Successful Aging: Using Information Technology to Enhance the Lives of Older Adults

By

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According to the 2007 State of Aging report from the US Centers of Disease Control and Prevention (CDC), the population growth of older adults today is unprecedented in American history. Experts agree that the growth is due in part to medical advances that have dramatically changed the landscape of aging in America. Today, chronic diseases have replaced infectious diseases and acute illness as the leading causes of death. In fact, some 80 percent of older adults are believed to have at least one chronic or degenerative disease. The report cites two forces – a longer lifespan and the maturing of the 77 million babyboomers – that will result in the doubling of the population of Americans 65 years and older by 2030. This dramatic change is also expected to raise existing healthcare costs by 25 percent. These factors are bringing attention to the capabilities of aging services in America. The impetus is strong to mitigate factors contributing to age-related, debilitating diseases such as heart disease, diabetes and cancer and in turn to achieve a better quality of life through healthier aging options. Community-based intervention models have achieved some success in addressing these concerns. But, as the aging population continues to grow, opportunities are emerging to integrate information technology in the approach to maximize the ability to age successfully, including opportunities to promote independence and quality of life.

Defining Successful Aging

Understanding the complex nature of aging has been an increasing focus of research as the average life expectancy of Americans has continued to grow from age 47 in 1900 to age 77 in 2001 (National Center for Health Statistics, 2007). A key study

conducted by the UCLA Center on Aging concluded that there are three main impact areas on successful aging:

--high level of engagement with life

--low risk of disease

--high physical and cognitive function levels

Researchers in the study followed 1189 adults ages 70-79, finding that even those with chronic health conditions found protective benefits from exercise and socialization (Seeman, 1996). Those subjects that participated in social programs also demonstrated a lower rate of physical decline. Other published literature, including The Encyclopedia of Aging: A Comprehensive Resource on Geriatrics and Gerontology, concluded that successful aging is a combination of longevity, health/lack of disability and life satisfaction (Palmore, 1995). Although promoting good health is an important part of a good quality of life, experts maintain that successful aging can occur despite physical limitations or illness (Kane, 2003). Each of these conclusions stems from years of theory and research on what it means to age in America.

In the 1960s, popular theorists such as Cummings and Henry publicized the "disengagement theory," promoting the perception that social withdrawal is a natural function of aging, related to increased mobility challenges and capabilities. Since this isolation and decreased activity was believed to be a normal part of aging, little effort was made to accommodate the changing needs of older adults. In the 1970s, perceptions about the capabilities of older adults moved toward a new "continuity theory." This theory purported that older adults age most successfully when they carry on habits, preferences and lifestyles into old age (Atchley, 1972). Into the 1980s, a new movement

emerged to maximize independence, which was key to prioritizing resources that would allow older adults to remain in the community. However, in the 1990s, studies from the American Federation for Aging Research and others promoted the goal of not only advocating for longer life, but for longer years of "active life expectancy." This key finding laid the foundation for the shared belief that quality of years, rather than quantity of years, should be the standard for how successful aging is measured.

Still, the definition of successful aging remains to some extent subjective. In a 2006 study published in the *Journal of the American Geriatrics Society*, more than 1100 older adults were surveyed about 20 perceived attributes of successful aging. In this study, 95 percent of participants rated having good health and being able to take care of oneself until close to death as the most important aspects of successful aging. Other top attributes included having close connections with family or friends (90 percent) and being able to make their own decisions about health, including diet and exercise choices (92 percent). Based on this research, the study authors concluded that successful aging includes a broad array of dimensions, including sense of value and culture, as well as physical, functional and psychological health (Matsubayashi, Ishine, Wada and Okumiya, 2006).

Regardless of the varying definitions, major organizations including CDC, AARP and National Council on Aging (NCOA) have identified successful aging as a national priority, working to increase the numbers of older adults with longer, high-quality and independent lives.

