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UNBOXED

Watch the Walk and Prevent a Fall

By STEVE LOHR

FALLS are so harmful to the elderly and so costly to society that if falling were a disease, it would be deemed an epidemic.

More than one-third of people ages 65 or older fall each year. About one fall in 10 results in a serious injury, like a hip fracture. Roughly 20 percent of older people who suffer a hip fracture die within a year.

The estimated economic cost of falls ranges widely, up to \$75 billion a year in the United States, if fall-related home care and assisted-living costs are added to medical expenses.

For years, a small group of geriatric experts has studied falls and suggested preventive programs. Most of the work has relied on visits to doctors and self-reported surveys of volunteers.

But now, researchers are beginning to apply the digital tools of low-cost wireless sensors in carpets, clothing and rooms to monitor an older person's walking and activity. The continuous measurement and greater precision afforded by simple computing devices, researchers say, promise to deliver new insights on risk factors and tailored prevention measures.

For an older person, a fall is often a byproduct of some other health problem: cardiovascular weakness, changes in medication, the beginnings of dementia, gradual muscle degeneration. Motion analysis aided by inexpensive sensors and computing, researchers say, may well become a new "vital sign," like a blood pressure reading, that can yield all sorts of clues about health.

"For the last 100 years, clinical research and medical practice have been based on appointments, examinations and asking patients questions — tiny biopsies of time in a person's life," said Dr. Jeffrey Kaye, a professor of neurology and biomedical engineering at the Oregon Health and Science University. "But technology now gives us the ability to get behavioral activity data all the time for a much more fine-grained, real-world picture of what is happening with a person's health."

The National Institute on Aging is intrigued, and sponsoring some initial research. Richard M. Suzman, the institute's director of behavioral and social research, said studies of older people's activity patterns, including early detection of risks, would "increasingly use sensors to deliver this higher fidelity of data."

"It's extremely promising," he added.

Fall prevention also promises to be part of an emerging — and potentially large — worldwide industry of

helping older people live independently in their homes longer. The European Union, for example, has committed 1 billion euros, or nearly \$1.5 billion, to study and finance technologies and services for the aged. Big corporations, including Intel and General Electric, are investing in the field.

“The independent-living industry could have a huge payoff in innovation, jobs and competitiveness,” said Eric Dishman, an Intel research fellow and director of strategy for the company’s digital health group.

In clinical settings, wearable sensors and wireless sensors embedded in carpets are used to measure precisely a person’s walking speed, stride length, step width and body sway — all variables in assessing the risk of falling.

In Ireland, a research group, Technology Research for Independent Living, recently completed a two-year study of 600 people, ages 60 to 94. The subjects came in for detailed walking assessments, using the sensor technology. The exact measurements, said Dr. Chie Wei Fan, a medical gerontologist at Trinity College Dublin, help in devising more customized exercise programs for specific muscles or changes in medication to eliminate dizziness.

The technology-aided “targeted interventions,” Dr. Fan said, reduced falls by 30 percent in the study group, compared with a similarly aged sampling of the population. But she thinks it should be possible to reach 50 or 60 percent.

“We’re still catching the fallers too late,” Dr. Fan said.

Earlier detection is the goal of an at-home sensor and data study being conducted by the Oregon Center for Aging and Technology, whose sponsors include the Oregon Health and Science University and Intel.

The initial five-year study, begun in 2006 and financed by the National Institute on Aging, involves 230 volunteers, whose mean age is 84. In each home, wireless sensors are placed in rooms and hallways linked to a personal computer connected to the Internet, allowing a person’s activity to be monitored steadily. The cost of the sensors is \$200 or less.

Activity patterns from the data, said Dr. Kaye, director of the aging and technology center, can help identify ways to prevent falls. The motion sensors may show that a person with congestive heart failure, for example, is getting up from bed often at night to go to the bathroom. If the heart problem is under control, Dr. Kaye said, it may well be a good idea to reduce the dose of the person’s diuretic, trading a little bit of ankle swelling for a good night’s sleep — and far less risk of falling.

