



Digital Home Technologies for Aging in Place

Summary

The United States is facing a major challenge, as an aging population threatens to strain our nation's healthcare system to the breaking point. Already we're feeling the strain, as Congress struggles to provide prescription drug benefits for today's 34 million seniors. The cost of caring for older adults will escalate sharply in less than a decade, when 76 million Baby Boomers begin to retire. Unless we develop a more effective and less costly model of delivering healthcare services to seniors, the U.S. may soon find itself in the midst of a public health crisis that could threaten our nation's economic well-being.

How can we deliver quality care to a rapidly growing population of older adults—historically the most expensive demographic to treat—while reducing the nation's healthcare costs? We believe the solution must include three components: an emphasis on prevention rather than treatment; a shift in the locus of care from expensive clinical settings to the home; and a shift of some responsibility for care from formal providers to individuals and their family and friends. This solution can be enabled by a range of proactive computing technologies in the digital home. These digital home technologies have the potential to improve public health and significantly lower the U.S. healthcare bill while enabling seniors to “age in place,” maintaining their independence and deferring more costly institutional care as long as possible.

This paper highlights Intel's role in advancing the digital home technologies and our efforts to help create an ecosystem of companies, universities and government agencies to address the challenge of providing quality, affordable healthcare for older adults. The paper also recommends actions that Congress can take to prepare for the coming age wave.

Improving Care, Reducing Cost

The U.S. has the potential to improve the quality of care for its aging population while saving billions of dollars annually in healthcare costs, through home-based technologies that focus on prevention and early detection of health problems; improved compliance with care plans; monitoring of older adults in their homes, and emergency response in the event of a fall or other health crisis. Together, these technologies could enable seniors to age in place in their home environment,¹ maintain their independence, and defer more costly care in emergency rooms and institutional settings for as long as possible. Intel is investing in the digital home, proactive computing and other enabling technologies to help translate this vision into reality.

Aging in Place in the Digital Home

Intel has made a substantial investment in R&D to advance the concept of the digital home, in which computers and consumer electronic (CE) devices throughout the home are linked together in a wireless network. Once the digital home infrastructure is in place, any computer or CE device could also be used to deliver health and wellness applications. Older adults will be able to access these applications through whatever interfaces are most familiar to them, from phones to PCs to televisions; they will not have to learn new technology. The goal is to have a variety of interfaces distributed throughout the home, within easy reach of the person needing assistance.

Proactive Computing Applications for the Aging

Intel is exploring a variety of proactive computing applications that could assist the aging in the digital home environment. As the name suggests, proactive computing is designed to anticipate people's needs and take action to meet the needs on their behalf. The input for proactive computing applications is real-world data gathered by wireless sensors. Intel Research Berkeley is developing tiny sensors or “motes” which can be used to gather both behavioral and biological data for customized proactive health applications.

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The Continuum of Care

With each successive move along the continuum of care² (below)—from living at home through residing in a 24-hour care facility—the cost of caring for older adults escalates and their quality of life sometimes declines. Digital home technologies for aging in place can play a key role in enabling seniors to remain at a given stage in the continuum of care for as long as possible before moving to the next level.



Home

Independent
Living Apartment

Assisted Living
Facility

Skilled Nursing
Facility (SNF)

24 Hour
Care Unit

Intel's Proactive Health lab employs both social scientists who study the needs of seniors dealing with cognitive decline, cancer, and cardiovascular disease, and engineers who build home health technology prototypes to test with real families. Their current research focuses on helping people with Mild Cognitive Impairment (MCI) to remember names, faces, and past conversations with their loved ones. Through connected home technologies—a telephone with a rich visual display, a PC, and a sensor network that looks for sudden declines in social contact—the goal is to help people with MCI to stay socially engaged for as long as possible. The researchers are also exploring future versions of such “social systems” which could detect early-stage cognitive decline and perhaps reduce the estimated \$100 billion the U.S. spends annually to treat illness related to social isolation among seniors.

