CDM-Net

A Broadband Health Network for Transforming Chronic Disease Management

Final Report
Executive Summary
March 2010
CDM-Net:  
A Broadband Health Network for Transforming Chronic Disease Management

FINAL REPORT
Executive Summary

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<th>Period of project</th>
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This work was supported by funding from the Australian Government under the Clever Networks program and by the Victorian Department of Innovation, Industry and Regional Development, Department of Human Services, and Multi Media Victoria.
EXECUTIVE SUMMARY

1. The need

The World Health Organisation (WHO) predicts by the year 2020 chronic disease will account for almost three quarters of all deaths. In Australia, chronic diseases are estimated to be responsible for more than 80% of the burden of disease and injury and account for over 60% of healthcare costs ($60 billion per annum). Chronic disease significantly impacts on workforce productivity ($8 billion per annum) and threatens the sustainability of the healthcare system as we know it. Over 30% of the Australian population has a major chronic disease but less than 5% of these people receive best-practice care.

If this drag on the nation is to be overcome, new models of collaborative care are needed that involve planned and continuous management by a team of care providers and the patient themselves, in contrast to conventional episodic, siloed care delivered by a single health care professional or organisation. However, without supporting information and communication technologies, these new models of care cannot be cost effectively or equitably delivered to those suffering chronic illness.

The aim of the CDM-Net project was to establish a broadband network of secure, scalable, and sustainable services, called CDM-Net, to support the management of chronic disease and collaboration among a patient’s care team and with the patient themselves. Such a network of services could lead to safer and higher quality care, greater efficiency in delivering that care, reduced costs of health care, more equitable access to care, and higher participation and productivity of the workforce.

CDM-Net could also help position Australia to take a leading position in the emerging worldwide market for technology-based collaborative care services and products. This could become a significant domestic and export industry opportunity for Australian businesses. For example, Forrester Research estimates the market for such collaborative care solutions will grow to over US$34 billion in the US alone by 2015.

2. Project partners and funding

The project was undertaken by a collaboration of twelve Australian and international organisations led by Precedence Health Care. The collaborating partners were: Barwon Health, Cisco Systems, CSIRO Australian e-Health Research Centre, Deakin University, Diabetes Australia – Vic, Global Health, the GP Association of Geelong, IBM, Intel, Monash University, Precedence Health Care, and Victoria University Centre for Strategic Economic Studies.

The project received a total of over $9.6 million cash and in-kind funding. This included $2.0 million from the Australian Government Department of Broadband, Communications and Digital Economy (DBCDE) under the Clever Networks program, $1.0 million from the Victorian Government Department of Innovation Industry and Regional Development (DIIRD), $0.5 million from Multi Media Victoria, $0.5 million from the Victorian Department of Human Services, and over $5.6 million from the collaborating organisations.

3. The project outputs

The primary output of the project was the CDM-Net network of computing services and infrastructure for supporting chronic disease management. CDM-Net includes the following components:
• a broadband-based (or ‘cloud’) service, called Chronic Disease Management Service (CDMS), for supporting the general practitioner (GP), care team, and patient in achieving best-practice care,
• a Health Services Bus, which provides an open, service-oriented infrastructure that allows different broadband-based services and other systems to ‘plug in’ to CDM-Net and communicate and interact with one another, and
• connectivity infrastructure, which provides gateways, data extractors, and encryption mechanisms that allow applications and existing systems (such as Clinical Desktops and hospital systems) to securely connect to CDMS and the Health Services Bus.

The core application service, CDMS, enables doctors to develop and track personalised care management plans and to share the real time status of these plans and the patient’s health record with the care team and the patient. In particular, CDMS supports GPs, care teams, and patients to better manage chronic disease by:

• creating a registry of patients with chronic disease
• creating a shared health record for these patients
• creating best practice, personalised care plans and distributing these to the patient’s care team and to the patient
• tracking the care plan, medication renewals, and appointments to enable timely follow up and review
• facilitating collaboration by sharing the health record, care plan, and progress against the care plan among the care team and with the patient
• supporting patient self-management by sending alerts, reminders, and notifications to assist with adherence to care plans and the achievement of wellness goals, and
• removing the administrative burden associated with care planning and management by automating the administrative processes and documentation necessary to meet Medicare and best-practice guidelines.