Barriers to Successful Aging

While successful aging is not synonymous with perfect health, quality of life is certainly correlated with access to health, recreation and social support systems. In its multi-year policy publication, the AARP policy institute found in its 2005 "Report on the Livable Communities: Creating Environments for Successful Aging," that the modern community design is in many ways incompatible with the needs of aging adults. Modern homes, for example, are often not equipped with the safety features needed by older adults. While 42 percent of women age 75 or older cannot stand for more than 15 minutes at a time (NCOA, 2004), many modern homes today are multi-level and do not have bedrooms or full bathrooms available without climbing stairs. Most bathrooms do not include handrails or cannot easily accommodate wheelchairs or walkers. This is particularly concerning because falls are such a major concern for older adults. In fact, falls accounted for 1.8 million visits to the emergency room by seniors in 2004 (CDC, 2007). Further, the fear of falling, especially after experiencing a trauma related to falling, can lead to a decline in physical and social function and increase the likelihood of nursing home admission (CDC, 2007). The physical design of homes, then, inherently predisposes older adults to limited years of independent living without significant modification. Homes that will not accommodate the changing physical needs of older adults could also result in isolation from community and social support systems.

Disengagement from the community can also put older adults at greater risk for health conditions, including depression. Studies show that social isolation as well as physical disability associated with age plays an important role in the onset of depressive symptoms (Huppert, 2000). Further, depression is more likely to affect older adults who

are forced to move into a residential care setting. While some five to ten percent of community dwelling adults are affected by depression, that number rises to 15 to 30 percent of older adults living in long-term care facilities (NCOA, 2004). Depression is also a significant concern because its insidious nature has been shown to interfere with activities of daily living more than many other health conditions, including diabetes, angina, lung problems or back ailments (NCOA, 2004).

Additionally, the AARP report identifies a lack of public transportation and mobility as a barrier to successful aging. In a time when communities are rapidly sprawling beyond city centers, transportation by car is in many cases required to access social opportunities, to participate in recreational activities and to receive health care or medical treatment. As adults begin to experience changes in vision, hearing or memory and are unable to drive, the loss of personal transportation translates into a significant loss of independence. Lack of transportation alternatives exclude seniors from the community, preventing them from continuing activities of their lives independently, such as working, volunteering, shopping, banking or pursuing personal or cultural interests. The AARP report concludes that adults who feel engaged with the community are more likely to report high levels of self-control, life satisfaction and quality of life.

Another major barrier to successful aging is cost – cost of care, cost of living and burden on the system for supporting increasing health demands of older adults. An estimated 95 percent of health expenditures today are for chronic disease management. Providing care for older Americans costs between three and five times as much as someone younger than 65 years of age (CDC, 2007). Public health programs focused on reducing the risk and impact of these diseases are needed to ease this economic burden.

For seniors as well, the cost of moving into assisted living or nursing homes is a significant demand on financial resources in a time when many have retired and are on restricted spending plans. Clearly, helping older adults remain in the community as long as possible is beneficial, not just to the adults in question, but to those around them.

If the prevalence of chronic disease is expected to grow, then a greater focus on primary prevention is key to enhancing opportunities to age successfully. Though the barriers are complex, many experts believe that new challenges in meeting needs of older adults are not insurmountable, but may simply require innovative thinking. Expert analysts suggest that growing demands for chronic care require expansion and diversification of points of service (Kane, 2003). Others suggest that empowering seniors to become effective self managers is the key to controlling the burden of disease. In either case, prioritizing the needs and capabilities of this population is an important part of the equation and information technology holds tremendous potential in bridging the gap in aging services.

