

TECHNOLOGY INNOVATIONS IN SENIOR CARE

Wearable devices and data analytics transform care delivery, improving health and potentially saving lives.

EXECUTIVE SUMMARY

A new trend in senior care speaks to the growing role of technology when it comes to improving health: an uptick in queries from prospective residents about communities' commitment to technological innovation.

This trend reflects shifting demographics: The oldest baby boomers began turning 70 in 2016, and every day until 2030, roughly another 10,000 Americans will turn 65. But this "silver tsunami" is not the only factor that has senior care providers scrambling to keep pace. It's also the fact that this wave of new clients is well versed in the digital world.

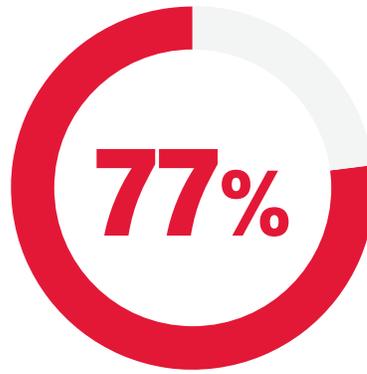
In a survey of older Americans' technology use, the Pew Research Center found that, among those age 65 or older who use the internet, 71 percent go online every day or almost daily, and 82 percent say their smartphones give them freedom. These users see their devices and associated apps, as well as "necessities" like wireless access, as lifelines that connect them with family members, caregivers and doctors. For these seniors, wearable devices, tablet computers and data-driven healthcare analytics have the potential to transform the way communities provide care.

With that in mind, several pioneering senior care organizations partnered with CDW Healthcare to investigate ways that providers can leverage advanced technologies to improve health, well-being and quality of life.

Timely Solutions Meet Needs and Expectations

It's no longer a question: Seniors today — like the seniors of tomorrow — increasingly expect to have technology in their lives. That's especially the case when it comes to communication. Seniors look to technologies like smartphones and the internet as a means to connect with their families and caregivers and as a reliable link to their healthcare providers.

For that reason, the next generation of communication technologies — including wearable devices, tablets and data-driven healthcare analytics — all have the potential to significantly improve seniors' well-being and health. Seniors are ready to use these technologies, as are their support circles and the professionals who care for them.



The percentage of seniors who report that wearable activity and sleep trackers are useful or have the potential to be useful

Pilot Leverages Multiple Capabilities

CDW Healthcare's partnership with Intel and data science company Big Cloud Analytics is designed to investigate the potential benefits of wearable device-facilitated biometric monitoring in the senior care environment. The Intel IoT Gateway platform supports the connection of legacy devices and systems to the Internet of Things (IoT), including products such as wristbands that track vital signs and other health indicators. BCA is a leading developer of analytics software for wearable devices.

The three companies created a pilot program that launched concurrently in four senior care communities: Masonic

Homes of Kentucky; Masonicare, in Connecticut; LifeWell Senior Living, in Texas and Florida; and Benchmark Senior Living, in Massachusetts.

The program monitored user data with consumer-grade activity trackers (the Garmin Vivosmart HR wristband), collected that data via wireless syncing with tablets (Samsung Breezies and Posh tablets), and analyzed the data using BCA's Intel-powered Covalence Health Analytics Platform.

Putting the 'Wear' in Wearables

At the start of the pilot, organizers were uncertain whether enough seniors from each organization would agree to wear the activity trackers. It was also a toss-up as to whether the residents who did sign on would stick with the program for its entirety. As it turns out, those fears were unwarranted.

"We had around a 90 percent success rate," says Charles Turner, LifeWell Senior Living's president. "For the most part, our residents were really excited about it. They thought it was fun, and they wanted to be part of it."

Gary Marsh, CEO of the Masonic Homes of Kentucky, saw a similar response, and he connects it to seniors' proficiency with digital devices.

"Our residents — and especially their families — are much more technologically savvy than they ever were in the past," Marsh says. "So when we tell them that we have xyz technology, and we explain it to them, and show them how it's workable, it's practical, and it can help them improve their lives — more often than not they embrace it."

