

## Low-Literacy Focus

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School for Rural Public Health programmed the software and helped to design the curriculum, which targets a low-literacy audience and incorporates text, audio, and video. The computer is set up to run only the diabetes education software, and does not provide access to the Internet or other programs, according to Dr. Ory, a professor in the school's department of social and behavioral health.

The kiosks are initially being tested in a family practice residency clinic that accepts Medicaid and Medicare patients, and in a federally qualified health center. These initial test centers will help ascertain what motivates people to use the kiosks and will serve as models for the placement of kiosks in at least three other health resource clinics in nearby rural counties.

Regardless of what a patient's appearance or behavior might suggest about his or her literacy level, clinicians and receptionists at these centers are encouraging patients to use the kiosk before or after an appointment, or both, Dr. Ory said in an interview.

Because some patients permitted their kiosk use to be monitored, the investigators will be able to analyze how often those patients used it, what goals they set, and what

sections they viewed most often and for how long. Receptionists also have been asked to provide kiosk users with a 10-question survey. "We hope from that pilot data that we'll learn how we can fine tune it," Dr. Bolin said.

Other studies have been conducted on computer software programs for the management of chronic disease, but they have targeted populations with a higher degree of literacy, Dr. Bolin said. Kiosks built for people with low literacy will work just as well for people with a college education, but the reverse is not true, Dr. Ory added.

Dr. Bolin and Dr. Ory are trying to devise methods to cue people to use the kiosk, through signs, via the receptionist, or by embedding recommendations to use the kiosk in a patient's medical record.

The total cost for each kiosk was about \$1,500 originally, but the software would probably only cost a nominal fee to recoup expenses in large-scale distribution. It may be possible for some clinics to set up the software and touch-screen monitor with already existing computers, Dr. Ory said.

"This is less expensive than printing up a booklet for each individual person, and we know that people don't read those booklets," she added.

The project is sponsored by the Centers for Disease Control and Prevention through the funding for Texas A&M to run its prevention research center. The Dell Foundation provided a grant for the computers.

The software also is being developed in Spanish. The word diabetes itself may be confusing to Spanish-speaking patients because it is commonly referred to as "sugar in my blood."

The Tex-Mex blend of English and Spanish that some patients speak in the central part of the state also makes it challenging to translate. For example, it was difficult to translate the phrase "setting goals" into Spanish because the English word has no meaning for many Spanish speakers outside of soccer, Dr. Bolin said.

The investigators hope to expand the project to more clinics in their area and in south Texas. If the kiosks generate enough interest and are successful, they potentially could be expanded nationwide by the Centers for Disease Control and Prevention through federally qualified health centers.

The hope is that one day such kiosks may be as commonplace as blood pressure monitoring machines at pharmacies and grocery stores, Dr. Bolin said. ■

**The kiosk 'is less expensive than printing up a booklet for each individual person, and we know that people don't read those booklets.'**

## PDA Helps Diabetes Patients Keep on Track

BY BRUCE K. DIXON  
Chicago Bureau

Patients with diabetes can take more active roles in their care, and improve glycemic control, by using a personal digital assistant preinstalled with special software, according to Dr. Samuel N. Forjuoh.

Dr. Forjuoh is leading a team of central Texas researchers to determine the potential benefits of personal digital assistant (PDA) use with outpatients, with the ultimate goal of leveling the self-care playing field across socioeconomic groups.

Their recently-published pilot study revealed that the incorporation of PDA use in diabetes self-care, while feasible, poses significant challenges, said Dr. Forjuoh, professor of family and community medicine and director of research at the Scott and White Memorial Hospital in Temple, Texas.

An initial cohort of 43 subjects was provided with Diabetes Pilot software for Palm handhelds (*J. Am. Board Fam. Med.* 2007;20:375-84). Diabetes Pilot is made by Digital Altitudes LLC, Arlington Heights, Ill.

The PDA system enables users to record glucose measurements, insulin, and other medicines; meals; exercise; blood pressure; test results; and other notes, according to the Diabetes Pilot Web site. Among other things, the software tracks the intake of carbohydrate, calories, fat, protein, fiber, sodium, cholesterol, and other nutrients, and allows users to see trends in blood sugars with various reports and graphs.

