Chapter 21
Optimizing Resilience in the 21st Century

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An individual's capacity to achieve, retain or regain a level of physical or emotional health after illness or loss may find support from new technologies for health care communication. Twenty-first century technologies also may fulfill additional components of resilience related to social functioning, morale, and bodily health – providing pleasurable activities and maintenance of contact with the world outside for those home or bed bound by illness or disability. Willingness to use technology may involve psychological factors such as receptivity, self-efficacy, and motivation, expressed in planning or acquisition of technologies for future needs or for future frailty.

Technologies related to health care are telehealth, electronic medical records, and telehome care. Technologies supporting independence and psychological resilience are safety monitoring and behavioral monitoring. Media applications, such as cell phones, the Wii, Facebook, and Twitter, have the potential to enhance and support social resilience. Most of these technology applications are based upon the same microprocessing chips and wireless, digital applications that have transformed worldwide communications – the way most people in the twenty-first century receive information, interact with others and carry out many tasks of daily life.

Compared to 1990, the array of technologies available for everyday activities has expanded exponentially; then, mass public access to Internet, cell phones, smart phones, Facebook, and Twitter were not contemplated. In the United States, access to broadband networks soon will be extended nationwide under Congressional mandates to the Federal Communications Commission (FCC) that every U.S. home have cost-free access to high-speed, broadband Internet service. In European countries, wide access already exists and there has been extensive governmental support for the development of technologies to assist older citizens.

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Age as a Predictor of Technology Use

Research and publications comparing computer and Internet usage of older and younger age groups have assessed elderly as resistant to technology (Charness and Boot 2009; Melenhorst et al. 2006). However, a 2007 Pew Research Center survey found 50% of Americans aged 65 and over had cell phones and that broadband use had tripled for these users between 2005 and 2008, the "biggest increase" was among those 70–75. The study suggested the aging-in of younger "Boomers" would create "access parity" . The 2009 Pew Survey showed that 38% of adults 65+ (Fox, Jones 2009; Fox, Jones 2009) use the Internet, 26% are home broadband users, and 16% access the Internet wirelessly, from computers or handheld devices (Raine 2010). The spread of wireless networks, digital phones and TV Internet access, should make Internet use "ageless."

Overcoming Accessibility Barriers

Universal accessibility principles and applications must be incorporated in cutting-edge technologies. Twenty-first century technology products should not place significant demands upon users with sensory, cognitive, and mobility/physical disabilities. Many consumers, regardless of age, have disabilities and require accommodating technologies. Stevie Wonder, a sight-impaired Motown musician, complained to the 2009 Consumer Electronics Show audience that touch screen technologies, using icons or keypads without auditory cues, disenfranchise sight-impaired users (Churchill 2009). Technologies that require voice commands and response to synthesized speech may disenfranchise the hearing impaired and those with speech difficulties or cognitive impairments. Recently, smart phone providers have recognized that mainstream consumers equally welcome large touch-screens, icons, and larger keyboards.

Privacy as a Barrier for Older Users

A recent study suggests elderly and younger people have the same concerns about privacy when accessing the Internet or using certain technologies (Beach et al. 2009). This study surveyed older, disabled, and nondisabled adults, age 65 and over, and "Baby Boomers," aged 45–64, to determine the conditions under which they would accept or reject the sharing of health information or the use of different types of technologies. Significant factors were the length of time required to learn use; the level of maintenance required, and whether the technology would improve quality of life and independent function in the community. Disabled persons were more willing to share personal health related information, if it would help them function in daily life, and more accepting of sharing and recording personal

information than those who were not disabled. Most people were willing to share this information to family and health care providers and less willing to government agencies and insurance companies, particularly driving information. Respondents preferred systems that would support, rather than replace, the need for human interactions, particularly with family and other caregivers. The study suggests that care must be taken to design systems that are intuitive and user friendly.

A 2007 AARP survey of consumers 65 and over found 93% agreed computers, Internet and Personal Emergency Response Systems, are "a good thing," but most had "limited awareness" of technologies for social communication, personal safety, health and wellness (Barrett 2008).