At Benchmark Senior Living, Vice President of IT Moulay Elalamy says that gamification also spurred adoption and made the pilot fun for residents. Tell someone they'll get a prize if they can improve their activity week over week or take more steps than the others in their group, he says, "and they really get into it."



Wearables Make Sense for Senior Care

Several factors made wearables a good fit for the pilot. First, they provide a noninvasive and straightforward way to collect and monitor an individual's heart rate, activity levels and sleep patterns, which can provide insight into overall health and wellness. This is particularly important as healthcare providers look for new ways to reel in costs, which are projected to rise in the coming years as more people live into old age.

Second, the commercial market for wearable technologies is poised for explosive growth. One estimate predicts the world market for wearables will hit \$40 billion by 2020, double the market of 2015.

Currently, 17 percent of Americans over age 65 use wearables to monitor vital signs and track fitness, not far behind the 20 percent of Americans under age 65. What's more, seniors' adoption of wearables is increasing more than five times faster than that of the general population. As the wearables market grows — and as younger users gradually migrate to senior living environments — acceptance of the technology in the senior care sector likely will increase as well.

The final reason for focusing on wearables is the projected need for remote monitoring technologies to support an impending shortage in family caregivers. According to the AARP Public Policy Institute, the "caregiver support ratio" (the number of adult children ages 45 to 64 relative to adults age 80 or older) is falling fast, from 7-to-1 in 2010 to a projected 4-to-1 in 2030 and just 3-to-1 in 2050.

"The supply of family caregivers is unlikely to keep pace with demand to assist the growing number of frail older people in the future," the AARP report notes.

Remote monitoring technologies, such as wearables, will presumably help fill that gap by giving family members and professional caregivers better access to key health information from a distance.

Meaning in Numbers: Data Yields Insight for Better Decision Making

Given these factors, one question for the pilot program was how to make the leap from devices that individuals wear and use to wearables as a source of data that can enhance decision-making for a population. That is, once an organization has the ability to track every heartbeat, step and minute of sleep that its residents take each day, how can they put that information to use?

Toward that end, the CDW Healthcare pilot was designed to:

- Determine how wearables can better serve seniors and inform caregivers and families
- Investigate ways that wearables support biometric monitoring to detect health anomalies that enable providers to make better decisions about care
- Assess whether wearables can show which residents are actively improving their health and well-being
- Identify potential use cases for expanding wearable technology into commercial applications

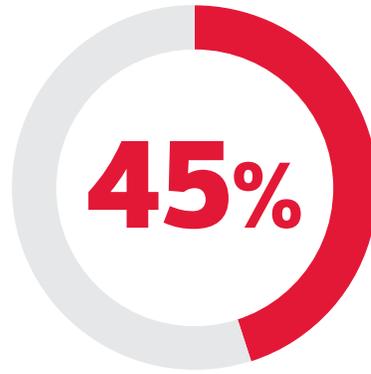
The Pilot Program: Wearable Devices in the Senior Care Environment

The six-week pilot program was held at four senior care organizations in five states.

Two of the pilot organizations — Masonicare and Masonic Homes of Kentucky — manage independent living communities where residents can regularly attend exercise and fitness classes. The other two organizations — LifeWell Senior Living and Benchmark Senior Living — serve residents in assisted living communities who typically rely on walkers, wheelchairs and other mobility aids. These communities also offer classes in dance, water aerobics and types of exercise that are tailored to residents' abilities. Approximately 85 residents, with an average age of 82, and 10 staff members from each organization volunteered to take part in the program.

The Technologies

Residents and staff members in the pilot received a Garmin Vivosmart HR activity tracker, a low-profile, water-resistant wristband with an easy-to-read, always-on display. The Vivosmart includes a heart rate monitor, a barometric altimeter that tracks movement, and a sleep-tracking function that records



The percentage of seniors who say that wearables increase their motivation to live healthfully

total hours of sleep and measures periods of restful and restless sleep. Other built-in algorithms combine motion data with the user's heart rate to calculate metrics such as calories burned and activity intensity. The commercial version of the Vivosmart also supports smartphone and computer syncing, as well as text, calls, email, calendar and social media alerts.