CDM-Net is a world-first chronic disease management network and has overcome the major challenges of security, privacy, reliability, and stakeholder uptake that typically frustrate many e-Health initiatives.

4. The CDM-Net trials

The project was conducted initially in the Barwon South Western Region (BSWR) of Victoria. This region extends from Geelong to the South Australian border. Approximately 85,000 people in this region have a major chronic disease and over 18,000 have diabetes.

The project was later extended to the Eastern Goldfields Region (EGR) of Western Australia, an area covering almost one third of the land mass of the state and with a population of 54,000 people.

The project involved 97 GPs in these regions and over 1,000 care providers and their patients. Of these, 12 GPs and 99 patients in the BSWR participated in a research evaluation undertaken by Monash and Deakin Universities.

The outcomes of the project were evaluated in three ways:

• analysis of service use over the population of participating GPs, other healthcare providers and patients in both the BSWR and the EGR,
• analysis of demographic data, service use, and health outcome measures for the GPs and patients participating in the research evaluation, and
• collection of information from surveys and expert panels on the use of broadband-based services to assist in collaborative care.

5. Key Performance Indicators

A number of Key Performance Indicators (KPIs) were identified prior to commencement of the project. The project met or exceeded most of these KPIs.

For KPI 1 (measuring increased broadband take-up), 97 GPs and 268 other healthcare providers (including practice nurses) used CDMS broadband services. This provided access to CDMS for approximately 30,000 patients with chronic disease, of whom about 6,000 have diabetes. During the period of the trial, 733 patients with diabetes were registered users of CDMS. The number of patients using CDMS is expected to reach 3,000 over the next 12 months.

For KPI 2 (measuring increased range and use of broadband applications, content and services), in the 16 months over which users progressively enrolled in CDM-Net there were over 90,000 page downloads from the CDMS web site. This represents an average of about 200 care provider interactions with CDMS per patient per year. Of these, 26,336 (or approximately 30%) involved care team members outside the GP practice, including allied health, specialists, and pharmacists.

For KPI 3 (measuring increased use of broadband in the health sector), from a baseline of zero, CDMS broadband services generated 725 new care plans and 186 care plan reviews. CDMS also collected over 30,000 health measurements, recorded over 2,000 appointments, and facilitated over 550 collaborative interactions between care providers. CDMS sent 322 SMS reminders and 385 email reminders to patients. These services were provided to patients and healthcare providers covering 71 postcodes across regional, rural and remote areas of Victoria and Western Australia.

6. Estimates of care planning activity

The primary measure of the efficacy of CDM-Net is the degree to which the use of CDMS increased care planning activity. This was measured by the level of provision of Medical Benefits Scheme (MBS) Chronic Disease Management (CDM) items: GP Management Plans (GPMPs), Team Care Arrangements (TCAs), and the subsequent reviews of GPMPs and TCAs after a recommended period of six months.

Analysis of data pre and post the adoption of CDMS for a sample of eight GPs in the BSWR research evaluation showed increases of:

• 205% in GPMPs (compared with a regional change of 21% over the same period)
• 201% in TCAs (compared with 45% regionally)
• 385% in GPMP first (6 month) reviews (compared with 10% regionally)
• 224% in TCA first (6 month) reviews (compared with 49% regionally)

For a sample of five GPs in the EGR for which pre and post data was available, the data showed increases of:

• 88% in GPMPs (compared with a regional decrease of 12% over the same period)
• 80% in TCAs (compared with a decrease of 10% regionally)
• 310% in GPMP first (6 month) reviews (compared with a decrease of 14% regionally)
• 220% in TCA first (6 month) reviews (compared with an increase of 32% regionally)
As the practices did not change their work processes to accommodate the use of CDMS, it can reasonably be assumed that these gains resulted in large part from improved productivity of the GP and/or the practice nurse through the use of CDMS.

Caution should be exercised in extrapolating the above results, given the relatively small sample sizes and the pre/post study design.

7. Estimates of planned service use

Important measures of both the quality of care plans and whether or not these plans are acted upon is the degree to which patients are provided with the services recommended by best practice guidelines, such as HbA1c (blood glucose) tests and podiatrist services.