Technologies to Assist Resilience with Health Issues

Electronic Personal Health Records

The twenty-first century technology affecting all Americans will be the implementation of Electronic Medical Records (EMRs) by all health institutions receiving Federal funding. The 2009 American Recovery and Reinvestment Act (ARRA) required changes in regulations related to privacy and security breach notification of the Health Information Privacy and Accountability Act (HIPPA) that have impeded widespread U.S. public use of EMRs.

The 2009 Consumer Health and Informatics Conference, a collaboration of Federal agencies, explored the role of EMRs and Personal Health Records (PHRs) and how health information technologies could be used to implement preventive health behaviors to reduce disability and death due to cancer, heart disease, and diabetes (http://www.consumerhealthinformatics.org).

Project Health Design, Robert Wood Johnson Foundation (http://www.RWJF.org), produced examples of "next generation" personal health records that would promote resilience in users: (1) a computerized health record for breast cancer patients, which provides tools to integrate treatment scheduling, care planning, and evaluation of treatment options; (2) a hand held PDA, providing an electronic diary for pain and activity management to help patients and caregivers to manage medications and control chronic pain; (3) a health record that helps people with diabetes track self-care, by recording and educating about daily behaviors; and (4) a computerized, voice activated "conversational assistant" to give congestive heart failure patients a daily "check-up," with reference to established treatment guidelines (http://www.projecthealthdesign.org).

Widespread use of electronic records will depend upon changes in Federal programs, principally Medicare, to enable interstate transmission of health information and applications and reimburse for telehealth services in urban as well as rural areas. These changes will encourage acceptance by health insurers. *The New York Times* (Vance 2009) described the difficulties faced by a woman with amyotrophic lateral sclerosis (ALS), who wanted to use an iPhone, with added text-to-speech

software so that she could carry her communications tool around with her as she went about daily activities. However, Medicare will only cover costs for a computer with a 2 lb. keyboard and a 6 in. screen with non-speech functions blocked. Since the iPhone could be used for non-medical, non-illness related uses: surf the Internet, view videos or play games; it could not be approved. A private insurer was quoted that if "enough people" requested common devices for medical purposes; the company would require "evidence-based data" to support payment for such use.

Telehealth

The U.S. Veterans Administration is in the forefront of developing telehealth and electronic medical records applications through its own systems. All veterans have EMRs. Internet technology is used for daily assessment and adjustment of care for frail community resident veterans. Pilot studies demonstrated that in-home therapy delivered by interactive video teleconferencing could successfully treat deficits in the performance of Activities of Daily Living tasks. Research has proved wireless videoconferencing to be a feasible way to provide individualized therapy in the home (Hoenig et al. 2006). The Miami University Medical Center T-Care Program blends care coordination with technology to reduce health care costs, by limiting or preventing hospitalizations and emergency room visits. An automated, telephone-based, in-home messaging device provides disease specific education for self-management and health care decision-making (http://www.umteleheath.com/projects/Miami-VA).

"Motiva," a commercial telehealth product of Royal Philips Electronics, uses the home television and a broadband Internet connection as an interactive health care platform that connects patients with chronic conditions – heart failure, diabetes, and pulmonary disease – to their health care providers to monitor vital signs. It provides daily feedback on measurements and personalized interactive health education content; surveys evaluate comprehension, motivation, and self-efficacy levels of patients (http://www.medical.philips.com).

The 2007 AARP survey reported "strong support" for telemedicine, with 75% of elderly responders willing to have a cardiologist diagnose or monitor a heart condition through electronic communications (Barrett 2008). The American Telemedicine Association (ATA) has been lobbying for changes in Medicare to cover telehealth medical services and remote disease management for the 34 million beneficiaries who live in metropolitan areas (http://www.americantelemedicine.org).

Monitoring to Promote Independence and Safety

Falls are a primary cause of injuries that challenge the physical, emotional, and psychological resilience of older people. Detection of falls and safety of individuals living alone is the goal of monitoring technologies. Little research has been done on the social, psychological, or self-efficacy effects of monitoring (Blaschke et al. 2009).