Opportunities for Information Technology in Improving Aging

In 2000, the National Telecommunications and Information Administration (NTIA) released its report on "Falling through the Net: Toward Digital Inclusion." The report measures connectivity in American households in terms of telephone, computer and Internet usage. The data revealed that although technology penetration has increased across every demographic group since the mid 1990s, differences in connectivity have created what they term a "digital divide" in technology access. Lower income households, people of color, individuals with less than a high school education and adults

over the age of 65 are less likely to have access to computers and the Internet. This is particularly concerning given the increased use of technology for health purposes. Disparities in access to any health services provided through technology may very well exacerbate broader access issues for seniors and other marginalized groups. But, older users of technology are on the rise. According to National Center for Health Statistics, in 2004, 79 percent of Internet consumers in the US – or 95 million people -- searched for health information online. Of these, 82 percent of users between the ages of 50-64 and 66 percent of users 65 and over used the Web to find health information. Despite the myth that older adults do not use computers, experts say that adults over the age of 55 are one of the fastest growing home computer user populations (Hoffman-Goetz, Friedman and Celestine, 2006). Additionally, adults over the age of 65 have consistently demonstrated the highest usage rate of telephones of any population. Some 96 percent of seniors have telephones in their homes (NTIA 2000). Indeed, contrary to stereotype, older adults are not resistant to technology, but in fact seek it to feel connected not only with children and grandchildren – for whom technology is an integral part of life – but also to feel included in the modern world (Irizarry, Downing and West, 2002), especially as their abilities to physically seek out these opportunities diminish with age. Information technology in many ways provides that opportunity to extend the reach of older adults to maintain social and community ties. Additionally, adults ages 35-55 have the highest PC penetration of any group (NTIA 2000), which underscores the future potential of computer-based interventions with maturing babyboomers.

In spite of access issues, technology offers some unique advantages to the older adult population. Many experts suggest that technology resources are particularly well

suited to addressing the chronic care dilemma (Kaufman, Pevzner, Hilliman, Weinstock, Teresi and Starren, 2006). For isolated older adults, technology offers long-distance opportunities to encourage clinician-patient interactions and can promote meaningful continuity of care (Neafsey, Strickland, Shellman and Chartier, 2002). Some studies have found that interactive, computer-based programs provide more opportunities to assess knowledge deficits and skills and to tailor programs to enhance risk reduction for various chronic diseases. Research has shown that the use of the Internet to educate older cancer patients was associated with increased social support and decreased loneliness and depression (Hoffman-Goetz et al., 2006). Others have found that technology can enhance a patient's sense of control in decision-making, self-efficacy and self-management of health conditions. Technology facilitates an effective self-management approach, which includes working with the population to set reasonable goals and solve problems and at the same time to connect with a supportive peer network (NCOA, 2004).

Other advantages of using technology for health education is the ability to offer an interactive experience, to ensure broad access to information and to be able to revise and update information as it changes (Neafsey et al., 2002). Publishing printed brochures or pamphlets is helpful, but dissemination is often limited by cost and community boundaries. Information technology not only expands the boundaries of dissemination, but also the opportunity to customize information for particular audiences, tailoring information for specific age and ethnic groups in a cost-effective way.

If social isolation, dependence issues and mobility challenges are a prevailing concern for older adults, then assistive technology and computers can be of particular benefit. A 2003 study funded by the US Department of Commerce allowed researchers

at the University of Tennessee to launch a project called CHIPs – Computers for Homebound and Isolated People. The program equipped older adults from all different socioeconomic backgrounds with a computer in addition to training them on e-mail and Internet use. The intervention group included several people with a wide range of disabilities from stroke and diabetes to thyroid disease and cancer. Outcomes from this study and others confirmed that access to computers and the Internet had a positive impact on life conditions for older adults. Respondents stated that they felt they were able to regain some aspects of their earlier lifestyle. Issues with illegible handwriting, finding opportunities for home-based employment, shopping and banking were enhanced through access to computers. Online connectivity was also shown to be a motivator for social engagement, even when a disability was present. Participants also reported better contact with home health agencies, increased self-sufficiency in ordering prescriptions online and better access to information on health benefits and government-based programs (Bradley and Poppen, 2003) because of their improved access to computer-based resources.

