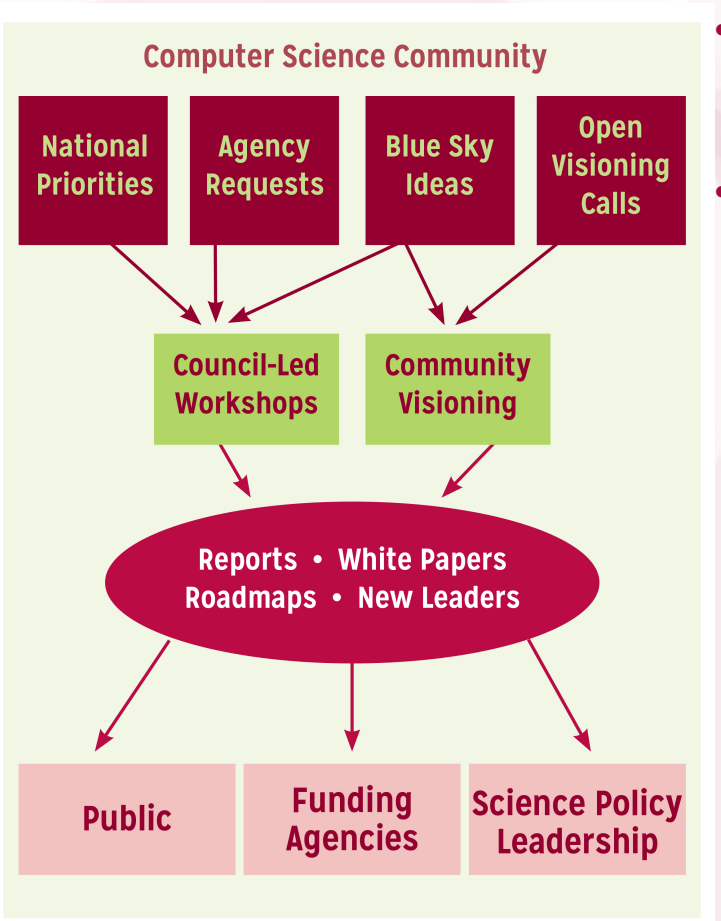
FRAMING THE AGING IN PLACE RESEARCH CHALLENGE

Elizabeth D. Mynatt
Professor, Interactive Computing, Georgia Tech
Vice-Chair, Computing Community Consortium

CCC
Computing Community Consortium
Catalyst

THE COMPUTING COMMUNITY CONSORTIUM

The **mission** of Computing Research Association's Computing Community Consortium (CCC) is to: **catalyze** the computing research community and **enable** the pursuit of innovative, high-impact research.

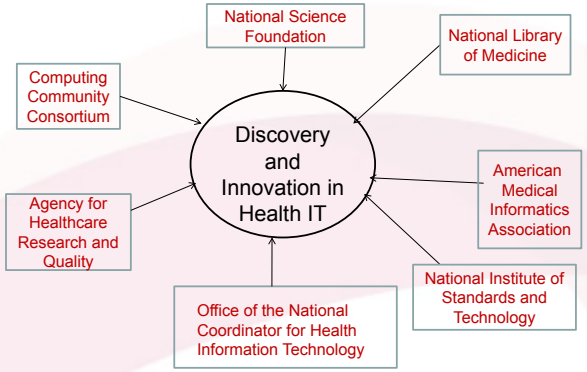


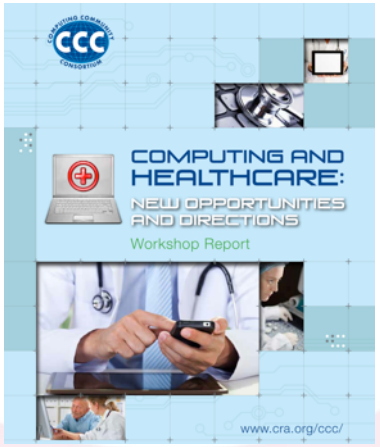
- **Audacious Thinking:**
  - Community Initiated Visioning Workshops
  - Blue Sky Ideas tracks at conferences
- **Outreach to White House, funding agencies:**
  - Outputs of visioning activities
  - Task Forces – Health IT, Data Analytics
- **Communicating CS Research:**
  - CCC Blog - http://cccblog.org/
  - Computing Research in Action Videos
  - Research "Highlight of the Week"
- **Nurturing the next generation of leaders:**
  - Computing Innovation Fellows Project
  - Leadership in Science Policy Institute

CCC
Computing Community Consortium
Catalyst

CATALYZING AND ENABLING: HEALTH IT

October 2009 Workshop





October 2012 Workshop

National Science Foundation
WHERE DISCOVERIES BEGIN

Directorate for Computer & Information Science & Engineering

SMART HEALTH AND WELLBEING (SHW)

CONTACTS

See program guidelines for contact information.