With active monitoring, the user may interact in some way with the technology, e.g., pressing a button, entering data, or information. Passive monitoring is present in the individual's living environment using wireless sensors to record activity of the individual on a relatively continuous basis and send data electronically to a central site where it is analyzed by computer to monitor safety and function. With Global Positioning Satellite (GPS) technology, wireless digital devices may be accessed almost anywhere, indoors, and out. Technologies specifically to assist people with dementia and their caregivers focus on safety, security, and social interaction. The ASTRID and ENABLE projects in Europe assessed the utility of various devices for people with dementia (Astell 2005). The use of tracking and surveillance equipment associated with law enforcement has been controversial.

Personal Emergency Response Systems

Andrew S. Dibner, PhD, and Susan Dibner, PhD developed the first monitoring technology to prevent premature institutionalization of elderly living alone because of family fears. The Personal Emergency Response System (PERS), marketed in 1974, required users to press a button on a landline telephone to dial the 24-h call center, which then contacted emergency services or a family member for assistance. Technology progressed to a portable device on a pendant or a bracelet with a tiny radio transmitter that sent the signal. With digital technology, alarms are sent wirelessly from a receiving box to the call center. Dibner found "positive psychological effects" resulting from PERS use, with subscribers reporting "an increased sense of security" and "strong anxiety-reducing effects for subscribers and their families" (Dibner 1985).

Lifeline (http://www.lifelinesys.com), now part of Phillips Medical Alert Systems, a U.S. subsidiary of Phillips Electronics, is used by an estimated 750,000 people in the US and Canada. New York State enacted legislation providing for Medicaid reimbursement for patients of certified home health agencies, whose PERS substituted for hours of safety monitoring by a personal care worker as part of the plan of care (Hyer and Rudnick 1994). At least 35 states now reimburse costs of PERS services under Medicaid. Compliance is a major issue, since PERS users must wear the device or have it within reach 24/7/365. After a fall, the PERS often would be found hanging from the refrigerator door or left on the bedside table. Some elders, who fell, would not send an alarm. People with memory impairment could not remember to push the button. In 2009, the Food and Drug Administration (FDA) issued an advisory safety alert in because people were being choked when PERS on neck chains were entangled in walkers, wheel chairs and bed guardrails (Lade 2009).

Lifeline's success fostered development of similar devices and services, many associated with security alarm services. An off-the-shelf PERS, available from electronics stores, can be programmed to send an alarm directly to a family member's cell phone; however, wireless "dead zones" limit effectiveness.

Most research on PERS has collected data on small numbers of users: characteristics, false alarms, falls, or alerts for other reasons and cost savings from reduction in hospital stays and postponed institutionalization (Edlich and Haines 2009).

A mail survey of PERS consumer satisfaction, with 618 clients of Victoria Lifeline in Manitoba, Canada and their designated responders, had a 53% response rate (Fallis et al. 2007). Most subscribers were satisfied, 79% were very satisfied. Men were more likely to use the PERS alarm than women. Sixty-seven percent of subscribers summoned emergency help at least once and these users were "significantly more satisfied" than those with no emergency use. Subscribers valued the "psychological comfort and reassurance of having the service." Both subscribers and responders said PERS provided "an all-important sense of security." In a study involving the home care experience of older widows, eight women, who had PERS experience and one of more falls, were asked about having a PERS (Porter 2003). Getting help after a fall and feeling safer with the ability contact help were main interview responses, also "shock" at hearing the "strange voices" of the PERS operators responding to accidental alerts or unexpected visits from responders to alerts from PERS operators. Porter concluded: "When the older person has a PERS, it might be more of a relief to family members and health care providers than it is to the older person." Dr. Porter is preparing to publish new research that includes data on PERS and fear of falling (PorterEJ@missouri.edu).

