

Aged-care – privacy and security of the Smart Home

Associate Professor Jeffrey Soar
Director, CAAIR (Collaboration for Ageing & Aged Care Informatics Research),
University of Southern Queensland, Toowoomba, Australia, and
Secretary, HISA Aged Care Informatics Australia
Email: soar@usq.edu.au

Keywords: aged care, home care, technology, privacy, security

Complete citation:

Soar, J (2006) 'Aged-care – privacy and security of the Smart Home.' In: Croll, P, (ed.). *e-PASS, National e-Health Privacy and Security Symposium*, Queensland University of Technology. (e-PASS, National e-Health Privacy and Security Symposium, 24th - 26th October 2006, Brisbane, Australia.)

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? This presentation 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.

There has been increasing interest in patient safety with research suggesting alarming levels of permanent 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 preventable (Wilson et al 1995) and better provision of timely information is a key to quality and safety. Adverse 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 through ICT adoption.

A key strategy of both Federal and State governments is to provide better health care for frail/aged people and chronic illness sufferers in their place of residence (own home, nursing home, and so on). There is a strong incentive for this -- to reduce the demand on hospitals as well as often being the preference for patients themselves. The strategy of hospital avoidance (substituting community-based care for hospital care) is consistent with other countries facing similar increases in demand for their services due to ageing and the growing incidence of chronic illness. Shepherd and Illiffe (2005) in their review of published research found that some evidence exists that admission avoidance schemes can provide a less costly alternative to hospital 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 Technologies - www.agingtech.com) 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 homes (Abbamondi AL, 2005). 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 Call Centre staff. 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 Conference (www.hisa.org.au) 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 technologies (Gururajan et al, 2005). 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.

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 (Radio-Frequency Identification) 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 way 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 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 (Tiong et al, 2006).

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 increasingly digital. 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 (2003) conducted a technical review on the security of wireless standard from past surveys and literature. 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 (2003) conducted a case study on security challenges in a mobile healthcare setting. 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 (2003) conducted a case study of wireless security in an Australian healthcare. 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 (2006) explored user perceptions of the wireless technology security. 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 (2003) 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 change. 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 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 WLAN security by associating certain attributes or factors to the technology, and measure the user needs.

Summary

Research is underway across 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.

References

Abbamondi AL, 2005, Telecare Project – Municipality of Florence, http://www.it4all-bilbao.org/ponentes/A_L_Abbamondi.pdf accessed 13 October 2006

April 2005,
<<http://www.cs.mu.oz.au/~bir/auscc03/papers/hmad-auscc03.pdf>>.

ACIA (Aged Care Informatics Australia) and ACIC (Aged Care Informatics Conference), www.hisa.org.au viewed 13 October 2006

CAST (Center for Aging Services Technologies), <http://www.agingtech.com/> viewed 13 October 2006

Coakes, E 2003, 'Socio-Technical Thinking - A Holistic Viewpoint', in S Clarke, E Coakes, M Hunter & A Wenn (eds), *Socio-Technical and Human Cognition Elements of Information Systems*, Information Science Publishing, Hershey

Fisher, J 2003, 'Human Factors and the Systems Development Process', in S Clarke, E Coakes, M Hunter & A Wenn (eds), *Socio-Technical and Human Cognition Elements of Information Systems*, Information Science Publishing, Hershey.

Gururajan R, Murugesan S and Soar J (2005) Introducing Mobile Technologies in Support of Healthcare, *Cutter IT Journal – The Journal of Information Technology Management*, August 2005 Vol 18 No 8, pp 12-18.

Misra, S, Wickramasinghe, N & Goldberg, S 2003, 'Security Challenge in Mobile Healthcare Setting', paper presented to Wireless I.T. Committee Meeting, Cleveland.

Shepherd S and Illiffe S (2005) Hospital at home versus in-patient hospital care (Cochrane Review) *The Cochrane Library, Issue 2, 2005*. Chichester, UK: John Wiley & Sons, Ltd

Tiong IC, Hafeez-Baig A, Gururajan R and Soar J, (2006) Preliminary Investigation to Explore Perceptions of Security Issues Associated with Wireless Technology in Healthcare in Australia in Westbrook J and Margelis G (Eds) *Proceedings HIC 2006 – HISA Health Informatics Conference, Melbourne 21-22 August 2005*, Health Informatics Society of Australia.

Wilson RM, Runciman WB, Gibberd RW, et al. 1995 The Quality in Australian Health Care Study. *Med J Aust* 1995; 163: 458-471.

Zeeshan, A 2003, *Wireless Security In Health Care*, University of South Australia, viewed 01