Pushing the boundaries of telemedical healthcare in Singapore

According to figures released by the World Economic Forum's Global Information Technology Report [1], Singapore ranks highly in the use of information and communication technologies (ICT). Leveraging on this good ICT infrastructure, Singapore Health Services (SingHealth) has been conducting tele-healthcare pilot projects since October 2005 with a view to enhancing patient care. These are collaborative projects between the Innovative Technology Application Group (iTAG) and SingHealth clinicians. SingHealth iTAG was set up in late 2003 with the aim to optimise the provision of clinical care and healthcare services through the deployment of information technology. It provides a platform and seed funding for clinical staff to develop and realise their innovative ideas in collaboration with ITC professionals. Three telemedical projects are highlighted in this article, namely the “Telecare project for chronic disease patients” [2], the “Telemedicine project for paediatric emergency transport services using 3G phones” [3], and the “Virtual Podiatrist” project.

by Lim Fang Seng and Alvin Ong

Telecare for chronic disease patients
Singapore is faced with three specific trends: a rapidly ageing population, a greater prevalence of chronic diseases and inhabitants who are increasingly well informed and perceptive about ICT and health matters. To address these needs, SingHealth has embarked on a Telecare project empowering outpatients to self-monitor their health with the assistance of SingHealth clinicians through a Telecare portal (www.mytelecare.com.sg) and/or mobile text messaging (SMS). When a patient’s health is at risk, clinicians are immediately alerted via SMS, so that they can provide timely intervention to reduce complications and emergencies.

With the help of Telecare, clinicians are also able to rapidly fine-tune the medication of their outpatients and adapt it to the patient’s current health status and lifestyle, rather than wait until the individual shows up for a regular clinical review, which may vary from weeks to months. Telecare also assists clinicians in extending their reach and care to overseas and travelling patients.

Since the launch of SingHealth Telecare in October 2005, the following seven outpatient groups are using the telemedical system on a pilot basis:

- Heart failure and post heart transplant patients
- Women with pregnancy-induced hypertension
- Pregnant diabetic patients [4]
- Peritoneal dialysis patients with kidney failure [5]
- Cardiac patients with diabetes
- Polyclinic patients with well-controlled hypertension [6]
- Occupational asthma patients. Patients will be using this from May 2007.

The SingHealth institutions and clinical departments involved in this project are:

- The National Heart Centre (www.nhc.com.sg)
- The Department of Obstetrics & Gynaecology, Singapore General Hospital (www.sgh.com.sg)
- The Department of Renal Medicine, Singapore General Hospital (SGH)
- The Department of Respiratory & Critical Care Medicine, SGH
- The SingHealth Polyclinics (polyclinic.singhealth.com.sg).

The project is currently in its pilot stage involving local and overseas patients aged between 19 and 62. The system has been developed and is managed in-house by a two-man iTAG team in collaboration with SingHealth clinicians. As a public healthcare provider, the project team has consciously endeavoured to provide low-cost telemedical care to the patients by using affordable communication devices/services and personal healthcare monitors.

The Telecare system allows the development of a personalised monitoring plan for every patient as clinicians are able to customise the vital signs to be measured, set individual parameter thresholds and tailor the health symptom questionnaire to the needs of each person. A patient’s health history can be monitored by the doctor concerned, as well as by the clinicians, through interactive informative charts. Besides vital signs and symptoms, the Telecare system also provides a Secure Messaging module for the patient and clinician to communicate with each other, so that patients can rapidly and confidently manage their condition on their own.

In addition to chronic disease management, Telecare is also used to:

- Replace one of the regular clinic reviews for Polyclinic patients who have well-controlled hypertension. These patients need only see a doctor every six months, instead of the current three-monthly appointments. This saves the patient time and money and frees the clinician to focus on more acute patients, without compromising the care of patients whose condition is well controlled.
- Facilitate diagnosis of Occupational Asthma patients through real-time monitoring and troubleshooting.