Twenty-First Century PERS Technologies

A twenty-first century PERS is a hands-free personal emergency response and fall prevention system, developed by the Intelligent Assistive Technology and Systems Lab (IATSL), University of Toronto (http://www.ot.utoronto.ca/iatsl), with funding from the Canadian National Science and Engineering Research Council (NSERC). The goal is to free users from the need to wear an alarm-sending device or press a button for help. The system links one or more ceiling mounted "vision sensor" units containing a non-recording video camera, a microphone, speakers, a voice processor, and a smoke detector. These send signals to a Central Control Unit that tracks a person moving about the home. Data, such as the dimensions of the tracked person's silhouette and shadows, rather than video photos, are analyzed to detect in real-time if there is an emergency such as a fall. The closest sensor unit uses speech recognition technology to have a dialogue with the person in distress to determine the type of assistance needed. Computer analysis of the dialogue has been developed to quickly assess the severity of the situation through a series of simple "yes" or "no" questions. The user can command a 911 call, speak with an operator or place a call to a neighbor or family member. If the user does not respond or the system does not understand the user's responses (e.g., severe injury, stroke, or unconsciousness), then the system automatically contacts an emergency response centre to summon aid. By responding to voice commands, rather than interpreting a fall using an accelerometer or vibration device, this system can respond to different types of incapacity (Alex.Mihailidis@utoronto.ca).

Another twenty-first century PERS application for falls, called "myPHD," incorporates passive and active monitoring, software-based data analysis, and web access.

AFrame Digital, Inc. (http://www.aframedigital.com) developed the myPHD with funds from Small Business Innovation Research (SBIR) contracts from the Defense Advanced Research Projects Agency (DARPA) and the National Institute on Aging, National Institutes of Health (NIH). The myPHD is worn 24-hours a day to monitor an individual's activity, location, and physiological status in real time, indoor and outside. The goal is to be able to continuously and non-intrusively monitor individuals to prevent falls and the medical complications that follow. The analog watch is lightweight, comfortable, and available in an array of colors – attributes based upon marketing research with 160 elderly. Caregivers or care managers have a mobile touch-screen device to receive alerts and check activity and health data.

AFrame Digital's research involves collaboration with the Virginia Institute of Technology, Locomotion Research Laboratory; the CREATE project at University of South Florida, and Florida State University. Studies remotely monitor elderly individuals and test external third-party devices that communicate with the AFrame system via a wireless Bluetooth gateway, a pulse-oximeter which provides both heart rate and blood-oxygen saturation level, a weight scale, a blood-pressure cuff, and a user-friendly device for responding to a daily health questionnaire.

Passive Monitoring

Over the past 10 years, research on passive monitoring of the functioning of older individuals within their living environments has evolved into products available in the marketplace. Some monitoring applications collect information unobtrusively, requiring little interaction from the user, summoning assistance on an as-needed basis or when data indicates a need for inquiry about the individual's health or wellbeing. "Behavioral monitoring" methods, based upon data recording trends in functional behavior, hold promise for moving beyond simple emergency response to helping elderly, disabled, and frail individuals to function better in their living environments by identifying changes needing preventive intervention to maintain independence.

QuietCare (http://www.GEhealthcare.com/AgingInPlace)

The basic concepts and methods used in behavioral monitoring systems were developed, researched, and patented, principally by David Kutzik, PhD and Anthony Glascock, PhD, both of Drexel University and Behavioral Informatics, Inc. (Glascock and Kutzik 2009). Their research resulted the QuietCare product that uses a simple array of wireless heat and motion sensors, strategically placed in the home, to monitor activity in the bedroom, bathroom, living area, use of the refrigerator, and access to medication. These sensors send signals periodically to a central data center, where data are interpreted by algorithms and related to behavioral norms established upon that individual's functional behavior over time. If the data

indicate an emergency situation, such as unusual lack of activity, the possibility of a fall, environmental temperature above or below safe thresholds, a "red" alert is sent to a designated caregiver or responder. All the behavioral data are available on the Internet, through a secure access site, to care managers approved by the individual being monitored. The data array for a single time period is presented as green (normal activity), yellow (some departure from normal), or red (emergency alert) dots for each monitored activity.

