CHAPTER II

REVIEW OF RELATED LITERATURES

1. COMPUTERS IN HOSPITAL MANAGEMENT - NEW TRENDS IN THE WORLD OF HEALTH CARE DELIVERY, ONE EXAMPLE IS THE TREND IN THE UNITED STATED

The purpose of any health care delivery system is to prevent or cure disease or, if that isn't possible at the time, to ameliorate its development or its symptoms. This purpose is achieved through the efforts of a well-structured system of patients, providers, institutions, facilities, equipment, and payers cast in the context of its environment. But the prevention, cure, or amelioration of disease is expensive, has varying quality, is frequently not easily accessible, and often is not the same level of intensity for all. Consequently, this system must function in an environment of cost control, quality assurance, open access, and equity of delivery. To do this it must have *information*.

The entire health care delivery system, and more particularly the hospital care delivery system, is built on the appropriate *people* having the appropriate *information* at the right time in order to delivery the *optimal care* to the patient. This information is critical and comes in many forms - oral, written, images, and most important for the modern times, computer screen and copy. It is ubiquitous

and as our health care systems become more and more complex, the demand for decision-aiding and decision-making uses of information grow exponentially.

Information system (IS) has a key role in the delivery of health care. In combination with decision and model based support system, IS contributes to improved decision making, improved quality of patient care, improved productivity, and reduce cost. In the area of improved decision making, managers can now conduct extensive strategic planning, market analyses, technology assessment, and demand forecasting to appropriately direct the institution. They can also assess the level of risk incurred as the institution adds new services, new technologies, new facilities; or modifies or eliminates old. Clinicians, nurses and other providers can call on protocols, algorithms, expert systems, and other models to aid in prognoses, treatment are critical. But also IS contributes to improved quality by reduced waiting time for orders, information and results, to the elimination of unnecessary services and orders, to reduced errors , and to increased satisfaction by the providers and the patients. In the area of improved productivity, IS leads to better staffing patterns, improved scheduling, appropriate supplies, equipment, and materials, and elimination of duplication and redundant systems and actions. Finally, all of the above benefits affect costs- the installation of IS

and support systems to achieve these benefits raise costs whereas the improvements in management, administration, and patient care delivery lower costs. In some cases the costs saved exceed the costs incurred. The others they don't but the benefits received are worth the expense. In most cases it is not actually known whether benefits exceed cost or vice versa. (Glaser,J.P. et al, 1986).

As stated above information always has, is and will be vital to optimal care delivery. But the role of computers in fulfilling a portion of the information need has only emerged in the past three decades and is still greatly involving. Before 1960 there was very little use of computers in the health care delivery. Most information needs were met by oral, written, manual, and largely local self-contained activities of the providers and administrators. From 1960 to 1969 all large health care institutions had large batch data processing capabilities. These facilities were almost entirely used for administrative systems processing-payroll, billing, registration, admission, etc. There was some interest in their use for clinical purposes but no software, appropriate hardware, or trained programmers and users were available to do the job effectively. Furthermore, equipment costs were so high that purchases could not be justified for the presumed benefits.

The decade of the 1970s saw not only the overwhelming success of information processing but also the development of on-line systems at many large media centers. IS also diffused to small to medium-sized hospitals and health care delivery settings, physician practices, health agencies and long-term care institutions. A few of the large health care chains and other multiple systems began to tie their operations and planning activities together. With the continuing sharp rise in hardware power and its significant drop in price, it became obvious that the greatest cost and the greatest constraint to further use of computing was software development. The clinically oriented software which was developed in this period tended to complement the skills of the users by handling large amounts of data more effectively. Some examples of this are the display of CAT (Computer Assisted Technology) images, complete EGG (Electro Cardia Graphy) images, and lab test and other protocols. Except for a few research sites, knowledge-based systems did not replace any of the decision activities of the clinical users. On the other hand managers and administrators were beginning to use decision support systems that not only aided in making decisions but also made decisions. Examples in this arena are nurse staffing and scheduling, surgery and recovery suite scheduling.

By the beginning of the 1980s the PC (Personal Computer) technology was well ensconced in the computer world and was making its way into health care delivery system. To utilize this technology most effectively reliable multivendor multicomputer networks were being built and installed. At the same time computing power and electronic storage capacity exploded at the desk top site. We could now talk confidently about the development of large decision support systems, large integrated hospital IS and the construction of knowledge-based systems for general use. By this time also a very large base of knowledgeable computer scientists, programmers, and sophisticated users had been built. There is now a large and growing group of software firms which market clinical DSS (Decision Support System) and IS (Information System) and also market some knowledge-based management and administrative systems (Austin, C.J., 1979).

What we are also seeing in this decade of the 1980s in the Unites States is the growth of the PC environment in all of the small hospitals in rural and suburban areas (Katz, 1986). Furthermore, more and more of these small hospitals are linking clinically to large media centers via telecomputer networks to retrieve information on library sources, laboratory reports, clinical protocols, and electronic mail (Pompili, 1987). These networks and

information links are also being extended to physician offices, home health agencies, and long-term care settings.