The response from clinicians and patients involved in this pilot project has been favourable and encouraging. Patients have benefited from the interventions made by clinicians when they have problems. “Telecare will revolutionise the way we practise medicine and manage chronic disease towards a more cost-effective healthcare. The system empowers patients to manage their illness confidently. Travelling abroad is no longer a worrying time as the physician is just a few “clicks away”, says Dr Marjorie Foo, Senior Consultant at SGH's Department of Renal Medicine. “In my case, I get a phone call from the doctors when either my weight or blood pressure increases too much. This really helps me to ensure that potential serious problems are prevented”, explains a 33-year-old male peritoneal dialysis patient.

Telecare is a possible long-term solution to provide care for a rapidly ageing population with increased susceptibility to chronic degenerative diseases. The Telecare project was a finalist in The Stockholm Challenge 2006, Asia Pacific ICT Award 2006 (APICTA), and one of the winners at TEC Public Service Innovation Award 2006 (Singapore).

3G Telemedicine for the transfer of critically ill patients
In a joint trial between SingHealth and SingTel (www.singtel.com), the mobile paediatric ICU team of KK Women's and Children's Hospital (KKH, www.kkh.com.sg) has been using 3G mobile phones to enhance communication when they transfer critically ill children from other hospitals to KKH. The team consists of a critical care doctor and an ICU nurse.

For such transfers, the mobile ICU team works closely with the hospital-based intensive care physician to stabilise the patient during the transfer. Prior to this project, the team made a voice call to update the consultant in KKH on the child’s condition. Through adding a 3G call into their process, more information is provided to the doctor.

Dr Janil Puthucheary, Director of the Children’s Hospital Emergency Transport Service, explained,
It is hoped that this low-cost, portable system will help allow the podiatrist to see more patients. Patients also benefit from this solution as they no longer need to travel to visit the podiatrist at the clinic, and this prevents potential movement-induced aggravation to the foot wound.

Working with Principal Podiatrist Jasper Tong of SGH’s Occupational Therapy Department, the iTAG team developed an innovative in-house solution for use on the wards. Summing up his experience, Jasper said, “The system helps me to carry out an effective remote examination by providing me with full control of the camera to view the patient’s foot from various angles, obtain good close-ups and assess the size of the wound. I am also able to zoom the camera to examine large and very small wounds (less than 2 cm in size), and clearly resolve skin ridges and prints with correct wound and skin colour. When required, I can also capture an image of the wound and record the examination. During the remote consultation from my clinic, the virtual system also gives me the possibility to chat with the patient or Podiatrist Assistant on the ward.”

No special lighting is required when using the Virtual Podiatrist system. It is encrypted for security and provides good real-time video coverage. With the successful pilot project, a technology transfer of this system was also made to another government agency for telemedicine and tele-maintenance purposes for staff at remote locations.

Initially, the project was launched to help alleviate the shortage of podiatrists in the hospital. Since then, the number of podiatrists has increased significantly, but the system is used as a valuable back-up.

**Conclusion**

Looking ahead, besides the common challenges of acceptance of teledmedicine and telecare by both patients and clinicians, the legal framework as well as appropriate business models and funding mechanisms need to be defined. Furthermore, Singapore is a small country where good healthcare facilities are reachable in less than half an hour. **Hence, we foresee that the adoption of ICT solutions to facilitate remote care will be successful for applications where the technology is appropriate, affordable, enhances patient care and facilitates the clinical work.**

At a regional level, teledmedicine has the potential to enhance SingHealth’s reach to overseas and travelling patients by providing value-added services, and also assist us in providing medical expertise to medical practitioners around the region.

The iTAG team will continue to collaborate actively with clinicians to stretch the boundaries with innovative telemedical projects in various clinical disciplines in SingHealth.

**About SingHealth**

Singapore Health Services (SingHealth, www.singhealth.com.sg) is the largest public healthcare provider in Singapore. SingHealth consists of a cluster of three Hospitals, five National Specialty Centres and a network of primary healthcare clinics (Polyclinics) distributed around the east side of the country. Each year, SingHealth attends to three million patients.

**References**

6. Bahadin J, Musirafah MS, Lim FS, Chee E, Chow MH and RMC Lim, TeleCARE@SHP: Our Initial Experience, 18th WONCA World Conference 24-27 July 2007, Singapore (to be presented).

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