Information explosion
by Shigekoto Kaihara

Hospital personnel today have to cope with an enormous amount of information per patient – a phenomenon which is now often referred to as the information explosion.

All hospital personnel directly involved in looking after patients are obliged to process a large amount of information, so as to provide good care. Physicians, for instance, must obtain each patient’s demographic data and a history of the illness, note the signs and symptoms manifested, and compile a past treatment history and associated information in order to arrive at a diagnosis for treatment. Nurses, in turn, need much of this information to formulate a proper care plan, after which they must note the patient’s daily progress. Laboratory technicians require details as well, to conduct tests that the doctor has ordered, the results of which are sent back to physicians. Pharmacists too need certain data, to supply the necessary medication. All these examples show that a large part of the daily work of doctors, nurses, laboratory technicians, and pharmacists consists of information handling, perhaps up to 40 per cent of their hospital working day.

One trend all modern hospitals have in common is that the amount of processed information generated per patient is constantly increasing. One survey in a Japanese hospital has shown that the number of clinical tests given to their patients has doubled every seven years for the past 30 years. Similarly, the variety of drugs that are used at hospitals is constantly increasing. Much of this is due to the great advances that have been made by modern medical science and, fortunately, this is reflected in better hospital care. But the reverse side of this coin is that hospital personnel must now cope with an enormous amount of information per patient – a phenomenon often referred to as the information explosion.

Naturally, the information that directly concerns the patient’s care is of paramount importance. But it also serves other useful purposes essential to health care.

First, when such information is properly compiled and aggregated, it provides basic data for efficient hospital administration. How each patient is treated can yield important statistical data, while the number of patients handled, categorised by sex, age, and diagnosis, provides basic information required by administrators to plan for the future of the hospital. Similarly, compiled data about clinical testing are vital for the efficient management of the hospital laboratory, and information as to the type and number of prescriptions issued allows the hospital to estimate the drugs the hospital will need for the year.

Second, health information provided by the hospital is needed by civic health administrators at the district level. Such data, accumulated from all the district’s hospitals, are essential in formulating health planning for the district, by matching with population statistics, other demographic data and the health resources of the district. The more limited these health resources are, the more accurate will be the data necessary to conserve them. This medical information then progresses upwards – to the level of national health care, where the central government digests the aggregated district level health statistics for national health planning. Thus each root of this informational evolution starts with the physician’s first encounter with the patients.

Third, this medical information, containing not only data about the patient’s illness but also the success or failure of therapy, is a valuable source of clinical training for medical students, nurses and allied health care personnel who are privy to such information. It is not an exaggeration to say that a large part of clinical training involves the proper use and the accessibility of this medical data.

The fourth and last point is that medical information is a source of new medicine and therapies. The development of new therapeutic drugs is built upon the careful observations of experienced physicians, and the comparison and analyses of the effects of previously administered drugs, gleaned from the patient’s data. This in turn leads to continued medical progress in, say, uncovering a new entity of a disease or a new method of diagnosis.

So, these medical data gleaned from patients form the bedrock of medical science and improved health care, and most of such information is generated in hospitals.

In spite of the importance this medical information has for health care,
it is still processed manually in a majority of hospitals the world over. This inefficient method results in delays in reaching crucial treatment decisions, for instance when test results fail to get back to the physicians in time, or in delayed action by administrations when a prompt response is needed. In the fast-paced, populous world of today, it is no longer possible to compile accurately statistics manually from such routine data as grading the patients by sex, age and diagnosis. Simply counting such entries can overwhelm the staff of a small hospital.

**Time-savers**

Fortunately, new technologies are now emerging which help to process this information far more accurately and efficiently. To the computer are now added allied machines that can undertake, for instance, imaging in the audiovisual field and rapid data transmission. Gradually, all these time-savers have been brought into hospitals to solve the problems created by the information explosion. Such technologies have been melded into a uniform system which is designed to meet hospital needs and is generally called a hospital information system.

The basic concept of such a system is to create a cumulative file of each patient’s data, which can be quickly updated on a continuing basis. This type of data file in computer terminology is called a database.

Once each patient’s database is created and regularly updated, data handling at the hospital improves tremendously, enabling a section requiring specific information on a patient to obtain it rapidly from the database. The information is delivered by a printout from a computer terminal in a standardized form. Or the physician may type an order into the computer database, which the computer then transmits to the laboratory as an instruction to perform clinical tests for a certain patient, the laboratory also receiving pertinent data that is stored in the patient’s database. Similarly, when a physician uses his or her computer terminal to write a prescription into the patient’s database, the computer transmits the prescription immediately to the pharmacy, while the prescription information is kept and accumulated in the database, which provides this information to the administrator in the form of hospital supply statistics.

