

Aged-care-privacy and Security for Smart Home in Australia

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Key words : Aged care, Home care, Technology, Privacy, Security

Abstract

Most developed countries are experiencing unprecedented increases in the percentages of older people. The Australian population 65 years and over is projected to more than double by 2050. The greatest rate of growth is in the population aged 85 years or over. This group will have the greatest need for health and disability support.

It is not only the increasing numbers of people requiring care in the future but also social changes that will increase pressures on aged care and health services. The level of informal care that was provided for frail aged family members some decades ago is less viable today.

Governments have responded with a range of strategies and policy initiatives such as abolition of the compulsory retirement age, promoting productive ageing and enhancing the capacity for home-based care.

There is particular interest in technology to assist active ageing and aged care to enable extending active and productive lives and facilitate care to be delivered according to consumer preferences for place and time. These changes will reflect the impacts of technologies that have transformed other industries, enabled new products and services and provided delivery at the convenience of the consumer.

There will be many opportunities for new and imaginative research. Research is needed to guide changes that will be required in policy, strategy, funding, work-practices, integration of technology

into care, future roles for the professions and new models of care. The introduction of new technology in home and aged care settings raises concern over privacy and security.

This paper will consider how research into policy, strategy, work practices and the integration of technology into care, and the subsequent new models of care to support this, will need to take into account such concerns.

For example, how far does the idea of the Smart Home invade one's privacy? Are current security measures adequate to prevent violation of our most vulnerable people? Consider the consequences of online banking in the home and the number of incidences of phishing account details - will the techno-savvy be able to determine movements of people around their home?

And it will give an overview of the age care dependence on technology and what we should be doing to protect them by way of policy, and work practice.

Introduction

Governments have responded to the challenges of ageing populations with a range of strategies and policy initiatives such as abolition of the compulsory retirement age, promoting productive ageing and enhancing the capacity for home-based care.

And there has been increasing interest in safety issues of health and aged care fields with research suggesting alarming levels of permanent

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disability and deaths of patients caused at least in part as a result of their healthcare. Many of these events have been assessed to be preventable¹⁾ and better provision of timely information is a key to quality and safety. Adverse events of health and aged cares are of particular concern with the elderly as many are on high and complex medication regimes which are managed using manual documentation. The elderly are more prone to various other risks that might be reduced or better managed with improved communications and management of resident information system through Information and Communication Technology (ICT) adoption.

A key strategy of both Federal and State governments in Australia is to provide better health care for frail/aged people and chronic illness sufferers in their place of residence, such as own home, nursing home, and so on. There is a strong incentive for this because governments and other key stakeholders has faced to reduce the demand on hospitals as well as response the preference of consumers themselves.

The strategy of hospital avoidance (substituting community-based care for hospital care) is consistent with other countries including Japan facing similar increases in demand for their services due to ageing and the growing incidence of chronic illness. In that strategy of many countries "Community" or "Community based" is a key concept and focuses of the strategy is to expand the management of organizations to that of community.

Shepherd and Illiffe in their review of published research found that some evidence exists that admission avoidance schemes, that is community based care, can provide a less costly alternative to hospital care²⁾.

However to realize the alternative scheme of hospital care, that is, community based care, it is necessary to build infrastructures to implement it and ICT is a kind of infrastructures to sustain community based care.

Home care and wireless technology

Wireless technologies are central in shared visions for independent living and home care. Expectations are that our productive and active lives will be extended by assistive technologies that will provide reminders for us of meetings and other events.

A picture of the future can be found in projects across the ageing countries. In Korea and Japan there are robotics and intelligent devices. In the USA there is CAST (Center for Aging Services Technologies³⁾) and associated laboratories that are researching a wide variety of approaches and technologies to support both active ageing and aged care. In Florence, Italy an operator of a chain of residential and community-based aged care, Montedomini Aged Care Services, operates a home telehealth system that links frail elderly in their own homes⁴⁾. The service provides security services, medication reminders, and video-call links through a set-top box connected to the client's television.

The home technology environments are managed remotely by distance facilities, such as call centre. In Australia interest in this research field is evident in projects across several universities. In addition there has been the establishment of Aged Care Informatics Australia (within the Health Informatics Association of Australia), an ICT group within the ARC-NHMRC Research Network for Healthy Ageing and the annual Aged Care Informatics Conference⁵⁾ as means of linking researchers in this field and promoting informatics for ageing and aged care.