For several years Charles G. Willems, Senior Staff, Zuyd University, Netherlands (c.g.m.h.willems@hszuyd.nl), has been conducting pilot research using QuietCare technology with clients of a care organization in supportive housing and living independently in the community.

The results of the pilots demonstrated that measurement of ADL activities provide a useful means to organize home care support but would require substantial changes in the way care is organized and delivered. A larger study is underway, funded by a Netherlands insurance company, to organize care in relation to data received from monitoring, particularly the intermediate, "yellow," alerts that indicate a change from usual patterns of behavior.

WellAWARE™ Systems (http://www.wellawaresystems.com)

The WellAWARE website shows how sensors are arrayed in a typical apartment to detect movement, temperature and humidity; a floor vibration sensor detects disabling falls, and bed sensors monitor sleep patterns and quality. Caregivers receive reports on behavior patterns and alerts. WellAWARE studied monitored residents in a Volunteers Of America (VOA) assisted living facility, assessing cost savings from reduction of hospitalizations, increased caregiver efficiency and reduced workload (Alwan et al. 2005; Alwan et al. 2006). The 21 residents monitored completed the Satisfaction with Quality of Life Scale (SWLS) pre and post installation of monitoring. The caregivers and facility management found the sensor data to be useful in care coordination and planning, data from residents of the memory care unit indicated nonverbal signs of pain and other behaviors.

Healthsense (http://www.healthsense.com)

The Healthsense, eNeighbor, uses tilt sensors on medicine boxes to monitor medication usage; motion detectors on walls to detect movement within rooms; contact sensors on kitchen cupboards and refrigerator doors to indicate that the resident is eating regularly; toilet sensors monitor toilet usage; pressure sensors on beds detect when a resident gets in or out of bed, and home-or-away sensors detect when the resident leaves or returns to the residence. Algorithms "predict" behavior based on a resident's habits and lifestyle; analysis of sensor data determines if the resident needs assistance and automatically issues alerts for help. A 2008 study surveyed 43 eNeighbor users in a senior residence, eight of whom had summoned emergency help, on perceived "level

of independence" as a result of having the system (Meade 2008). Being able to get help quickly if they fall or become ill was "liked best," (rating of 3.9 on a four-point Likert scale) and next was the support to live independently (3.8). Caregiver staff positively assessed the effect of eNeighbor on residents and care delivery. On the negative side, some residents were annoyed by "false alarm" calls when no activity was sensed because they were reading or sleeping. Some said they disliked wearing the device around the neck and one person said monitoring was "like Big Brother."

Technologies Supporting Social Resilience

Smart Cell Phones

"Smart" cell phones able to access the Internet and mimic computers, provide platforms for resilience supportive applications, such as exercise, reminders, calls for help, contact with family and caregivers. Major providers now market phones with larger keypads, touch screens, icons, and other attributes more "friendly" to older users. The simple, low-cost "Jitterbug," (http://www.jitterbug.com), designed specifically to meet the needs of older consumers, offers 24-hour "live, registered nurses" to answer health questions. The twenty-first century smart phones will have biomedical/physical functioning supports, such as blood pressure monitoring, pulse, blood glucose and pulse-oxygen. Users of the "Seri Virtual Personal Assistant" (http://www.siri.com) will speak or write requests directly into the hand-held device.

Social Connectedness

The impact of technology on social relationships has primarily focused on young consumers and the dizzying speed with which new networking technologies have been introduced has not given time for research. However, media reports provide useful indicators that older consumers find social benefits from new technologies.

In a recent wedding announcement (Weddings/Celebrations Section, The New York Times, Sunday Styles, December 6, 2009, page 18), the bride, 71, and groom, 75, described how they carried on their "old-fashioned courtship" by e-mail.

Eric A.Taub, Personal Tech Editor for *The New York Times*, illustrated the social power of technology with a story about his 100-year-old Mother. In her last days of life, she expressed regret at not being able to see her family in California. Taub connected his computer with a web cam and used iChat to enable his Mother to see and speak with her great-grand children (Taub 2009).