For management of risk reduction and disease management programs, telehealth services also offer several unique advantages for older adults. Telehealth programs provide medical care, health education and ongoing support through computer, video, audio and other electronic media. Studies have shown that telehealth programs can be more time efficient, more convenient, less costly and better accepted by older patients (McCabe, Copeland, Sholl and Dictson, 2001). Cost-effectiveness is further enhanced by eliminating the need for travel. Because of transportation and mobility barriers for seniors, reducing travel promotes access to services, patient safety and can make the

consultation with a clinician less intimidating because it is provided in the comfort of one's own home (McCabe et al, 2001).

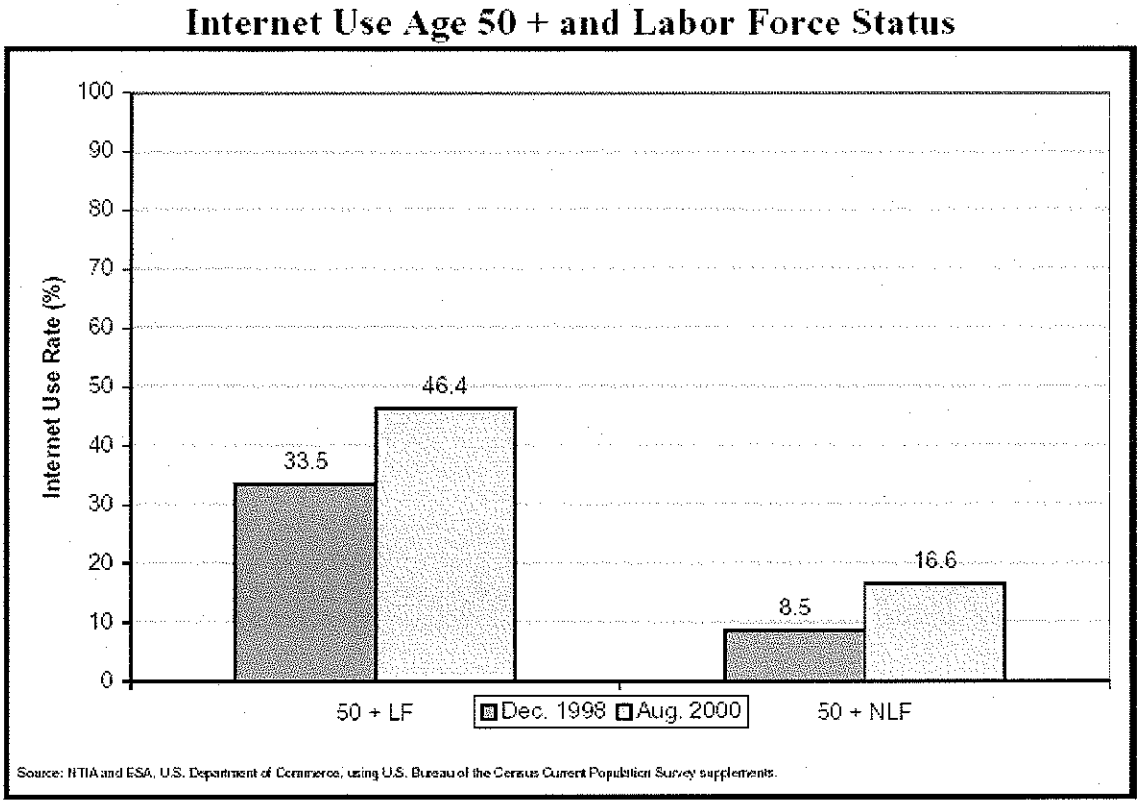
With an emphasis on successful aging, including maintaining residency of older adults in the community, it is of critical importance that older people have the knowledge, competence and confidence to take advantage of technologies to advance health, independence, safety and well-being. Mechanisms to overcome barriers to using technology are a critical part of that approach.

