

Health care management: An e-health perspective

Dr Richard Weeks

The first phase of the implementation of the National Health Insurance (NHI) system is now a reality and a host of challenges will need to be addressed to achieve the objective of universal coverage and access to patient-centred, quality health care.

According to an article that appeared in *Sunday Times* on 25 March 2012 ('Public hospitals in Gauteng sick and tired'), the current situation is described as one where "hospitals are under siege as doctors, nurses and patients battle with broken equipment, a shortage of linen, medicine and food, flooded theatres and no telephone lines". Add to this scenario the critical shortage of health care professionals and utterly exhausted doctors, nurses and medical interns, and the challenges assume a newfound reality.

It is within this context and the noble vision of achieving universal access to quality health care services for all South Africans that the potential role of electronic health (e-health) systems needs to be analysed. The concept of e-health embodies a significant spectrum of technologies, including health care informatics, mobile health (m-health), e-prescriptions, electronic medical records (EMR), telemedicine and similar technologies often cited with an electronic or 'e-' prefix.

The concept 'technology' includes the health care service delivery systems' infrastructure. Two key value streams exist within this context: primary or preventative health care and medical care (diagnostics, therapy and rehabilitation). The important aspect that should be noted is the emphasis that is placed on services, as opposed to products. The latter would essentially entail the supply of medication and the acquisition of physical devices, such as wheelchairs.

The following components support or underpin the services value stream: technology component, business systems (financial, asset, risk and maintenance management) and human resources. These are collectively depicted in Figure 2 (the systems health care perspective). Figure 1 could, in fact, be overlaid onto Figure 2 to reflect the technological system.

Notably evident in the two models are the systems' interrelationships, such as the human resources or people dimension that is common in both figures.

The reason why electronic technology is considered so important in the health care framework is because of the prevailing shortage of health care services professionals and the ability of this technology to enable these professionals to be more effective in their delivery of preventative and health care services to the community.

A critical shortage of medical doctors could hamper the successful implementation of the South African government's NHI strategy. The focus therefore needs to be on how to use scarce resources more effectively by using the appropriate technology.

The health care element of the technology model is one of limited resources and the need for increased efficiency and resource utilisation through the application of technological systems in order to improve service delivery to all South Africans. In this sense, the deployment of e-health systems embodies governance, clinical health care and education frameworks. The foundation for the governance framework is an electronic medical records system that forms the backbone of routine health management systems.

Within the clinical framework, telemedicine, decision support and mobile electronic systems, in particular, are important issues. In a widespread and diverse geographical environment, continuing education implies the need for distance education systems that are best delivered by means of electronic media. An e-health perspective to health care management takes the governance, clinical and education aspects of health care into consideration.