Residents in the assisted care communities received a Posh tablet, while those in the independent communities received Samsung Breezies.

The Breezie, which supports social, communication, financial, healthcare and entertainment applications, is designed for seniors, with large print, an easy-swipe interface and simple on-screen instructions. Users can communicate with the Breezie support team with the touch of a button, and an online portal provides remote access by family members, caregivers and care providers.

Finally — and perhaps most important for senior care organizations — the Breezie's open platform lets administrators centrally configure a large number of the devices, so they are well suited for enterprise support and management.

Design and Purpose

For the pilot, each participant received a kit containing a Garmin, a charger and a tablet. All devices were stamped with a unique digital tag that allowed BCA and administrators to identify its user, and the Garmins and tablets were pre-paired to enable automatic syncing when they were in close proximity to each other.

In the independent living communities, residents were encouraged to use the tablets on their own — not only to see their own data, but to navigate the internet and communicate with family and caregivers. In the assisted living communities, on the other hand, the tablets stayed in the background.

"We actually hid them so our residents wouldn't even see them," says LifeWell President Charles Turner. "They'd enter their rooms, their Garmins would sync automatically, and then the BCA software would pull all their raw data off of the tablet and suck it into their servers, where they ran their analyses."

At LifeWell, Turner says, the project was designed to investigate how gamification — using the wearables to create a friendly sense of competition — might help drive improvements in health. With guidance from experts at BCA, LifeWell staff also explored uses for predictive analytics, such as monitoring residents' sleep, stress and activity levels in search of insights that might boost well-being.

The Benchmark project also gathered data on activity, sleep and stress levels, but the overall focus was on finding

ways to keep Benchmark's residents at the assisted care level for as long as possible.

"Specifically, we wanted to see if the data we collected could help us reduce falls," says Moulay Elalamy, Benchmark's vice president of IT. If providers can identify correlations between residents' biometrics and their likelihood of falling, he says, perhaps they could keep residents on their feet — and prevent future hospitalizations.

At Masonicare and Masonic Homes of Kentucky, where residents are largely independent, the pilot program also focused on collecting and aggregating participants' heart rate, sleep and activity data. Here, however, residents played a much more active role in the pilot and often viewed their data as a source of motivation.

"They actually started to get competitive," says Gary Marsh, CEO of Masonic Homes of Kentucky. "You know — 'I've taken more steps than you. Let's see if you can do a little better.'"

Outcomes and Opportunities

At all four organizations, once the data was uploaded to a resident's tablet, BCA technicians used their population

\$30,000

The average cost of treatment when a senior has a fall that requires hospitalization

analytics platform to overlay the data with information relevant to each participant's daily life. For example, if a resident seemed more tired, anxious or stressed than usual, the BCA scientists could analyze data pertaining to that individual's sleep cycle to see if he or she were getting adequate rest — and

then overlay it with the resident's list of medications.

"One of the things we noticed," says J. Patrick Bewley, BCA's CEO, "is that a lot of these medications can really change your light-to-deep sleep ratio. They affect the way that people sleep and the quality of sleep they get."

Interestingly, he adds, residents who took sleep medications experienced a longer duration of sleep, but significantly less "biorestorative" deep sleep than those who were not taking such medications. Similarly, those who took pain medications also experienced lower quality sleep.

Overlaying wearables data with each facility's activities calendar also gave the BCA team interesting insights. For example, if a resident took a morning exercise class three days a week, the BCA algorithm could combine that information with Vivosmart data to see how those activities affected the resident's heart rate.

"We could also see who didn't make it to an activity they had on their schedule," says Bewley. "You could look at their data for 10 a.m. on a Monday, when they were supposed to be doing aerobics, and you could see that their heart rate hadn't changed."

Custom Solutions for the Unique Needs of Older Users

One challenge, Bewley adds, was that the Vivosmart, like other commercial-grade wearables, was designed to track "normal" steps rather than the type of motion that seniors often use.

