

Technologies for assessment and interventions to improve and accelerate dementia care research

Jeffrey Kaye

Layton Professor of Neurology & Biomedical Engineering

ORCATECH - Oregon Center for Aging & Technology

NIA - Layton Aging & Alzheimer's Disease Center

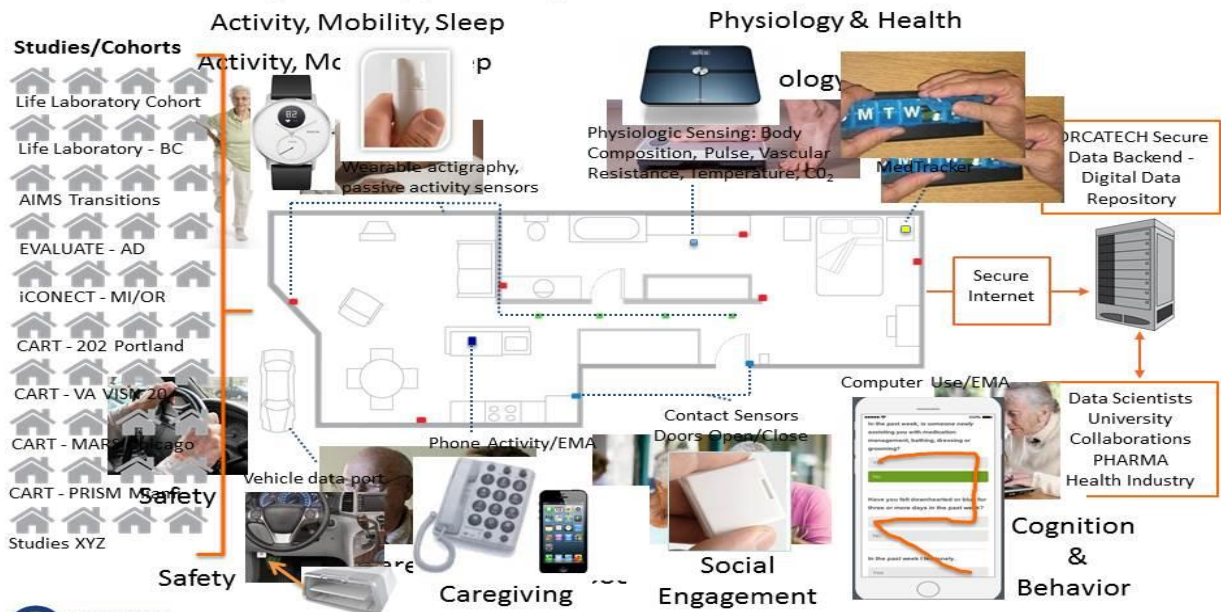
kaye@ohsu.edu

October 16-17, 2017 - NIH Natcher Center – Bethesda, MD



#DementiaCareSummit

Technology Use Cases – Home-based Functional Domains Technologies supporting Assessment & Intervention

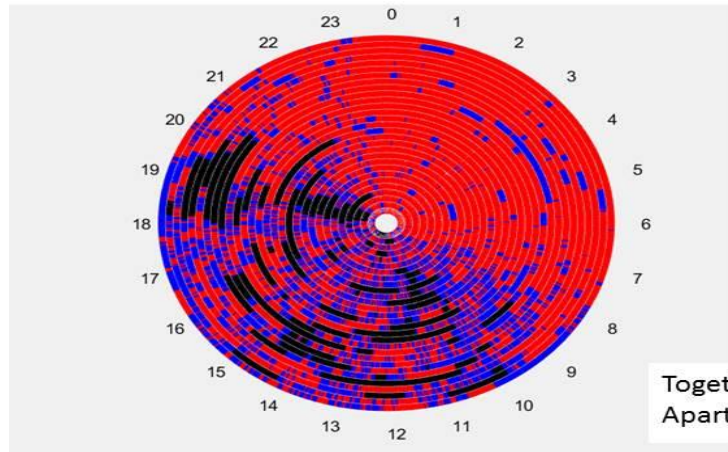


Kaye et al. Journals of Gerontology, 2011; Lyons et al. Frontiers in Aging Neuroscience, 2015

