

HEALTHCARE IN CONTINUUM FOR AN AGEING POPULATION

National Self Monitoring or Remote Offshore Monitoring for Australia?

Heather Grain, Kerin Robinson, Belinda Torney

HIM Program, School of Public Health, Faculty of Health Sciences, La Trobe University, Bundoora, Vic 3058, Australia

Bardo Fraunholz, Chandana Unnithan

School of Information Systems, Faculty of Business and Law, Deakin University, Burwood, Vic 3121, Australia

Keywords: Ageing in Australia, Electronic Health Records, Privacy, Offshore Resourcing.

Abstract: Australia is a country, similar to other developed nations, confronting an ageing population with complex demographics. Ensuring continued healthcare for the ageing, while providing sufficient support for the already aged population requiring assistance, is at the forefront of the national agenda. Varied initiatives are with foci to leverage the advantages of ICTs leading to e-Health provisioning and assisted technologies. While these initiatives increasingly put budgetary constraints on local and federal governments, there is also a case for offshore resourcing of non-critical health services, to support, streamline and enhance the continuum of care, as the nation faces acute shortages of medical practitioners and nurses. However, privacy and confidentiality concerns in this context are a significant issue in Australia. In this paper, we take the position that if the National and state electronic health records system initiatives, are fully implemented, offshore resourcing can be a feasible complementary option resulting in a win-win situation of cutting costs and enabling the continuum of healthcare.

1 INTRODUCTION

Ageing of populations is a world-wide phenomenon (Ozanne et al., 1997). However, in the past few decades, the central characteristic of ageing in societies worldwide has changed from high birth and death rates, to lower birth rates and increased life expectancies (Rowland, 1991). In Australia, falling fertility rates combined with the baby boomer generation moving into old age groups have contributed to the irrefutable demographic change (ALGA, 2005).

The proportion of people aged over 65 years, which is currently 13 percent (2.5 million), is expected to grow to one quarter of the population by 2051. While the proportion of people over 85 years is expected to grow from the current 1.4 percent to 6 percent during the same period, the people within the workforce age of 15-64 years is expected to fall from the current 67 percent to 59 percent (ABS-01, 2007). As a reflection of fertility, mortality and

migration, population ageing in states and territories shows varied trends (ABS-02, 2007). A significant dimension of the ageing population is the multiplicity of needs, interests and backgrounds. A wide range of inter-related factors including gender, location, socio-economic status, general health, culture and education have influenced the ageing process of individuals.

As Ozanne et al. (1997) recounted, migration resulting in the multi-ethnic character of the population seems to imply a need for differential arrangements in the public provisioning of health services as the ethnic aged may not share the attitudes of the mainstream groups. Conversely, the baby boomer generation is expected to age with different aspirations and expectations and on average greater financial means than previous generations (Australian Government, 2005). In addition, this generation is growing with transitional evolutions in technology. Their expectations of

independent living, for a longer period, are much higher compared to those of previous generations.

In a recent research study, “The Economic Implications of an Ageing Australia”, the Productivity Commission (2005) concluded that the delivery of human services, which represents 49 percent of local government expenditure, is forecasting the main demands from healthcare provisioning for ageing and aged care. Further, it reiterated that local councils are more likely to face budgetary pressures from population ageing than from traditional activities such as infrastructure provisioning.

The development of the “Australian Government National Strategy of an Ageing Australia” has provided a framework for responding to the opportunities and challenges of population ageing (Australian Government, 2005). It implied that population ageing affects more than aged care services and that an effective response requires a holistic approach including local governments. While Australia operates various initiatives for specific diseases and risks, the Australian Government (2005) has called for a more comprehensive approach to supporting and promoting health throughout life, which will require effective action across the continuum of care. Prevention and management of ill health are therefore seen as complementary strategies.

How can a continuum of care be facilitated to cater to the privacy conscious, financially sufficient, technology savvy generation with an ethnic mixture of migrant population? Are the current practices or initiatives ongoing, in alignment with their expectations of self-monitored, independent living for a longer term? To explore answers to these questions, in the next section, we consider the composite of Australian population: both the ageing and the aged, and ongoing initiatives.

