

Chapter 14

eHealth, eLearning and eResearch for rural health practice

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Learning objectives

- Describe the capacity of eHealth to improve rural health care and support the rural workforce and community.
- Describe the ways in which eHealth affects existing structures and processes of rural health care in Australia.
- Identify how eHealth contributes to the emergence of new models of rural health care.
- List and explain the issues around the implementation of eHealth systems in regional and remote settings.

Introduction

This chapter explores the emerging field of eHealth, identifying its potential to significantly improve rural health care and to support the rural workforce and community. Underlying principles and perspectives that will facilitate the successful adoption of eHealth in regional, rural and remote health services in Australia are identified and discussed. How do we provide health services to the six million people dispersed across the 7.5 million square kilometres that constitute ‘rural’ Australia? How do we meet the consumer need for access to quality health care in a cost-effective way? The fact that only 20% of the \$2.3 billion spent on Medicare general practice rebates in 2002 was spent in rural Australia suggests that there is an inequitable provision of health care, mainly due to access issues, which can contribute to poorer health status and can lead to suboptimal treatment and premature death (Jong et al 2004).

In an address to the Commonwealth Fund in 2002, Dr Donald Berwick (President and Chief Executive Officer of the Institute for Healthcare Improvement, and Professor of Health Policy and Management at the Harvard School of Public Health), outlined his vision for ‘health services that offer “24/7/365” access to help that is uncompromising,

meeting whatever need exists, whenever and wherever it exists, in whatever form requested'. Given the current challenges faced by health services, particularly in providing even basic levels of service to rural and remote areas, this may seem more of an impossible dream than a vision for the future. Yet, there is a view that information and communication technology (ICT) offers the capacity to bring about the changes necessary to implement this vision, through the use of eHealth, eLearning and eResearch. According to Berwick (2002) 'the emergence of new information and communication technologies ... is often seen as offering new opportunities for enhanced levels of care, structural reform and organisational modernisation in health care'.

Until recently, health services outside metropolitan areas were structured around a network of small rural hospitals and remote nursing posts. This model developed very early in Australia's history when it was both possible and desirable to have duplication of a range of services and facilities for each community. Medical care was much less complex and less technology-dependent. Health professionals with excellent generalist skills were able to cope with most medical situations.

Over the years, rural communities and services have declined (Humphreys et al 2001). Significant changes during the 1980s and 1990s saw cheaper, faster and more efficient transport, which increased the connections between town and country. Commercial, education and health services in rural communities dwindled or disappeared. The number of people living in more rural and remote regions also declined. Better transport and smaller populations saw expensive and complex health treatments rationalised to larger centres. Specialist services, such as cardiovascular surgery or counselling services, are usually available only via outreach arrangements with metropolitan hospitals. Recruitment and retention of suitably qualified clinicians and other health professionals is becoming increasingly difficult, as is the provision of cost-effective and accessible health services. General Practice and primary health care services are already scarce (HWQ 2005).

However, small communities are surviving and many are becoming increasingly resentful of the gradual removal of services. They are also adept at developing and using innovative solutions including those using ICT. One example is the way in which ICT is being used to create eHealth alternatives to the face-to-face consultation. Options currently being explored include online consultations, group visits, email consultations, and chat rooms (Yellowlees 2000, Berwick 2002, Car and Sheikh 2004, Ferguson and Frydman 2004, Katz and Moyer 2004, Pascoe and Neal 2004, Pinnock et al 2005, R Smith 2004).

Consequently, eHealth, eLearning and eResearch are central to resolving the problems of providing services to rural Australia. Introduction of these new approaches to rural health care will be driven by the persistent problems of rural isolation, the uneven distribution of health care facilities, and the possibility of cost savings (McDonald et al 1998).