"If you use a cane, a walker, a wheelchair or a motorized scooter, it's impossible to know how many 'steps' you've taken or what might be 'normal' for others," he says.

BCA's solution was to establish new norms for different subsets of the population based on their use of mobility aids.

"We were gathering anywhere from 50,000 to 70,000 data points per person, per day, so we had massive amounts," Bewley says. "So you could see: Mr. Jones uses a cane when he walks, and here's how far he walks on a normal day, and here's how far everyone else who uses a cane can be expected to walk on a normal day as well."

The pilot applied that same data parsing to other aspects of residents' lives, Bewley says.

"When we brought people into the programs, they were asked a series of questions — not only things like their age and gender, but whether they have any diseases, or if they take certain types of medication, or use a CPAP machine or an oxygen line or some other type of aid when they're sleeping."

From that metadata, Bewley says, it was easy to establish corresponding baselines they could use to better understand an individual's biometric data — or to compare that person with other seniors or with the community's population as a whole.

Elalamy, the Benchmark VP of IT, points out that the opportunity to refine these types of issues has been a valuable

New Capabilities Raise New Questions

The evolution of technology-supported senior care is likely to require communities to address a number of workflow-related issues. Charles Turner, LifeWell Senior Living's president, points out that sending all data from wearable technology to a single computer would reduce the hardware requirements of data collection. Administrators could also streamline wearable tech charging with central charging stations where residents could leave their devices at certain times of the day.

"It's not as easy as saying, 'Okay, here's a bunch of wearables. Put them on and start using them,'" Turner says. "There are a lot of things you have to figure out in order to operationalize it."

Moulay Elalamy of Benchmark Senior Living agrees, suggesting that long-term success may depend not only on the technology, but also on the social implications of round-the-clock monitoring. "What are the legal ramifications of implementing something like this across an organization?" he asks. "This data is personal — heartbeats, sleeping patterns. What can we do with it? What are we allowed to do with it?"

The answers to those questions will become clear over time, but until then, Elalamy says, "It's interesting to see what this technology can do."



aspect of the pilot programs. "This was really a test of not only the technology and the processes, but also how well operationally can it be rolled out," he says.

Dashboard Supports Granular Analysis of Individual Residents

To make it easier for administrators to understand the data they received from the wearables, BCA developed a split-screen dashboard that puts all the key metrics front and center. The dashboard can display a certain population, such as female residents ages 85 to 86, and their average heart rate by day of week and time of day.

Such data helps administrators see population-level "hot spots" related to increased heart rates that correspond to group exercise classes, for example.

On the same dashboard, Bewley and his team created a "lens" that lets a user look up individual residents and track heart rate at one-minute increments over a specific time period. "By drilling into the data, Bewley says, it is possible to create "heat maps" that

graphically display an individual's activity level minute by minute.

"If you know something about the class they were in — like for the first three minutes they do stretches and a warm-up, the next seven minutes they do their exercises and activities, then they recover before exercising again, and then they cool down — you can see it all mapped out right there on the screen," Bewley says. "Green in the beginning, when the heart rate is relatively slow, then red as the activity level goes up, and then green again as the individual cools down."

As with any technology, communities can derive the most meaningful benefits from these solutions when they leverage new capabilities to make a difference in the way providers deliver care and attend to residents' needs.

"It's important to remember that these are not medical devices," Elamy points out. "So we're not telling families that because their mother now has this wearable device, we don't have to watch her all the time. That's not their purpose. Their purpose is to collect information that we can use to improve care."

Benefits and Applications: Looking to the Future

For this pilot, Bewley says, access to individuals' wearable data was restricted to the BCA team and each community's administrators. In the future, though, he envisions that residents' families and caregivers will be able to log in to their system from a desktop computer and check on their loved ones from afar.

"We have that ability now, but it requires another level of consent," he says. "Each resident would have to opt in to that kind of sharing, and it would be the same thing if we were to share the data with their physicians."

