Facts at a glance

Project name	Loddon Mallee Rural Health Alliance *Connecting Clients to Care (CC2C)*
Project duration	A 2 year project, ending in April 2009, including an evaluation phase
Project budget & sources	$1.57 million from Multimedia Victoria and $100,000 in-kind contribution from project partners. Total budget: $1.67 million
Project stakeholders	LMHA, Mildura Base Hospital, Sunraysia Community Health Service, Mallee Track Health & Community Service, Kyabram & District Health Services, Maryborough District Health Service, Echuca Regional Health, Boort, Cohuna and Kerang District Hospitals, Momentum Technology Group and MedCare Systems
Main project objectives	To investigate the technical and clinical feasibility of using high technology telecommunications based services to: • enhance the quality of patient care available to residents in the Loddon Mallee region, and • increase the capacity of care providers to meet the needs of patients with chronic health conditions To determine and quantify the efficiency dividends technologies may offer the health sector
What the project involved	Establishment of two related projects: • *Remote Patient Monitoring (RPM)* - enabling rural patients to self-monitor clinical observations in the home and upload results to a central server, thus reducing the need for regular home visits by clinical staff, and • *Remote Nurse Assist* (RNA) - enabling rural nurses to access specialist advice on patient condition and treatment in real-time, by sending streaming video over a wireless broadband network Key steps included: • securing health sector and technology partners • purchasing equipment and software licenses • conducting focus groups to capture user requirements • developing software to enable customization of equipment and to support the integration of new technology with legacy systems • securing approvals for trials • training staff in the use of equipment and adjustment of new work practices • identifying and training patients for the trial • deploying patient monitoring systems in over 78 households and three multi-user settings • deploying 19 mobile video handheld devices to rural district nurses and hospital based aged care providers • staffing telephone and online support services • undertaking quantitative and qualitative project evaluation
Main benefits sought	Improvements in the level of care available to patients and in the efficiency of health service delivery in the Loddon Mallee region Easy and fast collaboration between health professionals with instant, virtual consultations in urgent cases
Biggest challenges	Convincing potential project partners of the benefits of the technologies, and converting interest into action Obtaining “buy-in” from multiple health agencies to conduct pilot implementations in real clinical settings Minimising the impact of unexpected delays in the project schedule
Results and benefits	Although the CC2C project is yet to be completed & formally evaluated, the pilots have proven that remote patient monitoring and real-time video streaming in clinical settings is technically and clinically feasible.

Anecdotal evidence suggests that the technologies create compelling benefits for both patients and the health system. Patients using the RPM system report a greater sense of improved quality of life, independence, reduced uncertainty and isolation. They are less likely to present at hospital and some have been empowered to re-engage in work or active community life. Cost and productivity improvements are yet to be assessed, however, estimates suggest that remote patient monitoring may reduce cost of health service delivery to chronically ill patients by at least the cost of the system compared with a remote patient receiving regular home visits.

Lessons learned

- Build in contingency time in the project plan to accommodate inevitable and unforeseen delays
- Choose partners that demonstrate a clear interest and belief in the benefits of technology-driven solutions and which have an internal champion who can help motivate and drive organisational change
- Build an evaluation phase into the project plan and think through the type of information that will be required, from whom, and when
- Communicate clearly and honestly with funding providers throughout the project
- From a project management perspective, pay attention to detail and lead by example
- Involve technology users in the prototype and design stages to ensure systems and devices meet actual needs in real clinical situations
- Provide training and adequate support for users in the field
- Be prepared to work through and wait for bureaucratic processes
- Select technology providers on the basis of their expertise and technology offering, as well as the quality of the relationship
- Remember that the project needs publicity

About the Loddon Mallee Health Alliance

The Loddon Mallee Health Alliance (LMHA) represents the ICT interests of 17 hospitals and 65 health agencies. The entities are located at 160 sites in 41 towns across the region. The LMHA has implemented high speed broadband services in the region to support better connectivity between health agencies via a virtual private network (VPN), and has deployed advanced voice, video and data services and a range of related and innovative applications, across the region.

Background to the project

Recognising the opportunity to use broadband

The Loddon Mallee region covers 25% of Victoria's land mass but is sparsely populated and suffers from an undersupply of health services and medical professionals. It is home to 5.9% of the State's population and 4.1% of the State's allied health workers.

