The Tygerberg Children's Hospital and Rotary Telemedicine Project
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**Initiative:** The Tygerberg Children's Hospital and Rotary Telemedicine Project in South Africa links specialists from Tygerberg Hospital to doctors at regional community or "district" hospitals to improve healthcare in rural areas. The initiative has assembled its own telemedicine system using off-the-shelf computer equipment and software that is more affordable than commercial telemedicine systems.

**Implemented by:** Specialists from the paediatric unit of Tygerberg Children's Hospital, Cape Town, South Africa.

**Funding or financial model:** The programme is supported with donations from the local Rotary Club (Signal Hill, Durbanville, Helderberg Basin, Stellenbosch).

**Timeframe:** The project was launched in 1999.

**Local context:** When the democratically elected Government came to power in South Africa during 1994, one of its biggest challenges was to address unequal access to healthcare. Under the previous Apartheid regime, public funds for healthcare had been biased toward city hospitals that primarily served privileged minorities. As a result, the new Government inherited several well-serviced city hospitals, along with healthcare facilities in towns and rural areas -- which tended to serve more disadvantaged people -- that had been largely neglected for a number of years. To help make healthcare more accessible to the majority of people, the South African Department of Health cut the budgets of many hospitals and redirected funds to the district health system, which is comprised of "district" hospitals and clinics responsible for primary care in towns and rural areas. Although many of the country's specialised doctors still practice at the city hospitals, these hospitals now accept fewer patients due to budget cuts. Consequently, many patients who require specialised treatment are served by district hospitals where medical practitioners often have only general training and experience.

**The development problem/obstacle addressed:** There is a demand for doctors at district hospitals to treat patients that require special attention or diagnosis that is beyond their training. Tygerberg Hospital specialists must support these doctors but usually do not have the time to visit them on site.

**How ICT is used to overcome the problem:** Dr. Etienne Nel and Professor Robert Gie of Tygerberg Children's Hospital set up a telemedicine system that meets the immediate needs of the district hospitals. The system uses a Pentium 4 computer with a 42 cm screen, printer, scanner, software, digital camera, and light-shelf for viewing x-rays. The system is connected to the Provincial Department's network infrastructure, which connects Tygerberg with the district hospitals and gives doctors unlimited access to e-mail. The total cost of the unit based at Tygerberg Hospital was less than R50,000 while the units at the district hospitals cost R45,000 each.

Doctors at district hospitals scan X-rays and electrocardiographs, and e-mail them together with blood test results, digital photographs, and clinical observations to the
telemedicine unit at Tygerberg Children's Hospital. At Tygerberg, one person monitors incoming e-mail and directs queries to relevant specialists. The Tygerberg specialists review the information received, send an e-mail reply, and consult remotely with the district doctors about diagnosis and treatment. If a district doctor needs an urgent reply, he sends an SMS message to a specialist's cell phone, alerting the doctor to check e-mail immediately.

**Next steps:** Tygerberg Hospital has received funding to also link hospitals in Somerset West, Stellenbosch, Hermanus and Windhoek, Namibia.

**Geographical area targeted:** The Western Cape, South Africa. Currently, three district hospital are linked to the system: Eben Dönges Hospital in Worcester, Clanwilliam Hospital, and Paarl Hospital, which are 100km, 250km and 100km from Cape Town, respectively.

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**II. Gauging Real Impact**

*This section considers whether and how this telemedicine system has made a Real Impact at the ground level by looking through the lens of basic best practice guidelines for successful initiatives. The bridges.org 7 Habits of Highly Effective ICT-Enabled Development Initiatives are used here as a framework to highlight what the specialists at Tygerberg Children's Hospital have done well.*

**The 7 Habits of Highly Effective ICT-for-Development Initiatives**

1. **Implement and disseminate best practice**

Dr. Nel learned about telemedicine options at the Telemedicine Conference 2000 held in Gauteng, South Africa. He also read up about telemedicine systems on the Internet and in medical journals to find out about best practice in the field. Tygerberg's system has been designed by doctors in a developing country and is much more affordable than more sophisticated models used elsewhere. Doctors in Namibia, Malawi, and Zimbabwe are keen to replicate the system in their countries. The Tygerberg team is actively contributing towards best practice in healthcare that is relevant in an African context.
2. **Ensure ownership, get local buy-in, find a champion**

Professor Gie has promoted the telemedicine system in interviews with local newspapers and magazines. Lack of training -- especially for older doctors who are less familiar with computer technology -- has been an obstacle. By taking it upon himself to visit district hospitals and train doctors to use the system, Dr. Nel has become an on-the-ground champion for the system.