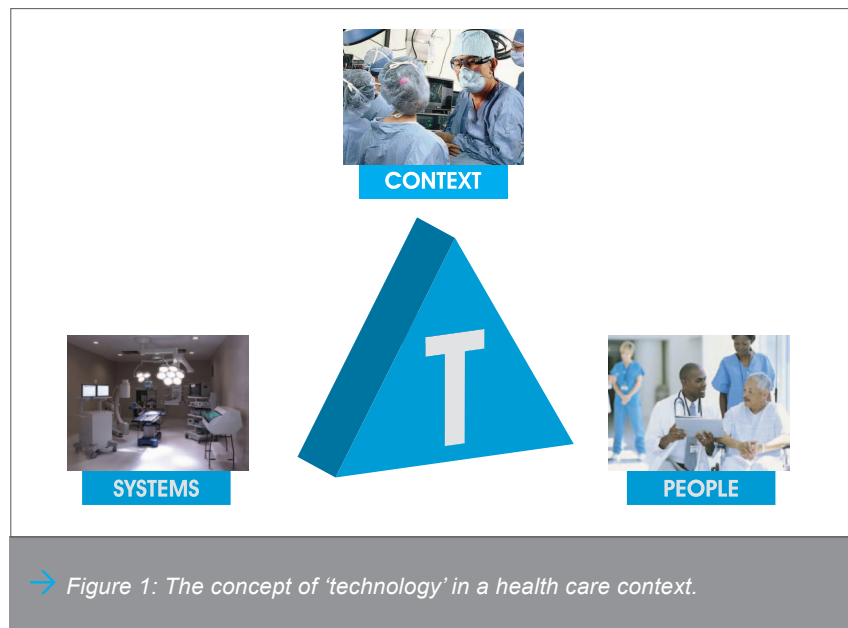
E-health systems

The Bill and Melinda Gates Foundation provides a five-stage categorisation of e-health maturity. South Africa is currently at the stage where traditional district health information systems are being migrated to electronic storage and reporting. The journey to the final stage of a fully comprehensive and integrated national information system will form an essential component of the country's e-health strategy.

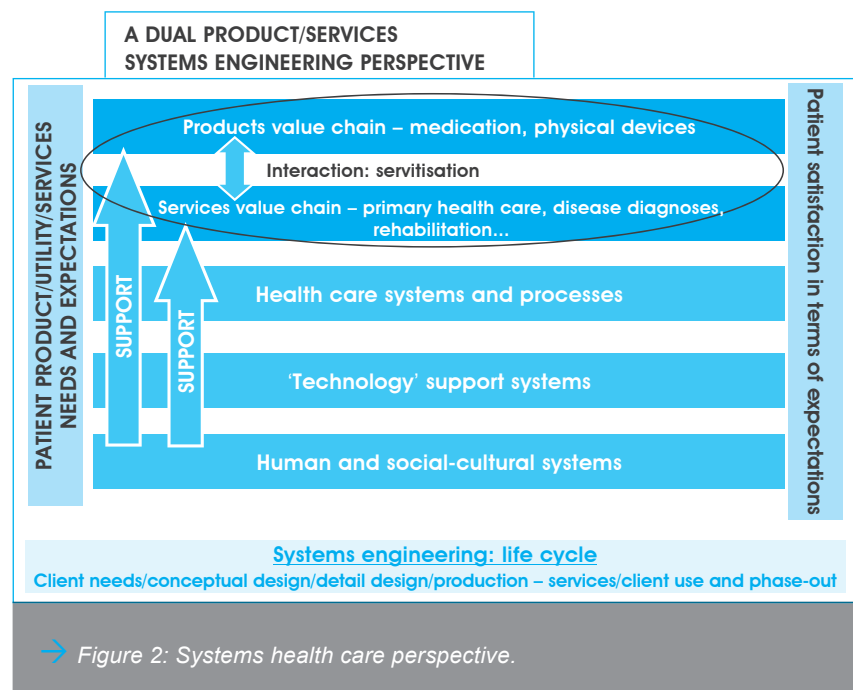
One of the challenges the health care community will face on this journey is the need to establish national standards that will ensure systems integration and interoperability. To this extent, an office of health standards compliance has been established.

A further constraint that needs to be overcome is that of connectivity and bandwidth, as the various provincial and district health care facilities are widely dispersed in rural settings that are not all that well integrated into the national internet network. Access to an intranet ICT infrastructure that enables digital imaging transfer, such as that associated with picture archiving and communication systems (PACS), will not only enhance the EMR system, but also the clinical medical diagnostic and treatment systems. PACS imply the digital processing, archiving, transfer and display of image data across boundaries. This gives new meaning to mobile health (m-health) systems, as it brings together health care professionals from varying fields of specialisation to provide patients with a seamless, integrated service.

Converting a traditional paper-based and film-based radiology practice from an analogue system to a completely digital one is, however, not merely a 'plug and play' activity. Not only does the technology change bring with it changes in technical systems and infrastructure; it also brings a very fundamental change in the way things are done. It changes the culture of the facility concerned. This brings into focus the third component of the technology concept, namely the human resources or people dimension.



→ Figure 1: The concept of 'technology' in a health care context.



→ Figure 2: Systems health care perspective.