2 AUSTRALIA IN PERSPECTIVE

One of the key expectations of the ageing population worldwide is a non-intrusive, privacy facilitating approach to health care. The generation that is ageing today has grown with digital technologies and is able to self-monitor their health to a significant extent. In an ideal situation, healthy ageing is preferable to after-care, which has been recognised as a major pressure on national budgets. We take the example of USA-based research to demonstrate the point.

Hayes et al. (2003) reported that over 20 percent of the USA population in the 85-plus age group were found to suffer from malnutrition and medication non-compliance as they do not receive appropriate interventional treatments by medical practitioners. This segment had limited capacity for independent living, with the result that they required continuous monitoring and daily care. This realisation spurred the piloting of remote monitoring of the activity of people in their homes for detecting acute events such as falls, using unobtrusive techniques (Glascok et al., 2000; Ohta et al., 2003).

The Point-Of-Care Engineering Laboratory at OHSU is one among the pioneers in developing approaches and technologies that allow early detection of reduced physical and cognitive function that leads to decreased independence (Hayes et al., 2003). They identified three key factors that facilitated this activity: the technologies must be unobtrusive, flexible and adaptable; and provide complete privacy. They argued that if people are aware of technologies, behaviours change and self-monitoring is un-reliable. Installing un-obtrusive and inexpensive sensors is perhaps the answer. Second, technologies needed for health monitoring are probably not those people would want in their homes all the time. Therefore, wireless devices and open standards for device communication are essential to simplify the placement of technologies on a needs basis and to meet dynamic health care needs. Finally, the use of encryption and authentication techniques including pseudonomisation, as well as judicious selection of what information is actually transferred between devices on the network, are recommended.

Advances in wireless networking, ubiquitous computing and unobtrusive technologies are now providing opportunities for facilitating healthy ageing and aged care, both of which are in the portfolio of health care provisioning for nations.

2.1 Initiatives

In Australia, two distinct issues confront governments in healthcare provisioning: providing for healthy ageing, to ensure a nation of self-independent individuals; and addressing the needs of the already aged proportion which needs assistance for living. We examined initiatives and frameworks that are ongoing for both categories.

There is a significant move towards e-Health recognising the facts that the society is increasingly technology savvy and that people would like to have the option of self-monitoring their health. In late

1999, the Australian National Health Information Management Advisory Council (NHIMAC) released a "Health Information Action Plan for Australia", which constituted the use of online technologies within the health sector and laid out national projects (Ride, 2007). A key recommendation was to develop a national framework for the use of e-Health records to improve the efficiency, safety and quality of care within the requisite privacy legislations.

The initiative of HealthConnect included the establishment of a national framework for a system of electronic health records – which involves the electronic collection, storage and exchange of consumer health information via secure networks and within privacy safeguards. The network, with consumer consent, allows electronic exchange of clinical information between health care providers. The information regarding consumer health was to take the form of standardised 'event summaries', extracted from health care provider electronic records for consultation, including current and historic information such as results of pathology and diagnostic tests, hospital discharge summaries, chronic illness monitoring, current medications, allergies, immunisation information and principal diagnosis (Ride, 2007).

Rather than replacing existing legacy systems at national, state and territory levels, HealthConnect proposes a composite of different layers: a records layer which consists of the regional storage repositories; a user layer which contains the computer systems software that will interface with HealthConnect to allow providers either to view/review records or add new event summaries to records; and a national coordination layer that links all regional storage repositories and provides the link between these repositories and user/source systems, allowing people to use their record throughout Australia (HealthConnect, 2007a).

However, the challenges for the system are still numerous. For instance, the states and territories are not alike, and there are major differences in geographic size, population density, investment capacity, information management infrastructure and health care issues and resources (HealthConnect, 2007b). As a result, each region is at a different stage of implementation development (Ride, 2007).

