COMPUTER ENHANCED HEALTH CARE DELIVERY IN SINGAPORE

Y C Chee

Introduction

Singapore has a strong national policy on Information Technology. In 1981, it established a National Computer Board (NCB) to "promote the exploitation of information technology by all sectors of the economy and the development of a strong Information Technology industry in Singapore". Now, over 10 years later, two new plans, the National Information Technology R & D Master Plan mapping out Singapore's strategy for Information Technology Research & Development and "Information Technology 2000" which aims to make Singapore a fully networked country by the year 2000, have been formulated for implementation[1]. In these initiatives, health care is recognised as one of the key sectional groups for development since it forms an important part of the national economy[2]. Further, in response to worldwide trends, the NCB has taken a significant step forward by promoting the certification of the software development process. Such certification will play a key role in making Singapore organisations world-class providers of Information Technology products[3]. This it will do by adopting and operating by the ISO 9001 standard. The ISO is the International Standards Organisation, a worldwide federation of over 90 national standard bodies. It maintains 8,300 published standards and produces some 680 new standards each year[4]. The ISO 9001 is the most comprehensive of the internationally recognised series of standards for quality management systems. Nationally, therefore Singapore believes in achieving quality through quality people and through quality systems.

Government Efforts

The Ministry of Health in 1984 began its computerisation programmes under the Civil Service Computerisation Programme of the National Computer Board[5]. Applications in these areas were implemented. The first - in Hospitals - saw all government hospitals linked in one network. A central Patient Master Index provides the basic information to support hospital administration and operation planning. The second - on Primary Health - links government polyclinics to Ministry's headquarters whose central node is connected to the Hospitals system to allow sharing of patient data. This includes the School Health Service System to input health related data captured at schools and school clinics. The third and final area of MoH's efforts links departmental computer systems of the Blood Transfusion Service, the Institute of Forensic and Scientific Services and the Drug Registration System also to headquarters.

Department of General Medicine
Tan Tock Seng Hospital
Moulmein Road
Singapore 1130

Y C Chee, PPA, MBBS, M Med (Int Med) (S'pore), MRCP (UK),
      FRCP (Edin), FRCP (Glas), FRCP (Lond), FAMS
Senior Consultant & Head

The other government effort of significant impact in the health sector is the development of MediNet - a nationwide computer network that links the computer systems of the medical and health care community[6]. This network will connect all participants in Singapore's health care delivery system such as the Ministry of Health, the Central Provident Fund Board, hospitals and clinics. By this year, some five areas will be implemented. These are the processing of claims for hospital bills, the electronic procurement of medical and surgical supplies, the electronic notification of diseases, the access to medical and health-related databases and the establishment of a National Patient Master Index.

Hospitals and Clinics

In many of the larger hospitals in Singapore, both private and government, computer systems support the administrative and financial functions. However only 10% of the 900 - 1,000 private clinics are using computers, mostly for accounting and wordprocessing purposes[7]. However, doctors in other countries for example Australia, Belgium, Saudi Arabia and the United States of America expect computers to assist in patient record maintenance and access, clinical diagnosis, health care in general and clinical research[8]. A local survey of 67 private clinics found that in 1990, 42 clinics (63%) had computers and 51 out of 76 doctors (67%) used them. This indicated a positive trend towards the use of computer-based information systems for administrative and medical applications[8]. The clinics with computers found the software generally suitable.

It is heartening and encouraging to note that local doctors have written medical software programmes for clinic use. Although in 1990 the statement was made that, "there are currently no well developed medical record management systems suitable enough for implementation in general practice"[9], in this issue of the Journal, four doctors have contributed an article titled "A computerised outpatient medical records programme based on the summary time-oriented record (STOR)"[10]. As is evident worldwide, the doctor's consultation room appears to be the last area for the benefits of the computer to be realised. But significant inroads are being made to conquer this vast potential market. And companies engaged in this are available in Singapore. They market software such as the Clinic Practice Manager Version 5 which includes a computerised problem oriented medical records system. Its selling point is an "All-In-One" Health Care Management System. Another available software is the Clinic Information System.

Turning now to hospital physicians, it was in 1985 that hospital-physician computer links allowed one-way communication access from the physicians' office to the hospital's mainframe computer. These links allowed dial-in access to information on real-time mode. Medical records, reports and laboratory reports were not included. Users logged on and searched for clinical results unsure of when such results would become available. The lengthy log-on routines often make it quicker and more convenient to telephone a department for a needed

result. The inefficiency of relying on the telephone, mail, courier or fax for delivery of medical information remains a problem. Log on, terminal emulation systems' chances for success correlate directly to their response times. How long does it take users from the time they sit down at the terminal until they have the sought-after information? Doctors suffer severely from NETS (not enough time syndrome). The race against time can become expensive.

