



CREATING A NEW MODEL OF HEALTHCARE SERVICE DELIVERY VIA TELEHEALTH

INTRODUCTION

Telehealth:

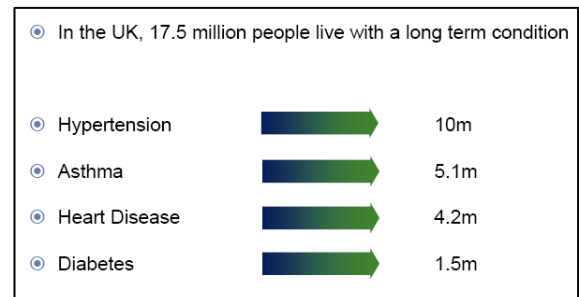
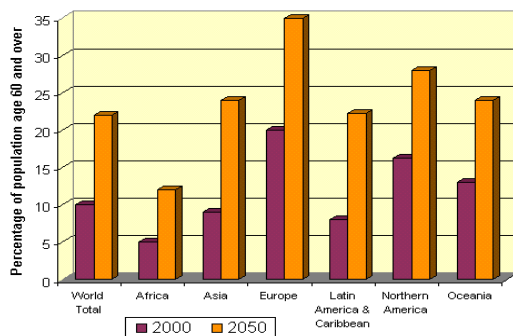
Telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional related education and the management as well as delivery of healthcare services to and from public and private health institutions.

Telehealth applications include a range of technologies and services which support patient self management and facilitate remote support of a patient by a multi-disciplinary care team, including family members and friends.

Telehealth services can be provided throughout the Primary Care Sector; in the home, in residential care, in GP practice, Pharmacies and Community health centres, the workplace and rural and remote settings.

Background

Over the next forty years the proportion of those aged over 65 will double and those aged over 85 will more than quadruple.



As the population ages the burden of chronic disease increases, and already today 73% of total health expenditure is spent on chronic disease and its exacerbation.

- Around 80% of Community Doctor consultations relate to chronic disease
- Patients with a chronic disease or complications use over 60% of hospital bed days
- Two thirds of patients admitted as medical emergencies have exacerbation of chronic disease or have chronic disease
- For patients with more than one condition, costs are six times higher than those with only one
- Some people are highly intensive users of services (10% of inpatients account for 55% of inpatient days) or very intensive users (5% of inpatients account for 40% of bed days)

Telehealth services improve case management, facilitate patient self management and can dramatically improve the efficiency of clinical HR. The evidence is now overwhelming that telehealth remote monitoring services;

- Improve health and quality of life
- Increase patient satisfaction
- Have a significant impact on the use of services
 - Visits to Community Doctors can decrease by 40%
 - Outpatient visits can reduce by 17%
 - A&E visits can reduce by 50%
 - Hospital admissions can be halved
 - Hospital LOS can be halved

- Medicine intake is regulated or reduced
- Days off work can reduce by 50%

PROJECT PROPOSAL

The National Broadband Initiative has created a new environment for the deployment of web based services in Australia, with a clear focus on the development of new health and education services.

Although some individual states in Australia have invested heavily in the development of new and often innovative programs for the management of chronic disease, such as for example, the Hospital Reduction Risk Program (HARP) in Victoria, these have invariably been very labour intensive and used little if any telehealth technologies for service delivery. It is also fair to say that unlike the UK, where government policy on telehealth has evolved over more than a decade of intensive planning and public consultation, the policy position on telehealth of successive Australian Governments has been virtually non-existent with a focus instead on e-Health and the development of a national EHR.

Clearly a national telehealth agenda needs to be developed and targeted funding allocated, to demonstrate categorically that telehealth services improve patient outcomes, are cost effective and introduce essential efficiencies in the healthcare system without which the standard of care for patients with chronic disease is almost certain to diminish unless investments are made that are likely to reach unsustainable levels as the population ages and the burden of chronic disease increases.

This is a reality that needs to be addressed in Australia as it is internationally, with large investments in Research and Development, the funding of large scale trials and a re-allocation of operating funds from the tertiary sector to telehealth services delivered throughout the primary care sector.

