Hospital information systems — a need to re-evaluate the roles of management

S. O. SHIPHAM, I. T. HAY, P. M. FALLLICK

Summary

Hospital information systems are now entering a third generation, not only as regards new technology but more significantly with regard to the role of those involved in their design and implementation. This new emphasis requires a re-evaluation of the roles of the designer and user. In the design of a hospital information system, its unique nature — relating central management to a number of independent clinical specialties — must be recognized. One way to achieve this is the establishment of a minimum basic data set dictated by the specific needs of top management interacting with independent clinical subsystems.

Numerous reasons can be suggested for the failure of first- and second-generation hospital information systems (HIS) in the past. Not least among these has been the failure of management to recognize its cardinal role in design and implementation. It may be that because the management structure of a hospital is different from that of a business organization, management responsibilities in a hospital have not been clearly identified. Further difficulties involve co-ordinating the diverse requirements of all the subsystems in the hospital in an attempt to provide a meaningful centralized information system that can be used for strategic planning, general hospital administration and patient care as well as serving the needs of auxiliary departments such as radiology and the clinical pathology laboratories.

In an attempt to ensure that all eventualities are taken into consideration, large steering committees are often set up, resulting in dragged-out bureaucratic procedures that further delay the decision-making process. A third problem is that the present HISs are often geared to gather information not really pertinent to the real questions facing our future health care requirements.

Furthermore, such systems are often upgraded by adding complex arrays of electronic gadgetry, thus deluding ourselves into thinking we have made significant changes. Probably all that we will really do is to gather and analyse the same old data in a faster and more elaborate way or to accumulate more and more data that are never used. If we are to prevent this happening in future we must be far more critical of the present role of all those involved in the design of HISs.

Past experiences have shown that design problems have largely contributed to the failure of the HIS and it has been suggested that those responsible have not had a clear enough understanding of information dynamics within hospitals. This has led to a controversy over who should be finally responsible for designing the health care professional or the computer professional. We believe that the senior health care professional (SHCP) must ensure that the system is designed around relevant requirements for the hospital and its information system, and the data-processing professional (DPP) must ensure that the most efficient computer technology is applied to this end. Mutual interaction of professional expertise is essential to achieve a logical and effective health care system within the hospital. Historically, this has predominantly been the domain of the computer scientist and therefore we feel these roles need to be re-evaluated if design and implementation of an HIS is to be successful. A number of important concepts need to be established if this process is to be effectively restructured. Some of these are: (i) a clear definition of the aims of an HIS; (ii) positive contribution of strategic management in its design and implementation; (iii) a re-evaluation of the relationship between the clinical subsystems and the HIS; and (iv) a re-defined role for the DPP.

Greater involvement and responsibility in the design and running of an HIS by the hospital administrators and health professionals are needed, as well as a re-defined role of the traditional data-processing department within the hospital environment. This approach will have far-reaching implications both for hospital management in particular and medical information systems in general. Unless consensus is reached on these diverse managerial roles within HISs they will remain inefficient and ineffective.

The aims of an HIS

For the purpose of this article an HIS is defined as the dedicated use of a computer with associated hardware and software to collect, store, process, retrieve and communicate relevant patient data and administrative information to those who require it. More particularly these aims can be considered as twofold.

The HIS as a source of information

Before computers were available most systems used by hospital administrators were designed to provide only historical information. These systems were usually so slow that hospital management seldom had a good idea of current happenings and by the time this information was presented it had little value. An important characteristic therefore of the modern HIS is its ability to report information of immediate value. The emphasis must also be on information utilization and not data accumulation and this imposes considerable responsibility on hospital management, since the onus is now on them rather than the DPP to ensure that the data are properly utilized.

An important question that needs to be clearly answered is: "What information should the HIS supply and to whom?" Lack of critical analysis in respect of the answer to this question is very often the cause of failure. In the past the HIS...
has usually been over-ambitious and designed to support the total requirements of hospital administrator and clinical specialist alike. Too often the approach has been that if a large amount of data can be collected at a sufficiently detailed level and processed through a powerful computer with adequate storage it will then be possible to solve any information problem. It is imperative that strategic management should define the prime objective of an HIS, which is to aid management in planning and administering the hospital. In a broader sense the objectives of an HIS are very wide and need to supply data relevant to patient care, research and health care evaluation on various levels. It is in the restricted sense that we apply our concept of an HIS.