When that day comes, Bewley says, it will open all kinds of opportunities for senior care communities to improve residents' lives. For instance, they could use a resident's sleep and activity data to identify potential onset of anxiety or depression and then intervene with a social outreach program.

"If you can be proactive in areas like that, you might be able to keep residents in certain service lines of support longer than you would have otherwise," Bewley says. That could, for example, enable a resident to delay a move to a more intensive (and more expensive) level of care.

There are other possibilities as well. For example, over the course of the pilot, a number of residents developed ailments that are common among seniors their age, such as pneumonia and blood clots. Other residents needed to have pacemakers put in, and a few residents died.

However, Bewley points out, these unfortunate situations provided a window into health trends. "We could look back at the data leading up to those events and see if there was anything that might have helped them see it coming," he says.

In fact, that was exactly what happened with one 89-year-old who developed pneumonia.

"I looked at her data," Bewley recalls, "and four days before she went to the hospital, her heart rate was elevated, but her normal activity decreased by 70 percent."

Another resident, who had a pacemaker inserted, also showed what Bewley describes as an unexplained "variability"

Testers Report Positive Findings for Wearables Market

An AARP study of wearable technology suggests that the senior market is poised to embrace smart wristbands that can measure sleep patterns, heart rate, physical activity and other health indicators.



The 2015 research, shared in "Building a Better Tracker: Older Consumers Weigh in on Activity and Sleep Monitoring Devices," tracked 92 seniors who agreed to use a wearable device for six weeks. By the end of the project, 77 percent of the participants said the wearables were useful or could be useful. Nearly that many (71 percent) said the trackers made them more aware of their sleep patterns and activity levels.

Wearables also showed promise as a motivational tool, similar to the gamification effect they demonstrated in CDW's senior care community pilots: Forty-five percent of participants said the wearables motivated them to practice healthy habits.

Globally, the overall market for wearables is expected to triple in the next three years, with fitness trackers accounting for the most sales, according to analyst firm CCS Insight.

Ultimately, according to the AARP study, seniors are more likely to adopt wearables that offer perceived value, such as being informative, simple to use and targeted to the needs of older users. Participants also said they would like for wearables to record even more biometric data, such as blood sugar, heart rate and caloric intake, and to provide more alerts.

in her heart rate in the weeks before the procedure.

"Things like that have really got us thinking: What if we had a watch list, based on the data, that we could hand off to the staff first thing every morning? Something like, 'Here are the three individuals who saw the biggest changes in their biometrics overnight. You might want to pay attention to them today.'"

Likewise, Bewley says, imagine if physicians had access to data as it streamed in from wearables. "We could set it up so they'd get an alert when something was off," he says. "They'd know right away that they needed to do something."

That, he says, is where wearables may offer the most promise — helping care communities and providers intervene early to potentially save lives.

"CDW Healthcare is proud to bring solutions to market aimed at improving seniors' quality of life, health and overall well-being," says Bob Rossi, vice president of CDW Healthcare. "We are honored to work with leading senior care facilities to pilot new and innovative tracking and monitoring solutions that will bring very powerful information to the patient, care teams and family members."

CDW: Your Healthcare Partner That Gets IT

Patients welcome greater engagement. According to multiple studies, they actively seek opportunities to communicate with providers and participate in their own healthcare. Both patients and providers have ample resources for connecting — the challenge for providers is finding the right mix of incentives and tools to help patients in their quest for greater engagement.

CDW can help. As technology continues to play an essential role in expanding engagement, CDW Healthcare is uniquely positioned to deliver industry insights as well as technology, solutions and services needed to advance this important objective.

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The CDW Approach



ASSESS

Evaluate business objectives, technology environments and processes; identify opportunities for performance improvements and cost savings.



DESIGN

Recommend relevant technologies and services; document technical architecture, deployment plans, "measures of success," budgets and timelines.



DEPLOY

Assist with product fulfillment, configuration, broad-scale implementation, integration and training.



MANAGE

Proactively monitor systems to ensure technology is running as intended and provide support when and how you need it.