Health informatics

New solutions to old challenges
by Salah Mandil

“...If the aircraft industry had evolved as spectacularly as the computer industry over the past 25 years, a Boeing 767 today would cost US$500 and could circle the globe in 20 minutes on 20 litres of fuel.”

This much-quoted comparison reflects the recent dramatic developments in the computer industry. Developments to date in health informatics are less sensational but the potential is enormous. Though it is tempting to make another comparison with the snail-pace progress in the global health scene, this article is only concerned with health informatics: the applications of computing methodology and technology to information systems in the health sector.

The informatics challenges in the health sector are both exciting and enormous. The problems involved in collecting health data are well-known but knowledge is piling up exponentially. Each day new discoveries are made and more data are collected. So there are two main challenges that face us at once:

- Firstly, how to manage the mountains of data and information selectively, economically and creatively.
- Secondly, how to acquire knowledge and disseminate it selectively, synergistically and creatively to those who need it, in a form they can use.

New computer methodologies and technology offer some cost-effective solutions. Microcomputers, hand-held computers, expert systems, videotext, compact disks and telecommunications – all these can be applied in efficient and effective ways to solve the many
problems in the health field. Also important is the need for informatics professionals to craft their skills so as to meet the challenges that lie ahead.

A key tool

The importance of informatics to development has been recognised and expressed in many different fashions. The overall message, however, is that informatics technology is an all-embracing technology and one which will affect strategic and operational issues. It is not a sector of development but has become a key tool and strategy to development.

In this issue of World Health, Professor Mahdi Elmandjra, President of the World Future Studies Federation, points out that no country can afford not to join the information revolution, nor can it avoid its all-pervasive impact. As to the question of whether developing countries should embrace informatics, he categorically states that having recourse to the most advanced technology is not a luxury for the poorest countries. His view is that they are the ones that most need to own such technology, since they can then shape its development and ensure its social relevance and cultural coherence.

The uses of informatics in the health sector are manifold. Viewed from the highest level possible, informatics should (a) support the management – in the broadest sense of the word – of health care services, and (b) support the actual delivery of health care. The developed countries are vigorously spreading the uses of informatics in their health sector. Indeed, some regional groups such as the European Economic Community are already working on a common strategy for “advances of informatics in medicine (AIM).”

Health uses

Most developing countries have made or are making a start in the use of informatics in health even before working out a national policy and strategy for health informatics. Some examples are referred to in the various ‘boxes’ in this issue. The making of a national health informatics policy involves setting up objectives and priorities; defining standards for data, software and hardware; and drawing up a plan for human resources development, allocation and utilisation, with a corresponding plan for financial and material resources.

Since computers help greatly in the processing of data and information, and as they become readily accessible, users have become far less apprehensive about seeking and generating data and information, sometimes to the extent of not being sufficiently selective. Coupled with the generally increased sophistication of health services, this forces the health care institutions to cope with an increasing amount of all sorts of data. This phenomenon is known as the “information explosion” in health care. Dr Shigekoto Kairaha, of the University of Tokyo Hospital Computing Centre, describes this in his article, examines the current state of the art and looks at the hospital information systems of the future.

Knowledge base

Computers are increasingly used to manage another type of information, commonly referred to as “a knowledge base.” Briefly, a knowledge base is not only a collection of information items but also contains the rules and interrelationships between the various items of information. The increases in what are known as “knowledge-based systems” are a present-day phenomenon frequently seen in the health sector. Sometimes referred to as “expert systems,” these typically provide support to the medical doctor, technician or other health workers.

The user submits certain facts (such as diagnostic data on a patient) to the system together with other information (for instance, previous medical history), and the system then examines its knowledge base and suggests to its user a possible diagnosis and related treatment. The same systems could also serve as training tools, and this is probably the area in which expert systems will produce the best results in the short term.

Nevertheless, a number of issues remain to be dealt with satisfactorily before the development and uses of knowledge bases in the health sector globally catch on. How to acquire the knowledge; how to validate the accuracy and conditions of applicability of such knowledge; and how to represent...
such knowledge in expert systems - these are but examples of areas that require a great deal of further investigation. Dr Roger Salamon of the Department of Medical Informatics, University of Bordeaux II, France, discusses the history and present status of expert systems in medicine.

Signal analysis

Another aspect, albeit more sophisticated, of the support that informatics can bring to health care involves the use of computers to analyse signals and produce related diagnoses or trends. In his article, Professor Jos Willems, of the University of Leuven in Belgium, traces the history of computer-assisted signal analysis and describes the state of the art, taking electrocardiograms as example.