Considerations for Overcoming the Digital Divide in Health Programs

In evaluating the causes of decreased connectivity in older adults, the NTIA identified several trends. One important factor is whether or not the person over 50 is still in the workforce. According to the NTIA survey, adults over age 50 that are in the workforce are three times more likely to be active users of the Internet than people of the same age who are not in the workforce. Workforce participation also affects the differences in connectivity by gender for individuals age 50 and older. In August 2000, men (46 percent) and women (47 percent) who were still in the work force were equally likely to be Internet users. However, men (18 percent) had higher Internet use rates than women (16 percent) for those who did not work. This gender difference may result from higher previous workforce participation by men relative to women in this age group and from the larger number of women relative to men who are over 70 years old.

Having a computer in the household is clear to promoting access to the Internet and other computer-based resources. NTIA reports that only 26 percent of older adults have a computer at home. In some cases, access provided through community centers

and public libraries has addressed this need. However, even with access to community centers, adults over 55 still have the lowest rate of Internet usage (NTIA, 2000).



Source: National Technology and Information Administration, 2000

Technology based health interventions will need to address ways to promote continuous access to computers, even when not available through work or the household.

Researchers have also identified issues related to perceptions and physical barriers to accessing technology. In a 2006 study in the *Journal of Consumer Health on the Internet*, the authors determined that for some adults, it is simply the cost of owning a computer and paying for Internet access that keeps them from actively participating the way they may have when they were in the workforce. For others, they may have negative attitudes about the perceived difficulty of using the equipment or simply lack the skills to

use the technology. Of course, some older adults may have physical limitations, such as visual, auditory or cognitive changes that make effective use of technology difficult (Hoffman-Goetz et al., 2006). Although the risk of exclusion from technologies is higher for all older people, people with English as a second language and those who are geographically isolated or disabled are less likely to seek out opportunities to learn to use computers (Irizarry et al., 2002). This is due in part to the structure of mainstream training programs that exclude seniors by requiring long-distance travel, not serving rural areas or by conducting training in only one language. But, programs designed to teach new computer skills have been successfully implemented to overcome these barriers. In the 2006 study, it was found that through a series of hands-on training workshops, 80 percent of the participants, aged 50-75, noted improved self-efficacy in their skills to use the Internet to find health information of interest. Effective training programs, then, need to be flexible and accommodating to the individual needs and abilities of older users. The potential to leverage training programs through public libraries and other points of service to promote access to technology has garnered interest of major stakeholders in health care, including the federal government.

Government Programs to Promote Successful Aging through Technology

Due to the growing body of evidence supporting the efficiency and effectiveness of technology in supporting the health needs of older adults, the Centers for Medicare and Medicaid funded a demonstration project to assist in the clinical management of diabetes symptoms. The project known as IDEATel – Informatics for Diabetes Education and Telemedicine – began in 2000 and lasted for eight years. The program engaged more

than 2,000 participants through multiple sites, including Columbia University, New York Presbyterian and several other institutions in the New York area. The program used an intervention designed to support self-monitoring and electronic upload of finger-stick glucose measurements and blood pressure, synchronous videoconferencing for monthly one-hour video visits with nurses, secure electronic messaging and Web access to educational materials. Though previous programs had used each of these methods alone, the services had never been integrated into one intervention. This allowed the program to engage older adults as partners in their own care by having access to their own test results, keeping in regular contact with health professionals and receiving more information about their condition through improved Web access. Subjects were directed to a modified Web page of the American Diabetes Association, specifically designed to be accessible for varying levels of health and computer literacy. A small select sample of users were also engaged in a targeted training study in their homes. These individuals were coached on various facets of the system in a four part training program customized to individuals needs. Some challenges identified in this training study included difficulty in using equipment that required fine motor skills and lower rates of access of follow up education materials. Authors proposed to use touch screen technology to overcome difficulties with the stylus and keyboard and to tailor training and Web tools to promote follow up education in future iterations of the project.