The Nintendo Wii has become a staple for activities in U.S. senior programs, stimulating inter-center sports competitions via the Internet. In October 2009, the National Senior League, 182 teams in 102 senior living communities, launched an online Wii bowling section to track scores and determine division and national

champions (http://www.nslgames.com). The Health Games Research project (http://www.healthgames.org), University of California, Santa Barbara (http://www.isber.ucsb.edu) funds research on interactive games to improve health, cognition, mobility/balance, and social networking of elderly. North Carolina State University (gainsthroughgaming.org) and Georgia Institute of Technology (http://www.gatech.edu), are studying the cognitive effects of the Wii and video games.

The "Eons" Internet site (http://www.eons.com) targets Boomers and seniors, offering brain fitness and other games, special interest communities and updates via Twitter. Nielsen, December 10, 2009, reported a survey of on-line destinations of users over 65. In the previous 30 days, Google Search was the No. 1 online destination, with 10.3 million unique visitors, second was Windows Media Player, 8.2 million, and Facebook was third, 7.9 million visitors (http://blog.nielsen.com/nielsenwire). In 2008, a *Neilsen* survey of the same age group ranked, Facebook, No. 45. In 2009, VibrantNation.com, an online site for mature women received on-line responses from 20,000 women, aged 50 and over, 63% owned an iPod or other MP3 player, and 30% used Skype (Reily 2009).

Social Networking and Activities

It'sNever2Late (IN2L) (http://www.in2l.com), a touch-screen computer and Internet technology, enables older adults to communicate with family members and participate in stimulating activities. Mather LifeWays Institute on Aging is conducting a case-control study evaluating the use of IN2L. "Resilience" is defined as a personality resource, evidenced by self-confidence, self-efficacy, and intellectual capabilities. Preliminary statistics show 43% of participants engaged in learning at least once a week, 41% in mind exercises, 41% in communication, 36% in communication with families and others, 34% in hobbies, but less than 10% in physical exercise. Over 21% participated in TV games, the most popular activity. Staff reported that IN2L activities increased interactions and relationships among residents, staff, and resident families; 70% reported staff learned more about residents and 50% said elders were interacting more with staff and had improved relationships. Significant differences were found between residents classified as "low resilience" compared to those with "high resilience." Among high resilience residents, 31% reported "very good or excellent" health and 58% were rated as "more active"; compared to the low resilience residents, 65% of whom reported "fair or poor" health and 75% were rated as less active (Hollinger-Smith 2009).

Technology Use in Resilience Supportive Communities

To provide examples of how twenty-first century technologies can be used to create "resilience supportive" communities, Mary H. Parker, PhD, interviewed staff and residents of Selfhelp Community Services, Inc., New York, NY (http://www.self-

help.net) and Lutheran Life Communities, Arlington Heights, IL, http://www.lutheranlifecommunities.org (Parker 2009).

Selfhelp Community Services

Established in 1936 to assist holocaust survivors, Selfhelp has taken an active approach to the integration of technologies into its services. Leo M. Asen, Vice President, Senior Communities, said that the Selfhelp Board and executive management made a conscious decision to incorporate technology in the "way it does business" providing services and programs for residents in senior housing and other community programs. Selfhelp annually serves over 20,000 aging, frail, and at-risk New York City residents. Selfhelp operates 6 senior facilities housing over 1,000 older people of many nationalities. It has four programs in housing facilities that have become Naturally Occurring Retirement Communities (NORCs), six senior activity centers, an adult daycare program for people with Alzheimer's disease, several homecare programs and three case management programs.