HealthConnect works briefly as follows: peoples' information is collected at point-of-care. The shared storage facility helps health care providers to access information, with consumer consent. Conversely, an individual may wish to check progress against key self-management observations such as blood pressure, weight or blood

glucose levels. According to Ride (2007) who provides the latest status, this network ensures robust privacy and security standards. The expectation is that by 2008, Australia will be well advanced in achieving the goal of electronic connectivity between all major health institutions and health care providers (HealthConnect, 2007b). From a future perspective, national implementation within 18 months (as of 2007) is expected in some areas such as e-prescriptions, e-referrals and hospital discharge summaries.

An Australian consortium is developing a possible architecture known as OpenEHR (OpenEHR, 2007). Based on openEHR release 0.9, a scalable, secure, shared e-Health record to meet national standards is being implemented using a combination of XML, Web Services, J2EE, Relational database, LDAP and PKI. Via HL7, it also supports interfaces with external systems and smart cards. The totally web-driven user interface works with all popular browsers. It currently supports hospital doctors, general practitioners, pathologists, endocrinologists, ophthalmologists, dieticians, diabetes educators and podiatrists. Emergency medication, pharmacies and community nursing are being added (OpenEHR, 2007).

In 2002, Standards Australia published the AS5017-2002- Health Care Client Identification to provide a basis for improved association of clients and their data between organisations. There are currently two dominant sets of messaging standards in the Australian health sector: UN/EDIFACT for financial applications; and Health Level 7 (HL7) for more clinically-related applications. Other standards such as DICOM (Digital Imaging and Communications in Medicine) are applicable to discrete applications such as diagnostic imaging. Standards Australia International is developing a Message Usage Handbook that provides recommended applications of the messaging standards. Further development of this message usage model is anticipated in the short to medium term (Ride, 2007).

In July 2004 the National E-Health Transition Authority (NEHTA), a not-for-profit company, was established by the Australian, State and Territory governments to develop better ways of electronically collecting and securely exchanging health information. Its mission is to set the standard, specification and infrastructure requirements for secure, interoperable, electronic health information systems (NEHTA, 2007). The Australian initiatives for monitoring health in the ageing are being built on

the existing principles of privacy, legislation and standards.

Conversely, there is increased pressure on the national budget to cater to the 85-plus or significantly non-independent aged population. Lifestyles have catered to longevity and perhaps technology-assisted living. Soar et al. (2007) reported the current status on approaches to reduce avoidable hospital admissions through information technology. The aged Australian prefers home care referrals, a less expensive alternative to institutional care. A workshop at the 2005 Health Informatics Conference identified a lack of reliable identification of candidates for hospital avoidance as a major barrier.

Subsequently, the Advanced Community Care Association (ACCA) was formed to provide a single point of referral to community service organisations. Further, "Nexus eCare" developed by Nexus Online Pty Ltd, provided a proof-of-concept web-based, community care management system which identified candidates, mapped services to patients, automated communication between hospitals and community service providers. Initially, the system uses a Rapid Assessment tool to identify avoidable patients. It incorporates an "intelligent filtering agent" which continuously monitors the digital data flow. The final assessment of this approach reveals that pressure on hospitals, emergency departments and budgets can be significantly relieved (Soar et al., 2007).

Philipson and Roberts (2007) reported on the impact of technology on aged and assisted living in Australia. This research recognised that the usage of digital technologies by the aged will become increasingly an important issue in future years. The authors point to a number of proactive computing applications that are being developed which will assist ageing persons to live longer in their home environments. Assistive technologies are wide-ranging, from radio/ultrasound/remote control appliances, alternate keyboards, voice input devices, phone amplifiers, etc.

Wireless sensors, for example, can be used to gather behavioural and biological data, to be input into computer applications (Philipson and Roberts 2007). Conversely, virtual uninterrupted communication possibilities as the user moves from their homes to cars or external places are being envisaged, with Telstra and other carriers in Australia contemplating a next-generation network (NGN). The use of BANs (Body Area Networks) can be useful in assisting home monitoring of paraplegics or compensating for deficits of

functioning caused by dementia. BAN, a base technology for permanent monitoring and logging of vital signs, is a proven method of supervising the health status of patients suffering from chronic diseases, such as diabetes and asthma (BAN, 2007).