Couples & Caregiving Analysis: *Time spent together*

EVALUATE - AD

Ecologically Valid, Ambient, Longitudinal and Unbiased Assessment of Treatment Efficacy in Alzheimer's Disease



- Together
- Separate
- Out of Home



Together: 1285 minutes (21.4 hrs/day)
Apart: 155 minutes (2.6 hrs/day)



Reynolds et al., 2017 unpublished
Thomas et al., AAIC 2017

Funding: NIA, Merck



Digital Biomarkers in ADCS **PEACE-AD RCT**: Prazosin for Agitation in AD RCT: BMDs in Agitation (Peskind & Raskin, PIs; NIA-ADCS RCT)



Digital Agitation Assessment -

Wrist-worn devices with long battery life, H₂O-proof. Activity levels monitored continuously during entire 12-week titration study using wrist actigraphy. Continuous monitoring critical as study employs a flexible dose titration schedule, and the use of rescue medication (lorazepam) for agitation..

Outcome measures -

Motor activity (total activity over a 24 hour period and the 12 hour period from 6 PM to 6 AM for each wk for the 12 wk study. Percent change in total activity counts at wk 1 (pre-TX) compared to wk 12 (post-TX).

Exploratory analyses -

Activity in those receiving lorazepam and in those discontinuing prazosin; Sleep disruption/continuity; and sensed environment mediators.

Evidence...

Topo P. Technology studies to meet the needs of people with dementia and their caregivers: a literature review. *Journal of Applied Gerontology*. 2009 Feb;28(1):5-37.

Pillai, JA, Bonner-Jackson A. Review of information and communication technology devices for monitoring functional and cognitive decline in Alzheimer. *Journal of Healthcare Engineering*. 2015;6(1):71-84

Lui L, Strouliab E, Nikolaidisc I, Miguel-Cruza, d A, Rincona AR. Smart homes and home health monitoring technologies for older adults: A systematic review. *International Journal of Medical Informatics*. 2016;91:44-59

Meiland F, Innes A, Mountain G, Robinson L, van der Roest H, García-Casal JA, et al. Technologies to Support Community-Dwelling Persons With Dementia: A Position Paper on Issues Regarding Development, Usability, Effectiveness and Cost-Effectiveness, Deployment, and Ethics. *JMIR Rehabil Assist Technol* 2017;4(1):e1

Ienca M, Fabrice J, Elger B, Caon M, Pappagallo AS, Kressig RW, Wangmo T. Intelligent Assistive Technology for Alzheimer's Disease and Other Dementias: A Systematic Review. *Journal of Alzheimer's Disease*. 2017 Jan 1;56(4):1301-40.

Van der Roest HG, Wenborn J, Pastink C, Dröes RM, Orrell M. Assistive technology for memory support in dementia. *Cochrane Database of Systematic Reviews* 2017, Issue 6. Art. No.: CD009627. DOI: 10.1002/14651858.CD009627.pub2.

Summary of Evidence - Gaps

- The technologies used are wide-ranging (passive sensors, wearables, apps, integrated multi-domain systems...), and have been used in many types of assessments and interventions;
- Overall there are few studies relative to other research areas – this is a small field;
- Within a specific technology there is variability in the devices or technologies used (hardware/software), and poor specification of the systems deployed and the analytic algorithms applied;
- There is little research on the usability of these technologies;
- Various benefits may be reported but are mainly based on low-quality studies (small sample size, short study periods, biased designs, non-diverse populations);
- Barriers to deployment of technologies in dementia care are prevalent (ease of use, research expertise, costs).

Recommendations

1. Feasibility research is still important - to be most effective:
 - a. Involve persons with dementia and their caregivers in the earliest stages of all research
 - b. Include iterative development designs as the norm
2. Technology research needs to include more diverse populations: ethnic/cultural, technical savvy and naïve, encompass the heterogeneity of dementia
3. Different outcome measures are used in efficacy and effectiveness studies: Develop consensus on the use of device/sensor ontologies, data specifications and outcome measures
4. Research into the effectiveness of technologies must move beyond explorative studies - Conduct more and adequately powered RCTs, as well as innovative designs (adaptive, n-of-1).
5. Embed technologies in 'conventional' studies whenever possible

Thank you!