Information technology today seeks to connect doctors to a full range of patient care information - from emergency room, laboratory, radiology, pharmacology and nursing - before making rounds. So time previously spent attending to paperwork is spent attending to patients. Such a system, to be useful to physicians, should include rapid response time, no down-time, access from home and office, an integrated view of patient status plus current medications and other ancillary orders; both "fast- and step-by-step guided pathways emphasizing non-keyboard entry, to facilitate system use. Physicians initially tend to resist the implementation of Hospital Information Systems, fearing loss of control over patient-related decision making. However, its routine use can lead to improved diagnostic and therapeutic decision making when supplemented by decision aids and expert systems; more accessible and logical presentation of test results; better ability to respond to the data collection needs of utilisation review and quality assurance departments and regulatory agencies; streamlined operation processes, such as the entry of clinical orders and verification of operative reports; and finally enabling physicians, clinical and support staff to better manage their time.

The scenario described above is becoming a reality in some parts of the world and Singapore will soon catch up because this seems the way to go if the overriding theme worldwide in health care today is how to ensure patient satisfaction while controlling costs. Time is money.

Innovations

The future is full of promises for those who feel uncomfortable with keyboards and large terminals. Light pen, touch screen and voice technologies are moving in fast[11]. These input technologies provide alternatives to voice and keyboards and enable clinicians to handle data needed to address various patient care, quality enhancement and risk management challenges.

Light pens provide more direct interaction between users and machines; it alleviates eye strain associated with searching for key-driven, on-screen cursors; mice abuse their rights to desk space and require practised eye-hand coordination.

Touch screens though expensive reduce the need for data entry professionals and can provide access to patients acuity, care plan information, assessments, progress notes, vital signs, laboratory results etc. Physicians are beginning to use the systems at the bedside for patient vital signs and laboratory results.

Voice recognition is also on the scene and has been used to document an entire emergency room record - medical history, assessment, physical examination and laboratory findings replacing the scribbled case records with immediately available typewritten clarity.

Finally power to the portables has allowed the invention of the lap top, palm top, note-book and pen-based computers. If a portable unit weighs over 8 pounds, call it a lap top. If a stylus is used to input data, call it penbased or a pen computer. Palmtops fit comfortably in a coat pocket, possess significant storage capacities, and allow instant access to information. In some United States hospitals, each doctor has a palm top with which he can produce and store files, and share files with other physicians, a common practice where a single physician is on call covering other physicians. In the same space as a product manual, an intern can inquire about a drug dosage, make sure a drug does not interact with the patient's other medication, reference an outline on details for managing the patient's medical problem, respond to an alarm to attend grand rounds etc. Nurses too benefit from this technology allowing them to record patient vital signs, intake and output information, assessment results and a variety of environmental, safety, medication administration and patient change information - all at the point-of-care and at the time-of-care.

Conclusion

The emphasis of operations has shifted from the simple delivery of medical care where business concerns were peripheral, to the imperative to succeed in an increasingly competitive consumers world. The personal concern and attention of the traditional family doctor and specialists have to be preserved despite the organisations' need for volume business. With that volume comes the challenge to collect, process and manage volumes of information and automated systems become essential. Patients somehow perceive efficient, accurate service and state-of-the-art equipment as indications of the quality dimensions of an organisation.

We all have a problem - information overload. The solution is systems that would increase the efficiency and accuracy of operations without requiring the user - doctor, nurse, administrator, front-line staff - to know many computer skills. We have a second challenge - the need to manage costs. This translates to a small skilled labour pool managing more and more operational functions, using integrated systems to coordinate registration and scheduling data, avoiding multiple requests for the same information each time a patient enters a facility or is referred to a speciality provider.

On the clinical side computer-based medical records will make it easier for doctors to view recently completed test results at the time of the patient's visit, to renew and monitor all the patient's medical information and to direct proactive, preventive care. Doctors may need their own terminals, note books, and voice typewriters. There will come the day of worldwide video conferencing on patient care when permanent, patient centred medical records become accessible anywhere health care is delivered. The computer system you own can connect you to virtually anyone, anywhere at any time.

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