Hovenga et al. (2007) have described comprehensive and recent research developments in the area of ageing/aged care using OpenEHR. They proposed an archetype management framework to facilitate the development of future information systems and optimise electronic health records within the aged care sector. According to them, Australia is leading in the field of developing Electronic Health Records using openEHR archetypes. These archetypes describe rich information structures by indicating how the information is to be expressed; what is optional and mandatory; what is a sensible value for each data element; and other rules (Hovenga et al., 2007:4). These archetypes have the potential to improve aged care in many ways such as standardising clinical content and enabling the data to be interchangeable; empowering residents by enabling them to switch providers easily without the need for multiple examinations; improving provider access to relevant resident information; providing necessary flexibility to reflect resident care preferences; and enabling care providers to access best practice information as part of daily workflow and decision making processes at the point-of-care (Hovenga et al., 2007:4)

Both the aged and the ageing would benefit from a nationwide semantic interoperability, requiring the national adoption of a key set of standards. Standard openEHR archetypes include the adoption of a standard terminology and set of data types, which best fit with the openEHR information model but can be used, to a variable extent, to enable communication between systems with different information models. Currently, an international team lead by Australian experts is engaged in identifying a common standard set of health data types and encouraging their adoption into international standards.

The current clinical information systems tend to be vendor specific, not adopting standard data models, due to the lack of agreed standards. Hovenga et al. (2007) recommend the adoption of standard structured messages that are compliant with messaging standards such as developed by Health Level 7 (HL7) and its international affiliates. Further, Standards Australia has developed a number of HL7 standard implementation guidelines for this purpose (Standards, 2007).

Having explored the initiatives for aging and the aged for future, we now look at a critical factor in the healthcare provisioning - privacy.

2.2 Privacy

Moor (1997) suggested that privacy is felt when a person is protected from intrusion, interference and information access by others. In most western societies, including Australia, this definition may describe privacy, but it is not a universally accepted concept. In many Asian societies shielding a person is not considered correct. In the context of Australia, which has a significant migrant population from these societies, it is regarded as acceptable only in rare circumstances to have the individual's privacy violated for general welfare.

For example, in Australia, RFID is used for non-invasive monitoring (Frost and Sullivan, 2005). However, does it concur with the needs of privacy that the ageing population expects today? Where individual privacy has to be respected, there are arguments for and against the use of RFID for monitoring or, for that matter, any forms of technology. ICTs pose a unique threat to personal privacy because of the type and quantity of personal information that can be collected, combined with the speed of transmission and length of time that the information can be held (Tavani, 2004:118). RFID monitoring intensifies ICT-related difficulties in protecting private information by offering the information collectors the benefits of ubiquity coupled with secrecy (Wiebell, 2005).

Mulligan et al. (2007:2) reported on research within the privacy regulations, detailing issues and solutions for custodians. They point out that there are two main ways in which data custodians handle the demands of privacy protection. The first is to seek informed consent and the second to respond by developing mechanisms for ensuring privacy i.e. the data are sufficiently de-identified and protected such that they cannot be linked back to the individual. However, Mulligan et al (2007) reiterate that this solution does not allow people to control the use of their data, nor to minimise the potential for individuals to be harmed.

One methodology (Mulligan et al. 2007:2-3) involves the separation of personal identifiers from clinical information and their separate encryption by the reporting clinician, and submission of these data to a "trusted third party" who allocates an identifier specific to paired data items and forwards personal identifiers and clinical data to separate repositories (Churches, 2003). As a result, the clinical data from

disparate databases can only be linked by trusted third parties. For example, personal identifiers are not provided with specific disease registers. Mulligan et al (2007) reiterate that this method requires legal protection and financial support from government. They also point out that in Western Australia, the custodians of disease registries and health databases that contain personal identifiers and clinical information sign a Memorandum of Understanding authorising the third party (the Linkage Unit) to identify data concerning the same individual in different databases. The Linkage Unit allocates Unique Anonymous Identifiers for each individual.

