

Telehealth

key to reinventing healthcare

Healthcare providers are struggling to control costs while trying to improve patient care – to do more with less. The combination of a rapidly growing elderly population and an increase in chronic diseases with high treatment and therapy costs and inefficient procedures, spells real challenge.

THIS IS A CHALLENGE the healthcare industry is struggling to meet. A striking figure is that per capita spending on healthcare has increased by more than 300 percent in most industrialized countries since 1980.

The healthcare industry must act now, and we believe that a large part of the solution lies in making systems and processes mobile, streamlining and simplifying the job of monitoring and treating patients. The tools for this are already available in this growing, potentially huge market.

The “telehealth” market as such is anticipated to grow significantly in coming years. Datamonitor, in its June 2006 report *Healthcare Technology – Extending the Delivery of Healthcare Beyond the Hospital Setting*, forecasts yearly growth rates of 40-80 percent between today and 2010. But this dramatic growth is yet to be seen.

The healthcare sector is enormous and many existing systems already count as telehealth applications. To be defined as telehealth, systems must include the ability to monitor vital signs (body data) and transmit them via mobile devices to a clinical center at a hospital. A variety of systems and trial initiatives are

already on the market. The systems are either tailored to fit a specific disease area, or are of a more generic type acting as a mobile front-end system and needing to be integrated with any required medical sensors or systems.

System software and hardware manufacturers are among the core players in telehealth because the products can be almost anything, ranging from stand-alone internet information services to highly integrated medical systems. Connected medical equipment is often made by manufacturers that normally deliver to the healthcare sector. The telehealth market is a new opportunity for these companies.

Mobile network operators as well as fixed-line operators have an obvious interest in promoting telehealth. Increasing amounts of sensitive body data will flow through the networks, and more treatment/monitoring areas will come into play as the systems evolve. Every telehealth solution will generate traffic.

System integrators also have an interest in telehealth solutions as they will be in charge of integration with hospital IT systems. The integration can be done at many different levels and will generate a lot of opportunities for this type of company: IT structures in healthcare are tremendously complex.

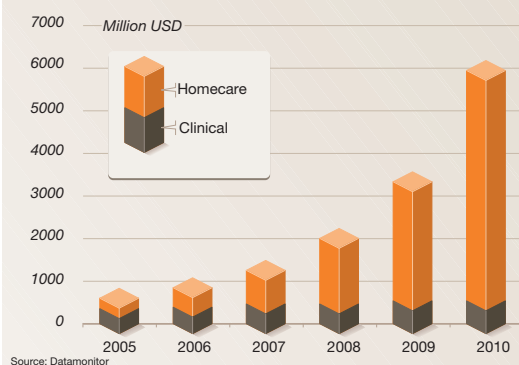
Service providers will also gain from telehealth deployment. Not every user of telehealth applications will want completely integrated systems. Sometimes there are advantages to an independent system approach and this can give rise to a market for hosted and managed services. There will also be opportunities for all kinds of service-related, stand-alone systems.

If we look at the more established parties involved in telehealth, we find (a) hospitals, public healthcare organizations and elderly-care institutions, and (b) the pharmaceutical industry.

Hospitals

Hospital-related costs usually amount to about 30 percent of total public healthcare spending in many countries. As such it is quite natural that public healthcare systems aim to reduce costs in this area.

Overall telehealth market in Europe and North America





Many European countries have therefore introduced Diagnosis-Related Groups (DRG), which clearly define a hospital's budget for certain interventions, such as an operation. The hospital must try hard to meet the budget constraints. If a particular hospital should exceed the DRG budgets because of, for example, higher internal costs, it will not be reimbursed for the over-expenditure. Hospitals have good reason to reduce costs quickly, so this area represents interesting potential for mobile healthcare and monitoring applications. Mobile systems make it possible to monitor patient conditions round-the-clock in their own homes.

Of the total number of hospital patients each year, it is estimated that 10 percent could be discharged early, requiring some kind of out-of-hospital monitoring. It might be assumed that of these, about 20-30 percent would apply and use mobile technology, adding to the potential for mobile applications.

Public healthcare

National public healthcare systems and health insurers across almost all developed industrial countries face increasing budgetary problems. This is mainly because of the growing number of elderly people and those with chronic diseases, as well as increasing treatment and therapy costs. On top of structural changes, patient

management or disease management are seen as possible parts of a solution.