A national e-health infrastructure and EMR system necessitate the introduction of a patient identification system. Ideally, such a system could be linked to a national electronic identity system that could encapsulate not only marriage, firearm and driver's licence particulars, but also the health care-related information of citizens. The issue of confidentiality in such an interconnected system needs to be taken into consideration. It is, however, hardly a technological constraint, as similar security and confidentiality issues exist in the financial industry. It follows that innovative solutions that have been

developed in this industry can be applied to a national e-health system. Diverse health care ICT systems currently exist in the private sector, but many are linked to medical aid systems from a financial systems perspective. When establishing an NHI dispensation, consideration needs to be given to how these systems will be integrated with those of the public sector. This again raises the issue of interoperability and national standards.

A legal regulatory framework is without doubt a very definite challenge that will need to be addressed when



(clinical), moving to aggregated data (performance and utilisation), knowledge-based data (planning and decision support) and comparative community data (policy development). It has been suggested that the integration and assimilation of EMR information need to become a reality of life for health care professionals. Capturing, organising and presenting medical information will need to be done in a way that will enable greater efficiency and resource utilisation.

E-health and telemedicine

Telemedicine has been defined as the use of information technology to deliver medical services and information from one location to another, and includes medical care delivery, consultation, diagnoses and treatment, as well as the education of patients and staff. Such a definition resonates with the systems health care perspective presented in Figure 2.

The deployment of telemedicine to address the shortage of health care professionals could be achieved by means of the 'teleconsultation' room, situated at more remote district hospitals and clinics. A typical consultation room of this kind is depicted in Figure 3. The purpose of the facility is to link health care professionals from diverse disciplines with each other in situations where, during the examination of a patient, the diagnosis is complex and difficult, or where a second opinion is required.

Such a facility avoids the patient's transfer and referral to a regional or more specialised hospital facility, saving both the time and cost of transportation. There is a need for video-conferencing

establishing a national e-health system. Not only are privacy and security issues at stake, but so are issues that relate to the services that health care professionals provide. One such issue is medical consultation taking place across national boundaries between health care professionals that are registered in one country, but not in another. It could even be contended that pure technological considerations are not the major constraint in implementing an e-health system, but rather the peripheral legal and human resources difficulties.

Closely linked to the EMR system from an e-health perspective would be an electronic pharmaceutical

information and prescription system. The value of the EMR system is the ability to integrate the health-related information of patients from diverse sources. The information system needs to be viewed as a continuum, beginning with patient-specific data

There are already too few specialists to train doctors in specialities and subspecialities. E-health, through the use of distance education, telemedicine and computerised health information systems, is seen as a possible solution to this problem.

e-health packages at clinics and regional and district facilities that will facilitate interaction between health care professionals and provide patients with medical services remotely.

The same facilities can be used for continuing education programmes for health care workers. E-education has been described as being videoconference- or web-based. However, despite the obvious advantages of telemedicine, its uptake has been very low because of challenges related to capacity development. The use of telemedicine in clinical practice requires some form of training and capacity development for the practitioners involved and it is at this point where e-education has an important role to play.

There are already too few specialists to train doctors in specialities and subspecialities. E-health, through the use of distance education, telemedicine and computerised health information systems, is seen as a possible solution to this problem, but there are few practitioners who are trained in e-health.

The people aspect of e-health technology

Over the years, health care professionals have grown accustomed to documenting and storing patient information in paper-based documents and filing systems. An interview with the manager of a large private sector clinic revealed that, while the institution had acquired a state-of-the-art EMR system, most of the doctors still made use of a paper-based system. The EMR system was essentially used for billing purposes and for forwarding accounts to medical aids.

Changing the way we do things is deemed to be an organisational culture issue, and traditionally the logic of culture change, based on scientific management principles, is inherently flawed. Developing mission and vision statements of telemedicine will hardly change the well-entrenched values, norms, beliefs



and related cultural artefacts that act as perception and behavioural determinants.

An alternative perspective is that of organisational culture as a complex adaptive system, where culture is seen as being emergent in nature and not static. Within a health care context, static systems are those where the system is practically dead and no longer functioning. In contrast, human cultural systems are alive, vibrant and constantly evolving in relation to changing contextual conditions and system adaptation. The question is therefore one of why e-health technology has not been readily adopted by health care professionals.