In August 2007, a regulation occurred in the Federal Parliament of Australia, titled "1.1 Medicare Australia (Functions of CEO) Amendment Direction 2007 (No.2)". In plain terms, without contest or assessment of value for money, Medicare (the national health insurance program) can scope, develop, build and test the NEHTA Unique Healthcare Identifier program. The regulation authorises NEHTA to make a copy of the two key identity databases supported by Medicare Australia (the client and the provider databases) and use them to provide an identity service. Despite the prohibition in the Commonwealth Privacy Act (2000) of personal information being used for purposes other than for which it was collected by Government Agencies, it has been decided that information that was collected to enable Medicare benefits to be paid is to be used to operate the NEHTA UHI (AHIT, 2007).

The implications this has, for the trust the population will have in Medicare Australia to keep their private information private, are profound (AHIT, 2007). Some pertinent questions that the regulations bring forth are:

1. Where is the Privacy Impact Assessment that validates this approach?
2. Who will be responsible if there is a security breach and personal details are released and the individual is harmed?
3. How will the information be protected from unwanted disclosure or access?
4. What is the legal liability?

Medicare patient and provider databases are key sources of a healthcare identifier regime being introduced to support a shift to e-Health programs. Consequently, records belonging to 99 per cent of

Australians are contained in Medicare's Consumer Directory Maintenance System, considered to be the most up-to-date and accurate government repository of personal information. The law prevents the use of Medicare data for other purposes; however, the Human Services Minister has unlocked access via a legislative amendment tabled in Parliament on August 16 (AHIT, 2007).

The durability and applicability of current legislation relating to privacy is very much in focus for healthcare provisioning in the continuum of care for ageing Australia. Furthermore, the OpenEHR initiatives need to be implemented in conjunction with continued amendments in legislation and standards, to ensure privacy protection.

Now we look at another dimension of healthcare provisioning that is under consideration, i.e. offshoring.

3 OFFSHORE RESOURCING – IS THERE A CASE FOR AUSTRALIA?

In 2004, Curtin University of Technology initiated a project that examined the long-term feasibility of off-shoring to India. The considerations included health services such as radiology and diagnostics (CBS, 2004). The study is ongoing and results are yet to be published.

The ACCI (2005) recounts that in the transition to a globalised economy, offshoring is a viable option for businesses in Australia, to better manage costs and quality of services. In the health services arena, including medical, dental, nursing diagnostics and health services such as data entry, hospital administration and processes, offshoring is a viable alternative. For example, Indian medical practitioners are interpreting radiological scans for patients in the USA. The Phillipines is providing medical record transcription services to a number of developed nations. However, offshore resourcing may not be an option where physical presence is required for legal and/or practical reasons, such as health care regulations.

Conversely, Australia has a shortage of doctors and nurses, especially in regional areas (AusGov, 2007). The ABC News (2006) reported an acute shortage of hospital beds, as citizens spend at least 25 minutes in an emergency waiting room. The report says the top five reasons for medical admissions in public hospitals were: respiratory problems; cardiology and interventional cardiology;

childbirth; renal dialysis; and neurology. While it may not be possible to offshore some of these services, non-critical procedures such as monitoring an asthmatic patient at home, could be done from overseas with relative anonymity.

For example, if effective pseudonomisation standards are finalised and therefore neither the person's identity nor the location is disclosed, we argue that there is potential safety for the aged to be monitored from overseas, given that the person is not within the limits of harm nor is of interest to the offshore partner other than those via their work commitments. Certainly, there is a case for feasible options in health services offshoring to enable continuity of health care.

4 OUTLOOK

Drawing conclusions from the above sections, it is evident that: if there is a functioning, fully implemented OpenEHR system that enables e-Health, supported by legislation and ongoing upgrades of standards that ensure privacy protection in Australia, this would enable healthcare in continuum for the ageing population.

