

Ubervveillance and the Social Implications of Microchip Implants: Emerging Technologies

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Chapter 7

Surveilling the Elderly: Emerging Demographic Needs and Social Implications of RFID Chip Technology Use

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ABSTRACT

This chapter describes the usefulness of RFID (Radio Frequency Identification Device) implant technology to monitor the elderly, who are aging in place in various retirement arrangements, and who need to maintain optimal functioning in the absence of available, and on location, service or care providers. The need to maintain functioning or sustainable aging is imperative for countries experiencing rapid growth as a demographic trend for the elderly. The chapter also raises some concerns including the social acceptance or rejection of RFID implant technology, despite the utility of the device. These concerns include a variety of political, social, and religious issues. Further, the chapter also attempts to show how RFID implant technology could be used in combination with other emerging technologies to maintain physical, emotional, and social functioning among the growing population of elderly. What follows is the introduction and a partial literature review on emergent elderly needs, and on the utilization of RFID and other technologies.

INTRODUCTION

Services to the aged population have been steadily improving in developed or developing nations over a number of decades, in part due to policy and funding allocations to promote improvements in

health and quality of life for the elderly, and in part due to the development of a number of tools involving some measure of advances in technology. Emerging technologies, such as the RFID tag and responder implants, may make possible the capacity to remain a functioning, productive

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and engaged member of a contributing portion of the society of which they are members, for many more years than previously expected for those who are willing and those who have some level of access to such technology. As the demand for these services and emerging technologies are expected to increase over the next several decades in both developed and developing countries, sustainable aging may become a more commonly understood construct and social and economic reality.

LITERATURE ON THE ELDERLY AND DEMOGRAPHY

Globally, there are some alarming growth trends in the numbers of elderly and projected elderly relative to anticipated service needs, due to the rapid and belatedly anticipated swelling of the aging portions of the population. For example, for the first time in recorded history, the number of surviving elderly members of the planet will be greater than the number of living children aged five years and younger. A recent United Nations estimate suggests that the global elderly population will more than double over the next forty years. Europe is also expected to lead in the trend having the largest proportion of elderly per population during this period. However, China and India, having larger populations, also have greater total numbers of elderly than most other countries, with these numbers expected to triple during the same time frame (The Demographics of Aging, 2011).

Demographic trends in these developed and developing countries suggest, however, that fewer young people will be available to meet the labor and economic needs of their societies while servicing larger and larger segments of the population who are expected to retire over the next several decades. This is also true of Asian populations in developed areas, as well as developed Middle Eastern, African and Western cultures. As a result, immigrations trends in these areas are expected

to increase, in part due to service needs for the elderly. The term “aging in place” has emerged to describe the less mobile, more service dependent and possibly less productive and less functional, elderly. Service needs for these elderly, and others, may be generally conceptualized as falling into the categories of physical, emotional and social needs, as differentiated in the aging literature.

A global investments organization projects that the world population of above age 65 years is expected to increase from 6.9% in the year 2000 to 19.3% by the year 2050 (International Wealth Solutions, Ageing Demographics, 2008). Population growth overall is expected to slow, however, with decreases in fertility rates. The United States, a highly developed country, may be used as one example. The already large aging population, estimated at 12.3% in the year 2000, will be increasing to 21.1% by the year 2035. As a result of these demographic shifts in the proportion of the aging population, there may be insufficient numbers of available laborers to service either the needs of the elderly, or in some cases, segments of society as a whole. Employment is expected to be available in surplus, but not enough workers will be available in some developed areas to suffice these needs, resulting in expected labor shortages (Foreign-Born Workers and Baby Boomers, 2010).

There are a number of causes for the changing demographics relative to aging in industrialized first world countries. Fluctuations in birth rate are part of the issue, as with the well known baby boomers of the United States. A boom, or expansion of the number of births, began at the close of World War II in the United States, which has dramatically contributed to the current number of elderly. Another reason for a growing elderly proportion of the population is declining fertility rates in several large developed countries. This may be due to policy, as in the case of China where one child to a family has been the policy and expectation for some time, or due to increases in utilization of family planning services, abortion, and increased utilization of contraceptives.

