

Are smart homes the answer to the long-term care crisis?

Sensors are everywhere. Sensor-enabled cars parallel park themselves. Sensor-enabled smart phones detect their user's exact location. Sensor-enabled traffic lights dynamically adjust to the flow of traffic. As sensors have advanced to include an increasingly broad array of functions, the range of possible uses has multiplied. Among these possible uses, is the potential for sensors to positively disrupt long-term care options for senior citizens.

As the number of Americans age 65 and older continues to rise, long-term care options for seniors must become more affordable, accessible, and responsive to individuals' needs. Sensor technology looks to be one of the most promising solutions.

The Senior Predicament

Although current long-term care options like retirement homes and assisted living communities offer around the clock care, their high costs can place a family into significant debt. According to a 2012 survey by MetLife, a private room in a nursing home costs an average of \$248 daily, or more than \$90,500 annually and a semi-private room costs \$222 daily, or more than \$81,000 per year.¹ Given the growth in demand, it's unlikely that these costs will decrease any time soon. A report by Genworth Financial finds that long-term care costs have been rising at a 4.5% compound annual growth rate since 2008.²

Cost is not the only factor driving the search for alternative elder-care solutions. Research shows that 90 percent of people 65 and older want to stay in their homes as long as possible. One reason many seniors are unable to do so is because their homes and communities cannot accommodate the needs of aging residents.³

Sensor Technology in Seniors' Homes

Researchers worldwide are experimenting with how sensors can transform the way seniors live their lives. Teams led by Diane Cook Ph.D of Washington State University and Nirmalya Roy of the University of Maryland Baltimore County, supported by a grant from the National Science Foundation (NSF), is exploring how to retrofit homes with sensor networks that monitor a resident's behaviors and activity levels. These sensor-enabled homes recognize and analyze behavior patterns (eating, sleeping, and movement) and identify and report signs of illness or cognitive degeneration to caretakers and physicians. When compared to the high costs of current long-term care options, sensor-enabled smart homes are affordable. Refitting a home costs \$2,500 plus the cost of monitoring and analyzing data, which is modest compared to the cost of traditional assisted living and nursing homes.

To be sure, smart homes will not eliminate the need for nursing homes. However, they could reduce the number of seniors that prematurely move into nursing homes, thereby reducing the financial burden on seniors, their families, and government. Experts estimate that states can save an average of \$9 million a day in health care costs by enabling just 10 percent of the elderly population to remain in their homes for 1-2 years longer.⁴ The monitoring capabilities of smart homes could also alert physicians to changes in the physical and mental health of their senior patients, allowing them to intervene before adverse events

¹Market Survey of Long-Term Care Costs: The 2012 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs <https://www.metlife.com/assets/cao/mmi/publications/highlights/mmi-market-survey-long-term-care-costs-highlights.pdf>

²Executive Summary, Genworth 2013 Cost of Care Survey: https://www.genworth.com/dam/Americas/US/PDFs/Consumer/corporate/131168_031813_Executive%20Summary.pdf

³ Shinkle, N. F. (2011, December). Aging in Place: A State Survey of Livability Policies and Practices. Retrieved from AARP: <http://assets.aarp.org/rgcenter/ppi/liv-com/aging-in-place-2011-full.pdf>

⁴ Roach, John. "Big Brother? Homes, cities to watch, interact with you." <http://www.nbcnews.com/technology/big-brother-homes-cities-watch-interact-you-608659>

occur. Increasing the time seniors can safely live in their homes will also allow them to retain their sense of independence and self-confidence.⁵

Despite their many benefits, several issues need to be addressed to encourage the widespread adoption of sensor-enabled smart homes.

1. **Cost** – Sensors are not commonly covered by private insurance plans or Medicare.
2. **Interoperability** – As the market grows, technical standards will need to be defined and adopted by sensor and smart home manufacturers.
3. **Senior acceptance** – The sensor solution to senior care will require older individuals to accept technology “invading” just about every aspect of their lives. Is the community ready for it?

What about Privacy?

The emergence of sensor-enabled smart homes that collect data 24-7 probably represents the ultimate nightmare for privacy advocates. But, given that current long-term care options like nursing homes can be just as intrusive, the ability for seniors to live longer and healthier lives in the comfort of their own homes, may just trump the accompanying intrusiveness of the monitoring required to make it possible.^{6,7}

As Baby Boomers join the senior ranks, society needs new solutions to take care of older Americans that don't contribute to rising health care costs. Sensors provide an opportunity to not only improve the quality of life for seniors but also to reduce the total cost of quality long-term care. As a leading financer of elder-care, government is well positioned to incent the research, development, and adoption of sensor technology.

⁵ Friedland, Ronnie “Home Care Versus Nursing Home Care, How to safely age at home.” <http://www.care.com/senior-care-home-care-versus-nursing-home-care-p1017-q14698.html>

⁶ <http://well.blogs.nytimes.com/2013/11/18/watchful-eye-in-nursing-homes/>

⁷ Roy, Nirmalya, PhD, University of Maryland Baltimore Campus. 22 10 2013