Shareable EHR's such as those proposed in HealthConnect that are built on OpenEHR will, if fully implemented nation-wide, have the potential to address the requirements of a technology savvy, privacy conscious ageing population who expect their health services to enable independent long-term living. However, the key factor is that the system needs to be fully functional, implemented, and compliant with legislation and standards, nation-wide.

At the next level, we consider the budgetary pressure on national/local governments in the provisioning of health services as well as the shortage of doctors and in-patient facilities in hospitals, in Australia. Currently, while the debate on offshoring is still rampant, we argue that it can be a viable option based on the following.

Use of architectures such as those proposed by OpenEHR would enable non-critical processes to be separated from critical procedures that cannot be offshored. Subsequently, as described by Mulligan et al (2007), the separation of personal identifiers from this information and submission of relevant data to a trusted offshoring partner, via a dedicated portal, is easily possible. The offshore partner on the other end can allocate identifiers specific to paired data items and forward personal identifiers and clinical data to separate repositories. No doubt, the

issues of trust and reliability become significant in such cases.

A specialist offshore radiologist, for example, who is providing expert opinion based on radiology reports, does not need the patient's name. In another example, if an aged person is being monitored in their home environment by a medical practitioner overseas, only the details that are relevant to their health condition need to be revealed and other personal details can remain anonymous to the observer. An online portal can be used for a medical practitioner at both ends to input radiology reports, diagnostics and analysis sheets. A general practitioner at the Australian end could be the interface and connecting point through a shareable EHR.

Where the portal is interfaced with an EHR that meets the NEHTA Privacy Framework requirements it should provide legal certainty. The identities of people should not be disclosed to third parties – enabling privacy protection. The separation of selected non-critical procedures from the EHR to offshore providers should ensure that control remains within Australia, and can be updated seamlessly via an interface on the online portal. At that level, compliance with legislation and standards would also be met via a registered medical practitioner who would act as the interface.

Therefore, our position is to implement a shareable EHR, compliant with standards and legislation and then to resource services offshore, with anonymised records, to improve service turnaround, relieving the pressure on government budgets and the skills shortage, while enabling healthcare in continuum for a healthier ageing Australia.

REFERENCES

- ABC News (2006). Hospital bed shortage worsens, ABC Online, Retrieved September 10, 2007, from <http://www.abc.net.au/news/stories/2006/07/03/1677583.htm>
- ABS-01 (2007). Population Projections *Australia 2002-2101 Cat.No.3222.0*, Australia.
- ABS-02 (2007). Population Projections – Statistical Local Areas 1999-2019 *Cat No. 3220.0*, Australia.
- ACCI (2005). Offshoring a viable option for some companies, Australian Chamber of Commerce and Industry Website, Last accessed 10 September 2007, www.acci.asn.au/text_files/issues_papers/Trade/June%2005%20-%20Offshoring.pdf
- AHIT (2007). Medicare, NeHTA and your Privacy, *Australian Health Information Technology*, Retrieved September 10, 2007, from <http://www.australianit.news.com.au/story/0,24897,22318001-5013040,00.html>
- ALGA(2005).Planning for an ageing community, *Australian local government population ageing action plan 2004 – 2008*, Retrieved September 5, 2007, from <http://www.alga.asn.au/policy/healthAgeing/ageing/plan/>
- Australian Government (2005).National Strategy for Aging Australia, 2005, *Australian Government, Department of Health and Aging*, Retrieved September 10, 2007, from <http://www.health.gov.au/internet/wcms/Publishing.nsf/Content/ageing-ofoa-agepolicy-nsaa-nsaabk4.htm>,
- AusGov (2007).Doctors and Nurses, Department of Immigration Website, Last Accessed 10 September 2007, <http://www.immi.gov.au/skilled/medical-practitioners/index.htm>
- BAN(2007).Body Area Networks, Fraunhofer, Retrieved September 9, 2007, from http://www.ban.fraunhofer.de/index_e.html
- CBS (2004).CBS Study looks at benefits and pitfalls of going offshore, *CBS Media Release*, Retrieved September 9, 2007, from <http://announce.curtin.edu.au/release2004/C17704.html>
- Churches T (2003). A proposed architecture and method of operation for improving the protection of privacy and confidentiality in disease registers, *BMC Medical Research Methodology*, 3(1), 1-13.
- Frost and Sullivan(2005). Australia RFID applications, *Frost and Sullivan Website*, Retrieved September 10, 2007, from <http://www.frost.com/prod/servlet/market-insight-top.pag?docid=49019419>
- Glascoek AP, Kutzik DM (2000).Behavioral Telemedicine: A New Approach to the Continuous Nonintrusive Monitoring of Activities of Daily Living, *Telemedicine*, 6(1), 33-44.
- Hayes TL, Pavel M, Schallau PK, Adami AM(2003). Unobtrusive Monitoring of Health Status in an Aging population, 2-5.
- HealthConnect (2007a). Introduction, HealthConnect, Retrieved September 10, 2007, from <http://www.healthconnect.gov.au/internet/hconnect/publishing.nsf/Content/intro>
- HealthConnect (2007b). What is happening, HealthConnect, Retrieved September 10, 2007, from <http://www.healthconnect.gov.au/internet/hconnect/publishing.nsf/Content/whats-happening-11p>
- Hovenga EJS, Garde S, Carr T, Hullin CM (2007). Innovative approaches and processes for capturing expert aged care knowledge for multiple purposes, *Electronic Journal of Health Informatics*, 2(1):e5, 1-13.
- Koch T, Jenkin P, Kralik D (2004). Chronic illness Self Management: Locating the self, *Journal of Advanced Nursing*, 48, pp 484 -492, EBN Online, BMJ Publication.
- Moor, J.H. (1997). Towards a theory of privacy for the information age, *Computers and Society*, 27(3), 27-32.

