

A.4. Evolution and Current Challenges for Healthcare Information Systems

As discussed in the previous Chapter, healthcare delivery systems share similar characteristics with most service and productive organizations but also exhibit specific characteristics, which are related to the complexity and diversity of healthcare production, including the dissimilar ways healthcare professionals discharge their clinical tasks.

New requirements and technological advances occurring in healthcare, information systems, and information technology have influenced the evolving role of healthcare information systems and related technology. Relevant aspects that took place in the evolution of systems and technology in order to appropriately support healthcare organizations are:

- The diverse organizational healthcare environment of information systems, which need to be adapted to multiple types of healthcare organizations.
- Dynamic changes in the required role of information systems, following changes in the role and dynamics of all levels of healthcare delivery and management.
- The need for integration of information systems within healthcare organizations, which are also organized as networks.
- Technological advances in systems structure and communications, facilitating the implementation of integrated healthcare networks.

The healthcare information network, when centered on the patient, allows the comprehensive and coordinated management of detailed individual data. Patient originated information also may be used as input for the development of collective databases. Aggregate clinical and administrative data may be applied to the process of planning, management, and evaluation. As these components use data arising from detailed patient care clinical and administrative data, resources utilized, and procedures performed, the development of common criteria and standards on data is fundamental to ensure quality and completeness of resulting collective indicators. The important subject of data standards is dealt with in Chapter 4. Data standards recommendations also make up the bulk of the appended material of this publication.

A.4.1. Evolution and Dissemination of Healthcare Information Systems and Technology

Healthcare Information Systems (HIS) have evolved according to the new role implied by changing demands to healthcare and healthcare information, and supported by the possibility to apply new technological advances to healthcare organizations. The vast majority of issues addressed until the

early 80's were those associated with how to "supply" information for business operations. As the supply issues became better understood and the price-performance of computers dropped dramatically, attention turned to more imaginative applications of the technology.

This shift of attention has highlighted new issues, now associated with the "demand" for information systems in organizations. With this change of paradigm, from supply to demand, no longer are organizations content to focus upon the obvious. The mid-80's saw the development of several techniques to help analyze an organization's objectives and methods of operation in order to reveal more innovative opportunities based on information systems. From being concerned primarily with the logic used in computerized processes, the focus shifted to information and its use.

For the past 30 years organizations have been developing computer-based information systems and before this, people paper, pencils, calculators, and mechanical punch card tabulators were the main tools available for data manipulation. The tasks undertaken by the early, cumbersome, and expensive computers were those which were the most obvious to identify and the easiest for the computer to improve, such as accounting, inventory control, billing, and other labor-intensive office activities.

Healthcare Information Systems have followed the general evolutionary trends of all information systems: an extensive central computer station, the appearance of microcomputers allowing the replacement of passive terminals, the connection of these components into a network, and the development of multimedia and workstations. Such systems have developed for many decades; most currently in use are still based on concepts originated almost 30 years ago. The history of the development and implementation of HIS in Latin America and the Caribbean is not very different from that in other parts of the globe. After using data processing service bureaus in the late 1960s and early 70's, healthcare institutions started to purchase and install commercially available information systems based on heavily centralized architectural designs. With the advent of microcomputers, networks, and client/server architectures, HIS evolved to a more flexible and decentralized framework.

Activities covered by traditional HIS systems also evolved from mundane tasks such as admission, discharge and transfer, to patient billing, then to more sophisticated tasks such as clinical information management, advanced laboratory systems, simulation, and image processing. Lack of integration and difficulties in obtaining key information have led to a number of major HIS revisions. As information becomes increasingly more important for cost containment and improving efficiency and efficacy, more pressure is put on HIS to deliver solutions that assist organizations to achieve the strategic goals of the healthcare enterprise of providing services with better quality effectively and efficiently in a financially sustainable environment.

There has been a major paradigm shift in healthcare information processing, corresponding to changes in the goals of the organization. The traditional emphasis on data has now given way to emphasis on information. Central control has now evolved to empowerment. Healthcare organizations are now much more concerned with each other and how they can exchange services, and necessarily patient information. This has forced information systems to leave the traditional healthcare institutions' physical boundaries. Now, more than ever, healthcare enterprises wield HIS to provide strategic, connected information to reduce costs, improve patient care, and increase service levels to their customers.

Despite the many dozens of Healthcare Information Systems (HIS) that can be found on the market, only a very small number of products cover all requirements of a particular institution or unit, and provide adequate integration with the potentially vast healthcare networking needs. The varieties of tasks, the players involved, the existing organizations, and the technical possibilities substantiate this situation. In any case, the installation of a HIS is universally viewed as a necessity that must be adequately and widely supported by all participants in the health system.

Until recently, they have done so almost exclusively for accounting and fiscal purposes. Among the factors that have been associated with the dissemination of Information Systems and Information Technology (IS&T) in the organizations, the following were most contributory:

- *Technological convergence* - Characterized by the integration of a variety of related developments in electronics, industrial production of integrated circuits, the introduction of new computer languages that fostered the increasing availability of easily operated low-cost systems with greater processing capacity, and the use of powerful user-oriented database management systems.
- *Diffusion of computer-related skills* - Increasing the number of non-technical individuals with basic computer knowledge and training in its operation.
- *Increased productivity and quality in application development* - Large number of generic software products that allow the development of complex applications.
- *Appreciation of the benefits of information* - Recognition of the effectiveness and efficiency of information systems as planning, operation, and control tools for managers.
- *Acceptance of technology* - Recognition that modern IS&T resources are appropriate technology for less developed countries and small organizations.

Information resources and commodities display four general economic characteristics:

- Information cannot be appropriated; the "seller" of information is not deprived of its possession.
- Information is non-divisible in use; some, if not all, sets of information must be complete if they are to be usable. For example, half of an algorithm or half of an application program would not be usable commodities.
- Information is heterogeneous; unlike quantities of homogeneous physical resources, "more information" means different items of information, not further copies of the same items.
- Information is context-dependent; the value of an information set as a resource depends on the context of its interpretation, use, or exchange.

This host of new requirements calls for fundamental change in the way information systems and information technology are deployed, used, and managed today — changes that capitalize on how technology can support the continuum of care are necessary.

The sharing of patient clinical and administrative data is a prime example of those new requirements. Healthcare providers traditionally approach their work on an episodic basis, treating patients for specific medical problems as they occur according to the realms of medical specialties. One goes to a family practitioner for a minor upper respiratory infection, to an orthopedist for lower back pain, and to a surgeon for an operation. Unfortunately, those involved in providing medical care frequently do not have the means to easily access and share patient information. The emerging development of the Computer-based Patient Record (CPR), while significant enough in itself, still does not solve the entire problem. From the patients' perspective, problems associated with the lack of information sharing are basic — they still must recite their present and past medical histories again and again as they move from one physician's office to another, one facility to the next. On top of it, a lot of important clinical data is lost or remains buried in individual patient files in different sites.

The focus on information that relates to administrative and financial issues, such as payer transactions, on an episodic basis, has been in general better addressed when there is an economic interest involved, as is the case of private health insurance. Characteristically, this aspect has been present in the public sector. Even less attention has been paid to developing an overall electronic health planning capability that focuses on all aspects of a member's wellness and includes plans to manage member care from birth through adulthood.

With the changes occurring in the context of the health sector reform processes information systems must have the ability to:

- Capture and deliver data at the point of service
- Support concurrent and multicentric clinical and administrative information utilization and exchange
- Support intensive data manipulation
- Provide facilities to support synchronous, as opposed to retrospective, decision making