Dorothy Martin, 81, and her husband Philip, 83, joined the study two years ago. They live in a two-bedroom apartment in a retirement community in Lake Oswego, Ore., and as part of the study they fill out weekly self-assessments of their activities and health. Once a year, they undergo detailed, in-person physical and cognitive evaluations. They say the sensor monitoring is unobtrusive because the sensors track only motion, not what they are doing.

Both of the Martins are in good health. Still, they have watched friends grow increasingly frail over the years.

“We did this to participate in research that would be helpful to other people, and possibly to us,” Mr. Martin

Fall-Related Injury Deaths, Non-Fatal Hospitalizations and Emergency Department Visits among Orange County Residents Aged 65 Years and Older, 2007

Falls are the leading cause of injury-related deaths, hospitalizations and emergency department visits among Orange County's senior population and result in significant physical, personal, social and economic burden.

- There were 47 deaths, at least 658 non-fatal hospitalizations, and at least 1,493 non-fatal emergency department visits due to fall-related injuries among Orange County's senior population.
- Falls accounted for 45% of injury deaths, at least 36% of non-fatal injury hospitalizations and at least 28% of non-fatal injury emergency department visits among Orange County's senior population.
- The external cause of injury code was missing for 52% of injury hospitalizations and 49% of injury emergency department visits thus the true impact of falls among Orange County's senior population may be grossly underestimated.
- Same level falls like slips, trips, stumbles, etc, were responsible for at least 50% of these injuries.
- Approximately 85% of fatal fall-related injuries occurred in a place of residence like a house, apartment, assisted living facility, nursing home, etc. However, the location of non-fatal falls is less known because place of injury is poorly recorded and/or coded within patient records.
- Males accounted for 53% of deaths, but only 26% of hospitalizations and 31% of emergency department visits while females accounted for the majority of hospitalizations (74%) and emergency department visits (69%).
- Other non-white residents had the highest fatality rate followed by white residents and black residents respectively. In addition, white, black and other non-white males had higher fatality rates than their female counterparts.
- In contrast, white, black and other non-white females had higher rates of hospitalizations and emergency department visits than their male counterparts.
- The rate of fatal and non-fatal fall-related injuries increased with age, especially after age 74.
- The most common fatal injuries were traumatic brain injuries and hip fractures. The most common non-fatal injuries were lower extremity fractures for hospitalizations and upper body wounds and bruises for emergency department visits.
- The median hospitalization charge was \$37,467 with total charges equaling more than \$27 million. The median emergency department visit charge was \$2,340 with total charges equaling more than \$4 million.
- The median length of stay for non-fatal, fall-related injuries requiring hospitalization was five (5) days. The majority of patients (58%) were then discharged to a skilled nursing facility, only 21% of patients were discharged directly home.



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Most falls are preventable with precautions

BY SUSAN JENKS
FLORIDA TODAY

Ruth Collins takes a "get-up-and-go test" every few months to assess her risk of falling.

The preventive test measuring balance and gait, as well as visual acuity and breathing, is easy to administer and something all medical providers should do, said Dr. Visa Srinivasan, a geriatrician specializing in treating the elderly and Collins' physician at the Health First Aging Institute.

"I still haven't fallen," said Collins, before pushing herself out of a chair in the get-up part of the exam, then walking down a hallway in the go phase.

As a retired nurse, the 87-year-old Melbourne resident is well aware of the hazards of fall-related injuries, including death, especially in the elderly.

Falls claim at least 16,000 lives in the United States each year, mostly in individuals older than 65. Nonfatal falls account for almost 2 million annual visits to hospital emergency departments, with significant disability afterwards, according to the Centers for Disease Control and Prevention.

These grim statistics, which Srinivasan and others believe underestimate the true scope of the problem, have led to a fall prevention push in the past few years. Florida is one of 21 states to declare today Falls Prevention Awareness day with a statewide broadcast out of Tallahassee, while the U.S. Senate has proclaimed the day National Falls Prevention Day.

"Falls are called the 'senior tsunami,' " said Mark Brimer, mayor of Satellite Beach and manager of rehabilitation services for Wuesthoff Health System in Rockledge. "And yet some 40 percent of falls are preventable" and not a normal consequence of aging.