Within this context therefore it is the role of hospital management to determine the criteria for information requirements of the HIS; once the central core of the information system has been established, specialty working groups can convene to define departmental requirements.

The HIS as an aid in decision-making
The dynamics of modern hospital management demand not only current information, but also information that will enable predictions of future developments related to changes in specific health parameters. Hospital management should therefore not merely be concerned with what is happening within the hospital, but also with those factors outside with a bearing on daily and future developments of the hospital. Patient hospital utilization depends on, and is often dictated by, environmental characteristics that cannot be ignored. An HIS should therefore in the long term be concerned with providing models that incorporate relevant environmental characteristics such as areas of health authority, sources of referral, and environmental hazards so as to provide ongoing decision support to strategic hospital management. The modern HIS should provide information that was generally unavailable on a manual record system; hospital management must ensure that provision is made for these strategic data in the system design.

The role of strategic management in the design of an HIS

Overall responsibility
Overall responsibility and control of the design of an HIS should be in the hands of SHCPs working in close conjunction with the DPP. In the past, hospital administrations have often not taken on this responsibility and the design of systems had been left to those who often lacked full understanding of hospital dynamics, leading to the subsequent over-design inherent in many systems. Information specialists are needed within the ranks of health professionals — people who are sufficiently computer-proficient to be able to establish communication channels between the purely technical aspects of computer technology and the specific information needs of hospital management. From this need have developed special training courses in medical informatics.

Design concepts
To ensure that over-design does not occur, SHCPs must play a decisive role in determining the information needs of the HIS. Management must therefore not solve the problem of diverse departmental requirements by expanding the system to an unwieldy extent. For an economically feasible system limitations must be rigidly imposed on the amount of data to be accumulated, and the term minimum basic data set (MBDS) has been established. The MBDS does not contain all possible variables that exist within medical information relating to the patient or to running a hospital, but defines a small set of meaningful indices that can be measured, collected and processed.

The MBDS is thus a compromise between the desirable, the feasible and the affordable. It is, however, an essential compromise. We consider that an MBDS should contain the following categories: (i) patient identification; (ii) epidemiological variables; (iii) socio-economic status; (iv) admission details; (v) diagnosis and management; (vi) outcome; and (vii) finance and administration (patient billing).

Obviously each hospital will need to specify its own requirements in addition to this minimum set. Hospital management should, however, recognize that the emphasis is on minimum patient data rather than total patient information, but it is not suggested that this MBDS provides all the information requirements of the hospital. The MBDS must provide hospital management with the correct information to make the right decisions, which are likely to be more rational and consistent if taken in the light of correct and relevant statistical and epidemiological information. Management must therefore ensure that the identification and measurement of sentinel health events as opposed to detailed data collection are inherent within the design of the MBDS.

The two concepts of a MBDS and sentinel health statistics, although not new, need continual re-emphasis and are of particular importance in the design of an efficient HIS. An efficient system will in turn allow top management to establish a more cost-effective health service, particularly as health costs escalate. This concept is, however, controversial in that it may well conflict with some basic tenets of medical training. Historically, medical training has emphasized the ethics of saving life at all costs and from this may have developed the attitude that cost-related factors are unethical when considering health care. In reality, however, decisions have to be made to remain within the scope of limited health budgets. A properly designed HIS will assist hospital management to achieve this.

Hospital dynamics
Insufficient consideration has been given to the inherent idiosyncrasies of the management structure of a hospital. The hospital superintendent and other SHCPs constitute the central authority of strategic management. Patient management in the clinical specialties is controlled by the specialist. HISs should recognize these levels of authority. Clinical subsystems must evolve independently within the framework of an HIS, and hospital management should support the independent development of such decentralized subsystems.