The region's public health system faces challenges in meeting growing demand for in-patient and outpatient treatment. The number of patients with chronic disease conditions, which are often related to congestive heart failure and chronic respiratory diseases like asthma and emphysema, continues to grow. Hospital admission rates for people presenting with these conditions are higher in Loddon Mallee than the state average[1].

The incidence of these conditions will increase as the population ages, placing more demand on both the region's hospitals and those rural health workers involved in clinical outreach programs (such as the Hospital Admissions Reduction Program (HARP), District Nursing Services and Hospital in the Home) that support patients in their homes.

Recognising the potential technology offers to improve the health system's capacity to deliver services remotely, (based on international experience with remote e-health services), the LMHA decided to leverage its broadband infrastructure to undertake two pilots under the umbrella of the *Connecting Clients to Care* (CC2C) project: *Remote Patient Monitoring (RPM)*, and *Remote Nurse Assist (RNA)*.

The purpose of the CC2C project was twofold:

- to investigate the technical and clinical feasibility of using high technology telecommunications based services to:
    - enhance the quality of patient care available to residents in the Loddon Mallee region
    - increase the capacity of care providers to meet the needs of patients with chronic health conditions, and
- to determine and quantify the efficiency dividends technologies may offer the health sector.

Remote patient monitoring (RPM) trial

Until recently, chronic disease sufferers in the Loddon Mallee region who needed regular monitoring of vital signs[2] to manage their conditions had no alternative but to travel to their GP, the local hospital or receive home visits from health professionals. This often meant traveling long distances at considerable costs to either the patient

[1] Victorian Ambulatory Care Sensitive Conditions Study 2002.

[2] e.g. blood pressure, lung capacity, heart rate, weight, temperature, blood sugar levels and other clinical observations

or health care worker. Those patients unable to travel also experienced a loss of independence and a sense of vulnerability and isolation in the times between home visits.

The RPM pilot is designed to enable chronic disease sufferers to conduct their own clinical monitoring from home, without the aid of a nurse, and to transmit results overnight via an analogue telephone line to a central server. The data is then stored in a patient profile and can be accessed securely and remotely by health professionals over a broadband network the following day, and used to make decisions about the most suitable care regime for the patient.

Core elements of the technology solution for the pilot included:

1. A patient monitoring station and peripheral devices (located in the patient's home and connected to their telephone line, as depicted in the picture below), used to collect and transmit clinical observations
2. A patient monitoring server (located in a data centre in Sydney), used to securely collect and store patients' clinical observations, and
3. A provider station (located at the remote clinical site), used to enable health professionals to assess clinical observations.

Nurse and patient with remote patient monitoring equipment, Courtesy Kyabram Free Press

Remote nurse assist (RNA) trial

Home visits by a nurse play an important role in the care of people with chronic illness, such as diabetes, as well as those recovering from surgery at home. Rural nurses attending such patients are often required to make decisions about their condition and care without reference to or the support of other health professionals. For example, a patients' condition can change unpredictably when a wound becomes infected.

The RNA trial uses mobile video-conferencing using a hand-held device. It enables nurses on home visits and in clinical settings to transmit a high quality streamed

video image of a patient to a doctor or colleagues who can provide real-time advice on appropriate treatment. Wireless broadband is used to stream video and to enable communication between the nurse and the specialist.

Ann Linklater, Registered Nurse, Boort Hospital with a mobile video-conferencing hand-held device and Helen Aikman, LMHA

Raising support and funding for the project

The two CC2C trials involved significant costs for equipment purchases, needs analysis, project management, software and website development, broadband network integration, nurse and patient training and project evaluation. The RPM project for example involved the identification, assessment, purchase and deployment of over 80 monitoring stations and 10 referral stations. The RNA project involved an extensive search to identify and purchase 19 hand-held devices capable of delivering high-quality images over Telstra's *Next G* broadband network, selection of a suitable technical partner, and purchase of expensive server and software development licences. Both projects involved costs associated with system design, customisation, testing and implementation.

Another vital prerequisite for the project was a network of health care partners willing to contribute time, resources and practical advice, and who could also provide access to a sufficiently large pool of patients and health care workers agreeable to piloting the new technologies.

By 2006 LMHA had established a project budget, and identified Multimedia Victoria's *Broadband Infrastructure Fund* (BIF) as a potential source of funds. Finding suitable

partners for the trials however proved harder than expected. LMHA approached a number of health care services in the region, with mixed results. Some had a poor understanding of the role and benefits of technology in health service delivery, and were therefore uninterested, while others did not have the human resource capacity to take on another project.