Various small-scale studies into potential savings from patient management programs have shown that disease-related costs can be reduced by 10-30 percent. This explains why public healthcare managers and politicians are studying the cost-cutting effects of patient management programs.

Homecare/elderly care

Many countries have increasing numbers of elderly people and of people with chronic diseases.

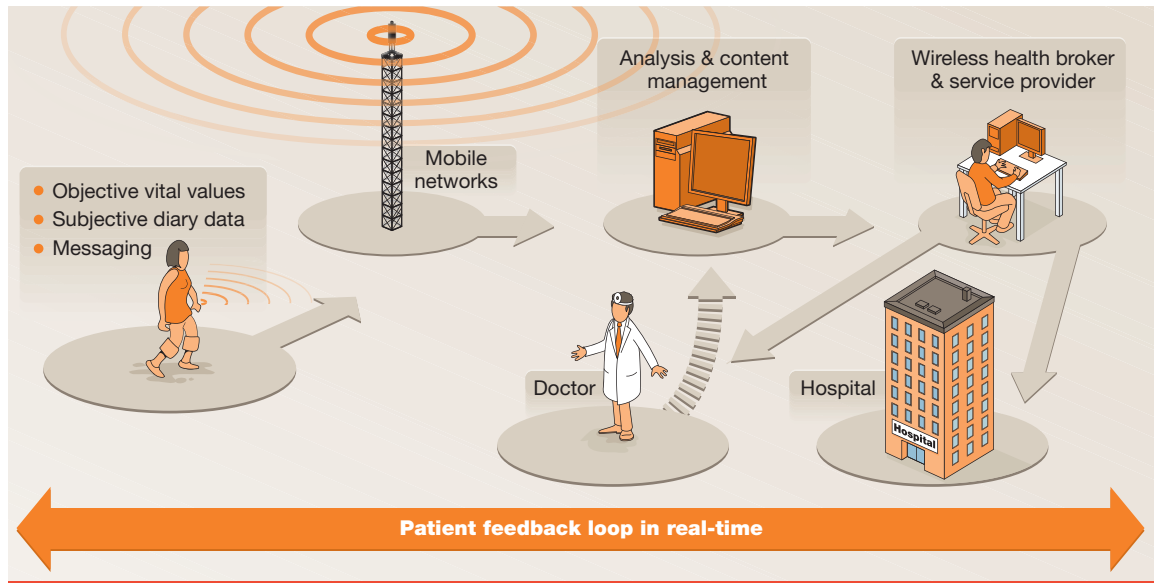
In the past few years, many private care organizations have been appearing to look after these people. As public healthcare systems try to reduce costs in this area, the financial potential and margins for these private care organizations and companies are starting to diminish. There is definite interest from these organizations and companies to look into new, more cost-effective ways of delivering care, and mobile applications and services can contribute to this goal.

Pharmaceutical industry

Time-to-market has become the most important success factor for the pharmaceutical industry. Every day a potential blockbuster



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product is not on the market – and is still tied to R&D – costs a pharmaceutical company an estimated USD 1 million in lost turnover and opportunity costs.

Bringing new pharmaceutical products with enhanced properties or completely new treatment mechanisms quickly to the market is crucial for the survival of research-oriented pharmaceutical companies. This is probably the main reason why the industry has seen so many mergers in recent years.

But sheer size is not enough to gain speed and shorter time-to-

market. It also depends heavily on a company's ability to structure and organize its R&D and related processes efficiently to save time.

Studies have shown that it is possible to reduce time for clinical R&D by up to 30 percent by using wireless technology, which means substantial gains. This provides strong motivation for the pharmaceutical industry to use wireless applications in clinical R&D.

The pharmaceutical industry can easily count the advantages of telehealth in dollars and cents, and is likely to deploy telehealth solutions as soon as the end-to-end quality and global rollout capability can be proven.

But for hospitals and public healthcare, the outlook is very different. And the major challenge is not the technological one of integrating telehealth solutions into the existing IT systems, using the same data exchange standards and formats. This can be done, with some effort, for every use case. The main reason behind telehealth not being widespread today is related to human behavior and social patterns in hospitals. The introduction of telehealth solutions means a new approach to treatment. Doctors and nurses need to adapt new, flexible work schemes. In the past, every patient waited outside the door to be let in – in the future, they will appear on a computer screen.

The need for change is obvious. Everyone knows it and many people working in the health sector long for more freedom in their daily lives. But few doctors will risk their patients' peace of mind without knowing how the new approach works. Change is always painful and takes time.