We propose a large scale telehealth project, utilising the NBN in which we would like to demonstrate three e-health scenarios;

1. A whole of population approach to managing chronic disease in the home and community in a rural and remote setting. Creating a clinical campus environment and fostering integration of healthcare services and the development of social and professional networks.
2. A large scale high need metropolitan setting with a high concentration of elderly residents, and disadvantaged families suffering from chronic disease, mental health problems and drug and alcohol abuse.
3. Remote monitoring and telehealth service delivery to a selected cohort targeting the approximately 350,000 residents of mobile caravan parks, who are predominantly elderly and socio-economically disadvantaged.

PROJECT AIMS

1. To build a sustainable new model of health care service delivery based on the provision of telehealth services and collaborative services networks that;

- Provide equity of access to healthcare services and resources in regional, rural and remote areas
- Prevent the exacerbation of chronic disease and reduces the risk and impact of disease and disability
- Improve chronic disease management in the community
- Reduce avoidable admissions (and unnecessary demand for hospital care)
- Improve service access and health outcomes for disadvantaged and vulnerable groups
- Empower patients' social networks to participate in the management and delivery of care.

2. Develop a Business Model for the deployment of telehealth services that will;

- Be capable of supporting and enhancing the current social and primary health service model
- Significantly increase the case load and cohort that a social/clinical team is able to manage whilst maintaining and in some cases reducing their workload
- Significantly reduce the dependence on hospitals

- Delay the point at which individuals access higher cost services
- Deliver greater independence and control for the individual
- Work towards a culture of self-care, management and responsibility
- Ensure sustainability of these telehealth services, by leveraging existing funding programs

3. Implement many of the recommendations of the National Preventative Health Strategy

- ✓ Provide a viable option for people to enrol in a comprehensive primary healthcare system based on residential location – especially those who are disadvantaged or who have multiple needs
- ✓ Responds to the changing health needs of people throughout their lives and to those of their families
- ✓ Provides quality preventative healthcare in the most appropriate setting
- ✓ Promotes patient- and community-centred preventative healthcare with genuine options for community involvement in planning and service delivery
- ✓ Harnesses and coordinates the contribution to preventative health made by a wide range of health professionals
- ✓ Networks primary care organisations, avoiding silos and gaps in care
- ✓ Provide a comprehensive clinical governance and quality audit system
- ✓ Introduce an electronic patient record

This integrated model should not be exclusive to the deployment of telehealth services in the home, but also include whole of population environments particularly where telehealth technology enables providers to deliver access to lower cost resources. These would include Residential care facilities, GPs, Community Health Centres and Community Pharmacies that with the assistance of telehealth technologies could deliver remote clinical management for GP's and AHS's, automated risk stratification, decision support and automated medication management and audits.

Telehealth services for the remote monitoring and management of chronic disease can be applied throughout the primary care sector, including the home, in residential care, in GP practices and in community health centres in rural and remote communities. In the home, remote monitoring of vital signs can be carried out with simple wired and wireless instruments connected via the telephone to web based services and databases. More complex systems promote self management by engaging with the user and providing a range of services such as health education, daily logs, medications reminders and the provision of alerts and alarms. One such a system, developed in Australia, is shown below;