While initial data shows that users of IDEATel have faced some challenges, the overall result shows enormous promise for larger scale programs. Patients in the IDEATel project were very receptive to technology, particularly appreciating the opportunity to interact with clinicians via video technology. Further, the study found that

access to home-based technology was correlated with positive results in timely reporting of glucose and blood pressure readings (Kaufman et al, 2006). This result confirms the previous supposition that technology can promote meaningful continuity of care and that enabling older adults to be effective self managers is part of effective health delivery.

The National Libraries of Medicine (NLM) has also led the way in promoting access to information technology for older adults. A search on PubMed literature revealed nearly 22,000 articles containing consumer health information. With the magnitude of health information, strong leadership and program direction is needed to help older adults access authoritative and reliable information about health conditions.

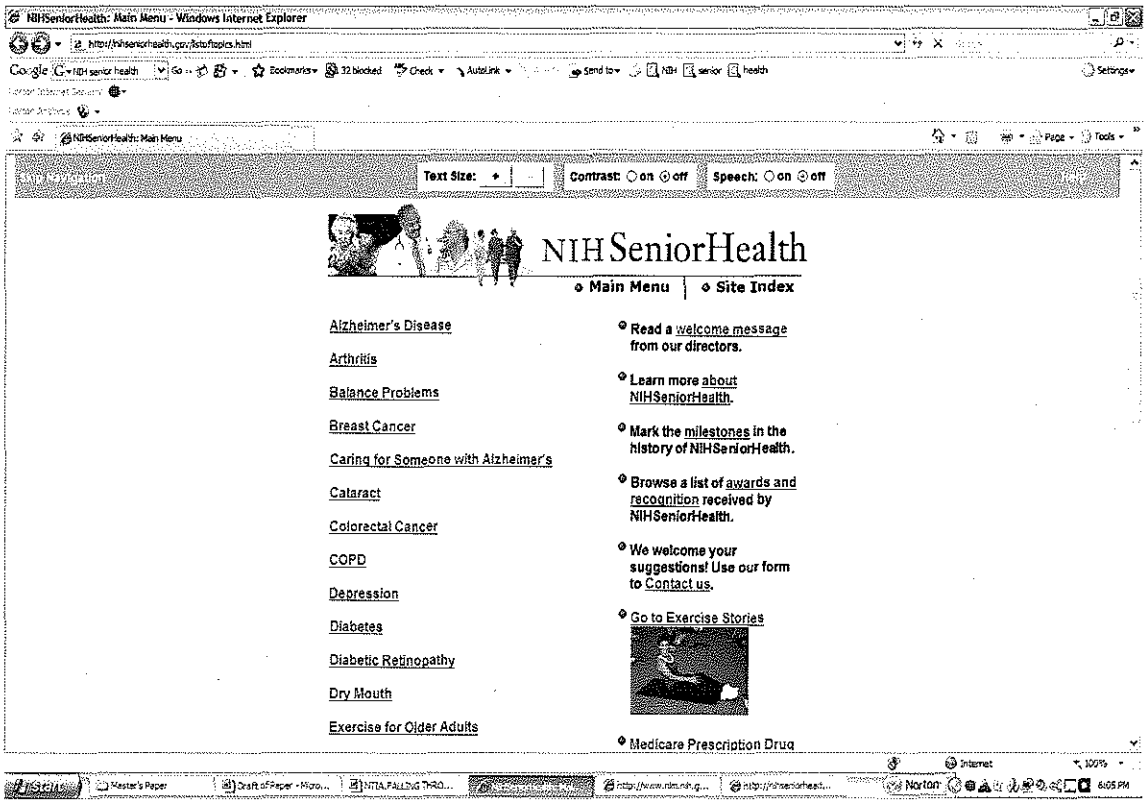
The NLM has worked to improve reliable access by seniors in part by funding expansion of community-based projects. One such project was orchestrated through the Pacific College of Oriental Medicine (PCOM) in San Diego, California, in 2004. The PCOM library program evolved into 12-month program that included multiple community sites – including churches, community centers and public libraries – and focused on skill building in relation to identification of evidenced-based health information online. The workshops focused primarily on Medline but also included skills for searching for health information through accepted government-based resources, like the National Center for Complementary and Alternative Medicine, to find valid information about evidence-based treatments. Additionally, PCOM offered its own digital library with access to full-text articles, catalogs and online tutorials for helping seniors take advantage of different services.