Yet, in other instances, increases in longevity, due to prosperity, improvements in nutrition, health care technology and decreases in various disease morbidity and mortality rates due to public health efforts, may be contributing factors to societal aging in the more technological and industrially advanced nations. These identified causal factors may be addressed in future by social planners over the longer term, but do little to address the impending demographic shift toward large proportions of elderly in these nations. Addressing the demands placed on society over the shorter term will require the needs of the elderly to be moderated to some degree. Successful aging, according to Gilmer and Aldwin (2003) includes the following: no physical disability over the age of seventy five as rated by a physician; a good subjective health assessment (i.e. good self-ratings of one's health); length of "undisabled" life; good mental health; objective social support; self-rated life satisfaction in eight domains (marriage, income-related work, children, friendship and social contacts, hobbies, community service activities, religion and recreation or sports). Further, according to the American Association of Retired Persons in the United States, it is expected that nine out of ten of the elderly will prefer to age in the homes in which they reside, at retirement (The Demographics of Aging, 2011).

In response to the need to maintain a contributing and healthier elderly population these nations have sought various solutions, other than technology, to meet the increasing demand for more service providers and professionals to address these needs (Atul, 2006), as well as to address the more immediate need to increase the overall supply of workers to service their respective economies. These attempted workforce solutions, have included a relaxation of immigration policy (Weil, 2002), various workforce retraining programs (Carmel & Lowenstein, 2007), and changes in labor policy directed at increasing overall labor outputs (Brown & Braun, 2008). Yet the alteration of immigration policies, labor laws, and voca-

tional training initiatives has not kept pace with the service needs of the aging populations of the developed and developing countries.

Technology has been proposed to bridge the service need versus the available care provider gap for the elderly by a number of proponents (Hargreaves, 2010). Numerous tracking, monitoring and identification technologies have been proposed to promote the ongoing health and welfare of elderly members of society and to facilitate their continued functioning and contributions to a productive society. This interest is due in part to recognition of the need to have increased numbers of successful aging, among the elderly populations, or due to societal aging of the industrialized nations (Harper, 2006). Recent and emerging technological devices, may bridge the gap by simply serving as extensions of earlier interventions such as pacemakers and joint implants capable of enhancing or prolonging human functioning and independence. Some devices are capable of providing diagnostic analytics, and information that may regulate healing and functioning. These passive and implantable communication devices are capable of informing the healers and care providers and professionals thereby maintaining elderly functioning (Michael & Michael, 2013).

The costs of traditional forms of care for the elderly to the respective governments and health programs is expected to be unaffordable for most of the affected countries, especially following a period of economic downturn (Spillman, 2004). However, the introduction of various forms of monitoring and computing applications could facilitate an increased number of the elderly achieving a level of successful aging and possible continued productivity (Rajasekaran, Radhakrishnan, & Subbaraj, 2009). Self care, or collaborative self care, to avoid disability may be achieved with health education programs and applications, personal medical monitoring devices and digital communication. Mental health and personal outlook, as well as retirement financial status, may be improved by using technologies to

transfer skills and expertise of the elderly to less experienced or younger associates. Social and community activities may be streamlined to correspond to the aging person's interests or hobbies and pushed technologically, or made available for the elderly, daily or as needed. Such technologies could be personalized to improve outcomes for needy seniors and the outcomes accomplished much more economically if matched in some way to their personal identity, preferences, limitations and capacities (Lazaros & Ahmadi, 2008). Interfacing these technologies into customized systems can also arguably improve their efficacy.

