Panel 3 - *Health transition trajectories: Data to action*
Jeff Kaye, Maureen Schmitter-Edgecomb, Dan Siewiorek

OUTLINE
1. J. Kaye: Frameworks for Building Evidence for Technologies to Facilitate Independence
2. M. Schmitter-Edgecomb: Technologies to Support Independence Across the Continuum of Prevention for Cognitive Aging
4. Discussion
FRAMWORKS FOR BUILDING EVIDENCE FOR TECHNOLOGIES THAT FACILITATE INDEPENDENCE

Jeffrey Kaye, M.D.
Layton Professor of Neurology & Biomedical Engineering
Director, ORCATECH
Director, Layton Aging & Alzheimer’s Disease Center
Oregon Health & Science University
Portland VA Medical Center

“This really is an innovative approach, but I’m afraid we can’t consider it. It’s never been done before.”
The use of particular technologies may be best framed by considering the point of application in the life or health course.
Research Trajectory (Process) Frameworks

UNDERSTAND THE STAKEHOLDERS/KEY QUESTIONS
ROI (Response Over Internet) surveys, Focus Groups Participant/End-User Assessment

UNDERSTAND REAL WORLD USE
Life Lab: Large Scale Deployments Relevant Health & Wellness Measures & Interventions in Everyday Environments

UNDERSTAND THE DATA
ORCATECH Data Repository, Data Aggregation, Measurement Analytics & Outcomes

UNDERSTAND THE TECHNOLOGIES
Point of Care ‘Smart Apartment’ Lab: Focused Sensor/Measurement Technology Development & Assessment
Technological Trajectory Framework

Gartner Hype Cycle

- 1956
- 2006

- 2013

- As of July 2013

- Plateau will be reached in:
  - less than 2 years
  - 2 to 5 years
  - 5 to 10 years
  - more than 10 years
  - obsolete before plateau
Evidence Trajectory: Setting a research agenda
What evidence is necessary? - The right evidence for the right time

EBM Pyramid

Effectiveness Needed
Health Systems Investment, Gov’t.

‘Reasonable Cause’/Efficacy/Safety
NIH R01; ‘Serious’ Investors; PHARMA/FDA

Early Development/Feasibility
SBIR, crowdfunding, credit cards...
Example: 1\textsuperscript{st} Prevention

Target - Utility of Technology in Preventing Transition

AIMS: RCT of sensed data to decrease care transitions

- Deploy technology; Assess at home
- Continuously collect data

- Randomize

- Consent volunteer

- 100 volunteers
  - ≥ 75 yrs old
  - ≥ 24 months follow-up

- Usual care assessments

- Higher Level of Care?

- Analyze data

Status Monitor
- Show all homes
- Show problems
- Manage homes

Check status ≤ weekly

Consented volunteers data:
- 20040317010536 545407 9 4 6 b
- 20040317010536 545407 1 8 e 7
- 20040317010536 545516 9 4 6 b
- 20040317010536 545516 1 8 e 7
- 20040317010536 545625 9 4 6 b

NIA AG042191
AIMS Home-Based Assessments

Activity, Sleep, Mobility Time & Location

Body Composition
Heart Rate, Temperature, CO₂

MedTracker

Secure Internet

Orcatech
Sensing Life Kinetics
Charting a Research Agenda - Some Issues to Consider

- Population:
  - Early Adopters (computer users)?
  - Diversity (cell use and low SES)?
  - ‘Caregiving’ Community (professional, family, none)?

- The comparator condition(s) or control:
  - Technology without intervention?
  - Blinding?
  - Refusers?

- Technologies:
  - What are the optimal sensed inputs (in this trial focus on established technologies, functional measures, informed by caring ecosystem)?
Example: 2° Prevention
Target: Feasibility and Acceptance of a Home Telepresence Robot

Device/technology characteristics:
• Appearance
• Efficiency
• Ease of use
• Reliability
• Control

User traits:
• Changes in vision, hearing, cognition
• Mobility issue
• Age, gender, education
• Previous experiences/exposure to technology

Original Research
Reactions to a Remote-Controlled Video-Communication Robot in Seniors’ Homes: A Pilot Study of Feasibility and Acceptance

VGo Applications

**Patient Monitoring**
Finite expert healthcare staff instantly interacts with patients and move around as if they were there in person.

