

Carnegie Mellon will test ability of embedded sensors to detect onset of dementia, infirmity

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Carnegie Mellon University researchers in the Quality of Life Technology Center (QoLTC) will embed wireless sensors in the residences of about 50 older adults who live alone to see if they can detect subtle changes in everyday activities that indicate the onset of dementia or physical infirmities.

The research team is one of five nationwide selected by the Robert Wood Johnson Foundation (RWJF) to explore how observations of daily living (ODLs) — what people eat, how they sleep, their mood, how their medications makes them feel and other factors — can be captured, interpreted and integrated into clinical care. Each team is receiving a \$480,000 grant for the two-year project.

The Pittsburgh team, which includes colleagues from the University of Pittsburgh Department of Rehabilitation Science and Technology and Presbyterian SeniorCare, hopes to demonstrate that simple, unobtrusive sensors in residences can alert medical professionals when a person begins to lose physical or [mental abilities](#).

"The loss of the ability to make a sandwich, dial a phone, or take medications correctly often occurs gradually and, particularly for people who live alone, insidiously," said Anind Dey, associate professor in the Human-Computer Interaction Institute (HCII) of Carnegie Mellon's School of Computer Science. "If we can identify this decline at an early stage, we have a chance to halt and even reverse deterioration that might otherwise result in an unsafe living situation and ultimately require the

person to be institutionalized."

In this initial stage of the research, Dey is working with Linda Kent, an occupational therapist at Presbyterian SeniorCare, western Pennsylvania's largest provider of care and services for [older adults](#), to identify participants. These people will be at risk of [cognitive decline](#), have osteoarthritis and live in one of the organization's assisted living residences. Wireless sensors will be added to such items as chairs, pillboxes and water glasses, which can then be used normally.

"Our goal is to determine not only that the resident has completed a task, such as preparing a meal, but how they went about it," Dey said. "Did he have trouble opening a jar? Did she take longer to make dinner than usual? Were preparation steps omitted? Over time, such changes might be a signal that a professional evaluation of a person's functional abilities is needed." The combination of motion, contact, weight and other sensors will vary from one residence to the next, depending on the occupant's needs and habits, he noted.

Diane Collins, assistant professor of rehabilitation science and technology at Pitt and an expert in assessing functional abilities of people with disabilities, will work with Kent to provide clinical evaluation of the participants. The other key member of the team is Matthew Lee, a Ph.D. student in HCII who specializes in behavioral and cognitive science.

The research effort is supported by the Robert Wood Johnson Foundation's Project HealthDesign: Rethinking the Power and Potential of Personal Health Records. Earlier Project HealthDesign work revealed that the data needed to inform day-to-day health decisions came less often from information contained in people's official medical record and more from information gained by monitoring health in everyday life.

Along with the other four teams selected for the grants, the Pittsburgh team will first participate in a refine/design phase to share ideas, establish goals and refine initial approaches. Project teams will then work with patients with complex chronic conditions to capture and interpret ODLs while establishing a relationship with a physician practice to share information. Over the 12 months, clinicians will care for 30-50 patients who are actively monitoring ODLs and assess the value of including the ODLs in their real-world care processes.

In addition, the program provides legal and regulatory compliance support to grantees and contributes to the public discourse on the legal and regulatory aspects of capturing ODLs and integrating them into care processes. The program will develop resources around the cross-cutting issues regarding use and safe integrations of ODLs as well as specifically advise grantee teams on applicable law and regulations that may alter the consequences of data-sharing between patients and clinicians.

"This project will establish a new vision of how personal health records can and should be used to strengthen the communication between a patient and the provider," said national project director Patricia Flatley Brennan, R.N., Ph.D., of the University of Wisconsin-Madison. "Things that people notice every day, such as what they eat, how physically active they are, whether they have pain or other symptoms, are not typically captured in visits to the doctor but they are key pieces of information in managing health," she added. "With the help of new technologies, we can now record this information and provide clinicians a more accurate and useful picture of a patient's health and the best ways to care for them."

Since its launch in 2006, RWJF has committed a total of \$9.5 million in grant funds and technical assistance to the program, led by a team of experts working in health information technology and patient-centered care at the University of Wisconsin-Madison. Project HealthDesign is

supported by RWJF's Pioneer Portfolio, which supports innovative ideas and projects that can lead to significant breakthroughs in the future of health and health care.

Throughout the course of the program, all grantee teams will provide frequent updates about their work through the Project HealthDesign blog and other interactive features. To learn more, visit www.projecthealthdesign.org/.

Dey and Collins are researchers in the Quality of Life Technology Center, of which Presbyterian SeniorCare is an industrial partner. A National Science Foundation Engineering Research Center, the QoLTC mission is to transform lives in a large and growing segment of the population —people with reduced functional capabilities due to aging or disability. It is operated as a partnership between Carnegie Mellon and Pitt. For more information, visit www.cmu.edu/qolt/.

Provided by Carnegie Mellon University

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