Researchers at Intel Research Seattle and the University of Washington have built a prototype that can infer a person's activities of daily living (ADLs). By placing sensor tags on everyday objects such as a toothbrush or coffee cup and using tag readers to track the movement of tags, we can determine, for example, whether a person has brushed his teeth or taken medication. The long-range goal is to develop computerized assistants to help seniors and their caregivers manage ADLs so that seniors' independence is compromised as little as possible.

Through the Intel Research Council, which funds university research worldwide, Intel is supporting dozens of researchers who are testing new home health and aging-in-place technologies. For example, one prototype system analyzes sensor data from drawers, medicine cabinets, pill bottles—wherever medications are stored—and delivers timely reminders via cell phone, TV, or whatever device is preferred or nearby. Two other projects: wearable wireless sensor networks that could alert caregivers to a senior's fall, and sensors in footwear which could monitor a person's gait for irregularity and prevent a crippling fall (and a costly hospital stay or premature move to a care facility). Such proactive intelligent systems could reduce U.S. healthcare costs by billions of dollars annually.

¹For some older adults, “home” may be an independent living apartment or assisted care facility. The digital home concept can be implemented in a variety of care environments.

²The American Association of Homes and Services for the Aging defines “continuum of care” as a complete range of housing, health care and supportive services for older adults. These include, but are not limited to, senior housing, assisted living, skilled nursing, and home and community-based services, such as home health care, adult day services, transportation, meals, and other programs. Few aging-services organizations provide every type of service, but many retirement communities and other organized systems of care do provide multiple levels of service for older adults and may be called continuums of care.

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Sensor networks are powerful new tools that can assist with caregiving across the continuum of care. They could be used to monitor the safety of an older adult in the home, allowing a family caregiver to take a nap or a break and ultimately, prevent burnout. The digital home network could be accessed through the Internet, enabling adult children to check in remotely to assess the well-being of an aging parent far away. Wireless sensors and mobile computing devices in skilled nursing facilities could automatically capture diagnostic and behavioral data, thus freeing an over-burdened nursing staff to spend more quality time with residents, reducing data entry errors, and providing real-time feedback to facility managers about the health of their residents, staff, and their overall facility.

The Need for a Collaborative Approach

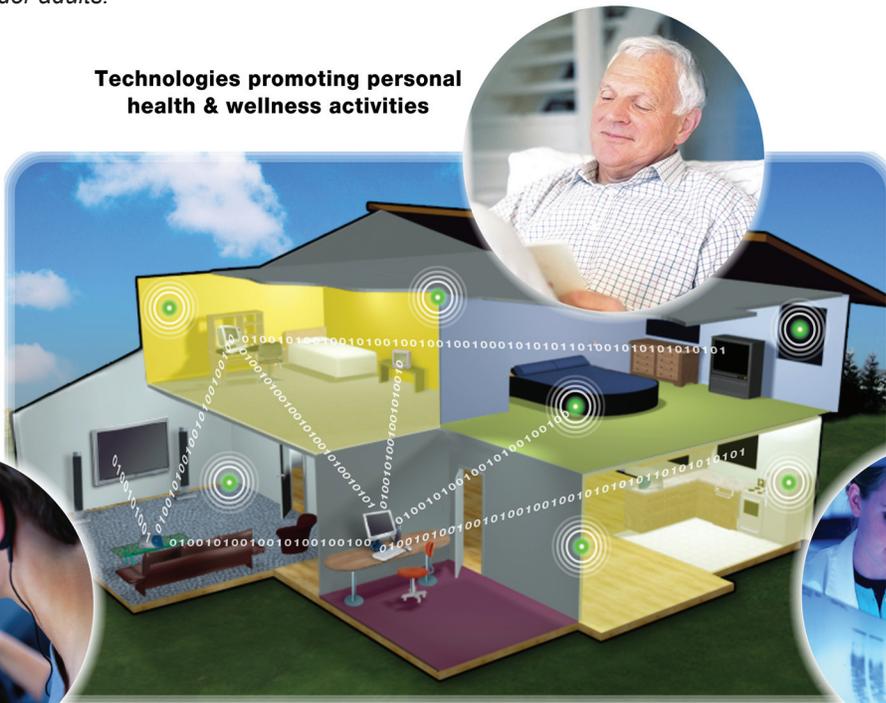
Successfully preparing for the coming age wave is a major challenge that requires a collective effort. Intel is helping to create an ecosystem of companies, universities and government agencies to address the challenge.