**Remote Student**
Students with extended illness, injuries, disabilities and immune deficiencies attend school without leaving home.

**Remote Visiting**
Visit with extended stay hospital patients and elderly in nursing homes or assisted living communities.

---

Materials and Methods: A mobile remote video-communication ability was placed in the homes of the patients. The participants were asked to communicate with them remotely via the device, using survey instruments. Results: Overall, the participants who progressed to mild cognitive impairment.

Participant who progressed to mild cognitive impairment.
Charting a Research Agenda –
Some Issues to Consider

- Importance of collaborating with industry - where technologies are developed into products and services
- Rules of engagement - best approaches and practices for these collaborations
Example: $2^0$ Prevention  
Target: Feasibility Social Engagement RCT for MCI

- 83 MCI or Normal randomized to video chat or control group
- 6 week tx period consisting of daily 30 min video chats
- 89% of all possible sessions completed; Exceptional adherence – *no drop-out*
- Intervention group improved on executive/fluency compared to controls.

- MCI participants spoke 2985 words on average while intact spoke 2423 words during sessions.
- This measure discriminated MCI from cognitively intact subjects better than the traditional cognitive tests of Fluency and CERAD Delayed Recall.

H. Dodge, PI

*NIA R01AG033581, P30 AG00187, P30 AG024978*
Charting a Research Agenda –
Some Issues to Consider

- Disrupting conventional wisdom and standards
  - “Older persons won’t do a video chat every day”
  - “It must be expensive…”
  - Automated measures may be better...
...studies showed no differences in outcomes between telehealthcare and usual care. ...reviews highlighted the large number of short-term (< 12 months) feasibility studies with under 20 participants. ...reported clinical effectiveness of telehealthcare interventions for patients with long-term conditions appeared to be greatest in those with more severe disease at high-risk of hospitalisation and death.

adequately describe the intervention makes it difficult to disentangle the contributions of technological and human/ organisational factors on the outcomes reported. Evidence on the cost-effectiveness of telehealthcare remains sparse. Patient safety considerations were absent from the evaluative telehealthcare literature.
RCT ‘Class 1’ Evidence...

Whole System Demonstrator

- Assessed telehealth and telecare over 1 year (6,191 patients in 238 GP practices)
- Telehealth RCT (> 3,000 patients with COPD, DM or HF): significant reduction in deaths with telehealth; ED visits, elective admissions and costs NS.
- Telecare RCT (> 2,400 patients with social care needs): No reduction in health or social care use.
- Economic evaluation of telehealth RCT. Costs and outcomes were measured: telehealth not cost-effective at the scale implemented
- Cost: $51,391,800; four years

http://www.fastuk.org/research/projview.php?id=1436
KEY QUESTIONS:
1. What are the top opportunities using technology among Primary, Secondary and Tertiary Preventions to ensure AiP?
2. What technologies across the spectrum may best facilitate AiP?
3. What are the levels of evidence and/or confidence that a system is effective and then scalable and generalizable?
4. What resources are needed to achieve the answers to these questions?
5. What are the timelines for reaching the answers to these questions?

Charting a Research Agenda - Health transition trajectories: Data to action

We still need to flesh out the concept, interface, content, feature set, information architecture, use cases and business model, but there’s your wireframe. That’ll be $38,000.
Thank You!

Many a calm river begins as a turbulent waterfall, yet none hurtles and foams all the way to the sea.

- Mikhail Lermontov
Technology Attuned to Trajectories of Change

End-to-End TeleCare

Integrated Wellness Promotion Program

Robot Assistant

Basic Telemedicine

PERS

Fitness/Lifestyle Apps

Healthy/Worried Well
At Risk/Mild Impairment
Chronic Disease

1⁰ Prevention
2⁰ Prevention
3⁰ Prevention