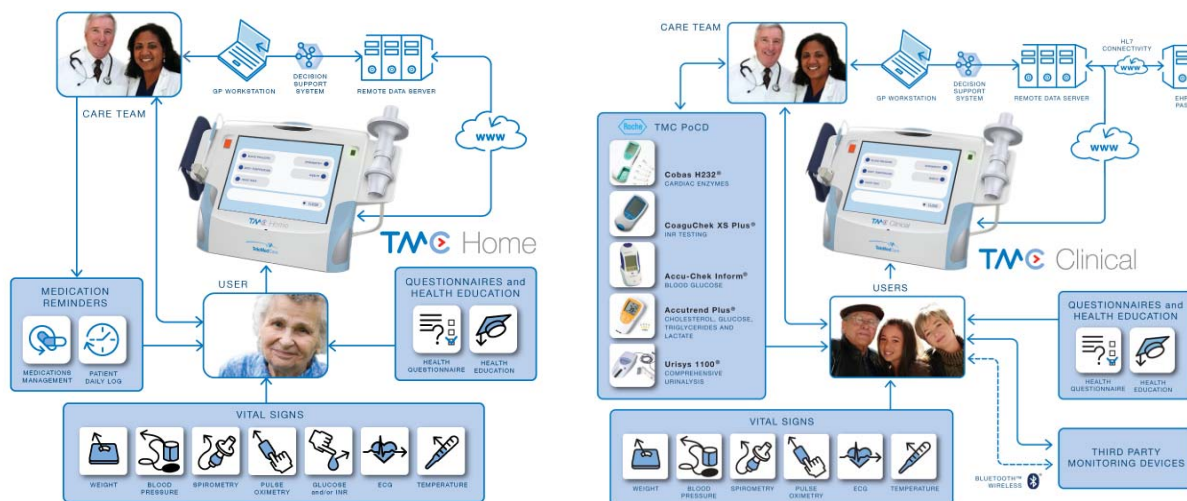


Figure 1. Schematic diagram of (a) TMC Home and (b) TMC Clinical

Hospital grade clinical instruments, designed for simplicity and ease of use, include blood pressure monitoring, pulse oximetry, spirometry and ecg as well as other simpler devices for measuring weight, body temperature and blood glucose. Data collected from these devices together with a record of medications taken and the responses to comprehensive health status questionnaires provide a rich longitudinal record of the patient's health status.

By simple observation of the longitudinal record, or with the assistance of sophisticated decision support, it is possible to reliably identify those whose chronic condition is stable, those who exhibit early signs of an exacerbation of their condition and those whose condition is deteriorating and who will be at risk of suffering an acute episode and possible hospitalisation unless an immediate intervention takes place.

Leveraging collaborative services networks, which enhance today's communication networks to become "relationship networks", the right amount of information is then delivered to the right people at the right time to make the right decision. This allows consumers and healthcare professionals to manage their healthcare relationships with the confidence of knowing that, when a health event occurs (i) family, friends, community services and care teams that need to make a decision are informed and (ii) have the contextual information they need to make a decision, and (iii) are provided with the decision options best practice recommends.

These capabilities represent a dramatic shift in models of healthcare delivery for the chronically ill in the community, by (i) enhancing patient self management, (ii) reducing the incidence of admission to Emergency Departments and (iii) reducing the demand on increasingly scarce and expensive clinical human resources.

THE EVIDENCE FOR TELEHEALTH

Evidence from studies overseas has shown that such sophisticated home monitoring systems are very well accepted by patients, are easy to use, promote self management and can dramatically reduce use of clinical resources.

There is an extensive literature on home telehealth. A recent study, *Vital Signs Via Broadband: Remote Health Monitoring Transmits Savings, Enhances Lives*, by Robert E. Litan, undertook a systematic review of the literature to identify studies in home telehealth that compared a home telehealth intervention with a non-telehealth standard/usual care alternative in terms of administrative changes, patient management decisions, patient outcomes, caregiver outcomes, economic impact or social impact on patients. The results are summarised below;

STUDIES MEASURING CHANGE IN EMERGENCY ROOM VISITS WITH TELEMONITORING

| Authors | Intervention | Disease Groups | Result |
|---|---|---|---|
| Johnston et al. (2000) | Video visits | Heart disease, lung disease, diabetes, chronic wounds | Outpatient costs (including ER visits) increased by 12% |
| Meyer, Cobb, and Ryan (2002) | Physiological monitoring, video visits, messaging | Heart disease, lung disease, diabetes, chronic wounds | Reduced ER visits by 29% vs. control. |
| Noel et al. (2004) | Physiological monitoring, remote wound camera | Heart disease, lung disease, diabetes, chronic wounds | Reduced ER visits by 19% vs. control |
| Rees and Bashshur (2007) | Wound camera | Chronic wounds | Reduced ER visits by 59% vs. control |
| Strategic Healthcare Programs, LLC (2004) | Physiological monitoring | Heart disease, lung disease, diabetes | Reduced ER visits by 49% for CHF patients, 66% for COPD patients, and 83% for diabetes patients |

STUDIES MEASURING CHANGE IN HOSPITALISATIONS AND BDOC WITH TELEMONITORING

| Authors | Intervention | Disease Groups | Result |
|----------------------------------|--|---|---|
| Cleland et al. (2005) | Physiological monitoring, telephone visits | Heart disease | Reduced BDOC by 20% vs. control. |
| Dansky et al. (2001) | Video visits | Heart disease, lung disease, diabetes, chronic wounds | Reduced hospitalizations by 64% vs. control |
| Finkelstein et al. (2006) | Physiological monitoring, video visits | Heart disease, lung disease, chronic wounds | Hospital and nursing home admissions reduced by 58% vs. control |
| Johnston et al. (2000) | Video visits | Heart disease, lung disease, diabetes, chronic wounds | Reduced hospitalization expenses by 44% vs. control |

