A collaborative approach in remote Aboriginal communities – why has telehealth worked in the Laynhapuy Homelands?

Abstract.
Aim: The aim of the project was to demonstrate that telehealth could be successfully done with good quality reliable satellite internet for three very remote communities.

Setting and participants: This project was a collaboration between the Northern Institute (Charles Darwin University), Laynhapuy Homelands Health Service (LHS), Aboriginal Medical Service Alliance NT, eMerge, Broadband for the Bush and Telstra Health and was supported by a Regional Economic and Infrastructure grant. The three communities chosen by the Laynhapuy Health Service for telehealth implementation were Gan Gan, Yilpara and Wandawuy (that is, their most remote sites).

Design and methods: A collaborative approach was taken with project consultation, development and implementation to demonstrate the value of telehealth and video conferencing and maximize benefits to the community. Three Gilat satellite dishes and twelve months uncontended internet connectivity were deployed in three very remote East Arnhem communities. (Contention in network terms refers to the number of people on a network link competing for the network's limited resources. An uncontended network is one where only users from one organisation have access to the bandwidth on that private network.)

Results: LHS staff now regularly use video conferencing cameras and software for telehealth. Diagnoses are being aided by less formal modes of video conferencing rather than scheduled appointment driven video conferencing tools (St Clair et al, 2018; St Clair et al., 2019). For example, clinicians are using Facetime, smart phone camera optics and digital capabilities for triage and diagnostic assessment. Anecdotally, video conferencing has proved to be a "game changer" in remote Indigenous health service delivery for many reasons, including the facilitation of joint and more informed decision making by patients, families and clinicians, and the patients being able to see familiar faces. Using videoconferencing has also resulted in more accurate assessments for evacuations and acute care retrievals, provision of access to a wider range of services, provision of training and direct supervision of staff including registrar GPs (St Clair et al., 2019). Additionally, savings to the patient travel for the last 6 months of 2018 are estimated to be in excess of $13,000 per month (St Clair & Murtagh, 2018a).

Conclusion: Face-to-face consultation via video conferencing and direct supervision and observation of patient examinations are delivering better health outcomes for patients (St Clair et al, 2019). By showing patients and families pictures and videos from the internet, the supervising GP can demonstrate clearly what the problem is, the treatment required and opportunistically provide education for both patient and remote end clinicians (St Clair et al., 2018). Additionally, telehealth implementation has facilitated timely joint decision making for remote Aboriginal people resulting in a more positive patient outcome and crucial clinical procedures being done more expediently therefore improving the probability of survival (St Clair et al., 2019).

Introduction.

The NT is recognised as a leader in digital health and has been an early adopter of new technologies in the Aboriginal community controlled health sector. Implementation of telehealth in three very remote clinics in East Arnhem Land has been successfully done using a collaborative and cross-culturally sensitive approach (St Clair et al., 2018; St Clair et al., 2019).

The collaboration involved the Northern Institute, Charles Darwin University, Aboriginal Medical Services Alliance NT, Broadband for the Bush, Laynhapuy Homelands Health Service (LHS), eMerge (an ICT company based in the NT) and Telstra Health. The project team identified the need to demonstrate the feasibility of using satellite internet for telehealth. It was recognised that lack of access to reliable and affordable internet in very remote areas is a major barrier to the uptake of telehealth (Murtagh, et al., 2017; Murtagh & St Clair, 2018).

Collaboration is a process in which stakeholders work together in a constructive manner to attain an agreed goal whilst working through their different understandings, perceptions, interests and limitations (Gray, 1989). Collaboration generates an outcome that stakeholders are unable to generate on their own (Bryson, Crosby and Stone, 2015). Engaging partners from a variety of disciplines and backgrounds (including government, research and not-for-profit organisations) in collaborations is resource intensive, requires compromise, commitment, good communication (often over large distances), building of trust, management of aims and power distribution (Huxham and Vangen, 2005; Gray 1989; Bryson, Crosby and Stone, 2015). A collaborative approach to implementation of telehealth in the Laynhapuy Homelands in remote East Arnhem Land has the potential to improve health service delivery for very remote Aboriginal people by improving diagnostic abilities, reducing travel and supporting family based decision making (St Clair & Murtagh, 2018a; St Clair et al, 2019). Additionally, there is an environmental advantage with the reduction of travel (air and road) and less vehicles travelling on very remote roads.