RFID TECHNOLOGY AND THE ELDERLY

RFID technology relies upon a communication interface of two components. The first of these components is an RFID chip, or integrated miniaturized circuit, which may be attached or imbedded (including surgically) into items, animals, or humans. It can transmit for short distances a unique identifier code, that may be registered to the item, animal, or human to which it is attached. The second component consists of an antenna or receiver that can identify the chip, though it may, or may not be, within line of sight of the receiver (Shah, 2011). The receiver may be connected to any number of data interfaces, or databases, such as consumer, commercial, communication, medical records, medical telemetry, financial, banking, tracking, or GIS (Geographic Information Systems, or locator systems), inventory, transportation, airport security, government, military, health, health monitoring, disaster response, or quarantine effort (for disease tracking and prevention), or to access demographic, service utilization, or purchasing background on the user.

There are a number of possible applications of RFID technology relative to the needs of the elderly (Radio Frequency Identification [RFID] Systems, 2011). These include the utilization of

RFID devices to ensure the basic security and safety of the elderly. For example, an elderly person admitted for an emergency condition could immediately have their medical information accessed, including provider information, insurance coverage, allergies, past medical care and prescriptions (Mohammadian and Jentzsch, 2008). If the elderly person is either living alone and is confused or disoriented, or living in a skilled care facility under the same conditions, a wander alert or alarm could be triggered if the person managed to leave a safe area (Schneider, 2006). For those who opt to age in place and have few social connections, the RFID could be placed on food parcels to measure consumption as an indicator of eating and maintaining nutritional health (Iso-mursu, Häikiö, Wallin, & Ailisto, 2008). For those who have care providers and family, the RFID may be combined with other smart home sensor technologies to provide continuous monitoring to distant locations and assure caring families of their relatives' overall well being (Rose, 2011). Additionally, purchases made by the elderly could be supervised if needed to assure that their purchases do not exceed their income and are consistent with their needs. Payment systems for retirement benefits and the purchases could also be included to confirm that benefits are being received and utilized by the beneficiary (Allan, 2006). Furthermore, elderly persons who become lost or separated from relatives or authorities while in transit could more easily be identified and located (Landau, Werner, Auslander, Shoval, & Heinik, 2009). If the RFID device is required to authenticate the ignition of a car engine, or that the ignition will not work, then the elderly person may not be able to drive alone without the presence, or authorization, of a second agreed, or appointed relative, or care provider (Frenzel, 2001). If the chips are implanted in the elderly there are also some counter arguments for health and safety. RFID devices may cause adverse reactions such as tissue damage and migration of the device, especially if the elderly person has to have

a diagnostic MRI (Magnetic Resonance Imaging) medical scan performed (Aarti, 2011). There are also a number of instances where the use of RFID technology has been shown not to be a panacea for identity verification. For example, passports containing RFID devices have been reportedly “hacked” and the code stolen, with the possibility of identity theft occurring (Naone, 2009).

RFID TECHNOLOGY AND VALUES CONFLICTS

Values conflicts are likely to occur with the deployment of technologies unfamiliar to the aging population. Other values conflicts may occur between service providers and other portions of the population, such as younger and differentially trained service providers and the elderly. There are cost allocations as well to sustain the elderly on a larger scale in anticipated times of scarcity of resources, due to historically higher national debt and declining economic markets.

Privacy, self determinism, informed consent, and moral and religious factors affecting utilization of RFID implant technology may be expected to impede, or obstruct, the acceptance of this potentially beneficial surveillance technology application. Some solutions may, as a result, be effective in one population of elderly, yet completely unacceptable in another due to cultural differences. Autonomous decision making may be more or less valued in some demographic segments, so as to make some forms of service delivery and RFID implant and other emergent monitoring technology a less preferred option.

Nearly all nations and cultures, whether developed, developing, or undeveloped would acknowledge having unique social contexts relative to the indigenous, or immigrant populations of their own portion of the globe, which must be advocated for and politically and geopolitically validated and valued. This is no less true for the

elderly sub populations, who are considered the most invested members of their local, national, or global populations. What follows are some of the more commonly held values issues, or social contexts for the elderly across a number of cultures that may be expected to emerge relative to the adoption and utilization of RFID technology.

