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A new frame for aging

Mizzou nurses and engineers remake senior living

Story by Dale Smith | Photo by Nicholas Benner

At age 86, retired factory worker Eva Olweean is an early adopter of technology. She also could be the poster child for the many millions of people who want to live independently as far into old age as possible. Olweean is a resident of TigerPlace, a long-term care facility in Columbia designed by researchers at MU's School of Nursing. She agreed to let researchers place sensors around her apartment as part of a series of studies measuring physical and cognitive decline. The sensors feed data about Olweean's daily movement patterns to software that creates a unique profile of her habits.

Researchers are developing an automated way to use the computer as an alarm system: The computer will monitor movement patterns and, in the event of an important shift, send an automated "Check on Eva" message to a nurse on duty.



In 2007, when Olweean could have benefited from the fully automated system, it was still in development. She was recuperating in her apartment after a hospital stay for congestive heart failure. Luckily, researcher Marilyn Rantz happened to be at TigerPlace looking over Eva's readouts. Rantz, professor of nursing, is a national leader in improving the quality of nursing homes and using technology to help elders live independently.

Eva Olwean, 86, has benefited from the technology set in place at Tigerplace.

"The data showed that Eva wasn't resting well. She kept moving back and forth between her bed and easy chair. That's not her usual pattern. When I saw this, I went to her room right away and assessed her." Rantz found that Olweean was in the early stages of troublesome weight gain that often accompanies congestive heart failure. The monitors had caught the signs in time, and Olweean's physician dealt with the problem promptly. News outlets all over the world carried Olweean's story.

Even in these early stages, researchers have identified pattern shifts in about one-third of people with emerging health problems that could lead to falls, emergency room visits and hospitalizations.

Mom and dad as models

Although Marjorie Skubic is the high-tech expert in TigerPlace research, the inspiration for her current work is about as low tech as it gets. Presentations about the project include a picture of her parents. The Skubics are playing polka music in Brookings, S.D. Mom Mary Ann, 85, is perched at a drum set, and dad Lou, 87, stands at her side with his accordion at the ready. The couple keeps active by gardening and performing polka music for "the old people" at local nursing homes.

"They've lived together for more than 60 years," says Skubic, professor of electrical and computer engineering. "They know each other well, they monitor each other, and they are good at helping each other fix small physical problems before they become big problems." In a nutshell, that's what Skubic and Rantz are trying to accomplish with hardware, software and nursing intervention at TigerPlace. "The goal is to keep residents functionally active," Skubic says.

A better way to age

Bottom line, nobody wants to live in a nursing home, Rantz says. She has directed much of the development at TigerPlace, located at 2910 Bluff Creek Drive. The retirement community is a leader in the aging-in-place movement that aims to improve homes, communities and services with the needs of elders in mind. Creating good long-term care is a particularly difficult part of the problem.

The high-tech research at TigerPlace has made headlines, but it's just part of the facility's aging-in-place model. For starters, it's an attractive setting. The public spaces — lounges, dining areas, movie theater, gardens — are all on one level and have the look and feel of a nice hotel. Elders have been living in the one- and two-bedroom apartments at TigerPlace since it

opened in 2004.

The aging-in-place approach relies in part on a professional safety net. When residents develop health problems, a nurse care coordinator ensures that they receive treatment in a timely manner. Navigating the health care system is a complex undertaking, and having the nurse on site minimizes chances that a treatment falls through the cracks. TigerPlace services range from minimal help with bathing to what nursing homes offer their most frail residents. Rather than asking seniors to endure the usual scenario in which they must move from facility to facility as their health care needs increase, seniors at TigerPlace can stay “home.”

In addition to the safety net, TigerPlace has a set of carrots and sticks to encourage healthy living. Carrots include wellness clinics, an exercise room, good food and plentiful green space, including a walking trail. Sticks include financial incentives to stay healthy. The basic cost of living at TigerPlace includes all the amenities mentioned above, plus care coordination, access to an on-call nurse and the wellness clinic, four nurse visits a year, and full health assessments twice a year. Beyond that, charges accrue.

“For example, if a resident needs help taking a shower, there’s a charge for that. When they get the bill at the end of the month, that helps motivate them to regain their abilities and independence,” Rantz says. “I’ve seen people move from needing services three times a day, seven days a week, to needing just a little help now and then. We put a lot of thought into making incentives that reinforce independence.”

A living lab

TigerPlace may look posh, but it’s also a 24/7 research lab. “The whole place is set up to develop, test and refine technologies so we can eventually deploy them in other facilities and in people’s homes,” Rantz says. An overarching question guides the research: “Can we measure functional decline and develop interventions to slow it?”

A few other universities are chasing a similar idea, but their lab spaces are limited to a single apartment or house equipped with sensors, Skubic says. TigerPlace provides a larger group of people and long-term data from real living situations. Of the facility’s 54 residents, 25 have agreed to have the monitoring technology in their apartments. Some residents have participated in research projects for as long as three years.

Skubic and Rantz are developing other monitoring technology that uses visual sensors to create digital silhouettes of residents as they move about. Before testing the new system at TigerPlace, they are training the software to analyze individuals’ various motions and gaits, features that can give early signs of health problems. Skubic’s team of students is developing software to compute a person’s risk of falling using data on posture, range of motion and ability to rise from a chair. “Then, if need be, we can go in with interventions to strengthen muscles and improve posture to prevent falls.”

The system is also learning some tricky distinctions between normal and abnormal movements and postures — for instance, the difference between lying down on a couch versus falling to the floor. Being able to detect falls immediately and send help would speed recovery significantly, Skubic says. To train the software, the researchers first had to train stunt actors

to fall in the same ways that elderly people fall. They filmed the actors recreating these motions over and over to give the software enough examples for analysis.

Using monitoring technology in people's homes raises the issue of privacy. Skubic says TigerPlace has been sensitive to this issue. Data gathered from the apartments are kept secure, and residents' privacy is protected. Researchers also have tried to make the technology as noninvasive as possible. "Our research shows that, after about a month, they forget the sensors are there," Skubic says.




Where's the money?

Rantz says aging in place works, both in terms of improved health and cost savings. This holds true not only for TigerPlace but also for her community study. Elders living in their own homes who had a care coordinator required \$719 less in monthly health care costs than Medicaid spends on a similar group without an aging-in-place approach. "The aging-in-place group also walked better, was less depressed, had better short-term memory and less pain," Rantz says.

"As wonderful as the housing is here, and even with the wellness programs and care coordinator, no resident's charges have ever exceeded the average cost of living in a nursing home. This place is unique in the country."

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