Yet, while rural areas have much to gain from eHealth — and there has been considerable investment by state, territory and federal governments — they have the poorest infrastructure, resources, capacity and capability for successful implementation and

uptake (Liaw and Humphreys 2006). At the same time, the rural models of health and human service delivery are as complex as any found in urban areas, with multiple funding streams and duplicative and uncoordinated services. This creates a paradox for rural eHealth, made more disappointing by the enthusiastic uptake by rural general practices (90% of RRMA 6 and 86% of RRMA 7 general practices) of secure, business-grade broadband through the Broadband for Health program (Medicare 2007).

The main contributing factors to this paradox, and therefore the main barriers to implementing rural eHealth, include:

- lack of a national and nationally-coordinated rural eHealth implementation plan and budget
- inadequate eHealth infrastructure in rural health services
- inefficient and unsustainable online information resources and telehealth programs
- lack of benchmarks and interoperability standards to enable cost-efficient and effective sharing of information, and lack of incentives for affordable broadband (Broadband for Health provides some financial incentives)
- workforce shortages generally, but particularly workers trained in eHealth services
- lack of skilled and reliable technical training and professional support staff
- a lack of remuneration for health professionals using eHealth strategies
- reluctance of providers and consumers to adopt eHealth, possibly due to concerns about privacy of health data.

The eHealth paradox reduces the opportunity of meaningfully addressing the rural–urban differentials in workforce, health services and systems, and ultimately, health. It is important to recognise that the eHealth environment is very fluid. For instance, with adequate ongoing support and funding from Government and industry, the rollout of the Managed Health Networks Grant Program as part of Broadband for Health in 2007 may be the beginning of a significant eHealth capacity building in rural and remote Australia.

The 2005, Eastern Goldfields Regional Reference Site Virtual Private Network project connected 20 GPs, three specialists, Aboriginal Community Controlled Health Services, a regional hospital and four district hospitals, the Eastern Goldfields Medical Division of General Practice, Aged Care facilities, four community pharmacies, Rural Clinical Schools, the Royal Flying Doctor Service, and private radiology and pathology providers. Like many of its predecessor projects, for example MediConnect, it is a short-term project with funding stopped in June 2006. To date, it has only demonstrated the promise of videoconferencing! The Australian Government plans to use the lessons learnt from this renamed ‘Gold Health Network’ to find better ways to support telehealth. However, the long-term fate of the network remains uncertain.

Evaluations of eHealth systems in Australia and overseas have identified the issues and perspectives associated with efficient, effective and sustained implementation of eHealth and eLearning. Adopting these principles with a sociotechnical approach, which

addresses the social and organisational aspects of technology diffusion and change management, as well as the technology requirements, are more likely to contribute to the resolution of the rural eHealth paradox (Liaw and Humphreys 2006).

Health professionals will embrace eHealth if it will benefit patient care and improve their own performance within an acceptable privacy and security framework. They do not expect to pay for the eHealth building blocks, such as secure business-grade broadband, semantic and technical interoperability standards, or patient identifiers. The government and industry are generally expected to be responsible for these public good infrastructure and systems. MBS items like telepsychiatry could be extended to other clinical domains.

eHealth reform has been impeded by the lack of a clear, consistent, effective nationwide regulatory framework for health information. This will be needed to provide the level of clarity, certainty and predictability needed to underpin the development of national eHealth systems and the wider workforce issues in the health sector.

The following case studies describe the situation with eHealth, eLearning and eResearch in Axis, a rural town, and provide a context for discussing these principles and perspectives.





Case study 14.1 eHealth supporting rural Australia

Axis is a small rural township situated three hours from the nearest regional town and base hospital. Janet, a nurse, is Chief Executive Officer of Axis Health Services, which is based in a 20-bed hospital complex. It is one of twenty hospitals in the region. These hospitals enter into various regional arrangements to facilitate effective use of resources, including the acquisition of ICT. Janet is excited about the prospect of using ICT for eHealth and eLearning. She has recently visited a nearby region where a Regional Patient Information System (RPIS) has successfully integrated administrative and financial systems. The ICT Committee in that region is now developing a regional electronic health record. Janet can see possibilities for her own service, where she is under pressure to share patient information electronically with the tertiary hospitals, other district hospitals and local GPs. Unfortunately, every organisation is using a different patient record system and she is concerned about how to transfer information safely, and about associated safety and privacy risks. A lack of information system standards and benchmarks contributes to this risk.