A total of 19 participants dropped out of the study and 6 more participants did not return and/or could not be reached after making several attempts.

The 18 people who completed the PDA intervention had a mean drop in hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) of 18%, from 9.7% at baseline to 8% after 6 months, Dr. Forjuoh said in an interview. He added that further updated results of the study, in-



Personal digital assistants enable users to record test results and medicine use.

cluding data on exercise, foot care, and diet, are contained in a manuscript which has been accepted for online publication this May in *Telemedicine and e-Health*.

"We saw that the more a patient used the PDA, the greater the drop in HbA<sub>1c</sub>," he said, noting that comparable reductions in blood glucose associated with PDAs or similar technology have been documented by other investigators.

The 18 finishers had an average age of 58 years. The group comprised 56% women, 56% Caucasians, and 38% college graduates. Also, 72% had annual family incomes of \$30,000 or more, said Dr. Forjuoh, noting the difficulty of expanding PDA use across a diverse population.

"The majority of patients in this pilot study were at the upper end of computer literacy, and it's apparent that only those who are comfortable using a PDA will benefit," he said, adding that many patients who could benefit from the technology are strangers to it.

The researchers are about to launch a larger study of 400 patients drawn from 14 Scott and White Health System clinics. The cohort will be assigned to four arms: a PDA-only group, PDA plus chronic disease self-management classes, self-man-

agement classes alone, and a usual-care group. In addition, the participants will be representative of the Central Texas population with respect to race, ethnic group, income, location, and insurance status, said coinvestigator Jane N. Bolin, Ph.D.

"We want to see if we can use PDAs to reduce health disparities among the population, and we'll also do a cost analysis that will determine how many health care dollars can be saved for every unit reduction of HbA<sub>1c</sub>," said Dr. Bolin, director of the Southwest Rural Health Research Center, a branch of the Texas A&M University System Health Science Center, School of Rural Public Health in College Station.

In the pilot study, it was found that many patients were discouraged by the tedious task of tracking dietary effects on glucose by entering into the PDA all the foods they had eaten. The complaints and potential for further loss of participants led the investigators to relax the rules on data entry. To make data entry easier and help more patients feel comfortable using the PDA, the vendor has been asked to fine-tune the software in time for the upcoming trial, Dr. Forjuoh said.

The cost per participant in the pilot study was \$650, but because that included expenses that patients would not normally bear, Dr. Forjuoh estimates the actual cost per patient at around \$300; the larger study with comparison groups is expected to settle that point, he said.

The spotty availability of reimbursement for such programs places a cloud over widespread adoption of self-management technology, according to Dr. Forjuoh. "Many states don't require insurance companies to provide reimbursement for nutritional education and diabetes self-management education; that causes patients to become dependent upon clinics, and eventually they end up in the emergency room," he concluded.

Neither Dr. Forjuoh nor Dr. Bolin reported financial conflicts. ■

## Hyperuricemia Associated With Type 2 Diabetes

High serum uric acid level is an independent risk factor for the development of type 2 diabetes, according to findings from a large population-based study.

In a study of 4,536 people free of diabetes at baseline, those with serum uric acid levels in the top quartile were 68% more likely to develop type 2 diabetes than were those in the lowest quartile after adjusting for potential confounders, according to a report in the journal *Diabetes Care*.

The population-attributable risk of high serum uric acid for diabetes was 0.24, indicating that, "One-quarter of diabetes cases can be attributed to a high serum uric acid level," reported Dr. Abbas Dehghan and colleagues of Erasmus Medical Center, Rotterdam, the Netherlands (*Diabetes Care* 2008;31:361-2).

The participants were part of the Rotterdam Study, a population-based, prospective cohort study involving subjects aged 55 years and older who were followed for a mean of 10.1 years. During that time, 462 of the participants developed diabetes, giving an incidence rate of 10.1/1,000 person-years.

After adjustment for age, sex, body mass index, waist circumference, HDL cholesterol level, and systolic and diastolic blood pressure, participants with serum uric acid levels above 370 micromol/L had a hazard ratio of 1.68, compared with those with levels of 267 micromol/L or below. The difference was statistically significant.

The importance of this finding is that "lowering serum uric acid in subjects in the highest quartile may decrease the incidence of diabetes by 24%, if the relationship is causal," the investigators wrote.

—Robert Finn