The concept of centralization or decentralization is another unresolved controversial subject. We think that within a hospital a decentralized system is the most viable. The responsibility of good central management will be to ensure that these independent units comply with the requirements of the centralized HIS. Hospital administrators must insist that each independent subsystem should supply the essential data needed for strategic management as stipulated in the MBDS. Management is further responsible for determining a clinical protocol for supplying information to the MBDS by the various specialties or subsystems. Once established, however, these subsystems should be largely autonomous under the sole jurisdiction of the head of that specialty. These subsystems will thus only develop when the necessary enthusiasm and expertise is available within that department. This has a practical application since it is obvious that various departments will have different acceptance rates for computerization. Some will prefer to wait and others will want to participate immediately.

The role of clinical information specialists in the management of subsystems
Traditionally, HISs have been developed around one large
mainframe computer and all services to the hospital were developed from this point. This approach was largely due to technological considerations but has never been fully compatible with inherent hospital dynamics. The recognition of decentralized clinical entities by the hospital environment will contribute to the success of the HIS. Clinical specialties have, on the other hand, the responsibility to develop computer literacy within their own ranks and the existence of at least one clinical information specialist within that specialty must be considered a prerequisite for generation of a viable subsystem. The concept of medical informatics is now a fast-developing reality and with it have developed, in Europe and the USA, specialized training courses to fulfil these needs.

Attention has now been given to similar courses in South Africa and without doubt there is a critical need to train health care professionals as clinical information specialists.

Problems in the design of previous HISs can be solved if independent subsystems are developed. Firstly, each specialty has a unique concept of the data needed for each patient. Very often these needs are not only specific to that specialty but are also very detailed. Secondly, in an academic environment varying emphasis is laid on the need for archival data for research purposes. These two factors rapidly lead to a degradation of the system both as regards data storage space and access times. An independent subsystem under the control of the head of that specialty, however, can develop unique data requirements without degrading the central system. Clinical specialists are furthermore very concerned about the integrity and security of their patient data. They are therefore reluctant to allow centralization of data with the possible implication of loss of control over these data and their utilization. Wise central management will recognize this and plan for sharing of minimum essential information rather than control of all available clinical information.

Data processing and technical considerations

There is no doubt about the important role the DPP plays and will continue to play in the design and development of a hospital information system. It is, however, suggested that with changing technology and developing computer awareness among health professionals, the historic role of the DPP will change radically. Either computer specialists will train more specifically within the hospital environment or alternatively health professionals will become experts in computer science. From these ranks the health care information specialist of tomorrow will arise, but a trained computer specialist or consultant will still be needed to solve particular technical needs of future HISs.

Technical problems and high costs related to creating a distributed computer network have been the main reasons for designing a centralized system in the past. Recent technological advances have, however, reduced these problems. It is envisaged that the computer specialist will continue to play a particularly important role in ensuring the success of a distributed HIS. One of the continuing areas of concern in the development of distributed systems is the need to standardize hardware communication protocols within the network. This will remain the domain of the computer specialist. Computer communication specialists will be needed in future rather than the present general computer specialist.

Conclusions

The implementation of a modern HIS imposes considerable responsibilities on both hospital management and DPPs. The ability to meet this challenge will be the measure of good strategic management. Hospital superintendents and other SHCPs must involve themselves sufficiently with the design of the system so that a clinically oriented model is developed and not a computer-structured model. In this process new demands will be placed on the historic role of the DPP. The independent evolution of clinical subsystems must be encouraged while at the same time employing all the technological advances to ensure eventual interfacing where required. Standardized clinical information protocols will have to be established to allow the sharing of a MBDS essential to the centralized hospital system. This is the prime responsibility of SHCPs. Hospital management must, however, accept and encourage the development of independent clinical subsystems.

The understanding and acceptance of this concept of hospital dynamics should make a meaningful contribution to future design of HISs. We recommend therefore the development of a minimum data requirement for the centralized system based on realistic strategic requirements of hospital management that serves as the nucleus of the development of the HIS. This development must go hand in hand with the evolution of independent clinical subsystems. These recommendations have far-reaching implications for the responsibility of central management, clinical specialties and DPPs.

The authors would like to thank Dr G. du Toit for his constructive criticism in the preparation of this manuscript and Mrs S. Revell for typing it.

REFERENCES