Home care technology developments are exploring the application of a range of new and emerging technologies⁶⁾. Facial recognition, already in limited use, might remind us of the names of clients and other key people to help us maintain effective in business and working lives. For the cognitive impaired technology can guide people through the steps of Activities of Daily

Living (ADLs) such as making a cup of coffee. Similar technology might guide us through the steps essential for us to extend working lives.

Radio Frequency Identification (RFID) technology is likely to be rapidly adopted across industries starting in logistics and retail. The same tags that will allow us to pay for goods in a retail outlet will enable us to track them in our homes. Intelligent refrigerators, pantries or medicine cabinets would know what items they have, use-by dates, re-order levels and could build our shopping lists that could be sent automatically to the store.

RFID can be used to track the location of things including assets, people, medications and almost anything else that can have a tag placed or embedded in it. Applications include retraining memory to cope with cognitive impairment by using photographs of key people that have RFID tags. When the photograph is picked up it could trigger a message to an ear-piece or a short video clip about the person in the photo. This was he can retrain the mind to cope with memory loss.

Using in-building location systems we could locate lost items and also know the last time an item was moved. The intelligent medicine cabinet could not only remind us when to take our medications but would know the precise time of taking a pill, would know when we last took a dose and would be able to tell where we left a pill container.

The expectation is that wireless technology will enable sharing of health and aged care information more effectively and efficiently among health care professionals and consequently will enable more timely and effective treatment of patients.

Some of the major conditions encountered in the care of the elderly include incontinence, falls, medication management and cognitive decline. Bed sores or ulcers are also an issue for those with limited mobility.

Falls are a serious matter for the frail elderly

and there have been developments in the use of devices to detect falls. The technology could track movement and provide alerts for turning a patient to improve circulation and reduce bed sores.

People with cognitive decline are prone to wandering and have the potential to put themselves or others at risk. Currently dementia wards in RACFs (Residential Aged Care Facilities or "nursing homes") have physical security. Intelligent technology might provide a means of tracking patients and allowing them to move freely but restrict or alert others if they approach areas that may not be safe for them. The technology might also guide them back to safe and authorised areas.

The elderly have the greatest fear of crime and feel vulnerable. While the incidence of crime with the elderly as victims is low the impact can be severe due to their frailty.

There have been cases of abuse of the elderly by staff, other residents or even strangers in RACFs. Technology in the form of monitoring the access and movements of people as well as cameras might give families comfort. At least one aged care chain in Brisbane is considering offering web-cams in residents' rooms for families to be able to check on their elderly family members. This of course raises issues of security and privacy and would need to have the approval of the resident or may need to be preceded by voice before the video component is switched on.

The current generation of elderly may not have the familiarity of younger generations who have grown up with information technology and use it everyday for business and social purposes. The elderly may be less equipped to secure their technology environments by, for example keeping security software up-to-date. Computing for the elderly will need to adopt plug-and-play approaches or else approaches where their home technology environments are remotely managed.

In addition to issues of privacy in the application of technology in aged care settings,

there are also concerns and issues in the physical security of technologies. Research undertaken by the University of Southern Queensland with health professionals in Queensland and Western Australia conducted by one of the team member of this project, it was discovered that a major barrier to the uptake of this technology appears to be user concerns over various security issues including physical, logical and data security ⁷⁾.

Technologies in health and aged care

The uptake of some new technologies has been rapid in health and aged care; laboratories make use of robotics, results are transmitted electronically and diagnostic images are digital increasingly. The sector is still cautious on the adoption of wireless technology and few organisations have gone beyond limited trials. There are concerns about the maturity of the technology and the fit with organizational culture and work practices.

While the technology has been in existence for some decades, recent developments have made it more accessible and affordable. Wireless technology promises efficiency gains for the healthcare sector in Australia because of the mobility offered. There are indications of efficiency gains including data capture and validation at point of entry. Despite this, its adoption rate is slow in health care industry.

Besides protecting confidentiality of personal information, there is also the issue of protecting the data from alteration especially during the process of exchange. Wireless data transmission is more at risk of interception. It does not have the shielded protection of wired technology. Any information modified or altered may cause inaccurate information supplied for treatment planning and delivery. Besides preventing alteration to information, it is also important to detect alteration of health information.