The Northern Territory (NT) population is approximately 32% Aboriginal, of which approximately 79% live in remote communities (ABS, 2011a). A remote Aboriginal community is defined as a community in a remote geographic location (as defined by ABS, 2006) bounded by physical and legal boundaries and inhabited or intended to be inhabited predominantly by Aboriginal and/or Torres Strait Islander peoples. Housing and infrastructure are generally managed on a community basis (ABS, 2016). In such remote communities the unemployment rate, exacerbated by limited opportunities for employment (Havnen, 2012), is estimated at 15% (ABS, 2011b). Hence a need to increase Aboriginal economic participation in remote communities has been highlighted (eg CoA, 2014). Collaborative implementation of telehealth in remote Aboriginal communities may be seen as a community capacity building and employment opportunity.

Internet connectivity is a critical part of health service delivery in the NT. Over the past ten years shared health records have been embraced by the community controlled and public health sectors. The use of these digital technologies is restricted by unreliable internet services (Murtagh et al, 2017; Murtagh & St Clair, 2018; St Clair and Murtagh., 2018b). This project aimed to demonstrate the uptake of a new digital

technology (ie video enabled telehealth) while using a highly reliable internet connection.

Figure 1. Map of East Arnhem. The 3 project sites are highlighted in yellow. (Map 15.1 Yilpara and the Laynhapuy homelands are, norther-east Arnhem Land, ANU Press http://press-files.anu.edu.au/downloads/press/p331981/html/ch15.xhtml)

Methods.
The NI and AMSANT obtained internal funds from CDU (approximately $50,000) and then secured just over $400,000 funding from the NT Regional Economic Infrastructure Fund. Additionally, the team had negotiated $1.5 million over 3 years to extend access to internet and telehealth in remote NT communities through Telstra's Reconciliation Action Plan.

Internet and Telehealth Video Conferencing (TVS) systems are typically installed in remote clinics by outsiders with no established relationship with community

members. This project has taken a collaborative and culturally safe approach working with members of the Laynhapuy Health Service that have well established long term relationships with community members. The two project managers were not known by the members of the community prior to the commencement of the project. However, the project managers took the time to do initial consultation with clinic staff and members of the community, and did a number of site visits in the early stages of the project. They maintained regular communication and visits to the sites including some "virtual visits" via video conferencing. This facilitated the development of good working relationships and the building of trust and respect between participants throughout the collaboration. It was established early in the project that all participants had an understanding of the common goal – that is the successful implementation of video conferencing and telehealth. The installations of satellite and TVS systems were managed by the project managers with minimal external providers visiting the sites. This collaborative approach may be a key factor in the successful deployment of telehealth.

Consultation with clinic staff including the GP providing services to the clinics commenced in February 2017 and continued throughout the project. This resulted in several trips to Nhulunbuy and three to Sydney (where the GP/Physician is located). The site evaluation and inspections were done in May 2017. The location of the TVS (comprised of screen, camera, video end point controller, switch, network box, satellite modem and UPS) and the best site for satellite and concrete slab installation were identified.

As each clinic has the same layout but varied orientation, installed infrastructure, trees and power-line locations, site specific installation strategies were required for each clinic. Factors considered when choosing a location for the satellite and the concrete slab supporting the satellite included: Proximity to TVS (to reduce signal loss); line of sight to the East (the satellite is based over Vanuatu so a clear line of sight to the East is required to obtain optimum connectivity); location of power lines (which can interfere with satellite connectivity); location of plumbing and phone line infrastructure.

