Putting Petabytes to Work: Home-Based Assessment Technology Can Help Elders Manage their Health

By JEFFREY KAYE

Within many industries that work with older adult populations there is often resistance to embracing technology in the health services arena. A possible antidote to this resistance is to demystify what can be accomplished with the tools currently available.

We already know that we exist in a growing bath of ambient information—surrounded by multiple sources competing for our attention—and much of it is uncaptured, unfiltered or purposelessly directed. However, intelligent, home-based health-assessment systems provide new ways to customize and fine-tune this information to help us maintain our health and wellness.

ONE SIZE DOES NOT FIT ALL

Current health recommendations are generally based on information obtained during brief and episodic assessments of health-related activities or behaviors. Questions are often framed like this: "During the past month how often did you get up to use the bathroom?" or even less specifically, "Are you taking your medications regularly?" This approach does not take into account how difficult it may be for older people, particularly if challenged by mild cognitive impairment, to provide accurate information.

Current health assessment is a one-size-fits-all approach where everyone is asked the same questions, even though each individual may vary tremendously in what they do each day, or were doing a month ago. This day-to-day or even hour-to-hour variability may be important to understand, but very hard for a person to be aware of or to describe.

TECHNOLOGY CAN IMPROVE ASSESSMENTS

There is great room for improving the way we assess functional change and health indicators over time. This can be done through a now-growing ability to use simple technologies, such as motion and activity sensors, bed monitors or home computer–based assessments, to unobtrusively monitor key behaviors and activities that are important for maintaining health and well-being. Ideally, these sensors and their assessments act in the background and do not require individuals to wear a device or maintain the technology. The data is then truly representative of a person's natural activity.

The Oregon Center for Aging and Technology (ORCATECH), which is supported by a National Institute on Aging Roybal Center grant and a collaboration with Intel at Oregon Health & Science University, has developed and deployed such home-based systems for several years. These systems, which have been placed in hundreds of homes during studies of

older persons living independently, demonstrate how the technology can help assess a variety of importanthealth-related behaviors—cognitive function, physical activity, socialization or sleep. The approach is clearly feasible and well-accepted by this older population.

As Margaret Isaacs, an 81-year-old research participant at the Center for Aging and Technology said, "Give me the sense of participating in myself and not being 'handled.' I manage my own healthcare. I manage myself. I've had the same doctor for 46 years because I have him trained. If I'm not going to take a medication, he listens. Doctors should realize that we are not guinea pigs to be practiced and tried out on—we are sane adults who can manage their own healthcare if you give us enough information."

Although understanding the type of continuous real-time data captured in the natural environment is a key focus of this work, the importance of the data is that it can be used to inform and track personalized health-behavior interventions and maintenance programs, much like the one Isaacs envisions.

THE POWER OF AMBIENT INFORMATION

The use of continuous real-time data as opposed to brief, static estimates of prior function creates an opportunity to inform individuals about their functioning, and in the process, it may radically alter the way people prepare to change behaviors. For instance, this data can help elders to become aware of particular changes in patterns of health-related activities that are difficult to self-detect, such as quality of nighttime sleep or levels of social interaction and engagement.

This information by itself is useful in helping people to make changes—behavior alterations that have traditionally been made with professional guidance. However, we must also consider that because the data is home-based, digital, detailed, continuous and uniquely personalized, there now is the opportunity to see the data directly, providing indicators about an individual's functioning that can be discovered at any time, but most importantly at a time when change may be most effective.

This stream of ambient information opens up a new world of detailed personal awareness and preparation for self-directed change, and creates an "ambient health intervention" where having this detailed information about an individual, outside of formal treatment options, can have an important impact on his or her daily activity. How we "see" that data also is open to a range of possibilities aided by technology. Information can be displayed through a variety of means—television, personal computers, wristwatches, electronic picture frames, wall clocks, telephones—and in a range of formats and times.

The next step is to determine how to best harness this capability—to understand what the optimal personalized displays might be and for which types of data, and what presentation times are best for each individual. The gerontology and wider research communities need to get to work, as there are petabytes of data to understand and put to great use.

Customizing home-based assessment systems can improve the way we maintain our health and wellness. It offers an opportunity to realize more cost-effective and relevant health-behavior interventions—ones that are personalized, preventative and that support aging-in-place initiatives for more independent living. ❖

Dr. Jeffrey Kaye is a professor of neurology and biomedical engineering and the director of the Layton Aging and Alzheimer's Disease Center, and is director of the Oregon Center for Aging and Technology (ORCATECH), at Oregon Health & Science University, Portland.