What must be done to speed things up? Time will work in favor of telehealth deployment. Initiatives from a multitude of telehealth players all over the globe will eventually form the path for healthcare organizations to take. This will let patients and doctors enjoy quality of life in a new dimension. And, lastly, let us all ask for some freedom and propose a telehealth solution from our own doctors when given the opportunity.

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Healthcare unbound

At Changi General Hospital in Singapore, a private-public initiative using mobile technology is bringing about a shift in the way healthcare providers deliver critical care.

WALK INTO CHANGI GENERAL HOSPITAL (CGH) today and you will probably see patients with chronic conditions such as stroke damage and asthma no longer confined to the critical-care unit. Most of them sport wearable, lightweight health sensors that use a combination of Bluetooth and WLAN technologies to communicate patient information to hospital staff. The technology ensures that caregivers can keep a very close eye on their patients even when they are not nearby.

The program is part of a larger, national initiative by the Infocomm Development Authority of Singapore (IDA) – entitled Intelligent Nation (iN2015) – to get the most out of information and communication technology (ICT) over the next 10 years. CGH is one of the first examples of healthcare players being linked up in order to achieve a healthcare continuum.

Taking the pulse of mobile healthcare

Changi General Hospital is rewriting the way healthcare is administered and managed. With the implementation of the mobile healthcare solution, the hospital is providing specialized, interactive and patient-based healthcare in a cost-effective way.

The hospital has been at the forefront of providing healthcare services and critical care to patients over the past 30 years. Efficiency is greatly enhanced by a hospital-wide network and ubiquitous IT systems and applications. One of the hospital's top priorities, however, was to maximize the efficiency of its critical-care unit and personnel, given its stated objective of achieving service excellence.

The CGH – housed in a nine-story building with 23 wards and 64 consultation rooms, sprawling across more than 120,000 square meters of built-up area on 5.2 hectares of land – presents an imposing challenge in terms of patient monitoring and care.

This challenge takes on added dimensions when the medical staff needs to observe the conditions of patients suffering from acute neurological or pulmonary conditions. Like many other hospitals, CGH also incurs escalating costs for the continuous monitoring

of these patients. While patients can be attached to monitoring machines, the hospital was acutely aware of how restrictive such measures could be on individuals because they could mean longer hospital confinement.

Given such high manpower, cost and lifestyle implications, what would it take to provide expert healthcare to patients without upsetting their normal day-to-day lives? A welcome answer to this poser was a powerful combination of device and networking technologies that would dramatically rewrite the way in which healthcare is provided today.

The mobile healthcare solution combines new-wave devices and networks to relay patient information instantaneously to key stakeholder groups. The solution is unique because of the intelligent application layer that processes diverse information from various sources and disseminates data and content that is most relevant to the different stakeholders – be it doctors, the hospital, or health insurers.

1. Self-administered monitoring

An integral part of this solution is a wireless, lightweight device that is attached to the patient, monitoring vital signs such as blood pressure, pulse and ECG (electrocardiogram) in real time and at regular intervals. These readings are sent to a mobile phone using Bluetooth and WLAN. These devices are unique in that they are easy to operate, via a single button, allowing patients to do the



Balaji Bhoovarahan takes you to
the workflow wonder of Changi hospital



measurements by themselves. At CGH, these devices were deployed among the patients quickly, without the need for training and manuals. The measurements, along with patient diary entries, are transmitted to a centralized server.

2. Real-time communication

However, the readings are not conveyed in isolation to the medical staff in charge of diagnostics and treatment. The patient information, consisting of the objective device readings and subjective patient diary entries, is relayed to a centralized server using mobile technologies. The information stored at the mobile health core system allows for intelligent content analysis and knowledge management, matching patient history, medication and other records with the data coming in from the patients. This information can be accessed wirelessly at any time to ensure efficient and timely monitoring.

3. Security and confidentiality of patient data

This mobile monitoring is customized to suit the patient's individual needs, while simultaneously guaranteeing the highest levels of security and accuracy. The solution draws on the core technologies for building mobile infrastructure to translate the common elements of health information exchange architectures, new architectures for secure mobile information exchange, and models for trusted health information-sharing based on 3G mobile networks.