Through hard work, persistence and by identification and mobilisation of project champions LMHA eventually garnered the support of a large rural hospital. This made it easier to secure commitment from a range of other partners, and a formal application to the BIF was made in August 2006 for an ambitious 18-month project. Multimedia Victoria contributed $1.57 million of a total budget of $1.67 million, with LMHA and project partners contributing the remaining resources in-kind.

The CC2C project commenced in February 2007 and is due for completion in late 2008 with a final report in April 2009.

Implementing the project

Remote patient monitoring (RPM) pilot

The RPM trial was deployed in two stages, the first commencing in early 2007 and involving installation of single-user RPM systems in the homes of over 70 Loddon Mallee residents spread across the region. Prior to deployment, formal approval had to be sought and secured from participating health services and administrative procedures approved. Servers were set up to receive clinical observation data and a website was designed to enable clinicians to access patient profiles.

Patients were selected on the basis of their need for clinical observation and their ability and willingness to be involved in the trial. A range of other important factors emerged that refined the patient selection process – such as an ability to communicate in English, and the capacity to learn and remember how to operate the equipment.

Many of the end users were senior citizens with very little knowledge of, or prior experience with, technology. They needed familiarisation with new processes and training to use the monitoring systems. Patient training was originally conducted by nurses, who themselves first required training on the equipment. Additionally, three multi user systems were deployed into two aged care facilities and one hospital based clinic, allowing the clinical observations of up to 400 individuals to be recorded on one monitor.

The second phase of the project will build on and validate the lessons learned from phase one and extended deployment into the homes of patients registered with the newly established HARP project at Echuca Regional Health. To improve efficiency and effectiveness, training in phase two will be conducted by experienced technicians rather than nurses.

Remote nurse assist (RNA) pilot

Unanticipated delays occurred in the RNA pilot, first due to difficulties in obtaining appropriate handheld devices to run the software required for video streaming, and then as a result of difficulties in securing licences to conduct the technical pilot. Despite the best efforts of LMHA and technology partners, these factors set implementation back over twelve months against the original schedule.

However, work continued on other milestones while these difficulties were resolved. Focus groups were held with potential users from four health agencies to determine preferences about interface design, use, training and acceptability of the device. The device interface and a website to receive video transmissions were developed, and demonstrations of the complete set-up were held.

Implementation of the pilot in the field is relatively recent, with 19 mobile video hand-held devices deployed to rural district nurses and hospital based aged care providers.

Main outcomes and benefits of the project

Although the CC2C project is yet to be completed and its results fully documented, the RPM trial is sufficiently mature to offer some evidence of benefits to patients and health service providers.

Patients have reported (and health workers have observed) improvements in quality of life – patients experience a greater sense of independence and security, more regular connection with the health service, and reduced feelings of isolation and vulnerability to their conditions.

Health professionals have suggested that the RPM system may be leading to lower levels of hospital presentations. Also, a preliminary estimate of the potential cost savings from a reduced number of home visits by clinicians, based on real data gathered for one patient in the pilot, suggest savings of up to $10,000 per patient per year.

Though it is too early in the RNA trial to determine quantitative benefits to patients and the health system, it is clear that it is possible to stream high-quality video from clinical settings to specialists in other locations over the wireless broadband network in Loddon Mallee.

The evaluation phase of the project will enable LMHA to formally assess the outcomes of both trials, and it is hoped that completion of the evaluation phase will produce a strong business case for a broad rollout of both e-health solutions.

Lessons learned

With the RPM trial well advanced and the RNA trial now gaining traction, LMHA has learned some valuable lessons that may be useful to other organisations intending to undertake broadband technology assisted projects.

Planning the project

1. *Build in contingency time in the project plan to accommodate inevitable and unforeseen delays*

Unforeseen delays can be inherent in projects that introduce new or unproven technologies and require process redesign or multi-organisational collaboration. Delays in the RNA trial demonstrate that it is wise to build some contingency time into project plans. It saves time and reduces the need to re-work schedules and re-negotiate milestones with partners and sponsors.