Since 1996, Selfhelp has placed over 80 QuietCare passive monitoring units; at present over 30 clients have monitoring. New monitoring clients are also issued a personal emergency response (PERS) to enable them to send their own alerts for help. Two women in their 90's, who have received passive monitoring and case management for several years, said monitoring was their choice and enabled them to live alone, feel confident and safe alone. One woman said that she had lived alone for many years, but felt "more secure" with the monitoring, which also gave her sons "peace of mind." By telephone, her son, who was vacationing over 100 miles distant, said he had checked his computer that morning and noted his Mother was up, breakfasted, and moving around her apartment. The other woman, who had a history of falls, said she felt "confident" in her ability to live alone with monitoring. Her son said prior to monitoring he made frequent daily phone calls to his Mother and, if she did not answer the phone, he would drive to her apartment to see if she was OK. Both women said that with monitoring, family members are less concerned about them living alone. One woman said: "Now, I ask about their health."

Under a grant from the New York State Department of Health, Selfhelp's Medicare-certified home health agency offers telehealth-monitoring of blood pressure, weight, and glucose to elderly with chronic disease. A 30-day, 1–3 daily dosage medication dispenser provides reminders and notification to caregivers of missed doses.

Selfhelp is extremely supportive of computer use by residents and other program participants; training is provided by a professional instructor. A wireless hotspot is at one senior center and residents use computers located in some of the residential facility lobbies. Touch-screen computer terminals are in several locations, so seniors can drop by either daily or several times a week to exercise memory skills with "brain fitness" programs. The Nintendo Wii provides exercise and socialization within the senior centers; bowling and similar sports are most popular.

A "virtual" senior center is being developed using the ItsNever2Late platform to enable residents and community clients, who can no longer easily leave their homes, to participate by Internet in senior center programming. Selfhelp is constructing a residential "smart" building, equipped to handle current and future technology applications.

Lutheran Life Communities

The Arlington Heights, IL, campus has over 1,300 clients in independent and assisted living and the three levels within its memory support program, with 24-hour nursing, Medicare-certified skilled nursing and rehabilitation therapy. Residents in assisted living and independent living have PERS services.

Using ItsNever2Late, residents engage in activities, such as a simulated bicycle ride led by one resident, with a controller and "pedals," followed by residents, "pedaling" themselves on a "virtual ride" down a country road. Staff training fostered greater use of IN2L in programming for residents and as a rehabilitation and therapeutic tool. A work group of therapists, trained by IN2L, developed a manual identifying specific therapeutic uses, such as individuals needing cognitive stimulation may use a computer game to stimulate memory or a word game as part of speech therapy. The height of the computer can be adjusted for standing balance and functional reach therapy, using simulated driving, tic-tac-toe, or another game for restorative therapy.

Activities Directors use both IN2L and Wii activities. Several residents have used the IN2L touch screen to teach staff how to play games like bridge and poker. A new resident, became more involved when a nurse aide brought up the real estate listing of her former home on the computer and showed her how it was being marketed. The staff has started to develop resident life stories; all residents will have their own page, identified by an icon, showing their selected photos and information about their life experiences. The WII is used primarily for programs such as golf and bowling, something that residents enjoy from earlier life activities, providing exercise even in winter.

Organizations Funding Research on Technology

Only when beneficial technologies leave the laboratory, are tested with real users and enter the market can Americans benefit. The lack of evidence-based research is a major impediment to widespread adoption or adaptation of generally available technologies for resilience-related needs of elderly. U.S investors require proof of marketability and return on investment, rather than evidence of efficacy to finance new market entries. Research is needed to create the evidence base for ways technologies support the resilient abilities of users, improving well-being and quality of life.

The Robert Wood Johnson Foundation (rwjf.org) Pioneer research projects have explored resilience-related benefits from Personal Health Records and digital games. The INTEL Corporation employs social science researchers to understand the ways elderly would use technology to deal with daily needs and activities and also provides grants to university research (http://www.intel.com/healthcare/research). The Alzheimer's Association and INTEL collaborate in the Everyday Technologies for Alzheimer Care (ETAC) grants to develop new technologies to assist people with dementia (Dishman and Carrillo 2007). The Center for Technology and Aging, Oakland, CA (http://www.techandaging.org) provides grants to support the diffusion of technologies that assist in the care of chronic conditions and improve the independence of older adults. Many Federal agencies fund Small Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR) grants and contracts for new technologies and products directed to meeting needs of older and disabled people.

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