Resistance to Change

Commonly, anything that is new or unfamiliar may be resisted by the elderly. Senior citizens are reluctant and often slow to adapt to, or accept readily, new technologies. The elderly have often seen numerous changes over a lifetime and at some point simply seem to fatigue in interest and adopt newer technologies less frequently (Gilly & Zeithaml, 1985). Interestingly, this is anticipated as the largest growing segment of the population for industrialized nations. Therefore, senior citizens will exercise greater purchasing power than younger groups that might more readily accept the technology. Seniors will also comprise a greater aggregate voice in affairs as voters in democratic societies, or constituents relative to adopting new technologies in general, and for their age group in particular. Numerous elderly may prefer to avoid novel or new technologies and could delay policy decisions for their implementation through their group influence.

Technophobia

Fear of emerging technologies is also of frequent concern for the elderly, though this phenomenon is closely related to resistance to change. The technology may simply lack familiarity (Sponselee, Schouten, Bouwhuis & Willems, 2008). Senior citizens have been witness over a lifetime to a myriad of devices, hailed as new, beneficial and benign technologies that were later found to have had some negative or harmful attribute. The elderly then, are understandably cautious about

rushing in to adopt the next touted technical advance. Separately from this concern though, is often simply a lack of information on how to best use, or exploit, the new technology for their own advantage in a way that is meaningful (Vastenburger, Visser, Vermaas, & Keyson, 2008). Numerous elderly may simply not invest adequate resources, or interest, to fully use emerging and available technology that could promote optimal functioning for themselves, or their elderly family members.

Informed Consent

Independence and competence are related to understanding fully the consequences of one's actions and commitments, as well as their associated risks or benefits. The established elderly are often concerned that they will become debilitated and unable to decide their life course. Imposing an RFID chip without consent would be invasive and likely experienced as a physical assault as well as an assault on dignity (Good, 2008). Self determination, and the right to enter into or withhold permission to agreements or contracts, is highly valued in Western democracies and many of the developed and developing nations share, or closely identify with this. Surreptitious implanting of RFID chips into hand held devices, consumer products, or within one's body without thorough evaluation, foreknowledge and thoughtful consent is likely to be met with strong opposition by the elderly (Stanton, 2005). Attempts to press the implementation of RFID technology without inclusion of consent by the affected seniors may well result in substantial resistance from advocates for the elderly and the elderly themselves.

In one recent and popular media, publicized example, RFID chip testing on Alzheimer's affected elderly was begun, as a trial by the chip manufacturing company, in the United States. A number of RFID chips were provided to facilities with instruction for use. Some affected elderly

were reported to have been implanted and monitored (Swedberg, 2007; Rotter, P., Daskala, B., & Compagno, R., 2008). However, due to their neurological condition and diminished mental capacity, could not have sufficiently benefitted from informed consent and in the case of guardianship, their rights were likely judicially delegated to non-familial authorities, which may have not held their personal values, or interests, as primary.

Caretaker Need

Alzheimer's disease, as it relates to the elderly and the advantages of RFID technology presents something of a contrast in acceptability when viewed from the demands placed upon familial or institutional care providers. In the absence of maintained or sustained functioning among the elderly, especially as functioning relates to self-care and decision making capacity, RFID technology may serve to provide respite for family members, or institutional caretakers. A recent published interview illustrated the acceptance, if not desirability of RFID technology, for impaired Alzheimer's sufferers, to restore some independence and quality of life for challenged and fatigued care providers (Michael, 2009). Care providers may be willing to have the convenience and sense of safety, which RFID implant technology provides for their charges with Alzheimer's disease.