Intel actively participates in the Digital Home Working Group and provides resources for developing the digital home solutions through the Intel Developer Network. In collaboration with the American Association of Homes and Services for the Aging (AAHSA), Intel helped to launch the Center for Aging Services Technologies (CAST), to drive awareness and advance technologies for aging services. We also joined the Alzheimer's Association in the ETAC (Everyday Technologies for Alzheimer's Care) consortium, which is funding university grants to research home health technology for older adults experiencing cognitive decline, and their caregivers.

A variety of technologies in the digital home will enable older adults to age in place, improving the quality of their lives and reducing healthcare costs by deferring expensive institutional care. Existing telemedicine technologies can access data from the digital home network, enabling virtual exams in the home. Proactive computing technologies under research at Intel and elsewhere will reduce costs further by enabling the aging to be proactive about caring for themselves.

A network of sensors throughout the digital home will track and monitor health status and activities of older adults, providing input for proactive applications that will offer a variety of assistance, from reminders to take medications to help in completing cooking tasks and accessing social support. Seniors will access the network using a variety of familiar interfaces, such as telephones and televisions; they will not need to learn new technology to receive assistance. Such proactive systems will also enable adult children to assess the health and well-being of their aging parents remotely through private, secure Internet connections and will provide on-site caregivers with the social support they need to avoid burnout—a common problem among caregivers of older adults.

Technologies promoting personal health & wellness activities



Technologies supporting informal family & friends care network



Technologies for telemedicine—remote diagnostics and virtual physician visits

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Government Participation is Essential

The participation of the federal government is essential if we as a nation are to prepare effectively to meet the needs of an aging society. Intel urges government leaders to establish a special commission to focus the spotlight on aging services and illuminate how technology can help the nation provide for its graying population.

The age wave will place a major burden on our economy. Unless we are prepared, workforce productivity could decline sharply within a decade as a growing number of employees continually miss work to deal with eldercare emergencies. In addition, Western Europe and portions of Asia are already innovating new healthcare paradigms and usage models. Congress must address the liability concerns and reimbursement issues that are inhibiting American innovation in this arena. Without the commitment of Congress, U.S.-based companies could be left behind in what will become one of the largest technology markets to emerge over the next 30 years.

Preparing Today to Meet the Challenge of Tomorrow

Digital home technologies can play a key role in helping to meet the challenge of caring for an aging population. The digital home electronics that will be part of people's everyday lives for other purposes, such as entertainment and communication, can also be used to deliver health and wellness applications, allowing older adults to age in place and reducing U.S. healthcare costs, which have soared to more than \$1.5 trillion annually.

Intel is contributing to the development of the digital home technologies for aging in place, through R&D investments, funding of university research, participation in organizations and consortia, and by catalyzing industry, university and government players to join in a collective effort to meet the challenge. The involvement of the federal government—through funding research and breaking down obstacles to innovation—will be essential to success. By being proactive today, we can avert a public health crisis tomorrow.

For more information about Intel's role in advancing the digital home technologies for an aging society, contact Eric Dishman (eric.dishman@intel.com) or visit the following sites:

<http://intel.com/research>

<http://www.intel-research.net/berkeley/>

<http://www.intel.com/research/prohealth>

<http://www.intel-research.net/seattle/>

<http://www.intel.com/research/university/>

<http://www.agingtech.org>

<http://www.alz.org/Research/Care/>

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