STUDIES MEASURING CHANGE IN HOSPITALISATIONS AND BDOC WITH TELEMONITORING (Cont..)

| Authors | Intervention | Disease Groups | Result |
|--|---|---|--|
| Meyer, Cobb, and Ryan (2002) | Physiological monitoring, video visits, messaging | Heart disease, lung disease, diabetes, chronic wounds | Reduced BDOC by 52% vs. control. |
| Montefiore Care Connect (interview, 2008) | Physiological monitoring, telephone visits, messaging | Heart disease, lung disease, diabetes | Reduced hospitalization and ER costs by 40% |
| Noel et al. (2004) | Physiological monitoring, remote wound camera | Heart disease, lung disease, diabetes, chronic wounds | Reduced BDOC by 19% vs. control |
| Rees and Bashshur (2007) | Remote wound camera | Chronic wounds | Reduced BDOC by 45% vs. control |
| Strategic Healthcare Programs, LLC (2004) | Physiological monitoring | Heart disease, lung disease, diabetes | Reduced hospitalizations by 39% for CHF patients, 51% for COPD patients, and 75% for diabetes patients |
| Trappenburg et al. (2008) | Remote messaging | Lung disease | Reduced hospitalization by 41% vs. control |

STUDIES MEASURING CHANGE IN NURSING HOME ADMISSIONS AND BDOC WITH TELEMONITORING

| Authors | Intervention | Disease Groups | Result |
|-------------------------------------|---|---|---|
| Finkelstein et al. (2006) | Physiological monitoring, video visits | Heart disease, lung disease, chronic wounds | Hospital and nursing home admissions reduced by 58% vs. control |
| Meyer, Cobb, and Ryan (2002) | Physiological monitoring, video visits, messaging | Heart disease, lung disease, diabetes, chronic wounds | Reduced nursing home BDOC by 68% vs. control. |

In one study in Norfolk not yet published, a telehealth trial using equipment similar to that shown in Fig. 1 demonstrated that hospitalization and length of stay could be reduced by up to 70% and nurse

visits by more than 85%, with an 80% reduction in admissions to hospital from Residential Care Facilities.

PROJECT PLAN

We propose to target three major demonstrator sites that will both demonstrate how effective telehealth services are in reducing admissions to A&E and the demand for community based clinical HR as well as addressing issues of disadvantage and equity of access to healthcare services and resources.

Target Group 1.

A number of small rural and remote townships with known ageing demographics, limited healthcare services and high incidence of chronic disease will be targeted. Critical statistical information will be collected to better understand the costs of delivering existing services and identifying areas where significant savings are possible using telehealth. Telehealth services will be deployed in some or all of the following target groups in each of several small rural and remote communities;

1. Up to fifty (50) chronically ill patients in their home who with complex co-morbidities and have been admitted to hospital at least twice in the previous 12 months. Typical disease conditions will include combinations of CHF, COPD, CHD, Diabetes and hypertension.
2. Up to three residential care facilities averaging approximately sixty (60) high care residents each. These will be provided with clinical monitoring systems as well as Medications Management systems.
3. All GPs involved in the delivery of care to the two groups targeted above. Estimate for purpose of preliminary budgeting is nine (9) GPs per community.
4. Three community pharmacies which provide medications dispensing services to the three residential care facilities participating.
5. Three (3) Community Health Centres or Community Hospitals

Each of the health service sectors identified above will be supplied with a range of single user and multiuser medical grade Clinical Monitoring Units (CMU's). These can monitor a number of vital signs including Blood Pressure, single lead ecg, forced and relaxed spirometry, pulse oximetry, weight and body temperature. In addition, facilities will be provided for the administration of clinical questionnaires, daily logs, messaging and video teleconferencing between patient and carer.

