The Telegraph and the Beginnings of Telemedicine in Australia

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Abstract. The history of telemedicine is at times presented to commence in the 20th century. Events in Central Australia in 1874 show that the history goes further back, when the newly constructed telegraph played an important telemedicine role not only in enabling care for a wounded person, but also in uniting a dying man with his wife 2000 kilometres away. Innovation with the tools at hand has proven to be effective to bridge the tyranny of distance in the delivery of health care.

Keywords. Telemedicine, history, Australia, telegraph

Introduction

Communication and information technologies are vital components in almost every telemedicine application, with advances in ICT usually driving development in telemedicine. The beginnings of telemedicine are to be found in the invention of the telegraph, with wireless, telephones, television, imaging devices, and the Internet all adding to the utility of telemedicine. Aronson [1] recounts the first reported use of the telephone for telemedicine in 1879 when a doctor listening to the cough of an infant reassured the grandmother that it was not croup and refused to attend for a house call. In the 1860s the telegraph was used in the American Civil War to pass on information about the care of wounded soldiers and arrange their transportation [2].

Historian, Geoffrey Blainey in his well-known book 'The Tyranny of Distance' describes how distance played an important role in shaping Australia, including how the telegraph was able to reduce the sense of isolation that cities and towns had from each other and from the rest of the world. When describing the beginnings of the telegraph in Australia he makes reference to a serious incident that occurred in Barrow Creek that may be the first reported use of telemedicine in Australia [3].

1. Getting the News to Australia

Australia was first settled in 1788, when a fleet of ships delivered a large group of convicts, soldiers and officials to the eastern coasts to set up a colony on Sydney. These ships took a year to make the journey from England. At that time, the return passage— back the same way they came westwards across the Indian Ocean, or later heading east

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across the Pacific Ocean, took even longer. Letters back to England asking for advice on many of the very serious problems that plagued the early years of Australia could take over two years to receive a reply.

A lot of effort was placed into increasing the speed of communication. Sail powered ships sought better winds and safer passages. In the second half of the 19th century, clippers were able to make the journey to Australia in 60 to 70 days. Cities across the country vied with each other to be the first ports of call so that the letters and news from England, Europe and the Americas could be broadcast across the colonies by newspapers and horse traffic to people hungry for information. Yet this information flow was very slow and often way out of date by the time it was received.

2. The Telegraph

Although the use of smoke signals, drums and flag semaphores to communicate over distances should not be ignored, nor their use in transmitting health-related information, it was the invention of the electric telegraph that enabled communication over long distances. The development of the telegraph is mainly attributed to the work of Samuel Morse in 1837, who worked on the foundation laid in earlier decades by many others in the field of electromagnetics. The basic principle of the first telegraphs was that a switch was used as a transmitter to complete an electrical circuit between the transmitting and receiving ends, which was recorded by the deflection of a needle under the influence of an electric field. Later, operators used a coding system developed by Morse to transmit the messages and also transcribed audible signals at the receiving end back into the message.

Ever lengthening telegraph lines were set up from 1838, with the first public telegraph commencing in 1844 between Washington and Baltimore, USA. By 1861 the telegraph had crossed the North American continent and in 1866 the first successful trans-Atlantic cable was laid after a number of failed attempts. The telegraph became the primary means of continental communications until the rise of the telephone and was finally largely abandoned in the early 21st century when telegram services were discontinued.

3. The Telegraph in Australia [4, 5, 6]

The first telegraph in Australia was completed in 1854 between Melbourne and Williamstown, a distance of 17km. State-based telegraph systems were established in subsequent years, the four main eastern states were connected by 1860, and Tasmania linked to the mainland with a reliable connection in 1869.

The telegraphic connection of Britain and India in 1870 was a large step towards bridging the gap to Australia. There had already been a strong demand, mainly from newspapers, business leaders and government for a cable to be laid from the cities in the south eastern corners of Australia to the north, and then undersea to India via Indonesia or Ceylon (Sri Lanka). It was one the main items on the agendas of many colonial meetings and there was much discussion and disagreement between the states as to which route to take—through Darwin, Queensland or northwest Western Australia. In the end the South Australian government won the battle and the decision was made to take it through the centre of the country from Darwin to Adelaide.