- Mulligan E, Rogers WA, Braunack-Mayer A (2007). Research within the privacy regulations: Problems and solutions for database custodians, *Electronic Journal of Health Informatics*, 2(1):e7, 1-5.
- NEHTA (2007). National e-health transition authority, Nehta Website, Retrieved September 10, 2007, from <http://www.nehta.gov.au/>
- Ohta S, Nakamoto H, Shinagawa Y, Tanikawa T(2002). A Health Monitoring System for Elderly People Living Alone, *Journal of Telemedicine and Telecare*, 8(3), 151-156.
- OpenEHR (2007). Research and Development based on openEHR, Retrieved September 20,2007, from http://www.openehr.org/projects/t_projects.htm
- Ozanne E, Borowski A, Encel S (1997). *Ageing and social policy in Australia*, Cambridge University Press.
- Philipson G, Roberts J (2007). Caring for the future: the impact of technology on aged and assisted living, *Electronic Journal of Health Informatics*, 2(1): e1, 1-9.
- Productivity Commission (2005). *Economic implications of an ageing Australia*. Productivity Commission, Canberra.
- Ride (2007). Ride D.2.1.1 – Current European practices in providing interoperability in e-health domain: HEALTHCONNECT and NEHTA (Australia), *Information Society Technologies*, Retrieved September 10, 2007, from <http://www.srdc.metu.edu.tr/webpage/projects/ride/deliverables/RIDED.2.1.1.%20-%20CurrentPracticesAustralia.doc>
- Rowland DT (1991). *Ageing in Australia*, Melbourne, Longman Cheshire.
- Soar J, Yuginovich T, Whittaker F (2007). Reducing avoidable hospital admissions of the frail elderly using intelligent referrals, *Electronic Journal of Health Informatics*, 2(1):e3, 1-13.
- Standards (2007). HL7 standard implementation guidelines, Retrieved September 9, 2007, from <http://e-health.standards.org.au>
- Tavani, HT (2004). *Ethics and technology: Ethical issues in an age of information and communication technology*, Wiley: Hoboken, NJ
- Wiebell H (2005). RFID Should Be Restricted by the State, *Information Age*, 14th December, Retrieved September 9, 2007, from <http://www.infoage.idg.com.au/index.php/id;1222880574;fp;4;fpid;675408222>