2. *Choose partners that demonstrate a clear interest and belief in the benefits of technology-driven solutions and which have an internal champion who can help motivate and drive organisational change*

Securing committed partners is critical to the success of innovative projects. LMHA made presentations to a number of hospitals and health agencies early in the project with the aim of forging project partnerships. Some organizations and individuals were interested from the beginning whereas others were either skeptical about the project and its benefits or non-committal about their potential involvement. Efforts to break through skepticism and resistance did not pay off. In retrospect, LMHA found that that time and resources could have been saved in the project planning and scoping stages by focusing more narrowly on the organizations that showed early signs of interest in the project.

3. *Build an evaluation phase into the project plan and think through the type of information that will be required, from whom, and when*

Test assumptions about the availability of data, and make sure systems are established early in the project to support relevant data capture for the evaluation. A convincing and thorough evaluation is critical to the future sustainability of an innovative broadband project, and will require quantitative as well as qualitative evidence. Discovering too late that cost-benefit data is not readily available can add costs and/or reduce the ability to make a convincing business case.

The original evaluation plan for the CC2C pilots involved a thorough, quantitative and direct cost-benefit basis. However, difficulties in obtaining data to substantiate costs and benefits have meant that in some areas substitute metrics have been required.

Financing the project and working with funding providers

4. *Communicate clearly and honestly with funding providers throughout the project*

Good lines of communication and a trusting relationship will be especially useful if the project hits unexpected challenges and as a consequence milestones, schedules or budgets need to be adjusted. Sponsors who understand the reasons for delay and have confidence in mitigation strategies will adapt and accommodate to changed requirements.

There were several unforeseen events that delayed achievement of milestones in the CC2C project. LMHA was able to draw upon the trust and understanding of the funding provider's project management staff to negotiate changes to the project plan.

Managing and implementing the project

5. *From a project management perspective, pay attention to detail and lead by example*

The CC2C pilots relied on the collaboration and collective involvement of numerous organizations, from health sector and funding agencies to technology and telecommunications suppliers. The pilots involved individuals at many levels of these organizations – technical, administrative, governance, service delivery – and were also predicated on the participation of patients in the field. Bringing together the range of organizations, perspectives and needs represented by the many groups was a complex undertaking. For LMHA it was important to make the pilots look easy, and to draw on the motivation of key people involved. To keep the project running smoothly LMHA clearly and regularly communicated next steps, timing and expectations and responded promptly to issues and concerns.

6. *Involve technology users in the prototype and design stages to ensure systems and devices are designed to meet actual needs in real clinical situations*

Feedback from potential end users helps to refine and improve both the software and hardware components of a technology solution. Explaining ideas, demonstrating prototypes and incorporating feedback into final system design has follow-on benefits in streamlining and simplifying training and implementation.

In the CC2P project, early workshops with nurses and other health sector professionals led to improvements in the design and functionality of device interfaces, which reduced the need for adjustments later in the pilots.

7. *Provide training and adequate support for users in the field*

Providing the necessary training and support for users of the new technology is critical to success. LMHA found that on-site, small group training with one device per

trainee was most effective. Users may also need a telephone or online support service to deal with problems encountered during the pilot.

Working with stakeholders

8. *Be prepared to work through and wait for bureaucratic processes*

Partners bring important human and knowledge assets to a project and make fieldwork trials possible. Working successfully with partners involves accommodating their internal approval and bureaucratic processes.

LMHA found that while intent and enthusiasm was high amongst individual project champions in partner organizations, it was still necessary to work within and meet the requirements of project approval, resource allocation and other established bureaucratic processes.

9. *Select technology providers on the basis of their expertise and technology offering, as well as the quality of the relationship*

A good relationship with technology providers is essential to realising innovative projects. The capacity to adapt, innovate and respond to users' needs in practical ways is core to a good working relationship. Technology providers need to be able to simplify technical aspects, and produce practical solutions. This was especially important in the CC2C pilots, where subtleties in device functionality, interface design and interoperability had to be right to integrate with and support the current practices of nursing staff and hospital information technology systems.

10. *Recognise that the project needs publicity*

At appropriate stages, pursue publicity opportunities that promote both the project *and* the partners. Newspaper articles, television and radio sessions and ministerial visits build the profile of a project. They raise community awareness of the benefits that can be captured through the application of technology to everyday life, and, importantly, provide public recognition of partners' contributions. These effects invigorate those directly involved and strengthen and broaden community understanding of the importance of investment in innovative broadband projects.