The leader of the construction of the telegraph was Charles Todd (1826-1910). Born in England and trained as an astronomer, he arrived in Australia in 1855 to take up a position as government astronomer and superintendent of telegraphs.

Work started immediately to cover the 3200km distance with three teams responsible for northern, central and southern legs. Called the Overland Telegraph, it consisted of 30,000 iron poles and 11 repeater stations spaced some 250km apart. Despite serious delays due to weather and difficult working conditions, the target to have it completed in two years was missed by a matter of only seven months. Even Todd had to take up some of the physical work to get the line finished. In the meantime, the undersea cable connection had also been made.

The first message was sent on the Overland Telegraph on 22 August 1872 by Todd, and the telegraph became an instant success with over 4000 messages being transmitted in the first 12 months. Todd continued his work on the telegraph, connecting Perth to Adelaide in 1877. By the end of the century, 18 million telegrams per year were transmitted in Australia.

4. Telemedicine and the Overland Telegraph

Maintaining the Overland Telegraph was not without its difficulties. Besides the geographical obstacles faced in provisioning the repeater stations, floods washed away poles and lines, and lines broke or were deliberately damaged.

Barrow Creek, 280km north of Alice Springs, was the site of a repeater station. On Sunday 22nd February 1874, the Barrow Creek station was attacked by Aborigines from the Kaytetye people, provoked by what some say was poor treatment of their women by white men or the fencing of a water hole [7]. Samuel Gason, a Mounted Policemen, immediately sent the following telegraph to Adelaide, via each of the intermediate telegraph stations.

'This Station has been attacked by natives at 8. Stapleton has been mortally wounded, one of the men, named John Franks, just died from wounds. Civilised Native Boy has had three spear wounds. Mr Flint, assistant operator one spear wound in leg, not serious. Full particulars in morning.'

Another telegraph was sent in the morning with more details (Figure 1).

Stapleton's wife and four children had been left behind in Adelaide, and she was summoned to the telegraph office courtesy of Todd's carriage. Here she was able to see the arrival of a message from her dying husband; his assistants had managed to get him to the telegraph keys. Todd wrote down the message:

'God bless you and the children.' [4]

Another journalist reported that Mrs Stapleton heard:

'...the exhortations by wire of her husband - distant 1200 miles, the wire at his very bedside - each bidding an eternal adieu to the other by the click of the instrument.' [3]

Murders by the Natives at Barrow Creek.

On Monday last intelligence was received by Mr. Little of frightful murders committed by natives at Barrow Creek Telegraph Station, which is very near the centre of the continent, and one of the most isolated places along the whole of the Overland Telegraph line.   The intelligence received is as follows :—

"February 23rd, 1874.

"The Barrow Creek Telegraph Station was attacked by natives at 8 p.m. on Sunday, and John Franks, one of the station men killed ; Mr. Stapleton, the station-master, seriously wounded ; Mr. Flint, the assistant, slightly ; and a friendly native very seriously.

"The Station-master, assistant, and all the men were sitting outside the building smoking, and also talking to several friendly natives, when a large body of others rushed from ambush and commenced throwing spears.

"The cause of attack is supposed to have been for the purpose of obtaining flour, which had been refused to the natives—except the aged, infirm, and those that worked—during the earlier part of the day."

Figure 1. An extract from the Northern Territory Times and Gazette, Friday 27 February 1874 [8].

Medical assistance had also been summoned. Dr Charles Gosse (1849-85) was a surgeon, who had first arrived in South Australia as a youngster in 1850, and returned in 1873 after surgical training in Bristol, Moorfields and Charing Cross Hospitals in London and Aberdeen. His father, William (circa 1813-82) was also a surgeon in Adelaide. His brother, William Christie Gosse (1842-81), was Deputy Surveyor-General in South Australia and worked closely with Charles Todd in the construction of the Overland Telegraph. These relationships and the family's prominence in Adelaide probably resulted in his involvement in the other part of this story.