All data collected from CMUs will be transferred to a secure hosted server and following analysis, will be available for viewing by any authorized member of the care team. Data can subsequently be made available to hospital PAS and HIS systems, GP practice management systems, community nursing systems as required, via the Collaborative Services Network (CSN).

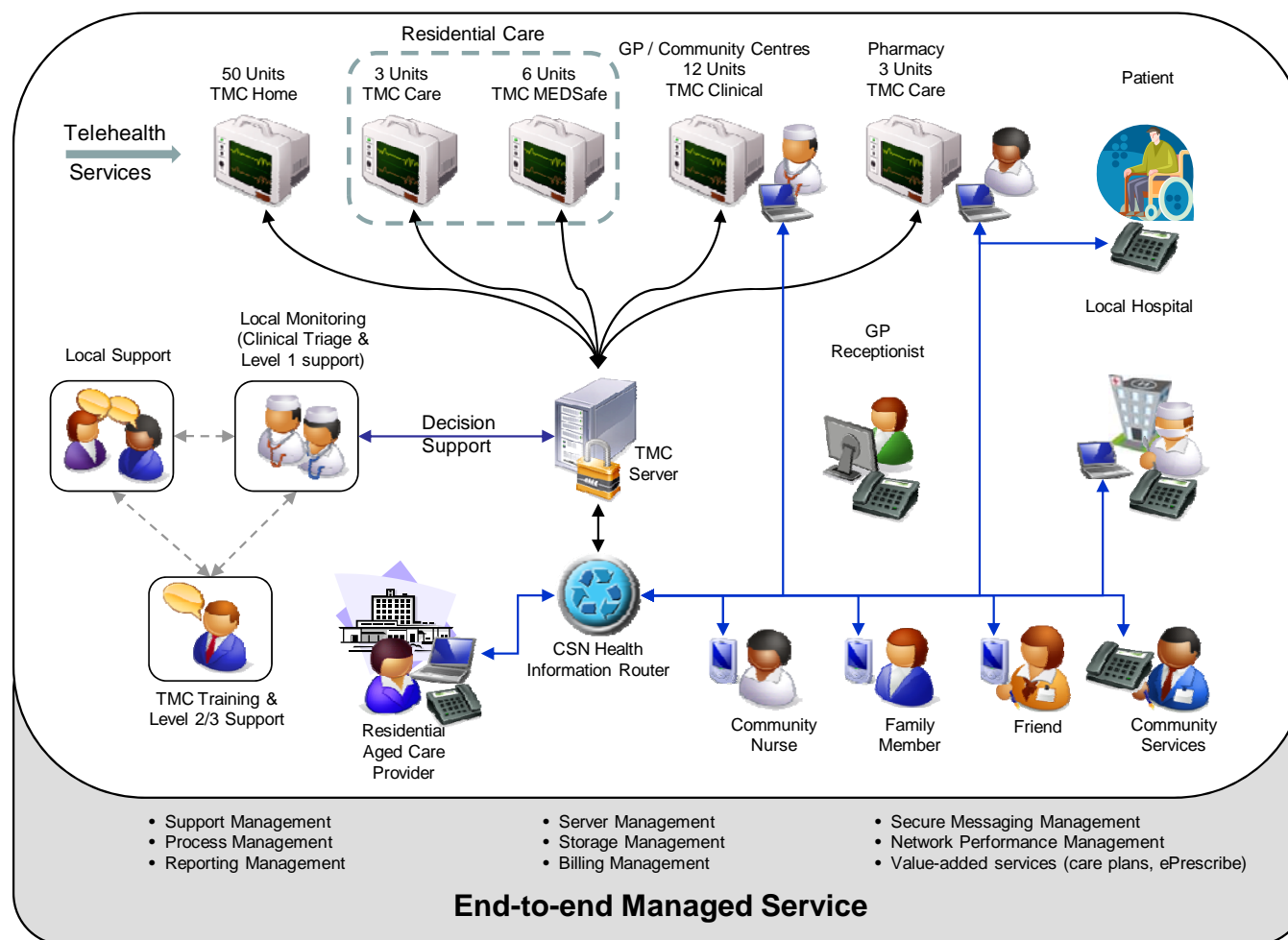
CSN enables Care Providers' current eHealth applications to talk to each other in a coordinated NEHTA-compliant fashion within a custom care plan as configured by the Care Provider. Care Plan statistics can be made available to State & Federal regulators in real-time.