Risks of Physical Harm

RFID implants are made of some combination of micro-circuitry, non organic elements, and likely trace metallic substances. They are of course foreign objects. There is some preliminary research to suggest that magnetic devices or MRI (Magnetic Resonance Imaging) may cause them to migrate within the human body. As a result of the migration, the RFID chip may become dysfunctional over time, or stop working, or have some as yet undiscovered adverse physical consequence (Stef-

fen, Luechinger, Wildermuth, Kern, Fretz, Lange, et al., 2010). These would be reasons enough for most cognizant individuals to prefer that they not be implanted with an RFID device. The elderly, having some additional physical frailties over time, would likely be even more averse to having these embedded in their person. As the RFIDs also emit a passive radio response to an available, nearby, antenna there may be some additional concerns about harm from radio waves, or microwave damage, from being in proximity to either the microchip or the antenna device (Härmä, 2009). Those intimidated by the risk of physical harm will likely then avoid RFID chip technology.

Western Religious Opposition

Perhaps the best publicized value conflict that will serve to promote opposition to the RFID chip is its correlation with end times Christian bible prophecy as a result of its defined function, specific historical development, description and early market studies (forehead and right hand placement) on best deployment for conducting individual commerce (Noack & Kubicek, 2010). More than one billion inhabitants of earth identify themselves as Christian by belief, or faith; a large proportion is entirely opposed to the existence, much less the deployment of, the RFID chip in humans. Implantation of the chip into one's body is equated to eternal damnation from God (see Additional readings section). This global value conflict as to the utilization of the chip is the most extensive and unyielding. Certainly, senior members of the Christian faith, and senior citizens within the faith, are likely to be intractable and steadfast in their absolute opposition to the device in any fashion. Further, the problem may become exacerbated by the inclusion of decision makers for the elderly person's care that are immigrant, foreign, or from a culture not sharing their same faith, values, or beliefs (Campbell, Clark, Loy, Keenan, Matthews, Winograd, & Zoloth, 2007).

Privacy Concerns

Utilizing the RFID chip as a tracking device for various consumer items raises a number of privacy concerns. An embedded microchip can connect the purchaser and the item at the point of sale, but can also continue to identify both the item and the purchaser, or person connected with the item over time (USA Today Magazine, 2010). That is, it can establish one's whereabouts, the locations and duration of time in which the item was maintained, or in the possession of the owner, other associated purchases, acts, or actions, or even various events at which the item and the person connected to it may have been present, or in which they were involved in some way. Consider then, that the device is sufficiently small enough to be unobtrusively attached to almost anything, or several things held in combination, or separated one from another at some point, by the owner, purchaser, or person connected, or otherwise known to be connected to the RFID chip in some way. Presence of the chip could be sufficient for a person under suspicion to activate any number of electronic devices when present to include audio and video and recording devices, remotely. An elderly person, socialized to a lifetime of personal privacy and independence and raised in an historical time frame when one's word and a handshake constituted a compelling moral contract, would likely be horrified by the invasion of personal privacy (Spiekermann, 2009). Of course the level of dehumanization experienced by the unwilling, but aware, senior member of society might contribute negatively to health issues and emotional concerns, to such a degree that using the device to monitor consumption, or other behaviors might not be beneficial for the elderly in need of monitored care, or self care. Members of western societies socialized to the rights of the individual over and above those of the state, will avoid using the chip.

Fears of GPS Tracking

RFID devices may readily be included in telecommunication devices, portable and wearable medical equipment, clothing, vehicles and other equipment such that knowledge of the ongoing physical location and probable moment to moment circumstance of the person being monitored is virtually assured. Within an equipped “smart home”, these can be combined with systems of acoustic monitors, video cameras and other telemetry or medical monitoring devices, to confirm constantly the location of the senior family member, or medical patient. Furthermore, the person could be tracked continuously (depending on the number and proximity of receiving antennae), while commuting, or in transit to locations outside of the senior citizen’s residence (Shoval, Auslander, Cohen-Shalom, Isaacson, Landau, & Heinik, 2010). Products can also be tracked in this way to confirm the presence, or absence, of medications, or other tagged items (Rawal, 2009). Logistical information for medication and services may be improved by using integrated systems of RFID device technology. An available and model service Project Lifesaver is currently using the technology to locate and return autistic children and demented elderly to their home or place of residence (Project Lifesaver, 2012).