The South Australian Advertiser [9] reported:

'... We are informed by Mr Told that during Sunday night Dr Charles Gosse at his request attended at the Telegraph Office and gave instruction as to the proper treatment of the wounded, and up to about 11 o'clock all were progressing favourably. Later in the day, however, a change for the worse took place in Mr Stapleton's condition, and notwithstanding all the aid that it was possible to render him, he sank under the effect of his injuries, and died, very quietly, at a quarter to 6 o'clock in the evening.'

5. Discussion

These are probably the first recorded cases of telemedicine in Australia. In the first place a dying husband comforted his wife many thousands of kilometres away. In contrast to the video-telephone which may be used now to keep the dying person in touch with distant family members [10], the Stapleton's only had the click of the telegraph.

We also see the foresight of Charles Todd to use 'his' telegraph to provide medical care for one of his employees. Whilst there is no detailed record of what occurred from Sunday night through most of Monday, we can conclude from the reports that effective clinical treatment was provided. We can imagine that a detailed history was taken and that instructions were provided to the staff at the telegraph station on managing the condition of Mr Stapleton. He was treated—it is likely that he was comfortable, and even though he eventually died, it was a very quiet death. It is also not unreasonable to assume that the other wounded were also attended to.

The technology that Dr Gosse had at his disposal was simple when compared to what is available today. It is worth bearing in mind that what for us are simple technologies, such as the telephone, can still play an effective [11] if not even increasing role [12] in telemedicine.

It is doubtful that the individuals involved in this episode recognized their pioneering roles in telemedicine and it is also not known if this encouraged more medical consultations by telegraph. However, it is likely that more instances occurred. As Prof Blainey argues, the tyrannies of distance faced by Australians have necessitated adaptation and innovation. This led Todd and Gosse to use what they had at hand, John Flynn and Alfred Traeger to use wireless radio in the 1920s to establish the Royal Flying Doctor Service, and the leading roles that Australian researchers and clinicians still play in advances in telemedicine.

6. Conclusions

The tyranny of distance continues as a barrier to the conventional method of delivery of health services in Australia. However, the story of Charles Todd, Dr Gosse and the people at the Barrow Creek Telegraph Station is an early example to show that these barriers can be overcome.

It is important that society aims for the provision of an equitable health service to the rural and remote regions, especially since the prevalence for many health conditions is higher in these regions than in towns and cities. Living in these regions also presents higher risks of injury, with poor access to emergency services [13].

Challenges remain, but the following four lessons can be drawn from this story of telehealth in the early days of technology advances in Australia.

i.   Use the technology that is at hand. It is not necessary to wait for the next technology innovation to implement a telehealth system. Telephones and email can be as effective as a live video consultation, and much simpler to implement. Store-and-forward technology continues to provide the best means of transmitting high-resolution images, such as those used in otology and

ophthalmology. Furthermore, whereas video-consultations can take some effort to arrange, a telephone provides an instant communication channel.

ii.   Use personal networks. The Barrow Creek Telegraph Station was, via Charles Todd, just one step away from access to the best health care available in Adelaide. Most of those working in health care are similarly only one or two steps away from the experts in diagnosis and management of patients, and in information and communication technologies.

iii. Be aware of opportunities. The people at Barrow Creek used the only tools they had at hand to raise the alarm regarding the attack, but also gave sufficient information regarding the injuries of the men for Charles Todd to realize that something could be done; for him, doing nothing was not an option. Whilst people living in rural and remote areas may accept poorer access to health care services, all health care providers—Aboriginal Health Workers, allied health workers, medical doctors, etc., play an important role in promoting the improvement in services.

iv.   Do not forget the family. Inclusion of the family members in the care of a recovering, injured or dying person is a significant element in health service delivery [14, 15], and therefore should be given attention also in telehealth solutions. It is remarkable that this played a part in the story of Barrow Creek and yet continues to be overlooked at times in modern medicine.

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