SYNOPSIS

Smart and Connected Health (SCH)

PROGRAM SOLICITATION
NSF 13-543

REPLACES DOCUMENT(S):
NSF 12-512

National Science Foundation

Directorate for Computer & Information Science & Engineering
- Division of Computing and Communication Foundations
- Division of Computer and Network Systems
- Division of Information & Intelligent Systems

Directorate for Engineering

Directorate for Social, Behavioral & Economic Sciences

National Institutes of Health

THE CRISIS OF OUR GENERATION

Longevity is such a recent phenomenon that it's estimated that of all the human beings who have ever lived to be 65 years of age or older, half are currently alive today!

Add to your consideration the increasing number of Americans with disabilities including returning veterans.

CCC
Computing Community Consortium
Catalyst

WHY ARE WE HERE?

What is possible in the “home” as an extension and complement to the existing healthcare system?

Health not just healthcare,
not just disease.

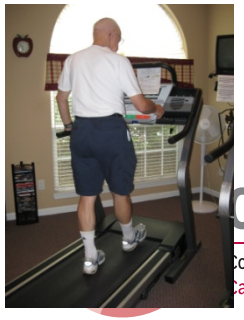
Older adults, people with disabilities, everyone.

Enhancing the quality of life and independence of people.

CCC
Computing Community Consortium
Catalyst

AGING IN PLACE FRAMEWORKS

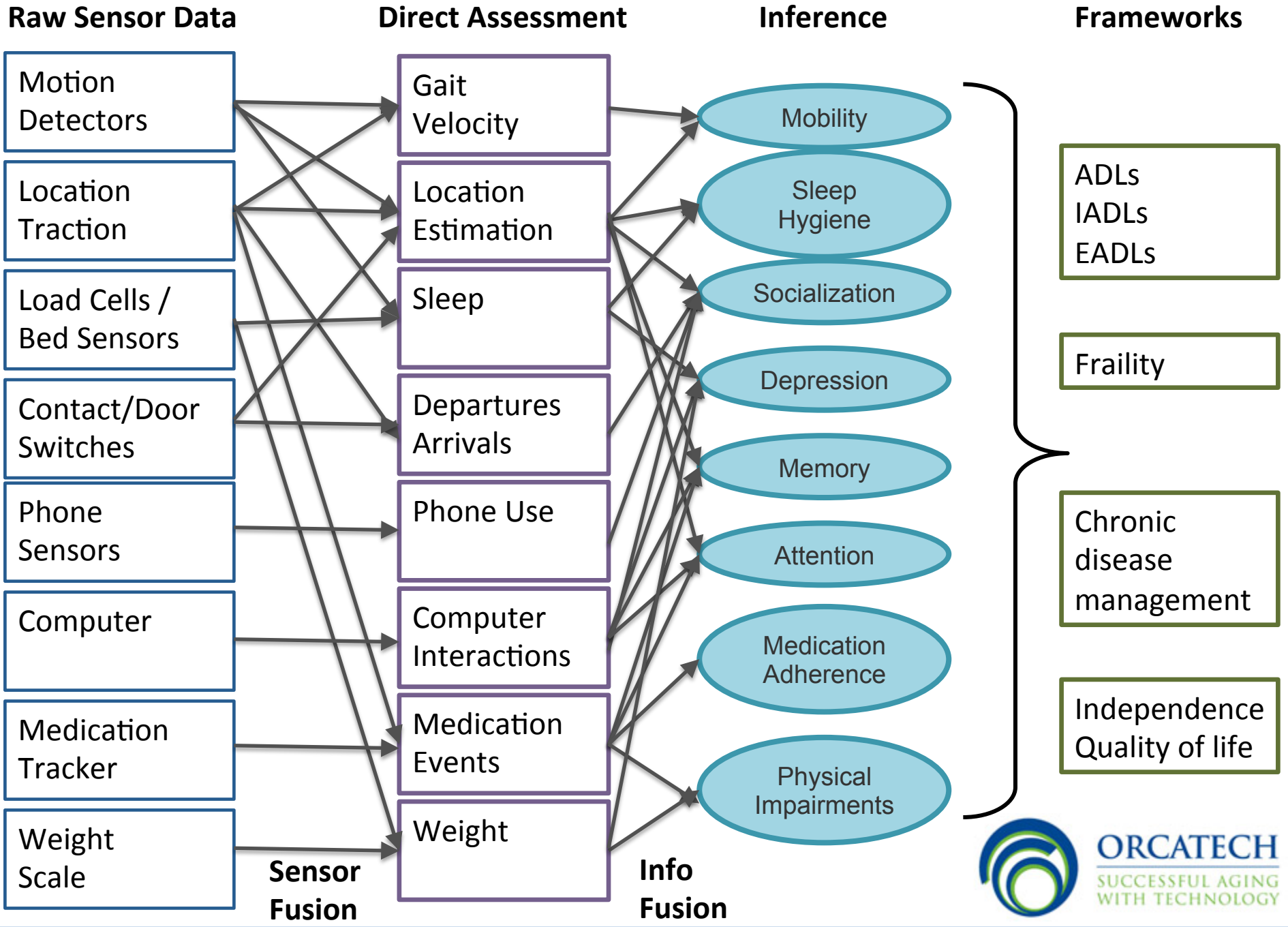
- Activities of Daily Living (ADLs)
  - Bathing, eating, drinking, mobility
- Instrumental Activities of Daily Living (IADLs)
  - Preparing meals, paying bills, managing medications, maintaining the home
- Enhanced Activities of Daily Living (EADLs)
  - Social communication, hobbies, new learning, work
- Frailty
- Independence / Quality of Life