Janet's first concern is upgrading the old computers and dial-up Internet access in her service. The funding from the Federation Fund, set up to improve rural ICT infrastructure, has not been sufficient for Axis Health Services to significantly improve its ICT infrastructure. Janet is concerned with more than technology issues. She understands that training and support are needed to enable staff to use eHealth effectively. She also understands that change management strategies must encompass the cultural, organisational and behavioural issues of introducing eHealth.

Axis Health Services has a videoconferencing system installed in a meeting room. The funding from the state government was for three years, with Axis Health absorbing the operating costs at the end of this period. The system was installed by ICT contractors, with limited consultation with potential users. It is used primarily for administration and management meetings. The high-speed connections necessary for most clinical consultations are too expensive for regular use. Health professionals find the equipment difficult to use and are unhappy having to leave their offices/consulting rooms to use the system in a non-private room. They also argue that it will cost them less time to refer a patient away rather than spend a lot of time videoconferencing, and end up referring them out anyway. They question whether telehealth benefits the centre at the expense of the periphery. Clients using the system are concerned that their discussions can be overheard in the adjacent staff-room. Greater use of this potentially cost saving tool will require a complex change-management strategy across the whole network. Janet does not have resources to allocate to this.

Discussion

Through eHealth, rural health services have the potential to become exemplars in offering coordinated and integrated health care and health education. The central role of the rural community hospital can be revived as it becomes the physical and virtual focus for intersectoral and interprofessional service integration and knowledge transfer among the rural health team, and between specialist urban and generalist rural services (RDAA et al 2004). Used judiciously to augment teamwork and enable information sharing, ICT tools can promote cost-effectiveness, facilitate coordination and integration in the health

system, and improve equity of access to health services, education and information by rural clients, health care professionals, health care managers and authorities.

However, successful exploitation of eHealth requires more than simply introducing ICT into the health care environment. While there may be a focus on the technology, eHealth also includes political, organisational and cultural factors. eHealth systems often disrupt traditional work routines, workflow and work relationships. The location of equipment, the need to consult with others, the protocols involved and the need to enter and access information in a timely manner may all have an impact. In a busy rural emergency department, general practice surgery or health administrator's office, these changes may or may not be perceived as a good thing. New systems must be designed to take into account the complexity of the health care environment and the needs, priorities and agendas of key players. A sociotechnical perspective acknowledges these political, organisational and cultural factors at both the strategic and the local levels (Whetton 2005a).

At the strategic level, governments influence eHealth by their willingness to provide resources, support initiatives and modify existing policies, procedures and guidelines to accommodate services (BCG 2004). Legal issues are also important (Milstein and Tognio 2001). This level of support is embodied in the following factors.

- *Adequate ICT infrastructure:* Without an adequate ICT infrastructure, eHealth will not progress. In Australia, the government has a key role to play in ensuring that the telecommunications infrastructure is extended across the whole country.
- *Leadership:* National and state bodies have a critical leadership role. This includes support for standards organisations to develop and implement accreditation for appropriate technical and professional standards quality-control mechanisms.
- *Interoperability standards:* If eHealth is to fulfil its promise for regional, rural and remote health care, it is essential that interoperability standards are developed to enable sharing information within the public sector, and between the public and private sectors.

