The CSIRO National Telehealth Trial, significance for rural and remote health care

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NBN Telehealth Pilot Program
CSIRO Telehealth Project

• **Summary**
  
  – CSIRO was lead organisation
  – Six clinical partners and three industry partners
  – Total project size >$5m ($3.02m from DOHA/DBCDE Pilot Program)
  – Six (6) Trial sites in Five (5) states and territories
  – Focus on Chronic Disease Management (CDM) in the Community
  – Trial duration 18 months – ended 30th Dec 2014
Telehealth services provided

- Daily measurement of:
  - BP
  - ECG
  - Spirometry
  - Pulse oximetry
  - Body Temp
  - Body Weight
  - BGL
  - Clinical questionnaires

- Based on patient health requirements
CSIRO NBN Telehealth Trial – 6 Sites

- Townsville
- Penrith
- Nepean Blue Mountains / ARV
- Canberra and ACT
- Ballarat and the Grampians
- Launceston / Northern Tasmania

Number of patients at each site
- 25 Test Patients
- 50 Control Patients

Total
- 150 Test patients
- 300 Control Patients

Trial Design
- Case Matched controls
- Before-After-Control-Impact (BACI)
- * One site was decommissioned
Clinical Triage and Care Coordination

The model of care

Objectives of clinical triage is not to deliver care but to coordinate and orchestrate the provision of timely and effective care by the patient's normal care giver ie GP or community nurse, to avoid an exacerbation of the patients chronic condition and unnecessary hospitalisation.
Summary of Results of Telehealth Trial

- **Rate** of expenditure on medical services fell by **46%**
  - Savings over the first year was **24%**
- **Rate** of unscheduled admissions to hospital fell by **53.2%**
  - Reduced number of admissions over one year **24-36%**
- **Rate** of length of stay fell by **70-76%**
  - Reduced length of stay over first year **34-42% (7.5-9.3 days)**
- **Mortality** was reduced by **45-48%**
- **> 83%** user acceptance and use of telemonitoring technology
- **> 89%** of clinicians would recommend telemonitoring services to other patients
Estimated Potential Return on Investment

- **Minimum estimated Costs / month for telehealth management of chronically ill patient**
  - Capital costs averaging $1324 amortised over 4 years at 7% pa $35 /month
  - Internet costs (3/4G data costs, 10MB monthly plan) $5 /month
  - Monitoring, hosting and maintenance @ $70/month $70 /month
  - Nurse coordination
    (100 patients / clinical care coordinator, $4 /day / patient) $120 / month

  TOTAL $230/month

- **ANNUAL COST ESTIMATE** $2,760 pa ($7.40/day)

- **ANNUAL SAVINGS ESTIMATES**
  - Savings in MBS and PBS Costs (from CSIRO trial) $1000 pa
  - Reduced LOS, averaging 7.5 bed days @ $2,051 / day >$15,383 pa
  - Reduced demand on community nurses
    (Reduction of one visit / week @ $60 /visit) $2880 pa

  TOTAL SAVINGS $19,263 pa

ESTIMATED ROI = 5.98
What have we learned?

- The longitudinal health record from the home is a very powerful diagnostic tool – something ED physicians learned a long time ago! ie modified early warning scoring (MEWS)/EWS track and trigger system (TTS) is based on the recording of physiological signals in ED
- The telehealth enabled model of care is cost efficient and allows one care coordinator to manage ~ 100 chronically ill patients
- Video conferencing is a nice-to-have but really not necessary – it was barely used in the CSIRO trial
- Whilst the project demonstrated that approximately 50% of predicted admissions were avoided, the other 50% potentially were avoidable as well! We need more intelligent and robust methods for risk stratification!
- Notwithstanding the limitations encountered, the return on investment was approximately 6!
- Appropriate workplace culture and capacity for organisational case management is essential!
Case Study: Exacerbation event, COPD patient. Hospitalisation NOT avoided! Why?

PATIENT OCID: 38
Relevance to rural and remote health

• Data driven diagnosis and care coordination can take place from anywhere

• Whilst at home telemonitoring is still viable in rural and remote communities, the international focus is on telehealth enabled community health centres supported by networks of clinicians.

• Best examples are in Canada, Alaska and rapidly developing in India
The international landscape for telehealth

• Telehealth and Telemedicine is being increasingly seen as a cost effective way of delivering health care to remote isolated communities both in developed countries and in developing countries.
• Primary care is the focus! Where care is provided in community health centres or through rural and remote GPs.
• In many developing countries where medical resources are poorly distributed, community health centres are typically staffed by nurses or allied health workers.
• The extension of these community based services to home telemonitoring however is still not common.
Canada

• Like Australia, Canada has a number of indigenous peoples (First Nations, Inuit and Metis) many of whom live in isolated remote and disadvantaged communities.

• The National First Nations Telehealth Research Project 1998, was one of the first projects to address the needs of these isolated communities and were rapidly joined by Northern Ontario Remote Telehealth Network (NORTH), KO Telehealth and MBT Telehealth, a 24 site province-wide telehealth network.

• These remote area networks are complemented by more regional services such as the Ontario Telemedicine Network (OTN), one of the largest telemedicine networks in the world, consisting of more 1200 sites and 2200 endpoints.
Alaska

• Alaska, shares many of the characteristics of the Canadian Norther provinces, and in step with Canada has developed the Alaska Federal Health care Access Network (AFHCAN)

• AFHCAN is an extensive telemedicine network, managed by the Alaska Native Tribal Health Consortium, which together with the Alaska Native Medical Centre (ANMC) provides tertiary and specialty healthcare services in the state.
Rural India

• A characteristic of telehealth services in rural and remote villages in India, is rapid innovation and deployment based around rudimentary community health centres connected via satellite to remote telemedicine centres,

• Services provided in community health centres typically involve low cost low bandwidth (250kbit) video conferencing, facilities for monitoring vital signs and simple biochemical urine and blood analysers and telehealth connectivity to services in regional centres.