Three Gilat satellite dishes were installed in September 2017. A number of hardware and software modifications were required to tune the video software to perform optimally over the satellite internet service. Training in video conferencing and the use of the National Telehealth Connection Service (NTCS) consultation booking and connection software was provided. There were some commissioning problems; for example, with the interface between the internet and NTCS software. There was extensive support provided by the project managers (including using Facetime) to work through implementation issues. Once commissioned, speed testing of the internet typically indicated 1.6 megabits per second (mbps) up and 3.9 mbps down with possible threshold of maximum 2 mbps up and 4 mbps down. Some shaping of this configuration has been required to maximise use for telehealth.

Determination of travel savings were calculated based on the number of retrievals averted and the number of visits to Darwin of patients and escorts to see specialists as recorded in the clinical data base. Estimates of travel savings were based on the estimate of the number of patients and escorts that would be sent to Darwin for specialist appointments on an average monthly basis.

Results.
Clinicians have benefited from clinical training and support. Staff within the clinics, local community members and visiting clinicians were encouraged to use and innovate with the available equipment. This spirit of innovation allowed less formal technologies (eg smart phones) to be included in the diagnostic process. For example:

> A patient had a cut hand. The off-site GP could see what was happening with the hand using both traditional video conferencing and a smart phone camera for close up observations. The staff were able to make a video and the GP consulted a hand surgeon for advice. The clinical staff under supervision of the GP/physician were able to treat the wound in the community clinic. This resulted in the patient being able to stay on community and not travel to Darwin to be treated by the plastic surgeon. Staff also emailed a video to the physiotherapist to assist on-going treatment.

LHS staff now regularly use video conferencing cameras and software for telehealth. Diagnoses are being aided by less formal modes of video for example, Facetime, using smart phone camera optics and digital capabilities for triage and diagnostic assessment. Savings in travel for the first 6 months of 2018 are estimated to be approximately $29,000 (specialist visits and retrievals) and $13,000 per month for the remainder of 2018 for specialist visits (St Clair & Murtagh, 2018a).

Discussion.
Telehealth using satellite technology has been demonstrated to be a new and innovative strategy to improve remote Aboriginal health service delivery, that is, telehealth is a "game changer" in "Closing the Gap" for remote Aboriginal life expectancy. Telehealth is providing opportunities for family, patient and clinician meetings to facilitate joint and more informed decision making (St Clair et al., 2019). Patients are able to see familiar faces – even if it is via a video-conference. More accurate assessments for evacuations and acute care retrievals, providing staff training and support, providing the ability to access a wider range of services, facilitating more culturally sensitive induction of new staff and patient safety are all benefits of telehealth implementation (St Clair et al., 2019). Additionally, higher quality training and direct observation of trainee GPs is also facilitated by telehealth. That is, telehealth has changed the way services are delivered in the Laynhapuy Homelands for the benefit of Aboriginal people living in very remote areas.

Telehealth has required extensive technical support. There have been a number of issues arising in Internet connectivity routing, problems with remote control devices, failure of hardware (eg firewall due to over-heating) and network management/configuration. A significant amount of trouble shooting is required to maintain the TVS. This has led to the on-site staff frequently using smart phones for telehealth as the internet connection was reliable but the video conferencing devices lost connectivity to the internal clinic network. Further work needs to be done to build simplicity, reliability and redundancy into the TVS.

The high quality uncontended satellite connectivity deployed and the TVS are both high maintenance and expensive. Many of the TVS systems are complex, require significant technical support and have low levels of redundancy. The paradigm needs to be changed to more robust, simple, intuitive solutions. More cost-effective and

robust internet needs to be secured and TVSs need to be usable by community members without extensive training and support. Smart phones and other digital devices are being used effectively and the next phase in the research will be to explore alternative digital solutions. The aim will be to deploy reliable and easy to use technical infrastructure with high levels of redundancy that require minimal support and can be used by untrained members of the community with minimal assistance.