There is also much that can be done locally to increase the uptake of eHealth. Senior management need to set parameters around the nature, scope and focus of eHealth programs. Focuses on efficiency, technology or quality care will each produce different issues and different outcomes. Senior management also influence outcomes of eHealth by the level of support and involvement they demonstrate (Liaw and Tomlins 2005). The following inter-related principles should underpin local organisation planning:

- *Warm-ware/management support:* Management support is needed to provide the policies, resources and protocols necessary to promote and support the use of eHealth services and applications.
- *Measurable outcomes:* Advocates for an eHealth application must be able to show that it will improve clients' health outcomes or result in significant savings of resources. The most successful projects use ICT tools to address issues that health care providers have seen as problematic. For example, electronic patient-discharge

summaries are a clear improvement over hand-written summaries that are sent by post.

- *A respected clinical champion:* The enthusiasm and credibility of a champion or role model will influence other clinicians to adopt changes. The most effective clinical champion is one who has sufficient resources to be involved in the introduction and ongoing implementation of an application.
- *Accurate, timely and secure information:* Ideally, new applications will be consistent with current information flows, such as prescriptions sent to a pharmacist. Applications requiring new information flows must be designed carefully, because applications that are not trusted, counterintuitive and time-consuming are less likely to be accepted or used.
- *Ongoing training and support:* This will ensure that eHealth services and applications are used efficiently and effectively.
- *An embedded evaluation framework:* This should include process and outcome components. An effective evaluation framework will be rigorous but realistic. It will cover technical, organisational, cultural and behavioural dimensions, with a focus on user and patient outcomes over the longer term (Hersch and Hickam 1998, McDonald et al 1998, Liaw et al 2003, Littlejohns et al 2003).

Challenges for the learner and teacher

1. What are the current Australian Government policies and frameworks that will provide structure and support for Janet's initiatives?
2. What are the current policies and frameworks in your state that will provide infrastructure and support for Janet's initiatives?
3. What national standards initiatives, policies or guidelines would help to resolve the connectivity issues at Axis Health Services specifically and Axis generally?
4. What organisational, cultural and political issues will Janet need to consider when seeking to develop the eHealth systems at Axis Health Services?





Case study 14.2 The potential and pitfalls of eHealth: other health professionals in Axis

Min-Yu, a pharmacist who works in the local Axis pharmacy, is also interested in how clients with chronic diseases manage their long-term medicines. She is especially concerned about people in the isolated townships scattered across the region, particularly if they are using the Internet for information. Unlike John, the GP registrar in the Axis general practice who uses RACGP Online regularly, she has reservations about clients using the Internet, because she believes that much of the information available is unreliable. With the support of Axis Health Services, Min-Yu has developed an online education program for people with a chronic disease. The program has not been used much, and feedback suggests that it is too difficult to navigate, the images take too long to download, and the help files are written in technical jargon. Many people are trying to access the site using dial-up modems.

Discussion

As the rural health sector's experience with using advanced ICT technology increases, it is becoming clear that eHealth is not just about changing how we deliver the same services. Rather, it is about offering services in different ways. In education, ICT can enable health professionals, clients and the wider community to initiate and access many formerly unavailable education opportunities via eLearning. One of the main uses of ICT is for education; but, the technology should be used because it is the most effective and appropriate tool, not simply because it is available. Educators have adopted a number of principles to ensure that this occurs. These apply to undergraduate programs (Hilty et al 2006) and continuing professional education (Liaw et al 2002). A quality program will embody most, if not all, of the following principles:

- *Relevant, appropriate content:* Activities and content should be meaningful to learners and practitioners (Dorsch 2000, Gorman 2001, Gorman et al 2004).
- *Inclusive practice:* This underpins good pedagogy by seeking to develop programs that cater for learners of different age, gender, ethnicity, physical and intellectual ability (Goins et al 2001). eLearning programs must also cater for different levels of access to technology and different ICT skill levels.
- *Learner engagement:* This is achieved through a meaningful, enjoyable and interactive program. This is a particular challenge for eHealth programs offered to isolated learners.
- *Fit for purpose:* Technology should be used because it is the most appropriate tool, not simply because it is available. eLearning has particular strengths. It can, for example, be used for simulations, or to provide an experience with situations that rarely occur in real life, or that are too expensive or dangerous to include in hands-on training.
- *Effective learning:* This is facilitated by learners being able to work at their own pace and time, and pursue their own paths through the material. The most effective

programs offer alternative learning pathways that cater for different learning styles/preferences.