Analysis of Medicare claims data for the BSWR research cohort of 99 patients over a 10 month period shows that patients using CDMS receive a greater proportion of these services than patients on care plans prior to the use of CDMS. The proportion of patients on a care plan who received the recommended services increased by:

- 25% in HbA1c tests
- 5% in microalbumin tests
- 0% in HDL (high density lipoprotein) tests
- 707% in dietician services
- 68% in podiatry services, and
- 185% in Home Medicines Review (HMR) services.

These changes indicate that either many of the care plans created prior to CDMS did not include these recommended healthcare services or that patients were not followed up to ensure that they received these services.

The actual change in the number of patients provided the recommended services is further multiplied by the increase in the number of patients on care plans resulting from the use of CDMS. This results in the following overall increases in service use on a population basis:

- 82% in HbA1c tests (compared with 4% regionally)
- 75% in microalbumin tests (12%)
- 66% in HDL tests (-4%)
- 1645% in dietician services (26%)
- 151% in podiatry services (53%), and
- 498% in HMR services (23%).

8. Clinical evaluation

The design used for the clinical study of the 99 patients in the BSWR was a single cohort before and after study with the intervention period being between seven and fourteen months (depending on when the patient was placed on a CDMS care plan). Data was collected at four times during the intervention, including baseline. The sources included a questionnaire, data provided by CDMS, semi-structured interviews with health professionals and patients, and field notes. Data collected included demographic data, psychological and behavioural information, medicines profile, physical status, patient attitudes, health professional attitudes, service use, and process data. Completion rates of the questionnaire were high: 99 at Time 1, 93 at Time 2 and 80 at Time 3.

Following the use of CDMS, patients reported increases in allied health attendances consistent with recommended team care for diabetes management.
During the study, eight metabolic parameters were recorded in CDMS care plans. When the mean values were compared, seven out of the eight metabolic parameters show an improved reading, though not statistically significant. The moderate changes are not unexpected given the short duration of the trial and the fact that most patients had only just reached the first review stage of the care plan.

Prescribed medicines were recorded for 96 of the 99 participating patients. No significant relationship was found between the number of prescribed medicines and gender or income. Duration of diabetes was longer for patients prescribed one or more diabetes medicines than patients who were not prescribed one of these medicines. There were no changes to recorded prescribed medications or dose regimens throughout the study, but this was not unexpected because these patients indicated that their use of medications was already excellent.

9. Users’ perspectives

Interviews with professionals and patients reflected a positive view of their involvement in the CDM-Net project and their experience with CDMS. All indicated they had experienced both positive and challenging aspects of CDMS.

Approximately two thirds of the participants reported having Internet connected, of which 70% were using email and 70% were conducting Internet searches. Approximately 75% of the patient participants owned mobile phones and, of these, about 40% were using SMS. Hence CDM-Net interactions with patients, especially reminders for tests and appointments via email or SMS, could be sent to around half of this population.

Questions were also asked about beliefs and attitudes to, and satisfaction with, CDMS. Sixty one percent of patients agreed that they believed the care plan developed through CDMS improved their control of diabetes and helped them comply with their care plans, with 29% unsure. Of the 50% of respondents that used email or received SMS, approximately 80% found CDMS reminders and alerts helpful. Of importance to this study, two thirds of respondents agreed they would recommend that CDMS be made available to others with diabetes, with 9% unsure.

Attitudes to and beliefs about web-based care plans were sought from health professionals who attended either one of three focus groups or two face-to-face interviews. One clear message was that neither a web-based plan nor electronic communication can be separated from other aspects of chronic disease management. A second message was that planning cannot be divorced from the understanding that patients do or do not have about GPMPs and TCAs. The concept of a care plan, the nature of inter-professional engagement, the time and financial pressures in clinical practice, and most importantly, the need to have the patient at the centre of the process, all add layers of complexity to chronic disease management.

10. Medico-legal studies

It is likely that shared electronic care plans will become more prevalent in Australia which raises new legal and ethical issues that need to be understood and addressed if GPs and other care team members are to use such services with confidence.

Interviews were conducted with eight professionals (four GPs, one diabetes educator, and three practice nurses) and ten patients between March 2009 and October 2009 and a second interview conducted with the four GPs approximately six months later.

Seven of the eight health professionals felt that sharing patients’ health information electronically with other health professionals was a positive thing to do. Six of the eight
professionals felt sharing health information electronically had made a difference to the care they provided for the patients. Significantly, all ten patients’ responses supported the professionals’ views.