Remote Monitoring by Use Case (In an aging context)

Segment	Typical Functions and Activities
Wellness and Prevention	• Weight Management • Behaviors: exercise, calories consumed, sleep
Chronic Disease Management	• Diabetes: monitor blood glucose • Congestive Hearth Failure (CHF): track weight • Hypertension: track blood pressure • Chronic Obstructive Pulmonary Disease (COPD): measure strength of breath (spirometry) • General: medication adherence
Acute Care, Post-Acute Care, and Rehabilitation	• PERS • Prevent hospital readmissions • Monitor physical therapy at home
Aging at Home (in Place)	• Medication optimization • Remote monitoring of vital signs and activities of daily living • Assistive technologies (e.g., smart home, smart wheelchair)

Modified from Sarashohn-Kahn, J. (2011). The Connected Patient: Charting the Vital Signs of Remote Health Monitoring. Oakland, CA: The California Healthcare Foundation.


Raw Sensor Data
Direct Assessment
Inference
Frameworks
Motion Detectors
Location Traction
Load Cells / Bed Sensors
Contact/Door Switches
Phone Sensors
Computer
Medication Tracker
Weight Scale
Gait Velocity
Location Estimation
Sleep
Departures Arrivals
Phone Use
Computer Interactions
Medication Events
Weight
Mobility
Sleep Hygiene
Socialization
Depression
Memory
Attention
Medication Adherence
Physical Impairments
ADLs
IADLs
EADLs
Fraility
Chronic disease management
Independence
Quality of life
Sensor Fusion
Info Fusion
ORCATECH
SUCCESSFUL AGING WITH TECHNOLOGY

REALITIES OF AGING IN PLACE

- Women and suburbs
- Multiple chronic conditions, disabilities
- Evolving health needs
- System administrators are few and far between
- Messy data compared to traditional medical evidence
- Conflicting priorities: Health vs. Healthcare
- Evidence for accountable care models

CCC
Computing Community Consortium
Catalyst

WOMEN AND AGING

It's fitting that the nation's first baby boomer is female; Kathleen Casey-Kirschling, born just a second after midnight on New Year's Day 1946 which earned her a title: The country's first baby boomer.

- More likely to be alone in old age
- 65+ Poverty rates 2Xs higher than males
- Living longer with chronic diseases at 2.5Xs the rates of Males

According to AARP, four million women 50+ live in households with at least 2 females 50+ and are house-sharing to meet the challenges of aging in suburbia.

CCC
Computing Community Consortium
Catalyst

MULTIPLE CHRONIC CONDITIONS. DISABILITIES. EVOLVING HEALTH NEEDS

There is nothing static about aging.

- Successful aging used to be defined as the absence of chronic conditions but only a small percentage of seniors meet this criteria.
- More than 77% of seniors between the ages of 65 and 79 suffer from one or more chronic diseases. The number rises to 85% for those over age 80.

Reflect on how much your health needs have changed in 30+ years.

CCC
Computing Community Consortium
Catalyst

SYSTEM ADMINISTRATORS ARE FEW AND FAR BETWEEN

What does technology look like in the home?

- Household appliances replaced every ~10 years

as consumers?

- Cell phones replaced every 2 years

in healthcare environments?

- Medical devices refreshed every 3-7 years?