- *Ease of use*: Usability is an important factor in the adoption of technology. An eLearning program should be intuitive, requiring little, if any, training before use.
- *Cost-effectiveness*: eLearning programs need to be affordable and sustainable.

Challenges for the learner and teacher

1. Analyse the possible strengths and weaknesses of Min-Yu's online program, using the eLearning principles to suggest improvements. As an example visit the falls prevention website (<http://www.falls.unimelb.edu.au>).



Case study 14.3 Challenges for professional learning and development: making Axis less remote

Iman, a mental health nurse, is researching mental health in his rural setting while collaborating with a mental health team in a remote interstate health service. He is also communicating with a rural mental health project in Saskatchewan, Canada. Iman is having trouble trying to match reports he receives from his collaborators. The terminology and data structures they use do not appear to be consistent.

To complete his rural term, John (the GP registrar) has joined the local general practice. John is happy with the range of clinical experience, but, while debriefing with his GP supervisor, he raised issues relating to professional support. He is also keen to explore the potential of eHealth to support his professional development. John recognises that face-to-face groups or journal clubs would be helpful, but difficult to organise. He wonders whether an online group would be useful and how the interaction could be facilitated.

Discussion

Clearly, the use of ICT is allowing increased collaboration and information sharing, and changing the relationships between health professionals and between health professionals and consumers. This is creating exciting opportunities for the future of health services in regional, rural and remote Australia.

However, despite much rhetoric in the past two decades, we have not been able to achieve a national shared electronic health record (EHR) in Australia. There is a significant gap between what systems and resources exist to support the adoption of eLearning, and what systems are still required. Table 14.1 summarises the current resources and future needs that are required for sharing electronic health information.

Table 14.1 Current resources and future needs for electronic information sharing

Need	What exists in Australia	What is still required
Interoperability standards for shared electronic health records (EHR)	Terminology standards (eg ICPC2, ICD10AM, SNOMEDCT) ^a Architecture standards (eg NHIM, NHDD, openEHR) ^b Messaging standards (eg HL7) ^c	An implemented standards-based, distributed EHR system Decision-support systems and knowledge bases ^d Greater choice of user-friendly interfaces Incentives for data collection at point-of-care Training and support services
Consumer and provider access to information and education (personalised medicine)	Online editorial standards (eg HTML, XML) ^e Primary literature sources (eg Pubmed) Secondary literature sources (eg Cochrane Collaboration)	National reference terminology Web content accessibility guidelines Sharable Content Object Reference Model (SCORM) ^f
Relevant population-based classifications to facilitate secondary use of data to support research, evaluation and development of health services	ICD10AM (+MBS) ICPC2 LOINC SNOMEDCT	Comprehensive reference terminology with mapped classifications Implemented standards-based distributed system

a GP Computing Group (2000a), GP Computing Group (2000b), NCCH (2001)

b NHDC (1996), NHISAC (2001)

c HL7 (1999)

d NEDST (2002)

e UN/CEFACT and OASIS (2000)

f <http://www.cyberlink.com/english/products/streamauthor/articles/scorm.pdf> (Accessed 17 August 2007)

Source: Liaw

Research initiatives that use ICT are leading to the establishment of international eResearch networks, which use standard data sets and data dictionaries. This allows network members to connect seamlessly through the use of national and international interoperability standards. Australia has adopted the Systematised Nomenclature of Medicine Clinical Terms (SNOMEDCT) as its terminology standard, making it part of the international SNOMED family. However, like a number of current technical standards, a functional implementation of SNOMEDCT is not yet available. The main rural issues associated with eResearch relate to:

- privacy and confidentiality in small communities
- relative lack of access to research expertise
- difficulty with regular face-to-face networking and discourse, an essential component of academic rigour and collegiality.

