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Synopsis

Information Systems

Information Systems

Information systems as presented by the four papers in this section can be described as any computer information program which attempts to systematically automate elements of a topic or program.

The systems referenced in this section are comparable only within this broadest representation, and therefore are illustrative of the extent to which automated information systems have infiltrated the culture and the daily operation of widely disparate health care disciplines and organizations.

The first paper reports on the evaluation of one specific computer-assisted cognitive rehabilitation software program [1]. The carefully designed study highlights at once the difficulty and the importance of determining effectiveness or superiority of computer assisted education or rehabilitation programs as compared to other more traditional techniques used to address parallel problems.

Moving to a different set of problems, the second paper reviews the transformation of health information systems from their freestanding financial platform origins to the emerging cross institutional systems which permit the creation of clinical data repositories [2]. This article examines one case, discussing the issues from three perspectives: that of the administrator, the patient and the clinician.

The third article in the set describes a geographical information system (GIS) modified for field use in tracking malaria in Brazil [3]. The system is refined for ease of use, extending epidemiological specific capabilities which enhance the interpretation of data.

The fourth and final paper in this group describes the creation of a patient centered, physician- oriented health information system in a urology clinic setting [4].

Each of these disparate topics illustrates one facet of possibility that information systems provide for managing knowledge and data in new and productive ways.

Evaluating Benefit

One of the most potent challenges for the creator of any new information system is assessing the efficacy of the system. That assessment is made even more difficult where human subjects are integral to the evaluation process. Chen et al. [1] report on a research study for evaluating the efficacy of computer-assisted cognitive rehabilitation (CACR) in individuals who have suffered traumatic brain injury.

In this study, Chen compared 20 case records of individuals who had sustained closed head injuries and subsequently completed inpatient neurorehabilitation using CACR. These records were compared to those of twenty similarly injured individuals of comparative age and education who had gone through a traditional rehabilitative process. Individuals in both groups had been tested prior to and after the rehabilitative processes. The complexity of the design of the research project illustrates the difficulty of working with human subjects. Despite attempts to standardize patient profiles, differences in severity of trauma, chronicity, and length of coma made statistical analysis difficult.

The author reports that both groups had improved significantly at post testing but notes that test score improvement was parallel for both use of CACR or traditional neurorehabilitation treatment.

Studies continue to be conducted on computer based rehabilitation and training. These efforts will define whether or not the more cost effective and consistent computer aided rehabilitation should be used as an adjunct to the more traditional ways of restoring function.

Integrating Clinical Databases

Remarkably, although some forms of computerized systems have been in

existence in health care institutions since the late sixties, few models exist which integrate all aspects of the patient record. With the advent of integrated health care delivery systems across institutions, that lack of a system becomes even more critical.

Kahn [2] examines the issues associated with integrated clinical information systems, and information sharing from three perspectives: that of the clinician, the administration and the patient. He then describes one institution's attempt at grappling with the issues inherent in instituting an integrated health system.

Kahn points out the need for the clinicians to have rapid access to the most recent information along with the ability to place the information into the context of that patient's medical history. This is critical for developing treatment strategies. Lack of that information results in repeat tests, or clinical decisions made in a vacuum. Yet, barriers to comprehensive integrated clinical information systems are not insignificant.

Physicians are concerned about who decides which data are sufficiently important to be stored and conversely which relevant data can be excluded. There are issues about liability and issues related to confidence level in data which are recorded. Data validity is central to good decision making in patient care, yet the inability of any information system to be 100% accurate raises serious questions for many.

From the administrative perspective, there are other issues. Importantly in multi-institutional collaborations, integrated health information systems attempt to eliminate traditional separations. And for systems which are often deeply imbedded in the operation of institutions, true integration is a very difficult task, requiring high levels of sustained commitment for each of the participating institutions. One of the largest concerns is often the disparate methods of description. Do disease or test data from one institution truly equate to parallel data from the next institution? Lack of data dictionaries, standardized test protocols, etc. make this assumption tenuous at best.

The patients offer yet another perspective. They worry about control over their own information, security from others, their own ability to view their records, and correction of errors.