Need realistic models for technology adoption and sustainability

CCC
Computing Community Consortium
Catalyst

MESSY DATA COMPARED TO TRADITIONAL MEDICAL EVIDENCE

Less controlled environment

Diverse data

both in scope and origin

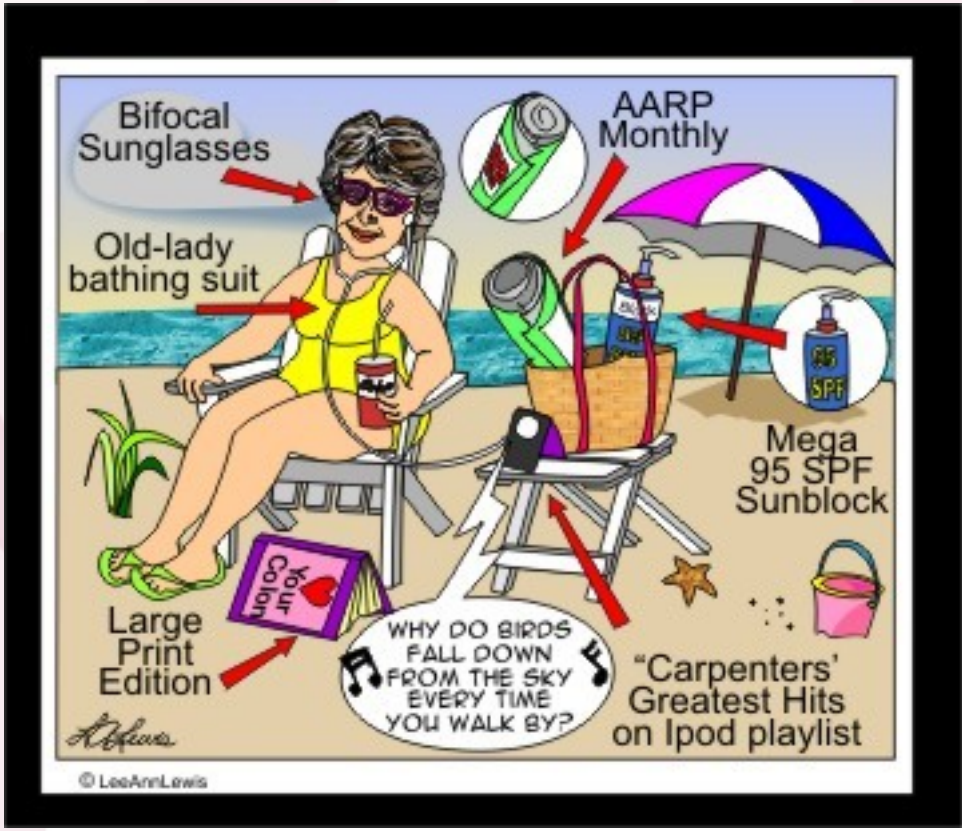
Many stakeholders

Remember that people are messy too.

- On average, individuals 65 to 69 years old take nearly 14 prescriptions per year, individuals aged 80 to 84 take an average of 18 prescriptions per year
- Adverse drug reactions and noncompliance are responsible for 28% of hospitalizations of the elderly
- 36% of all reported adverse drug reactions involve an elderly individual
- Each year 32,000 seniors suffer hip fractures caused by medication-related problems

CCC
Computing Community Consortium
Catalyst

CONFLICTING PRIORITIES: HEALTH VS. HEALTHCARE



NSF

NIH National Institutes of Health

CCC Computing Community Consortium Catalyst

EVIDENCE FOR (ACCOUNTABLE) CARE MODELS

Aging in Place exists within multiple larger economic contexts.

Providing synergistic health and economic value

TigerPlace

ORCATECH

Elder Tree

CCC

Computing Community Consortium

Catalyst

HOW DO WE CREATE THE SCIENCE

TO DEMONSTRATE
THE VALIDITY OF

AGING IN PLACE APPROACHES?

POSSIBLE PATHS AHEAD

- Advanced data analytics
- Care coordination
- Healthcare as engineering control system

- Consumer adoption
- Holistic system approaches

- Pilot projects: System demonstrations

CCC
Computing Community Consortium
Catalyst

WORKSHOP FORMAT: PANEL INSPIRED DISCUSSIONS

- Insights and Realities of Designing for Older Adults and Their Caregivers
- Innovation Needed: Sensing, actuation and system integration technology
- Health transition trajectories: Data to action
- How to integrate Aging in Place in a Learning Healthcare System
- Shaping the future of Aging in Place
- Summary Panel

CCC
Computing Community Consortium
Catalyst

POST WORKSHOP ACTION

- Executive summary
- Research roadmap:
  - The white paper or road map should provide a list of grand challenges and priorities for next 5, 10, and 15 years.
- Journal publication

- Inform and influence

CCC
Computing Community Consortium
Catalyst