Statistics become far easier to compile, and the data can be easily copied on to a diskette for transmission to the district level, where similar medical data from all the district’s hospitals can be compiled by another computer into a statistical analysis of any district-wide health matter.

Hospital information systems based on the above concepts have been installed in some large hospitals in various countries and are successfully in operation. As many as 300 terminals have been placed in doctors’ offices, in outpatient clinics, in wards, laboratories, pharmacies, administrative offices, and at other necessary locations. The system can be tailored to each department’s specific needs, and this adaptation is then called a departmental system. Doctors and nurses have already become so accustomed to computer use that written memos, the traditional form of communicating medical instructions, are a thing of the past. Until recently, however, these systems have required expensive, large computers, or main-frame computers, so that smaller hospitals with limited budgets have been unable to consider buying them.

Yet there are sufficient reasons to believe that, even if hospitals spend three per cent of their budget on information handling technologies, they still reap rewards. Although this figure may not be reached in a short time, it is advisable for the cost of improving information handling in hospitals to be itemised in the hospital budget, whether or not computers are installed.

**The future**

What of the hospital information systems of the future? They will be even more sophisticated and versatile since constant advances are being made in information handling technologies. Even small hospitals will be able to afford them, and they are destined to become a convenience as common as the telephone.

The first technological advancement has already appeared—the microcomputer, which is now in use in all parts of the world. The advantages of microcomputers are many: they are economical, compact and, unlike the sensitive mainframe which requires a constantly cool environment, they can be used in a natural climate. So in many developing countries microcomputers have blossomed and since they can be programmed to operate in any language, their adaptability to any country is assured. Hospital information systems based on these microcomputers are being developed and will revolutionise the system of health care globally.

Another technological advancement is information transmission, which allows for direct computer-to-computer data transfers. But even communication on a smaller scale, such as the sending of diskettes full of data, remains an important method of ensuring the interchange of valuable medical information.

Clinics and physicians will in future be able to take advantage of data from the hospitals. In the health care systems of most countries, people normally visit clinics or health centres for simple ailments, and are only sent to hospitals if their illness is serious. Without access by the clinics to the data that the hospital may have, the present hospital
information system does not satisfy the requirement for total patient health care. However, technological progress will make it possible to transmit the data contained in hospital information systems through a telephone line to the clinics. Once this computer networking is established, the health care provided to the patient at either the clinic or the hospital will be more accurate. And while the privacy of each patient must always be protected, the accumulation of accurate data concerning matters of health that can be achieved through computer linkage with other health care facilities within a district and, ultimately, throughout the country will contribute to better health research and planning for the benefit of all.

Thailand's national system

The present National Health Information System of Thailand was developed during the fourth Five-Year National Socio-economic Development Plan, 1977-1981. This set up a Central Health Information Centre to collect and disseminate all health information. The system processes three types of data: health programme activities, disease/epidemiological data, and vital statistics. These data are collected from the village level or peripheral health infrastructure and passed on to the District Health Office, then to the Provincial Chief Medical Office, and finally to the Ministry of Public Health. The Information Centre houses two minicomputers, one used for epidemiological analysis and the other for general purpose data processing. Microcomputers have gradually infiltrated at the periphery and are used to support the management of projects, hospitals, districts and provinces.

Health administrators are satisfied with the system, although informatics professionals recognise many areas for improvement, generally involving problems common to developed and developing countries alike. Data are often inaccurate and incomplete, and suffer from a lack of standard definitions. The Ministry is correcting these problems by setting up standard data definitions and improving the recording and reporting forms. Personnel are often not qualified for their data collection and processing tasks, but this is being attacked with an intensive training programme for health personnel which will also help users to make use of the information available to them in their daily activities.

An information processing network will encourage units responsible for separate functions to cooperate more effectively. This will be supported by a mainframe in the central computer service centre and a local area network covering parts of the Ministry.

As part of its strategy, Thailand is encouraging the use of microcomputers. These are already in wide use by hospitals but their purchase and software development has generally been handled locally by users, and this has resulted in incompatibility in hardware, operating systems, and software. Experience and information cannot be easily shared. The Ministry has drawn up a “Masterplan on Computerisation” which encourages the use of standard software throughout the country.

A district health centre in Brazil has readily adopted the new technology.

Dr Shigekoto KAIHARA
is with the Hospital Computer Center of the University of Tokyo, Japan.