Fears of Asset Tracking

Many of the elderly are on fixed incomes and often these are inadequate to provide for their increasing health and personal needs. Further, assets may be seized for any number of reasons including unpaid medical debt, or care. RFID chips may be placed, or embedded within banking cards, or money, stock certificates, deeds, automobile titles, or anything of value, held, or owned by the senior person or relatives (Raths, 2009). Transactions involving assets, including placing them in a safe deposit bank vault, or residential safe, may become known to third parties, or creditors.

Assets may be cancelled, or seized without notice for such debts, providing no security or safety net for the affected senior or family members. In some instances where the debt is substantial and the assets limited, asset cancellation could extend to home foreclosure, or loss of affordable, but essential care (Premier Inc., 2009). Numerous elderly may fear that they will have less access to resources to recover from adversity.

Fears of Identity Theft

There is ample concern, even among engineers, that the RFID chip’s unique numerical code, though encrypted, may be discovered or copied, placing the owner at risk of identity theft, which could result in the fabricated identity being almost undetectable. The code itself is presumed to be unique to an individual, or an item in which the RFID chip is embedded, such as a credit card. Should the encrypted code be discovered by someone other than the owner, the unique identifying number could provide access to other associated numbers for other proximal people, or items, such that the restoration of one’s digital identity becomes impossible (Britt, 2007). Some elderly may be at risk of losing everything unless the RFID technology becomes virtually identity theft proof.

Transhumanist Concerns

Transhumanism refers to the enhancement of human capacities through the direct infusion of technologies into the human body and brain (Bostrom, N., 2012). Transhumanists, or those who would advocate for transhumanism, would optimistically view the benefits of technology, to prolong life, or add to the quality of life, above any potential risks, for the recipient elderly. RFID technology would be viewed as an extension or advance over earlier technologies that have provided mobility, strength, information, socialization, life extension and a range of other modifications and enhancements (HUMANITY +, 2012) including the pos-

sibilities of human machine hybrids and transfer or simulation of human brains into non-human hardware (Stephan, Michael, Michael, Jacob, & Anesta, 2012). The RFID “chip” technology provides a direct information technology interface for the wearer. That is, the device has the capacity to serve as an identifier for various databases of information about the elderly person associated with it, as well as others who wear, or are embedded with, the device. The use of RFID technology may also serve as a cueing device, which when recognized activates other devices, communicates care or medical requests on behalf of the wearer, and tracks their whereabouts and habits.

The elderly population, or many of the elderly population’s current members, when competent, may not generally share the values of transhumanists. Nor, are the prevailing views and values of the elderly likely to be quickly revised, or altered to become rapidly tolerant of embedded technology. Autonomy and independence and traditional ways of doing things are well documented as mainstays of elderly shared values. Technologies are often tolerated, rather than enthusiastically accepted as functioning and health are lost by affected elderly individuals. Yet, some aspects of transhumanism and RFID technology have the capacity to prolong human independence and functioning, in terms of health infirmities (Posts tagged “Transhumanism,” 2012). In terms of the shifting demographic in developed countries toward the elderly, the application of these technologies may serve to provide greater economic security and prosperity for a population, by sustaining the elderly as viable contributors to the larger society.

Solutions and Recommendations

Acceptance or rejection of RFID chip technology among the elderly in developed and developing countries relative to augmenting the many anticipated service needs for the elderly, depends greatly on developing active strategies to address some of these identified value conflicts and fears. In some

instances, working within the social context and long held values and beliefs of the elderly may mean creating some social and technological compromise or accommodations such that the technology can be deployed usefully where warranted. Senior adults who are expected to continue to remain productive, healthy and contributing to their respective societies for longer should retain their independence and legal rights as citizens, for as long as possible. This includes the right, of most adults, to decline unwanted or intrusive interventions. RFID technology is, and may continue to be, an evolving and adaptable approach to identify verification and database access for various items, animals and humans.