2. CONCEPT OF MIS AND SOME OTHERS INFORMATION STRUCTURAL SYSTEMS

These is no consensus on the definition of the term *"management information system"*. Some writers prefer alternative terminology such as "*information processing system (IPS)*", "*information and decision system (IDS)*" or simply "*information system (IS)*". This text uses "**MIS**" because it is descriptive and generally understood, it also frequently uses "**IS**" instead of "**MIS**" to refer to an organizational information system.

A definition of a management information system, as the term is generally understood, is *an integrated, user-machine system for providing information to support operations, management, and decision-making functions in an organization. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database* (Gordon,B.D. et al., 1985).

A *Decision Support System* (**DSS**) is an information system application that assists decision making. DDS tends to be used in planning, analyzing alternatives, and trail

and error search for solutions. DSS incorporates a variety of decision models (James,A.S., 1990).

An *Information Resource Management* (IRM) is an approach to management based on the concept that information is an organizational resource. Given that view, the task of the information system executive is to manage the resource. The resource is defined very broadly. The scope of IRM includes data communications, word processing etc. The IRM concept tends to emphasize the organizational effectiveness of information resource other than the technical sophistication or efficiency of the hardware and software.

3. MIS IN HOSPITAL MANAGEMENT IS HIS

Many tasks in the hospital that can be supported by computer application, such as patient management. Williams D. (1985) studied the admission of diabetic patients in order to provide information based on hospital activity analysis. Shea S. (1985) suggested the application of the computer to manage medical records. Other authors have paid more attention to the administrative systems such as accounting, financial, drug inventory, equipment management (Gannon, 1985) or staff management (Dombro, 1985).

In Management Systems, the emphasis is now on planning and strategy in a high competitive environment. In Administrative Systems, it is in systems to cut cost and errors, improve productivity, and improve the timeliness and usefulness of the information and decision support. In Clinical or Patient Care Systems, it is on decision support and knowledge support to provide correct and appropriate diagnoses and treatments in an error-free, timely, and possibly less costly manner. In several large research-oriented medical centers and a few large hospital chains, it is on highly Integrated Systems which combine the Management, Administrative, and Patient Care System in a distributed largely decentralized network of databases, IS, DSS, and knowledge systems (KS).

Figure 2.1 illustrates an Integrated System on a network for a hospital. The core of this integrated system is the patient identification (PID) or Patient Master Index (PMI) and patient medical record (MR) (Applegte, et al., 1986). Almost every service or unit of the hospital must have access to this information and key its activities to work revolving around the PID and MR (Pierskalla et al., 1988). This record receives inputs from the clinical departments, the administrative departments and support services. Consequently, it is used for decision analytic models to conduct utilization review, productivity studies, cost assessment studies, tracking of the patient diagnoses

and therapy and location, and billing and other purposes. It is central to all patient care and most administrative activities. It is also used an aggregation in strategic planning and market research.

The integrated system is also capable with the present and forthcoming computer network systems to have centrally available database management tools, productivity tools, reports/graphics generating tools and free text entry capabilities. This effectively means each department will have many work stations to support multiwindow, multiterminal emulation,large storage capacity, integrated telecommunication capability, and extremely high speed computing and data access power.

PID/MR
Centralized Database
- Network
- Census data
- Medical records
- DRG data

Patient Care

Nursing
Planning
- Order/entry

Labs
- microbiology
- hematology
- pathology
- chemistry

Inpatient
- ICU/CCU
- dietary
- treatment
- protocols
- diagnostic

consent
Pharmacy
- allergic reactions
- distribution

Surgery
- anesthesiology
- protocols
  algorithms

Emergency
- triage
- primary
Outpatient
- scheduling tests
- triage

Administrative Systems

Scheduling

- Census
- registration
- surgery/OR
- outpatient

Financial
- payroll
- accounts rec/pay
- billing
- gen'l ledger
- op budget
- case mix

Facilities

- purchasing
- inventory
- maintenance
- housekeeping

Personnel
- employee records
- skill inventory
- labor analysis
- nurse scheduling

Quality Control

Management Systems

Strategic

- budget
- facilities
- technology
- competitive
- product mix

Marketing
- demographics
- utilization
- research
- case mix

Risk Management
- malpractice
- informed

- incentives

Quality Control
- utilization review/PSRO
- organizational structure
- organizational processes

Figure 2.1
HOSPITAL INFORMATION SYSTEM

Another point to note from Figure 2.1 is that although PID and MR are the core of the HIS, every service and unit of the hospital will also have its own databases, IS, DSS and KS. To set up a proper model for a concrete hospital, we need a so-called feasibility study.

Methods to study the feasibility of MIS have been suggested by many authors. James A. Senn (1990) and Gordon et al. (1985) mentioned the general approach to develop a MIS and also have given some illustrative cases. Zviran M. (1990) presented many useful considerations and a complete model for an integrated hospital information systems. Of special note was the method for designing a hospital information system introduced by Priest L.S. (1982) who suggested forms to define problems and automation needs in hospital. My study is chiefly based on the Priest's method.