Practitioner and student use, and knowledge and understanding of ICT are being enhanced through the University Departments of Rural Health (UDRH) and the Rural Clinical Schools (RCS). The UDRH and RCS have established a national network of academic centres, with good ICT infrastructure, across rural Australia. In addition to the infrastructure, the UDRH support eHealth, eLearning and eResearch through programs like the Primary Health Care Research, Education and Development (PHCRED) program and other training opportunities.

Challenges for the learner and teacher

1. How does one design and conduct eResearch in rural settings that might be useful and applicable to other rural and to metropolitan settings?
2. Find out about SNOMEDCT and how it could contribute to the resolution of Iman's problems with understanding reports. What are the limitations of SNOMEDCT?
3. Why is privacy and confidentiality a particular issue in small communities?
4. How might research, networks and eResearch assist Janet and Axis Health Services to improve the services they provide?
5. Expand John's ideas for professional support and development into an eLearning program, incorporating relevant eLearning principles.



Key points

- Rural health has much to gain from eHealth, eLearning and eResearch, but the relative lack of infrastructure, policies and guidelines, and adequately trained workforce are obstacles to achieving these gains.
- ICT is used within a wider sociotechnical system that includes cultural, organisational and political factors.
- Successful implementation of eHealth programs requires a good understanding of all elements in a sociotechnical system.
- Incorporating identified principles and perspectives will facilitate the success of eHealth, eLearning and eResearch initiatives.



Recommended readings and resources

- eHealth, Australian Government Department of Health and Ageing
<http://www.health.gov.au/internet/wcms/publishing.nsf/Content/e-Health-3>

This website includes a number of articles which outline current eHealth policies and programs initiated and/or supported by the Australian Government.

- Chaudhry B, Wang J, Wu S, Maglione M, Mojica W and Roth E (2006). Systematic review: impact of health information technology on quality, efficiency and costs of medical care. *Annals of Internal Medicine* 144:E-12-E-22.
- Siman AJ (1999). *Sharing the Caring: Telehealth offers Fairer Distribution of Health Expertise Across Canada*. Online document.
<http://www.hc-sc.gc.ca/hcs-sss/pubs>

Andrew J. Siman is the Director General, Office of Health and the Information Highway, Health Canada. In this article he discusses the potential of telehealth for rural and remote services and emphasises the importance of adopting a patient-centred approach to eHealth.

- Walker J and Whetton S (2002). The diffusion of innovation: factors influencing the uptake of telehealth. *Journal of Telemedicine and Telecare* 8(Suppl 3):73–75(3).

Factors which have been found to influence the successful uptake of telehealth include legal issues, technical difficulties, time and convenience, cost and training/familiarity with the equipment. No single factor has been identified as being consistently present, suggesting that strategies for the introduction of telehealth should take into account the particular structures and cultures of individual organisations.

- Whetton S (2005a). Successes and failures: what are we measuring? *Journal Of Telemedicine and Telecare* 11(Suppl 2):98–100(3).

This article discusses issues around evaluation of telehealth programs. It suggests the development of frameworks enabling all similar studies (eg diabetic home care) to be examined in order to extract commonalities and differences. The author suggests this would enable comparisons and conclusions about where telehealth is effective, as well as what variables demonstrate success.



Learning activities

1. Identify an eHealth initiative intended to meet one of the current challenges faced by rural and remote health care services. Identify the extent to which the barriers to eHealth discussed in this chapter may be impacting on this initiative.
2. eHealth can never replace traditional face-to-face services. Discuss.
3. Review the videoconferencing program outlined in Case Study 14.1. Using the principles for local organisations, develop a strategy to facilitate more effective use of the videoconferencing facility.
4. Find three consumer health education sites and evaluate them using the principles listed above.
5. Prepare an annotated list of online databases and resources that support eResearch.
6. Discuss the differences between connectivity and interoperability from the eHealth perspective.