The study's authors reported that some 3,500 people participated in the integrated library information service. Though some difficulty was experienced in implementing

classes in churches without wireless technology, modifications were made to make the technology flexible enough to engage participants (Broering, Chauncey and Gomes, 2006). The program also was affected by the digital divide, in that access issues to a home computer prevented some participants from carrying forward skills. However, PCOM's program raised awareness of public libraries as resources not just for computers but also for technical assistance in using technology. This project and its findings are particularly important to the query of how to age successfully because satisfaction with the integrity of Internet information has been correlated with improved quality of life, increased confidence and lower anxiety about health (Hoffman-Goetz et al., 2006).

In addition to teaching seniors how to use computers and the Internet, the government has also taken a leadership role in providing senior-centered Web sites that

Image of NIHSeniorHealth.gov Website (http://www.nihseniorhealth.gov)



offer a central location for health information about the top health concerns. In 2003, the National Institutes of Health, the National Institute of Aging and the National Libraries of Medicines partnered to launch NIHSeniorHealth.gov (see image). The Web site includes easy-to-find information for older adults about 31 key health topics organized alphabetically, from Alzheimer's to Taking Medication. The innovative design also includes specialized features to accommodate the unique visual and cognitive changes experienced by older adults in using the technology. For example, the welcome page offers multiple options for the user to adjust font size, contrast and to opt for voiceover audio of text as desired. These innovations earned the NIH the 2004 Industry Innovator Award from the International Council on Active Aging. Among seniors, usership has been high. An estimated 40,000 people visit the Web site each month, initiating approximately 500,000 page views online (International Council on Active Aging, 2005).

Fashioning technologies to be inclusive of the needs and interests of older adults has created a need for evidence-based practices in designing health technologies. Based on its research and experiences, the NIH released a checklist for effective Web design for older adults. These include recommendations for:

- Designing Readable Web Sites – Making sure to use simple type faces, large font size and bolded text along with appropriate colors and backgrounds
- Presenting Information to Seniors Online -- Includes tips for using active voice, simple phrasing, avoiding and/or defining technical terms and providing a clear and consistent organization

- Incorporating Other Media – Taking advantage of video, audio, photographs and illustrations to enhance comprehension and overcome disabilities
- Increasing Ease of Navigation – Implementing single-click interactivity, ability to move easily between pages, imbedding hyperlinked material and eliminating auto scrolling and other functions that can disorient older users.

(Source: Making Your Web Site Senior Friendly: A Checklist. Available at http://www.nihseniorhealth.gov).

Like the many other programs discussed for older adults, providing support and technical assistance is also essential to empowering seniors to use this kind of resource. Equipping Web sites and Web-based programs with telephone support lines is critical to effectively reaching the target population.

Blended Program Models

According to the National Council on Aging, research shows that people have great success adopting healthy behaviors if they have connections to a variety of resources, in the community and beyond (NCOA, 2000). Although technology interventions are still in their infancy, opportunities exist to fortify current community models with information technology resources.

Through a grant from The Robert Wood Johnson Foundation, the Center for Home Care Policy and Research, part of the Visiting Nurse Service of New York, launched a four year survey of 17 American communities in 1999. The survey evaluated senior-friendly community resources and programs and released a report in 2003,

identifying best practice programs in supporting health, well-being and independence of older people. Some of the criteria for best program models include program variety, opportunities for social engagement, measurability, appropriateness of programs to functional level of participants and creative use of resources.