CSN is a plug-in component to today's consumer and Care Provider communication networks. Australian communication service providers currently exchange and store consumer and Care Provider voice, video, and text either free (with advertising) or at a very low cost. CSN is a low cost option to upgrade these networks to improve the efficiency and effectiveness of multi-party collaborative care plan management.

End to end Service Management

End to end management of the telehealth service will include, Support Management, Process Management, Reporting Management, Server Management, Storage Management, Billing Management, Secure Messaging Management, Network Performance Management and the provision of other Value-added services (care plans, ePrescribe, etc)

Schematic of Telehealth Service Provision in Primary Care



Target Group 2.

This project targets residents of inner city high rise housing estates that are characterised with high levels of social inequity, high levels of chronic disease, a predominantly older population and high levels of mental illness and drug abuse. This is a particularly challenging study group as they represent probably the most socio-economically disadvantaged group in the community.

Inner city high rise housing estates can typically contain more than a thousand individual apartments. Each and every one of these apartments be evaluated and risk stratified for chronic disease, mental health and other social inequities.

Once this risk stratification is complete we would propose the installation of appropriate telehealth and communications equipment in order of complexity and cost to provide the following services;

1. Provide a very simple personal emergency response system with alarm button operating through the home communications Hub
2. Monitor and manage simple early stage chronic disease through a range of simple Bluetooth monitoring devices connected to the home communications hub.
3. Monitor and manage more complex chronic disease with complex co-morbidities using desktop monitoring systems such as those shown in Figure 1a.
4. Provide multi-user monitoring systems to local community health services to manage those who are proven incapable of carrying out a self monitoring regime at home.
5. Manage Medications delivery, reminders and review, in conjunction with partners who operate a wholesale pharmacy operations with overnight delivery. The project would use a single e-connected pharmacy operation to manage the whole process of prescribing, dispensing, delivery, daily reminders and reviews of medications.
6. Provide multimedia education services, VOIP telephony, entertainment, video conferencing and health related questionnaires and access to their own Personal Health Record through a low cost laptop or desktop device. This would also provide facilities for social computing and the creation of virtual communities.
7. Provide Life Coach assistance, in collaboration with a number of partner organizations, to provide low cost hands on support and life style management training to the resident community. These staff would provide life coaching, lifestyle assistance and Level I technical support through the technical triage facility.
8. More specialised clinical staff located at a clinical monitoring centre would monitor the residents health condition and orchestrate the most appropriate response to avoid the exacerbation of the resident's health condition and unnecessary hospitalization. The clinical triage facility would coordinate with local community nursing, GPs and local hospitals to ensure that the most appropriate level of care is provided in a timely manner.

This project would be a unique demonstration of the benefits of providing telehealth services in a very challenging environment, which would connect ALL elements of the primary care sector through telehealth services in the home, the GP, the Pharmacy, the workplace, the community health centre and the community hospital.

This project, which would also include video conferencing, multimedia educational services and entertainment, whilst maintaining a health flavour, would represent the most comprehensive model for the delivery of telehealth services in the community, through the availability of broadband internet services, attempted anywhere in the world.

Target Group 3. - Improving Service Delivery to Caravan Park Residents

This project aims to target the approximately 350,000 residents of mobile caravan parks, who are predominantly elderly or socio-economically disadvantaged.

There is previous evidence that Caravan Park Residents present disproportionately at A&E. The methodology and outcomes arising from that study are summarised below.

The project involved a number of local organisations joining together to examine the trends and work with the park residents to address the issues. Peer review meetings were held with Community Health and key stakeholders including Centrelink. Service usage data from electronic data base systems was reviewed, a project team was formed and a literature review undertaken and the involvement of park owners and the resident community was secured. This led to the development of a Collaborative Community Action Plan to;

- increase community linkages
- distribute information
- provide services on parks
- improve transport
- survey residents (15 surveys completed)

Results obtained from this intervention included a 65% reduction in hospital admissions, but a 100% increase in referrals to Community Health in 2004-2005 and a 75% increase in new clients in 2005.

The project concluded that the health of the more disadvantaged members of the community can be improved through agencies working together to ensure access to health and community services, and increased participation in education and employment programs and promoting a healthier lifestyle. Evidenced based research does open the doors for communicating with a range of agencies, strategic planning ensures momentum and ensures local ownership.