The importance of “information support” has been appreciated for decades. The related data collection, validation, processing, dissemination and, equally important, feedback to the original suppliers of the data, are areas that ultimately determine the quality and the usability of information support. Recent informatics tools have significantly improved in these areas. For example, hand-written forms and reports can readily be replaced by hand-held computers (some costing as little as US$200) capable of holding electronic images of the forms, and thus ensuring the validation of the data at its source and eliminating transcription errors. In turn this drastically improves the efficiency and economy of such operations. Dr K. C. Lun, Associate Professor at the National University of Singapore, reviews the improvements brought about by the uses of hand-held computers and highlights their advantages. He cites a practical study carried out in Singapore in collaboration with WHO and reviews examples of relevant products available in the market today.

Telematics

Telematics, or computing combined with telecommunications, is just beginning to help alleviate the problems of feedback. Providers of data are greatly motivated when they receive feedback showing the uses and the relevance of their efforts in collecting and transmitting their data. Informatics has greatly improved this two-way flow. Whether by making it easy to generate and duplicate high-quality reports, in hard copy or in computer-readable media (e.g. microcomputers diskettes or magnetic tape), or by enabling feedback transmission by telecommunications, the technology of feedback has certainly improved in recent years. The article by Dr Ilana Fogelman and Dr Eduardo Chaves of the Secretariat of Health for the State of Sao Paulo, Brazil, describes the use of videotext technology to transmit feedback to providers of data. Of course, this presumes the availability of a reliable telephone and television service.

Another significant contribution of informatics technology is in the field of health literature. First, desktop publishing or the use of microcomputers to produce reasonable quality “publications” speedily and economically has contributed to the increasing availability of written materials from a much wider spectrum of sources. Second, the advent of compact disks (CD) and their interface with microcomputers has made it possible for a “remote library” to come to its user instead of the user requiring reliable telecommunications links to it. Compact disk technology permits the contents of whole libraries to be contained on a few compact disks, which can be read by a
CD-reader (some cost about US$350) and searched using a microcomputer. Mr Claudio Brito of the Pan American Health Organization, Washington DC, explains here the significance of compact disk technology to health literature services.

The reason why I am personally optimistic that informatics can significantly support development in general is that it is a technology which relies more on software than hardware. In other words, it relies more on people than on equipment. It is quite safe to assert that most uses of informatics depend almost 80 per cent on software and 20 per cent on hardware.

Developing countries have great numbers of professionals whose training in informatics can readily be used. Indeed, it is already a reality today that many Third World countries (for instance, Egypt, India, Mexico, Philippines) take on massive software development contracts for industrially developed countries. Since the existence of appropriately trained human resources is the most critical factor in the use of informatics, several developing countries have already taken significant steps in this direction, and with notable results. Dr Denis Protti, Director of the School of Health Information Science at the University of Victoria, Canada, points out the importance of training information professionals on the needs of the health sector.

Standards

The growth of informatics technology and the corresponding growth of its applications in the health field are both so rapid that they often occur before norms and standards are set up and agreed to. Standards for health data, for software and hardware, and for the procedures involved, all require to be set up so that the multitude of application areas may relate to each other. This is essential for sharing and exchanging data and for making economies in the use of hardware and software. A number of international organizations are working in this all-important domain of standards, and a great deal of investigation and hard bargaining is still to come.

The use of informatics in the health sector also influences the way in which health care is to be provided. It therefore has an effect on the norms and standards for the "evaluation of the medical actions taken." The article by Professor Jean-Raoul Scherrer and Dr François Borst, of the Centre for Medical Informatics at the University Hospital of Geneva, Switzerland, argues that the uses of health informatics call for the standards of "medical management" to be developed or revised.

In a number of policy statements, Dr Hiroshi Nakajima, Director-General of WHO, has emphasised the importance of informatics to health and has underlined health as one of the principal pillars of the technology. WHO is engaged on a number of collaborative activities with member states that are either directly concerned with informatics or include an informatics element. The WHO secretariat itself is a heavy user of informatics support, and is actively establishing an electronic mail service with networks to its collaborating institutions.

Though we have found a number of informatics solutions to old challenges, many other challenges still remain. Making computing support available in local languages, providing tele-links to remote and outer-city areas, establishing codes of ethics that govern the access to and uses of medical data and computerised systems, and drawing up appropriate legislation - these are but examples of what remains to be done.

The advent of computing, and particularly the informatics explosion of recent years which has put the new technology within reach of millions of users in developed and developing countries alike, has been compared to the coming of electricity. We are still discovering new uses for it, and it is indispensable. This is already the case for the business and financial sector, and it is only a matter of time - a very short time - before it will be true too for health informatics.