CGH business model: a workflow wonder

The CGH business model was woven around four prime principles:

- improving the patient experience;
- enhancing quality and efficiency of patient care;
- equipping staff to make informed decisions, while adopting a positive work style; and
- introducing cost and productivity efficiencies.

Patient requests and their conditions can be addressed more quickly because of instant access to information and shorter processing time. Medical staff can make more informed scheduling and prioritize treatment plans.

Periodic updates of patient conditions speed up response time and increase quality. The time taken to address questions and resolve issues has shortened dramatically.

The enhanced workflow results in a sharp reduction in stress for staff providing critical care to patients. Reductions in paperwork, doing away with information silos, and faster completion of routine checks ensure a greater sense of accomplishment among medical staff.

Piloted in the post-care ward 38, the mobile healthcare solution will be rolled out across all the hospital's critical-care units. However, it is envisaged that as the service expands in scope, the hospital will move away from operational issues, to act as a referral point and a bridge between the patients and the service provider.

The solution provider will work in conjunction with the mobile network operator to operate and maintain the equipment and devices, sharing a percentage of its service costs with the hospital. There will be multiple benefits from such an arrangement: while the hospital will focus on its core competencies of providing affordable, expert healthcare, it will benefit from the improvements to the overall customer experience. There is a growing

Feature summary: the mobile healthcare solution	
Features	Benefits
Lightweight wearable sensors	Portability, ease of use and accuracy in readings
Multiple data inputs (vital data and diary entries)	Availability of objective and subjective information. Simulates consultation sessions
Use of Bluetooth, WLAN, GPRS and UMTS	<ul style="list-style-type: none"> • Ensures widespread communication, using popular communication technologies • Easy, robust connectivity • Automatic upload of vital-signs data
Mobile phones as access devices	Make the most of mobile phones' availability for offering critical healthcare
Security and integrity	Adheres to HIPAA (US Health Insurance Portability and Accountability Act) specifications for generating and accessing patient information.

expectation among patients that hospitals should play a proactive role in minimizing their costs by keeping hospital stays as short as possible.

For the hospital, the workflow enhancements allow it to extend its services to a greater number of people without incrementally increased costs. This capacity increase enhances the service reach, resulting in significant revenue inflows. The medical staff, for instance, can keep close tabs on patients without adding to stress levels. As efficiencies increase, so will their satisfaction and commitment to work.

Efficiency and empowerment

Technological prowess together with the ubiquity and efficiency of a mobile network service provider ensure high connectivity, reliability, availability, context-awareness, scalability, personalization, security, and privacy. Despite initial hiccups and new routines, hospital staff acknowledge that the system has greatly improved efficiency. With the system running properly, they were able to schedule their tasks more efficiently, could respond to patient requests in real time, and could make better-informed decisions. There was a new sense of empowerment and ownership as they could offer relevant remedies via the patient's mobile phone or PDA.

The patients, especially those prone to schizophrenic and anxiety attacks, are able to find help much closer to home as the experts are available round the clock.

Benefits

For the 776-bed CGH, the mobile healthcare system was a simple yet powerful answer to a complex problem that posed serious challenges in terms of manpower, productivity, and resources. Many of CGH's clinical health professionals, including physicians, ward

nurses and dieticians, are always on the move, with little access to networked resources. The wireless solution allows access to information anytime, anywhere, from within or outside the hospital.


1. Healthcare just a click away

One of the biggest advantages of the healthcare solution is that it effectively decentralizes patient monitoring and patient care. Apart from relaying critical information regarding vital signs, the system also allows patients to receive mobile consultations and advice on pain relief, exercise regimes and physiotherapy, dietary recommendations, and medication. This is in sharp contrast to a scenario where patients had to allocate several hours to visit a hospital in order to receive a 10-minute consultation with a physician.

2. SOS and emergency response

A predominant concern among the healthcare services community is to ensure that healthcare organizations can respond quickly and in a coordinated way to emergency situations arising from sudden changes in patient conditions. This concern is largely met by the system that allows physicians to access clean, summarized results within the shortest possible time of evaluation, as opposed to muddled and time-consuming manual data collection.

3. Roadmap for the future

The technology is by no means futuristic, but the use of it could be. Medical staff at CGH have responded positively to the task of altering their workflows to suit a real-time solution. As the system becomes more widespread, the different stakeholders may need to become more creative in responding to the needs of the patients. The technology could move the pivot of healthcare from hospitals to the patients themselves, who may become increasingly independent and more knowledgeable in dealing with their conditions. 



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