This project demonstrates the benefits of targeting Caravan Park Residents to reduce admissions to A&E and hospital admissions, but also reveals that the provision of such intensive social services and interventions greatly increases the demand for community social workers and community nurses.

The objective of this project is to both reduce hospital admissions and reduce the demand for community health services.

Project Plan

In this project a number of Caravan Parks will be selected and surveyed to establish the demographic profile, community health needs and incidence of chronic disease of residents. Following their engagement and the approval of the park management, a caravan would be equipped with one or more multiuser telehealth monitoring and teleconferencing facilities, that following an initial period of training, could be used at will by all residents.

Specialised clinical staff located at a clinical monitoring centre would monitor each resident's health condition and orchestrate the most appropriate response to avoid the exacerbation of the resident's health condition and unnecessary hospitalization. The clinical triage facility would coordinate with local community nursing, GPs and local hospitals to ensure that the most appropriate level of care is provided in a timely manner.

As in the previous two projects, it would also be possible to also manage the whole process of prescribing, dispensing, delivery, daily reminders and reviews of medications.

TIME LINE

Overall time line is two years from date of signing contracts and commercial agreements, and first availability of funds

| Activity | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |
|---|----|----|----|----|----|----|----|----|
| Project planning, Training & Installation | | | | | | | | |
| Patient Monitoring | | | | | | | | |
| Monitoring Period for Outcomes Analysis | | | | | | | | |
| Outcomes analysis and reporting | | | | | | | | |
| Project Management | | | | | | | | |

PROJECT DELIVERABLES

Analysis of Healthcare outcomes

Workforce efficiency/utilization metrics

Community Feedback

Analysis of change management requirements (organizational, workforce utilization, clinical practice, quality of care)

Health economic analysis

Patient/User Feedback

Impact on Community Social Capital

Development of Business Plan / Business Case for large scale national deployment of telehealth services

BUDGET

The budget requirements depend on a number of factors, including the scale and range of projects approved, the level of participation of academic institutions or the engagement of auditing firms trusted by Federal and State Treasuries for evaluating health care outcomes and cost effectiveness and the availability of high level consultancy support for the development of business plans for future up-scaling of the project nationally.

Given that the UK has invested approximately £120m over the last four years to create and support the development of a telehealth services industry, a budget of \$100m over 2-3 years would be a reasonable estimate at this stage.

PARTNERS

The proposed large scale deployment of telehealth services will require the establishment of a consortium that includes Australian SMEs with mature offerings in this sector, some multinationals and the active participation of Federal Government due to Medicare provider number changes that may be required as well as State Governments if Area Health Services, Departments of Housing and HACC programs are to be involved.

It is the intention to comply fully with government competition policy and requirements for probity by putting the project to open tender. An important consideration however would be to support local industry and small to medium enterprises by using this project to help develop the local capacity to deliver a comprehensive telehealth service, that can be scaled up internationally.

Australia already has world leading telehealth technology, developed through ARC and DOHA funding and supported through Govt R&D tax incentives.

However many of the SMEs operating in this area struggle in Australia because of a lack of a funding model for the delivery of telehealth services, and the complex funding arrangements existing between the Federal Government and State Governments which make it difficult, if not impossible to make the necessary market alignment between the entities that fund services and those that would gain benefit from the delivery of these services.

The participation of a large Australian domiciled multinational organisation in the consortium is intended to provide Australian SMEs, operating in this rapidly maturing sector, with exposure and access to international markets and channels that would be difficult if not impossible to achieve within a competitive commercial timeframe. One such organisation is IBM, who have expressed interest in providing end-to-end managed services, as would be required should such a project become national in scale.

Successful completion of such a wide ranging project would re-establish Australian leadership in telehealth and demonstrate that Australia is at the forefront of developing and deploying new and cost effective services for the management of chronic disease both in metropolitan areas as well as rural and remote communities.

Demonstration of such a capability in Australia would lead to both international recognition and new commercial opportunities to become a telehealth hub for the Asia Pacific region, whereby technical and clinical triage services could be provided and telehealth service networks established in a number of neighbouring developing countries such as East Timor, Indonesia, and the Pacific island states.

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SPONSORING ORGANISATIONS

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