Therefore, it is crucial to ensure the flows of data in care environments are not at risk. The

solutions to these issues can be achieved through proper security infrastructure and advancement in technical specification of wireless technology standards and work is underway.

Fisher conducted a technical review on the security of wireless standard from past surveys and literature⁸⁾. He proposed a five layer of security framework consisting of hardware protection, wireless security policy, monitoring and intrusion detection, business and technology integration, virtual private networking, and transport layer security. Misra conducted a case study on security challenges in a mobile healthcare setting⁹⁾. The study suggested a wired equivalent security standard that makes mobile devices as secure as wired transactions.

The basis of the common framework would be a security model that assures authenticity, confidentiality, integrity, availability and non-reputability for any transaction whether wired or wireless. Their research also suggested additional problems between the provider and mobile device, the mobile device and the mobile infrastructure operator, the mobile infrastructure operator and the wireless application gateway of the merchant, and the wireless application gateway and the web services of the merchant. Their analysis was more user and content centric.

Zeeshan conducted a case study of wireless security in an Australian healthcare¹⁰⁾. His study investigated a bare minimum wireless security framework specifying the essential and desired components of wireless security in health care industry. Patient confidentiality is protected by numerous legislations in Australia. It suggested numerous technical limitation and threats of current wireless standards. It is obvious that no 'out of box' wireless security solution provides the level of security desirable in health care area.

Tiong et al explored user perceptions of the wireless technology security⁷⁾. His research investigated user concerns for wireless technology and security requirements in healthcare in order

to obtain a view for security management in Australian healthcare.

The Importance of User Perceptions

It is important to know the socio-technical aspects of information technology usage besides the technical aspects. Coakes describes socio-technical aspects as the study of relationships between the social and technical part of any systems in helping organisations to explore and adjust to conflicts and complexity in the human, organisational and technical aspects of change¹¹⁾. In particular, these principles emphasise an ethical principle relating to the individuals participation in decision making and control over their immediate working environment.

The implementation of wireless technologies in healthcare and aged care organisations causes changes and would result in a wide variety of impacts upon the design of business, economic performance and the working conditions of staff. It can cause either positive or negative impacts. Therefore, it is important to investigate how information collection, storage and dissemination strategies could affect people's attitudes, beliefs and behaviours. The measurement of user perceptions on features and concept of wireless application security would be a good indicator of what constitutes a secure wireless environment in health care.

Fisher described several elements that contributed to a successful system from a user's perspective. They include understanding user requirements and perspective, user and developer communication, effective user involvement, accessibility of quality user information, ease of use, and appropriateness of the design of user interface. Therefore, it is possible to measure user perceptions on Wireless LAN security by associating certain attributes or factors to the technology, and measure the user needs.

Discussion

According to Effken, health care systems are complex socio-technical systems, which are undergoing rapid changes¹²⁾. In this dynamic system, change, chaos, information overload, organizational works and cyclical behaviors are common. Lee et al found that instead of improving work process, technology induces stress when employee's age increases¹³⁾. Fisher et al observed that employees in organizations where new technology was introduced developed a malaise called "technostress" - a combination of technology fatigue and aversion¹⁴⁾.

In order to adopt new ICT to health and aged care, It is necessary not only to understand organizational work process, their cultural context and how people interact with available information but also so to be sensitive to users' or patients' perspectives including privacy and security issues.

Now many researches, one of which is the research collaboration of CAAIR (Collaboration for Ageing & Aged Care Informatics Research) based on University of Southern Queensland and CCSCR (Center for Community and Stream Care Research) based on Niigata University of Health and Welfare, are underway across not only Australia and Japan, but also those countries impacted by ageing populations to explore technology for active ageing and aged care.

Many of these technologies use wireless and mobile connectivity to assist the elderly in maintaining active and independent lives as well as to receive care and monitoring in their own homes. The implementation of technologies for ageing and aged care will need to be designed to accommodate the physical, cognitive and visual limitations of the elderly as well as ensure adequate security considering their real or perceived vulnerability.

Acknowledgements

We are especially grateful to Professor Hideaki

E. Takahashi, President of Niigata University of Health and Welfare for his suggestions and supports for our research. This article is a part of results of the researches, "For effectiveness of patient/user evaluation of its experience" (Principle Investigator: Tsuyoshi Hamano) and "For secondary data usage for health and Welfare" (Principle Investigator: Yoshio Yonebayashi), both of which funded by the internal grant of Niigata University of Health and Welfare.

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