QuietCare (Gold service)**
  - $2.67/day
  - $79.95/month
  - $870/year
- For every $1 spent on QuietCare, $12 in direct savings
Estimating the Benefits

- For every $1 spent on QuietCare, $10-$12 might be saved in direct health care expenses
  - Prevented hospitalizations, due to prevented falls, improper medication compliance
  - Shorter hospitalization due to quicker intervention
  - Reduced rehabilitation costs
  - Fewer admissions to nursing homes due to caregiver burnout
- A full year of the QuietCare service costs less than 15 minutes a day of homecare
  - QuietCare costs between $2 and $3/day
  - Homecare costs average $12/hour
- U.S. employers lose approximately $200 billion annually in lost wage productivity due to informal eldercare assistance
  - Reducing the uncertainty and unpredictability family caregivers face reduces absenteeism and anxiety, enhancing productivity
Client Perceptions of The System

- Consistently and unanimous enthusiastic
- Finds system makes them feel safer and more secure
- Wants monitoring extended from 8 hours per day (9:00am to 5:00pm) five days per week to 24/7
- Some want family caregivers to begin accessing information
- Requesting utilization of emergency response capacity
- Urging system be placed in all apartments in the complex
Responses of Institutions and Care Managers

• Health insurance companies, hospitals, home care agencies, and housing for the elderly, see systems as a means of preventing illness and maintaining wellness
  – Capitated rate/shared risk programs benefit
  – A needed service to attract new members/patients/clients/tenants
  – A means of developing new models of service delivery
• Responses of care coordinators at the above range from
  – Concern about additional work, responsibilities, and liability
  – Concern about their own responses being monitored
  – A way to better understand the needs of their clients
  – A way to focus interventions and better use scarce resources
Value to Patients and Providers

- **Consumer Value Proposition:**
  - Early Detection + Early Warning = Can prevent unnecessary hospitalizations and provides peace of mind

- **Institutional Value Proposition:**
  - Early detection + Early Warning = Better allocation of resources = Better Care
Indications for Smart Home Technology

- What are the leading medical indications?
- What are the main social indications?
- What criteria should be used in writing an Rx for SMT like e-ADLARS?
- What are the geroethical issues that need to be considered?
• Not just for today’s older people
• But for tomorrow’s, too
• As most of the little children of the world will live most of the 21\textsuperscript{st} century
• Like my granddaughter, Carmella, born June 23, 2001, and her mother, Stephanie
Bob’s Top 10 List for Living Long and Well

#10 - Have old ancestors
#9  - Have enough $  
#8  - Have gero-HCP’s
#7  - Have friends
#6  - Have BP $140/90

#5  - Have low-fat diet
#4  - Have BMI <27
#3  - Have daily exercise
#2  - Have plans
#1  - Have fun!
• Francisco de Goya’s inscription on this lithograph (c. 1826), presumably a self-portrait at age 80, translates to “I am still learning.”
The wisdom of the venerable George Carlin
The only time in our lives when we like to get old is when we’re kids!
Ask someone under 10 years old “How old are you?” They think in fractions: “I’m four and a half.”
You become 21, turn 30, pushing 40, reach 50, make it to 60, hit 70…
If you get to 100, you become a little kid again: “I’m 100 and a half!”

View of aging by a new sage
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