Many of the concerns of the elderly relative to RFID chip technology are centered on risks to privacy (surveillance, or uberveillance) including economic and health information, and threats of possible identify theft. Some concerns are related to religious beliefs and strong social values derived from the cultural contest of the elderly person’s life experience. Reservations to adopting the technology also relate to concerns of being exploited in some way, in part due to the common experience of many elderly in losing capacity to remain self-reliant in later years of life.

Gaining acceptance relative to privacy concerns will likely require a combination of socialization and education. It will also require verifiable security measures that are tested and evaluated and confirmable by authoritative organizations, such as those for consumer safety and endorsed through media that are most accessible or most utilized by the representative group of potential elderly RFID technology users. Additional safeguards may be implemented within elderly residences such that RFID information is only transmitted through an encrypted communication link, in much the same way as residential internet access is currently accomplished. Consumer institutions such as banking and credit agencies may also provide linkage technology that masks identification and assures financial privacy. Though policy may fol-

low engineering advances in this area, other less exacting forms of identification may continue to be used for lower levels of non-essential or non-critical transactions for elderly users. The RFID device could be automatically masked by any antenna device either by geographic location, or function if the RFID device is not intended to be read, allowing for some privacy from GPS location devices. Legal protections and assurances that preserve assets as the private property of the elderly, unless a crime is committed, may serve to reduce anxiety about the tracking of privately held financial assets. Furthermore, once an item (physical or financial) that may be tracked is sold to a consumer, the selling entity should no longer have an option to track the movement of that item, nor should law enforcement officials without some alternate evidence of some illegality. Perhaps accessing an RFID would require probable cause of the commission of a crime before access by law enforcement could occur.

Assurances of the lack of risks of RFIDs to render physical harm will require extensive medical testing under a variety of conditions so that the risks are clearly understood. Possible use of varying materials used to construct some specialized RFID devices to lower the risk of harm, for example, a specialty chip version might be made so that it is relatively non-reactive to MRI or other magnetic based medical scanners would also reassure the elderly. The primary physician for the elderly person can also be called on to evaluate the risks of physical harm and to educate the elderly patient so that anxiety may be further reduced over time.

Resistance to change and some technophobia from the elderly is a relatively common reaction for any number of technologies that may be adapted to, or needed by, the elderly. Social service providers and allied health professionals can contribute when possible to providing ongoing education to groups of the elderly and family members to facilitate adoption and adaptation. In some instances, training programs may be

transmitted by popular media for the elderly to provide further information and appropriate reassurances. This would also serve to improve rates of informed consent for those elderly in need of RFID technology.

Western religious opposition or Christian faith opposition to the deployment or personal utilization of the RFID chip technology should be recognized and accommodated. Those opposed to an implanted device should not be required under any circumstance to obtain one. It is likely that a number of the same oppositional religious elderly raise few objections to the magnetic strip of identifying information in their credit or banking card. Some may even carry access devices to open their employer's garage for entry that includes RFID chip technology. Most carry personal cell phones that are locatable by an embedded RFID such as a GPS traceable chip installed within the cellular phone. Additionally, for those who would benefit strongly from keeping an identity device or RFID chip on their person, there are already a number of non-removable devices used for house arrest, or tracking, that are wearable and washable without undue discomfort and that may be less offensive.

FUTURE RESEARCH DIRECTIONS

For the most part, RFID tags or devices are considered either passive or active, that is, they derive their energy to transmit a numerical or identifying code to an antenna, or reader, whenever the two are in close proximity and the reader transmits a signal which provides the energy for the device to be read. There are advantages, especially for the elderly, in developing active RFID chip technology with its own power source, or battery, to strengthen the signal, in the event that a reader is not close by and a health crisis or other adverse event befalls the elderly person. There are a number of engineering efforts proposed and ongoing, which are attempting to improve the active version of the RFID tag.