The eight professionals indicated they take patient privacy seriously. All ten patients felt that the use of CDM-Net did not make any difference to their sense of privacy.

An expert panel was convened to address two key legal issues of privacy and professional negligence. On the first issue, the consensus stressed the difficulties in ensuring appropriate informed consent on the part of patients and the privacy dangers inherent in creating a shared record accessible by multiple treating professionals and a private sector intermediary IT service provider.

On the issue of professional negligence, the panel concluded that there was some legal uncertainty regarding the potential additional risks associated with failure to follow up specific aspects of patient treatment as they appear in the care plan.

Many of the medico-legal concerns could be addressed by ensuring privacy receives appropriate protection in a context of informed consent, that care plans reflect best practice, and that the mutual rights and responsibilities of participants are clearly documented.

11. Health economic impact

The hypothesised health economic impact from the CDM-Net trial is difficult to establish, because of the short trial period, the small number of participants, and the limits of a before/after trial design. However, the program logic of the intervention is sound, reflecting the literature on chronic disease management and current barriers to high quality care. CDM-Net is designed to encourage GPs to prepare and review care plans, to promote multi-disciplinary team care and management that follows care protocols. The expectation is that this will result in higher quality care and better outcomes for patients.

Trial participants achieved a high rate of care plan preparation and review compared with rates prior to the use of CDMS. Observations suggest multi-disciplinary team care is being encouraged by CDMS. Patients also report greater use of dietician, podiatry and diabetes educator services during than before the trial; based on self-report and also as suggested from Medicare data. The care plan process also demonstrates considerable dialogue between GPs and other members of a patient’s care team. It is not possible at this stage to know whether the initiative has or will result in better patient outcomes, in terms of health and wellbeing, or a reduction (or increase) in use and cost of other health services.

As yet, any benefits are not translating into quality of life improvements, as measured by the AQoL (Assessment of Quality of Life), which shows no change between base-line and follow up. However, the capacity to observe any change in quality of life was compromised by the short follow-up period and lack of a control group.

CDMS provides for the GP a potentially more efficient approach to care planning, in terms of GP time. However, the increase in care planning activity and the greater utilisation of related health care services will result in an increase in cost to government.

12. Economic and social benefits of wider implementation of CDM-Net

The CDM-Net initiative is consistent with the Government’s announced National e-Health Strategy and a good example of the benefits arising to patients and doctors of innovative, networked approaches in contrast to high cost, centralised solutions.
There are good theoretical reasons for believing that there is serious under investment in IT systems that provide critical tools and services to doctors and patients. This theoretical view is supported by a range of empirical evidence showing that expenditure on health IT is a fraction of that spent by many other industry sectors. A recent review undertaken by the National Academies in the US highlighted the failure to provide computer-based tools and systems for clinicians and patients as the key shortcoming of IT development in the health sector. This evidence argues for government support for individual firms to build IT-based tools and services in response to the particular demands of doctors and patients.

An economic assessment was made of the economic and social benefits that could result from the wider implementation of CDM-Net if implemented for diabetes patients across Victoria. The expected benefits from a full scale rollout over a ten year period with a 50% take-up of the service by GPs were determined as follows:

- GPs would gain $156.8 million from MBS CDM items and $9.8 million from practice incentive payments; allied health professionals would gain $144.1 million; giving a total of $310.6 million over ten years.
- Victorian public hospitals would save $148.8 million over ten years due to a reduction in diabetes related separations.
- The benefit to patients from better chronic disease management would be $19.7 million in 2010 rising to $229.3 million in 2019 for a total of $1.22 billion over the ten year period.

The cost to the Commonwealth Government of supplying these patients with chronic disease management plans would be $310.6 million derived by health professionals from MBS items and $569.3 million for PBS medicines over the ten year period. This would be compensated for by the improved health of individuals and their consequential higher workforce participation rate which could result in additional tax revenue of $733.1 million. In addition, the Commonwealth would receive a further $93.2 million from taxes on the increased payments to healthcare professionals.

The analysis only considered diabetes patients and the costs and benefits to Victoria of a wider rollout of CDM-Net. Including all major chronic diseases covered by CDM-Net and a national rollout would multiply these benefits and costs proportionately.