• India is about to release a tender to connect 2,500 rural and remote villages with telehealth services
How are these services distributed?

• Consider as an example the OTN
  – supports access to care across a wide variety of clinical therapeutic areas of care which include 65 community care access centres, 72 community health centres and 28 nursing stations on aboriginal reserves (in collaboration with the Keewaytinook Okamakanak Telemedicine Network.

• Benefits?
  – 237,221,884 kilometers of patient travel was avoided by using Telemedicine per the Ontario Telemedicine Network (OTN) in their 2012-13 Annual Report.  
How are these services delivered?

- Commonly via a diagnostic “store and forward” telehealth platform which combine, text, data, EHR and a range of biomedical peripherals.
- Healthcare professionals can view patient data and can provide diagnostic support to local allied health staff remotely from their own desktop or mobile device.
- Approximately 75% of AFHCAN’s telehealth usage is for primary care services.
Video conferencing workstations
A model for telehealth enabled rural and remote health in Australia

• Hub and spoke model – The hub should be a regional telehealth referral centre associated with a hospital or local health district

• The spokes are interconnected. Typically community care access centres, community health centres and nursing stations in remote communities, mostly operated by community nurses or health workers.

• Each remote facility properly is equipped with telehealth enabled monitoring technology and communications infrastructure.

• Nursing staff and health workers fully trained on use of all diagnostic equipment, and supported by GP and specialist services in the regional telehealth hub
Objectives

• EMPOWER local allied health staff by investing in technology and services
• CONNECT local health workers with GP and specialist support at regional centres
• SUPPORT on-going education and training of local staff and their role in their communities
• PREVENT unnecessary exacerbation and hospitalisation of chronic conditions
• AVOID unnecessary fly outs and patient travel
Interoperable and standards based

- Telehealth devices and services must be able to be deployed in a variety of clinical settings from GP and community health centres to remote nurse outstations.
- Devices, software and services must be fully integrated and Telehealth enabled to allow for HD video conferencing (when possible!), the convenient transfer and sharing of images, clinical traces and electronic health records within both fixed and mobile clinical settings.
- The integrated system must be standards based and demonstrate compliance with the NeHTA National eHealth Architecture, and the eHealth Interoperability Framework.
Requirements for rural and remote facilities

• **Infrastructure and services**
  – Minimum 1Mbps bidirectional cable, wireless or satellite connectivity
  – Desktop computer and tablets
  – Shared electronic health records
  – Practice management software
  – Care planning
  – HD video conferencing (When possible!)
  – My Health Record
Requirements for rural and remote facilities

Diagnostic devices

• Basic Vital Signs
  – Blood pressure, single lead ECG, Spirometry, Pulse Oximetry, anthropometry (weight, height, BMI, % body fat)

• Medical Imaging
  – General imaging and clinical photography
  – Otoscope, sinus probe, dental probe, dermatology probe, endoscopy adapter, opthalmic probe
Requirements for rural and remote facilities

• **Point of care analysis**
  – Cardiac enzymes, BGL, INR, cholesterol, triglycerides, lactate, comprehensive urinalysis, haemoglobin, blood gas analysis

• **Specialised instruments**
  – 12 lead ECG, electronic stethoscope – cardiac auscultation, portable ultrasound, ophthalmoscope
Some examples
Rural and remote telehealth technologies and services

- All of these are available at a fraction of the cost of one EFT health worker!
- On-going costs are funded from increased efficiency, savings and reduced flyouts!
- Impact on staff satisfaction and retention, as well as community support would be at least comparable to that recorded in Canada and Alaska.
Considerations and Impediments

• Voice services in rural and remote areas are adequate, data services are not! Wireless spectrum essential for data services has been sold off!

• High performance internet connectivity is essential to support health, education, training and business and economic development in rural and remote communities

• Fragmentation of funding. State and Federal silos. Those who pay and those that benefit are not aligned.

• Capacity for local organisational change management is patchy.
NGARA - Point to Point high bandwidth, zero latency wireless data services

- In March 2012, CSIRO demonstrated the NGARA system with 100 Mbps per site (50Mbps to the ‘home’ and 50 Mbps from the ‘home’) to 12 sites simultaneously – a total data rate of 1.2 Gbps over a 28MHz wide channel. This trial was performed in CSIRO’s Marsfield site in Sydney and offers approximately 20 times the spectral efficiency of LTE.

- In the 900 MHz band, (8 MHz upstream + 8 MHz downstream) various configurations have been demonstrated, 6 remote nodes @ 112 Mbit/s operating over a range of 13 km range or 90 Mbit/s over a 17 km range or 67 Mbit/s, over a range of 23 km range, or 12 nodes @ 11Mbps over a range of 55km all at transmit power of 144 W at the central node.

- At 700MHz, a frequency band particularly suited for long distance propagation, 12 remote nodes can be serviced @ 44 Mbps bi-directionally over a range 20 km.
A snapshot of Australian Literature on Rural Telehealth

- Services for Australian Rural and Remote Allied Health – Position Paper, Telehealth and Allied Health, July 2012
Some valuable International Perspectives


Some valuable International Perspectives


Valuable resources

• The National Rural Health Resource Center
  https://www.ruralcenter.org/
  – A nonprofit organization dedicated to sustaining and improving health care in rural communities.

• A start-up and resource guide was created in partnership between Telligen and gpTRAC, the Great Plains Telehealth Resource and Assistance Center

Thank you!

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