3. **Do a needs assessment**

The project emerged from a clear need in the healthcare environment in the region, where district doctors need support from Tygerberg Hospital to help them deliver more specialised care.

4. **Set concrete goals and take small achievable steps**

A two-year pilot project involving only one hospital was conducted before the project was expanded. The pilot had three clear goals: (1) to test whether the equipment could convey clear images of X-rays, electrocardiographs, etc; (2) to test whether the Provincial Health Department's computer network would cope with the transfer of a vast amount of digital information; and (3) to evaluate whether doctors would use the system. Once the system was tested and proven, it was expanded.

5. **Critically evaluate efforts, report back to clients and supporters, and adapt as needed**

Throughout the pilot, the specialists evaluated the system to see whether it was cost-effective and whether it would indeed improve district healthcare. They also adapted it as needed as they went along. For example, when it was difficult to repair the scanner because parts were not readily available in South Africa, the scanner was replaced with a local brand to ensure future availability of parts.

6. **Address key external challenges**

A key external challenge faced is the installation of the connection points at hospitals not yet connected to the Provincial Health Department's computer network infrastructure. For example, Clanwilliam Hospital uses a dial-up connection to access the telemedicine system. Continued support of staff after initial training is also crucial, especially where the central "receiving unit" (based at Tygerberg Hospital) is far from the "send units" (in Worcester, Paarl and Clanwilliam). To address this problem Rotary Club members from local communities and paramedical staff are providing support when doctors experience difficulties in operating the system.

7. **Make it sustainable**

Although Tygerberg telemedicine system is much cheaper than commercial telemedicine models and uses the Provincial Department's network infrastructure to send e-mail, the system's future is reliant on continued donor funding from the Rotary Club. Hospitals situated in far-flung communities such as Clanwilliam have to pay for a dial-up connection because they are not connected to the Provincial network. Tygerberg Telemedicine System is reliant upon future funding from the Rotary Club. The South African Government has started implementing (much more expensive) telemedicine systems elsewhere, but whether it will support Tygerberg's model is not certain.
III. Lessons Learned

In this section bridges.org invited Dr. Etienne Nel of Tygerberg Children’s Hospital to share his views on the telemedicine system’s greatest success, the challenges they have faced, key constraints and dependencies that affect the initiative, opportunities for future improvement of what they do, and other lessons they have learned. This is what he had to say:

"A number of important lessons were learnt during the implementation of the pilot site. Prior consultation with all stakeholders is essential. Most are enthusiastic and eager to make use of the new facility. Some, however, felt threatened by what was perceived as an intrusion by 'outside specialists' into their domain. While these fears were unfounded, they had to be addressed. There is a perception that this technology is inappropriately costly for a country with limited health resources. Although the project is funded by donations and the cost per unit is low in comparison to any other medical hardware, this perception has been strong enough to delay implementation in certain areas.

A major technical difficulty has been in the area of network access and support. Frequent 'down time' on the network discourages use. In addition problems accessing the network with poor technical support further dampen enthusiasm.

Apparently minor problems emerged as significant issues limiting the use of the system. Limited typing skills, lack of easy access to the system, time constraints during the workday were found to be problems by staff. The equipment needs to be kept in a secure environment while still being easily accessible. This is a problem particularly after normal working hours if the equipment is locked in an office.

A number of technical problems still need to be solved. These include:

1. The user interface has to be simplified. Users are still required to go through a number of steps before they can send an enquiry. Automating these procedures would encourage correct use of the system.

2. Image files are large. Transmission of large images is either not permitted by the network that is being used or is slow.

3. Ensuring the security of information sent needs to be addressed.

Despite these problems medical and paramedical staff have been enthusiastic and are learning to use the telemedicine system. It will however be some time before the true benefits of this telemedicine application can be quantified."