Kahn goes on to describe an integrated information systems infrastructure for sharing patient data, PROJECT SPECTRUM which was developed to bring together data from fifteen hospitals in Missouri and Illinois. The system relies on interface engines, data repositories, readily available workstations and a Master Patient index. While the goals of the project appear quite simple, Kahn notes that the lack of built in export systems in each of the institutions, proprietary protocols, and lack of common terminology made progress toward the goal difficult. But progress has been made.

The PROJECT SPECTRUM model is one which can benefit those in other multi-institution health care delivery systems. By focusing on the barriers perceived by the variety of stakeholders, Kahn forces examination of the barriers that every group will need to address as they work to assure that information travels as freely in a system as the patients who are being treated.

Geographical Information Systems (GIS)

Geographical information systems have become increasingly important in epidemiological study. These systems allow for the spatial distribution and reconstruction of datapoints plotted against standardized maps. Using GIS, epidemiologists have taken a here-to-fore labor intensive manual plotting process. Additionally, and most importantly, the geographical information system graphically illustrates comparative data in new ways. Epidemiologists can conduct complex computations over time, by various geographical areas, or by specific biological vectors.

In their paper entitled "GISEpi: simple information system to support public health surveillance and epidemiological investigations" Nobre et al. [3] describe a public health project intended to systematically track the increase or decrease in the incidence of malaria in the Amazon region of Brazil.

The data collection system for surveying incidence of malaria had long been established and relied on both active and passive search. Field sanitation technicians periodically visited localities within a health district to gather data, (passive) and a second process was established to regularly collect data from health clinics (active).

The authors found that existing GIS systems did not adequately meet their needs. Either the systems required too much training for the professional entering data or the systems lacked the more complex computational elements required for sophisticated data analysis.

To address these differences a program was developed for IBM PC compatible computers using a WINDOWS environment. Using an object oriented paradigm the group allowed for expansion, ease of maintenance and portability. A complementary digitizing tablet provides accurate cartographic data input. Digital maps were created and stored and the familiar, existing format for data entry was used, enhancing acceptability by the field workers and also permitting the retention of the standard monthly report forms.

In addition to the digital maps and data entry forms the group also created a module for data retrieval and analysis, key to harnessing the power of the GIS. Authors describe in detail

their methods for managing the relational linkages between data points and cartographic information.

GISEpi has been tested for ease of entry and for its ability to provide managers with relevant evaluation tools. Its extensibility makes it a viable new tool and the increasing availability of continuously updated digital maps bode well for the continued use and development of this new system.

Patient-Centered and Physician-Oriented Information System

Health care information systems have in many instances been developed around the need for improved fiscal management within the healthcare institution. All too often this first attempt at automation has been the core around which other systems have been based. Young et al. [4] recognized the inherent weakness in such systems and elected instead to start de novo with a patient centered, physician oriented system.

The authors describe such a system developed for a Urology Clinic in Taipei, Taiwan. The system integrates all departments within the clinic and is unique in that all services are initiated directly from the physician desk. No data entry clerks are involved in the process of ordering diagnostic tests or services. The authors argue that this system minimizes patient movement and waiting periods.

The client server system provides a menu driven graphical interface available on each physician's desk. Predefined menus minimize keystrokes for both defining the patient complaint and systems. Predeveloped laboratory and radiological request forms, pharmacy order forms and treatment forms are all automatically integrated with patient information.

Service requests are directly integrated in the Subject Object, Assessment Plan (SOAP) form to become part of the patient's history, thereby easing retrieval of information on follow up visit.

Running on a UNIX operating system, the program is user friendly for the physicians but robust enough to manage massive character information.

Conclusion

While information systems are certainly not new, enhancements in the sophistication of the software development such as GIS and, client server architecture continue to have a major impact on the ability of individuals to manage information in more sophisticated ways.

There is still much to be learned about the impact of these systems, particularly in the area of computer assisted learning systems. Many are still just discovering the power of integration and the value of single data entry. Still others are pursuing new ways of analyzing information.

As the technology improves, individuals will increasingly join the effort to streamline their work with computer tools and systems as the partners of choice.

References:

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