Through simple modifications to the home, Brimer and others stressed, individuals can lessen their risk. Among the best safe-proofing measures:

- Tacking down or throwing out area rugs
- Installing grab bars in the tub or shower
- Insuring adequate lighting throughout the home to compensate for visual difficulties often accompanying aging

"Small environmental modifications can make a big difference in risk," Srinivasan said. "More than a third of falls happen in the home."

In Collins case, the former North Carolina native had tremendous difficulty getting out of the chair during the office-based test. Srinivasan said that showed her leg muscles are weakening, and she needs a higher chair or armrest at home to compensate for that loss to reduce the risk of falling.

Also, walking revealed "a decrease in stride, and she is not swinging her arms as she should," Srinivasan said, so Collins will need leg-strengthening exercises in a physical rehabilitation program to avoid falling in the future.

Safe-proof homes

In Brevard County, where the 60-plus population numbers 155,000 residents, an estimated 7.5 percent will experience a fall within the year, according to Tammy Harris, a supervisor with Brevard County Housing and Human Services.

Of this number, more than half will visit a local emergency room, while a third will require assistance either at home or in a long-term care facility afterward, she said.

The Brevard County Commission on Aging has led the initiative to stem falls locally, Harris said, as the demographic continues to skew older. The organization is trying to educate seniors about how to protect themselves, without making them overly fearful of falling.

"We don't want anyone to be afraid," she said, "but we do inform seniors about the best shoes to wear to reduce their risk, or how, for example, to safe-proof kitchens and bathrooms, where the highest incidence of falls in the home occur."

Through partnering with the Community Services Council (639-8770), Harris said, any senior in Brevard is eligible for a home risk-assessment, with basic updates provided, based on the ability to pay.

"They don't turn anyone away," she said.

Although falls are a leading cause of emergency room visits for all ages, older adults are at highest risk for injury because of their lack of flexibility, loss of muscle mass and thinning bones.

Still, like her colleagues, Lynn Beattie, vice president of the National Council on Aging, said falling is not necessarily because of aging and can be largely prevented.

"Some of our (prevention) strategies include reviewing your medications, assessing your balance and checking your vision annually," said Beattie, a former colonel in the U.S. Army Medical Specialist Corps and chief of the physical therapy section, ticking off a few measures.

"These are evidence-based strategies, or things that work," she said.

One newer program, Matter of Balance, Beattie said, targets older people with a fear of falling to help them regain a sense of control over fall risk.

Otherwise, these individuals begin to limit their social activities, becoming increasingly frail and at an even higher risk for harmful falls, she said.

Stay active

One reason falls become so dangerous to the elderly is they often have other medical factors at play, according to Dr. Rosemary Laird, medical director of the Health First Aging Institute.

"Very often, these people are very frail to begin with and have an underlying illness," she said. "They may suffer from dementia, poor nutrition or deconditioning, no longer active or able to exercise."

In elderly women, in particular, osteoporosis, the brittle bone disease, also may contribute to the fall risk, with an 85-year-old at greater risk for severe injury than a 65-year-old woman, Laird said. But in this case, "the hip can break and then you fall. It's not trauma causing the fall."

Hip fractures are considered the No. 1 injury in the elderly, and as the population continues to age, experts worry, it could become an even greater problem.

Laird's advice: Just keep active, no matter your age.

"I think too many people underestimate the need to keep moving," Laird said. "If seniors don't keep active, it's hard to regain strength. It's harder for the older body to get back in shape."

She recommends 30 minutes a day of an activity, like walking, at least five times a week, even if only in 10-minute increments. Several studies have shown these mini-exercises are just as effective as doing it all at once, Laird said.

Additional Facts

Preventing falls

- Begin a regular exercise program.
- Have a physician or pharmacist review your medicines.
- Have your vision checked annually.

Make the home safer by taking the following precautions:

- Remove things you can trip over from stairs and places where you walk.
 - Remove small throw rugs or use double-sided tap to keep them from slipping.
 - Keep items you use often in cabinets easily reached.
 - Have grab bars put in next to the toilet, tub or shower.
 - Improve the lighting in your home.
 - Install handrails and lights on stairs.
 - Wear shoes inside and outside the house. -- *Centers for Disease Control and Prevention, Florida Department of Health*
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