A research study undertaken to investigate physicians' perspectives of health information technology revealed that six out of ten physicians feel that electronic health care records have not improved either diagnosis accuracy or treatment planning. Private sector doctors also cited the cost of EMR versus a perceived low return on investment as a constraint in the adoption of such systems in private practice. The research study revealed that only two out of ten doctors provide online scheduling

Teleconsultation Room

Physical assessment

- Integrated diagnostic system efficiency

Thermometry

- Fast, predictive oral thermometry
- Technology and innovation leader in category



Vital signs monitoring

- Automated spot-check and continuous vital signs collection
- Simple, fast, easy-to-use range of devices

Cardiopulmonary

- Aggressive development of ECGs
- Full range of PC-based connected devices

→ Figure 3: The teleconsultation room. (Source: Eshwari, 2012)

or the downloading of test results and the use of e-health as a private health care communication system. The use is thus extremely low among physicians. The reasons most cited by doctors as being barriers to the meaningful use of health information technology are cost and workflow disruptions. If medical practitioners view an e-health system as something that adds an additional workload with little real benefit, the already overworked and exhausted doctors are hardly likely to change their existing behaviour patterns.

The training of health care professionals in e-health care systems entails having to take them out of the workplace (hospitals and clinics). In light of the shortage of staff at these facilities, this places an extra burden on the remaining staff. The training programmes therefore have to be designed in such a way that they will cause as little disruption to health care service delivery as possible. The skills required for implementing an e-health system are therefore best dealt with through distance education, which permits the trainees to complete the modules where and when they

find appropriate time. This will imply that the people concerned will need to be convinced of the value of the training and use of such systems. Currently, the University of KwaZulu-Natal offers videoconference and e-learning courses. Staff at the receiving institutions who have completed these courses can then act as mentors.

While the focus is generally on the health care professionals who will need to implement and manage the systems, thought also needs to be given to the availability of ICT professionals, who play a very fundamental role in establishing and maintaining the systems. The ICT skills that are required for such a project are also in short supply and there is a large demand for ICT skills within a wide range of service sectors, such as the financial sector.

The technologies themselves are subject to innovative changes and applications in the health care industry. As major new, innovative technological advances are made, the breakthrough technologies will require a fundamental review of prevailing practice. This is particularly

evident in the m-health sector. The ICT technical specialists and the health care professionals often do not understand each other's work, resulting in significant challenges when project managers attempt to put the infrastructure in place to support and manage the new technology.

Conclusion

E-health technologies have the potential to improve health care service delivery to the broader community. In order to implement the technologies, however, a number of challenges will have to be addressed. These include network access and bandwidth, staff training, and – above all – the formulation and implementation of a new management strategy. A key consideration in the formulation of this strategy is the emphasis on creating a culture that is conducive to e-service delivery at the various facilities that will be affected by the system. The e-health technology framework presented in Figure 1 could serve as a point of departure for developing an e-health strategy that will support the implementation of the NHI initiative. 📌



References

1. Al-Shorbaji, N. 2001. *Health and medical informatics*. World Health Organization: Cairo, Egypt.
2. Bailey, C, Maphumulo, S & Govender, P. 2012. *Public hospitals in Gauteng sick and tired*. Available: <http://www.timeslive.co.za/sundaytimes/2012/03/25/public-h> (accessed on 14 March 2012).
3. Eshwari, RR. 2012. Interview: E-health systems. Department of Health, KwaZulu-Natal.
4. Greenspun, H. 2011. *Physician perspectives about health information technology*. Washington, USA: Deloitte Center for Health Solutions.
5. Mars, M. 2010. Health capacity development through telemedicine in Africa. In: *IMIA Yearbook of Medical Informatics* (pp 75–81).
6. Mars, M. 2011. Building the capacity to build capacity in e-health in sub-Saharan Africa: The KwaZulu-Natal experience. In: *Telemedicine and e-health* 18(1) (pp 32–36).
7. Mosombuka, S. 2012. *NHI stillborn without doctors*. Available: <http://www.timeslive.co.za/local/2012/04/17/nhi-stillborn-without-doctors> (accessed on 26 April 2012).

Dr Richard Weeks is associated with the Department of Engineering and Technology Management at the Graduate School of Technology Management, where he lectures in engineering service science management.