IV. The Story

This section presents a narrative description of the Tygerberg Children's Hospital's telemedicine system that highlights why this use of ICT for development is particularly interesting.
In the developed world, telemedicine has been criticised as a cost-cutting device that leads to a depersonalised approach to healthcare. It has also been criticised in the developing world as an expensive, high-bandwidth overkill approach that focuses attention away from real problems and sucks up scarce resources. But at a hospital in South Africa telemedicine has proved to be more of a hands-on approach to patient care.

Ironically the telemedicine system at Tygerberg Children's Hospital in Cape Town was established as a direct result of stringent budget cuts. In the past decade the South African Government has shifted the majority of health funding towards primary healthcare.

The budgets of academic hospitals such as Tygerberg were slashed severely and redirected to district level. Over a period of about five years, 25% of Tygerberg Hospital's budget was cut and redirected to district hospitals and clinics in towns and rural areas. The Tygerberg Children's Hospital was also adversely affected. Many physician and specialist posts were frozen and bed space was reduced. As a consequence, doctors at district hospitals had to make tougher decisions about which patients should occupy the limited bed space at Tygerberg Hospital where they could get specialised treatment. Those patients who could not be accommodated at Tygerberg had to be treated at district hospitals -- and cared for by district doctors who often do not have the specialised training needed for all cases.

To support district doctors with the referral process and provide more specialised care, Professor Robert Gie and Dr. Etienne Nel, who are based at Tygerberg Children's Hospital and had attended conferences in telemedicine, investigated the possibility of introducing a telemedicine system at their hospital. Their initial excitement was dampened when they realised that the cost of such systems starts at R200,000 -- way beyond the hospital's budget. Fortunately, the two doctors proved to be fairly resilient. Dr. Nel started reading up about telemedicine systems on the Internet and in medical journals, while Professor Gie contacted the Rotary Club. They bought off-the-shelf equipment, assembled their own system, and connected it to the Provincial Health Department's computer network to send and receive e-mails. The main unit at Tygerberg Hospital costs R55,000 and those at the satellite hospitals cost R45,000 each.

The system enables doctors at district hospitals to e-mail X-rays, electrocardiographs, digital photographs of diseases, blood test results, and their clinical observations to specialists at Tygerberg Hospital for an opinion about a patient's condition. The system at Tygerberg is regularly monitored for incoming e-mail and relayed to the relevant specialist whose expertise is required. The specialist then sends an e-mail reply back to the doctor at district level. According to Dr. Frikkie Strauss, superintendent at Clanwilliam Hospital, the system that has been installed at their hospital about six months ago is already making a big difference. Thanks to his online access to specialists’ advice, he can treat patients sooner without having to refer them to Tygerberg Hospital first -- a process that costs the Provincial Health Department a lot of money. The system also helps him to stay in touch with specialists' opinions and keeps him abreast of the latest treatment protocols. In addition, the radiographer responsible for taking X-rays now receives regular feedback about the quality of his X-rays.

Thanks to the system patients no longer have to travel unnecessarily to Tygerberg Hospital just to have the local doctor's diagnosis confirmed. Patients of Clanwilliam have to board an ambulance at 4 am in the morning to beat the long queues at Tygerberg Hospital and be home by nightfall. In addition, they have to pay R100 for the ambulance transportation fee. For many, especially farm workers who earn a meagre weekly wage,
R100 is a lot of money. One woman, who was referred to Tygerberg Hospital because of a bad break in her arm, did not board the ambulance because she could not afford the fee. Today she walks around with a crooked arm.

A four-month-old baby girl who has been suffering from congenital heart valve scars has been luckier. The girl who is from Clanwilliam, a small town situated 250 km from Cape Town, had to be hospitalised for almost three months and was supposed to go to Tygerberg Children's Hospital in the city. However, her mother would not have been able to stay by her bedside because she had to work and could not afford accommodation costs in Cape Town. Dr. Strauss used the telemedicine system to consult specialists at Tygerberg Children's Hospital on a regular basis and, thanks to them, was able to treat the girl locally. "When she was brought to the hospital she was very ill and I contacted the specialists about three to four times a week. She has recovered to such an extent that I eventually only contacted them about once a week".

Professor Gie and Dr. Nel are now hoping to expand the system to four more hospitals. All that stands in their way is the small matter of funding -- and convincing the Provincial Health Department administration to expand its network infrastructure to more district hospitals.