

Towards an AI-based Care Plan for ADRD Caregiver-Patient Dyads

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MassAITC AD/ADRD Focus Pilot Core

Background & Need

ADRD affects
6.7 M in US and
13.2 M by 2050.

11.4 million
caregivers provide
\$339.4 B unpaid
care annually.

Caregivers experience high **stress, anxiety, and burnout**, leading to **decreased patient well-being**.

Current care plans **lack adaptability**, making it difficult for caregivers to adjust daily care strategies.

Scientific Goals

Goal: Develop a candidate digital biomarker for patient agitation from physiological and behavioral time series.

Objectives:

1. Extract candidate digital biomarkers from wearables and smart home sensors.
2. Develop AI classifiers to predict patient agitation and caregiver well-being.

Accuracy and Accessibility of Patient Data



Figure 2: Pilot Home Care Kit being installed at Dyad Homes. (A) Kit Pack, (B) Installation, (C) Fitbit monitoring devices



Figure 3: Dashboard shows real-time data from smart home devices over 24-hours (left) and 7 days (right).



Figure 4: Hub, iPad, Smart Bulb, Agitation Button, Door/Contact Sensor, Movement Sensor, Smart Plug (not shown), and Wearable (Fitbit) referred to here as the pilot Home Care Kit.

Note: The technologies used in this pilot study are not EC Safety technology but a collection of other technologies that may combine through APIs to create an integrated system that can connect to the existing EC-Safety EHR and Caregiver App in the future. The home care kit workflow was designed by UMass/CH2P. Please note that the system is a combination of existing components that may need to be licensed for future commercialization.

Frictionless tracking of mental health status

Real-Time Collaboration



Figure 5: EC Safety Product Current EHR & Vision

Product Vision: an AI-enhanced electronic health record (EHR) platform and Mobile App for ADRD caregivers, capable of integrating with (Figure 5):

- ✓ Wearables (Fitbit, or others)
- ✓ Sensors (various brands)
- ✓ Health assessments (QoLS, etc.)
- ✓ Remote Cognitive assessments (requires licensing)
- ✓ SmartThings App (requires licensing)

Pilot Project Highlights

- 7 dyads enrolled (03/25); 7 kits installed (Figure 2) within 2.5 months of beginning official recruitment.
- See illustrative screenshots of the dashboard being monitored at the UMass-Amherst mHealth Lab. The right panel shows a seven-day time frame, the left, a 24-hour time frame. Both clearly show diurnal patterning in the smart home data, consistent with the data we're aiming to capture (Figure 3).
- Enrolled dyads seem enthusiastic about using Fitbit wearable.
- Opportunity to turn experimental data gathering sensor+ home kit into an actual product (e.g. **Home Care Monitoring Kit**).

Next Steps

- Submit STTR Phase I to begin productizing potential innovation.
- Build data pipeline and infrastructure; scale up AI classifiers.
- Launch test of productized Home Care Kit connected to the EC Safety EHR.
- Prove feasibility to scale kit installation and production.
- Pursue licensing agreements as needed for memory games (M2C2, etc.), SmartThings/Samsung, and Qualtrics (to replace REDCap functionalities).

Concluding Remarks and Future Directions

- ✓ **Deployment of smart home kits seems feasible.**
- ✓ Installed kits and mobile notification systems currently being tested have the potential to integrate to EC Safety through APIs.
- ✓ Future expansion may explore clinical trial applications, commercialization, and regulatory pathways.
- ✓ Validate findings across ADRD populations.
- ✓ Establish a data-driven feedback loop for real-time intervention and support.

Data, Methods & Innovation

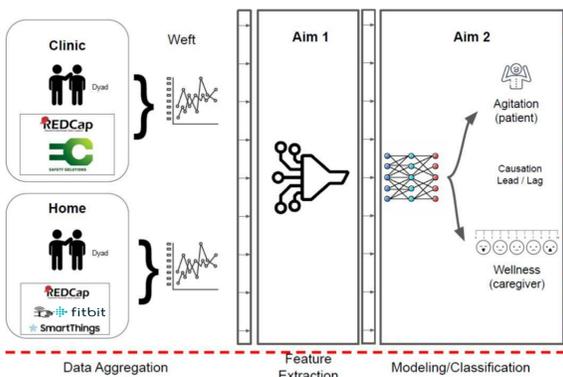


Figure 1: Aims & Data Workflow

- 22 dyad target enrollment for a 6-month study at OPAPA, Puerto Rico .
- Data sources: REDCap, Fitbit wearables, and SmartThings home sensors.
- Machine Learning Analysis: Developing classifiers for patient agitation and caregiver wellness.
- **Smart Sensors** – Smart Bulbs, motion sensors, door/contact sensor, plugs
- **Patient Questionnaires (QoLS, etc.)**
- **Caregiver Questionnaires (QoLS, etc.)**
- **Remote Cognitive Assessments: M2C2 (Figure 6 and 7)**

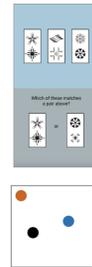


Figure 6 and 7
M2C2 Game
Examples



Figure 8: UMass Visit to SJU, PR (January 2025) for installation training.

Milestones

Q2/Q3 2025: AI model development expected to initiate (subject to sufficient data obtained).

March 2025: 7 dyads enrolled, 7 home kits installed.

April 2025: NIH STTR Phase I submission for productizing home sensor kit.

January 2025: First dyads enrolled and UMass Team Visit to SJU, PR (Figure 8).

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