At the grassroots level of Indigenous engagement it is important to follow cross-cultural best practice as a guideline to enter Aboriginal communities. Many of the NT Aboriginal communities have their own cultural protocols for their country that may include being invited to their community. It is important to adhere to Traditional Owners' and custodians' instructions regarding their sites of significance through to their sacred sites. To install satellite and video conferencing infrastructure, project team members consulted with the local communities through the Laynhapuy Health Service throughout the project and maintained continual communication to inform community members of the project as it progressed. Collaboration and the development of respectful cross-cultural relationships with local communities is important to enhance Aboriginal ownership of telehealth implementation.

Decision making in remote Indigenous communities involves a number of family members. Decision making processes in the cultural context for Aboriginal people are different to that of Europeans and differ between localities. Often when a family member is diagnosed with an illness that requires medical intervention the whole family are informed so they can make the necessary joint decisions and arrangements (St Clair et al., 2019). This ensures the patient understands what the practitioners are conveying and consequences of the diagnosis, treatment, any time critical issues and consequences of no treatment. Community members often need to interpret for the patient as English is typically their third or fourth language. The medical terminology and some concepts are often not understood by Indigenous people without effective and culturally safe communication mechanisms. Therefore, it is critical to find a cultural conduit to liaise between the health practitioners, patient and family members.

Due to the remoteness of many of the communities and families being spread over large geographical distances, it is important to ensure the right family members are present for the diagnosis, ensuing discussions and joint decision making. Therefore, it may take some time (maybe months) to facilitate family meetings. Telehealth can reduce the challenges associated with travel to facilitate family discussions and consultations with specialists and other health professionals in major centres (St Clair et al., 2019). Additionally, if the appropriate family members are in a different community, they can be involved in case conferences, consultations and decision making via video conferencing. This results in less travel from community, more informed, speedier, thorough and effective decision making and improving health outcomes for remote Indigenous people (St Clair et al., 2019).

What could we do if we had reliable, expanded and consistent internet in remote Indigenous communities? Access to services previously not available to remote people can include specialists such as endocrinologists, orthopaedic surgeons; support for learning sign language by deaf people; direct observation of trainee GPs including External Clinical Teaching Visits (ECTVs), increasing exposure to new digital

technologies thereby improving digital literacy (digital inclusion (Thomas et al., 2018)) for the community and possibly most importantly – providing services to aged and disabled people. Many people in remote Aboriginal communities (especially aged and disabled people) choose not to travel to town or major centres to receive treatment. They often do not speak English and choose to remain in their community rather than seeking treatment away from community. A number of remote Aboriginal people feel unable to cope with the problems arising from being away from family and the community. This can result in a number of Aboriginal people not receiving treatment and dying prematurely on country.

Telehealth has been shown to save approximately $1.2 million with just over 1,000 consults in the NT (Department of Health, 2015). The same report suggested 75,000 potential telehealth consults could have been done in the 2014/15 financial year. In an era of increased access to internet base resources we must find a way to improve service delivery to remote areas.

Conclusions:
The use of video conferencing in the remote Laynhapuy Homelands has been a "game changer" in remote Indigenous Health service delivery. Face-to-face consultation, direct supervision and observation of patient examinations are delivering better health outcomes for patients (St Clair et al., 2019). By showing patients and families pictures from the internet the supervising GP can demonstrate clearly what the problem is and the treatment required. This provides professional development for staff and builds capacity within the community. The opportunities for expanding telehealth uptake in remote areas are wide ranging, but the technology solutions need to be 'fit for purpose' simple, flexible, robust and intuitive. The remote ICT service delivery paradigm needs to shift to a more user friendly interface: Digital health service facilitates a practical process that offers the end user a simplified approach and a more coherent patient journey.

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