One example is the Just1Call program based in Mecklenburg County, North Carolina. Just1Call is a free, one-way call for access to information and counsel about social and support services for older and disabled adults in the community. The service also provides a 24-hour hotline staffed by professional social workers 24 hours a day. The program additionally provides a Website offering a comprehensive database of area services and a follow up services to ensure that callers received the information they needed and were able to follow through in the pursuit of those services. In its first four months of operation, Just1Call received 2400 calls and made almost 7,000 referrals to some 500 agencies in the Mecklenburg County, North Carolina area. Based on input from users and potential users, program planners determined that some of the program's success could be attributed to a preference by older people to have assistance from a live person in navigating resources. Designers also did not rely on prepackaged software in implementing their program, but instead sought input and customized the design of their services based on the preferences of older people in the community (Center for Home Care Policy and Research, 2003).

Mather Café Plus is an innovative new resource offered to seniors by Chicago-based Mather Lifeways. The concept is overcome the feeling of exclusion from the community by offering a hip hang out for older adults. The cafes featured healthy culinary choices as well as opportunities to take advantage of programs and services that

enhance the independence and life satisfaction of older adults. Class offerings include information assistance, clinical consultation, social opportunities and computer skills classes. More than 2,800 people have taken classes at the three cafes in Northwestern Chicago. Some 80 percent of these participants – ranging in age from 55 to 90 -- have completed four levels of skills-based computer classes. Program planners chose café sites by analyzing neighborhoods to determine where older adults spend their time and how they get there. They also actively engaged older adults in planning the look, feel and services of the facility. This involvement has created a sense of ownership and belonging in the community and even attracted younger patrons, creating a new place for intergenerational communication (Center for Home Care Policy and Research, 2003).

While Just1Call and Mather Café Plus rely on some action of the older adult in receiving services, the Gatekeeper Program of Multnomah County, Oregon, engages the entire community in recognizing and accommodating the needs of older adults living in the community. Gatekeeper trains employees of community-based businesses to recognize when an older person needs assistance and to call their agency for a referral. Typical calls take approximately five minutes and are coordinated through the Aging and Disability Services Department of Metropolitan Portland.

Finally, the Independent Transportation Network (ITN) of Westbrook, Maine, seeks to address the mobility challenges of older adults by providing an attractive service that will preserve the independence of older adults while recognizing safety concerns of having seniors behind the wheel. Using innovative computer software to coordinate trips, ITN is able to map routes, provide a computer-based accounting system for transportations costs and a call ahead service to reserve car trips to medical appointments,

the grocery store or to social outings. With the limited range of public transportation options in the Portland, Maine, area, a program like this is a significant benefit to seniors attempting to carry on the lifestyle they had when they could drive an automobile (Center for Home Care Policy and Research, 2003).

Conclusion

Aging successfully in America is a challenging endeavor for a healthy person. There are physical barriers (such as home or community design and transportation systems), there are perceived barriers (including low self-efficacy and fear affiliated with aging) and there are also significant social barriers. These may include reduced opportunities for social networks and recreation or even loss of connection to families and friends. Compounded by high rates of disease and disability, life in today's world is in many ways inhospitable to older adults.

Information technology is one avenue of innovation that has the potential to level the playing field for older adults in participating in their communities. It can eliminate barriers related to transportation or mobility. It can enable even a very weak person to seek out social or clinical support, communicate with loved ones and perform routine activities of life like shopping and banking. While the pool of evidence about the effectiveness of telehealth and health education interventions is still developing, there is compelling work that shows the ways that these added media can revolutionize the accessibility of care and increase participation levels of older adults as partners in this care.

More investigation is needed to study access to technology for older adults and to design widespread skill-building programs for this population. Healthcare providers and community educators also need to be engaged in leveraging appropriate information technology interventions. But, the cost and care outcomes of technology-based interventions indicate that flexibility, understanding of geriatric health needs and a willingness to think of older adults as contributing, valuable members of society are core values that will help these programs succeed.

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