Another important research consideration is to improve the capacity of the antenna or RFID reader devices to manage a large number of signals, many of which may be coded or encrypted, when several RFID devices are in close proximity to a reader. Though the device may have greater consumer application, the improvements are needed to ensure that there is no substantial risk of confusion of identity between any numbers of closely grouped devices relative to the unique identity of the user, and that the many potential signals are linked to the appropriate and responsive data infrastructure, as quickly as feasible. This advance would render it highly unlikely that there is any signal capture, or method to replicate a unique identity, or duplicate the RFID device signal in any way.

However, the development of levels of systems of care and information access, with a variety of social and cultural, or religious values considerations and applicable legal protections for both the elderly RFID user, or potential user, and for those opting not to use the devices (whether implanted, or not) is needed. Such a development would make the technology acceptable to the broadest degree possible by the elderly, to facilitate elderly care and wellness and continuance of productivity in the absence of sufficient care providers from the younger population within those developed, or developing nations, affected by rapid sociological aging.

CONCLUSION

The phenomenon of the graying of civilization is underway in most of the developed and developing world. In these countries, most of the population will be affected socially and economically by rapid shifts in the demography of their respective nations, over the next few years, or decades. As these same countries are well advanced in industry and technology, they will need to rely on these advances to supplement or augment allocation of resources to, and the maintenance of functioning and continuing contributions of, the elderly. Suc-

cessful aging and productive and healthy aging in place will be an imperative for the longer term leadership, if not survival, of these cultures. This problem is compounded by inadequate available numbers of youth to provide care for the population, in some instances to fully provide the labor needs of these nations.

Longer term policies or strategies may be adopted which would increase fertility and child-birth rates, or perhaps some natural events such as epidemics may change the composition of the relative age of a population, or even changes in economics may mean that fewer can afford high tech medical procedures that are extending life. Over the shorter term of the next generation or two, these changes will not be timely enough to make any foreseeable substantial change.

Of necessity, surveilling the elderly is one of a number of effective strategies that may be adopted to produce a best case scenario of continuing health and productivity during senior years. Such approaches may mean that the entirety of society is gradually strengthened and may also gradually recover to optimal population norms. In some instances, retired elderly will seek residence in resort areas, and form mutual support networks within NORCs (Naturally Occurring Retirement Communities) which may or may not be technologically supported, but which are likely to support healthy aging.

RFID chip technology provides a potential method of addressing the demographic needs of the elderly in developed and developing countries. This is despite a number of limitations at present and a series of known apprehensions and values issues of the elderly concerning the deployment and wide distribution of RFID technology. Ueberveillance (or the omnipresent surveillance) of the elderly can be circumvented with limited additional research and development, and with the development of specified social, legal and engineering advances, to address the anticipated values conflicts and natural apprehension of the elderly in use of this and other emergent related technology.

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KEY TERMS AND DEFINITIONS

Aging in Place: Remaining one's present residence, while elderly with the capacity to function as independently as possible and access necessary support services in response to changing service, health or financial needs.

Developed Countries: Countries with an economic base and large gross domestic product, built largely on manufacturing and technology rather than agriculture with the potential to access adequate health care and other essential services.

Developing Countries: A country that is poorer than developed countries and whose citizens are mostly agricultural workers, but that desires and has some capacity, or support, to become more advanced socially and economically.

NORC (Naturally Occurring Retirement Community): A retirement community, or active older adult community, especially designed or geared for people who no longer work, or restricted to those over a certain age.

RFID (Radio Frequency Identification Device): A wireless microchip mechanism that may be attached to, or imbedded, to identify and manage inventory, animals, or people. Unique identifying data stored on an environmentally resistant tag several centimeters in size is passively or actively transmitted to a microchip reader via electrical or electromagnetic waves which may then access a comprehensive data file, for the item, animal, or person to which it serves as an identification tag.

Surveilling the Elderly: Surveillance, (or) the monitoring of the behavior, activities, or other changing information, relative to the needs, or status, of the elderly population, with, or without, consent, in either, an overt, or surreptitious manner.

Values Conflicts: A state of opposition between persons (including, groups, or populations), or ideas or interests; derived from the person's principles, morals, or values, or other standards of behavior relative to one's judgment or beliefs of what is important in life.