THE CLINICAL PATHOLOGY LABORATORY AND ITS RELATIONSHIP TO A HOSPITAL INFORMATION SYSTEM

Marion J. Ball, Ed.D.
Temple Medical Center

The role of the laboratory is seen as an intrinsic part of the total hospital operation. The author regards it as one of the distributed data processing centers within a well-planned and well-organized hospital information system. This paper presents a definition of current hospital information system classifications and introduces the issue of combining a dedicated system in the laboratory as a Class A System into a Hospital Information System defined as a Class B or C System.

Introduction

Defining Current Types and Levels of Hospital Information Systems

Hospital Information Systems are an established part of the medical scene, with several versions currently operational throughout the country. This discussion will begin by addressing the communication aspect of the hospital information system, making the important distinction between the communication system proper and the individual applications that supply the information that is communicated.

Classes of Systems

Three classes of system development have contributed to medical information systems. They are:

CLASS A: Individual, stand-alone, systems which usually address problems of single departments or specialties.

CLASS B: Embraces the typical hospital information system. It usually deals with interdepartmental or specialty boundaries. It is institutionally oriented and centers on communications. However, it often dips deeply into application areas to get the basic information to send and may include complete integrated applications as well.

CLASS C: Comprises comprehensive medical records systems. When medical records systems include communications, they have many similarities to hospital information systems. They often address many of the same application areas, but they are oriented to the patient disease process rather than to the problem of institutional support.

The Hospital Information System Model

The typical Class B hospital information system consists of: (1) the communications system, (2) the clinical, and (3) the administrative application areas, among which communication occurs. The overall communications component integrates these parts into a coordinated information system. In it are the programs that handle communications, manage a variety of data files, and keep things straight. A typical hospital information system has terminals of some type on each of the nursing stations and in, or accessible to, each of the application areas involved. The terminals are tied together through one or more computers.

There are three main functions of the computer network:

1. to recognize both sending and receiving stations, format all message routing (this is called message switching);
2. to validate, check and edit each message to assure its quality; and
3. to control all of the hardware and software needed to perform the first two functions.

Any activity beyond these begin to encroach upon the applications functions.

Often systems contain files or data bases that are used jointly by several application areas. These files exist because they are technically easier to handle and can avoid error prone duplications.

Both hospital information systems Class B, and medical records systems Class C contain examples of advanced communications, which in combination, begin to emerge as health information systems. Individual applications development (Class A) support them.

Class B systems have been called by various names, including hospital information systems, medical information systems, total hospital information systems, and global medical infor-
information systems. The scope of systems does vary and the semantic confusion is bound to continue. This difference in scope has been recognized more objectively in recent jobs by accepting the term "hospital information systems" and dividing them into two levels—Level One and Level Two:

LEVEL ONE systems emphasize communications and administration oriented applications. In general, they transmit orders, capture a day's charges, prepare census, often provide some report functions such as laboratory or pharmacy, and they frequently allow inquiry into patient financial records.

LEVEL TWO systems include the functions of Level One systems, but also provide significantly more support for aspects of the clinical record. They not only offer expanded reporting features of such areas as laboratory, radiology, dietary and the like, but also maintain record files of these areas during the patient's hospital stay. In addition, these systems commonly support the nursing service as well.

It cannot be over-emphasized that the difference between these two levels is not primary in their communications, but rather in the complexity of their integrated application functions. It is true that some systems can handle a larger variety of messages than others. Some systems have more sophisticated provisions for validating, checking, editing, and formatting than others. Some respond faster and offer a better variety of displays. These variations are differences in the communication portion of the system. They are important, but criteria based on these factors are not those used to distinguish between Level One and Two. It is the integrated application structure that makes the difference.

The application structure of a hospital information system can be analyzed in two ways. The first is according to the number of application areas supported. The second is according to compatibility of various application areas with one another. Interdepartmental activities are coordinated and data are merged and reorganized. The integration of various departments is the key to smooth accomplishment of common goals and to better patient care. The tying together of Class A systems and Class B and C systems is the focus of this paper.

From the applications come the messages to hospital personnel. Familiar messages include orders, reports, schedules, notice of patient or material movement, charges and credit, and perhaps at a slightly less conscious level all the bits and pieces of information that are needed to construct consolidated records and summary reports. The working together of all of these functions in a well planned integrated whole has been the focal area of discussion and planning in furthering the current state of the art in hospital information systems.

Admitting, discharge and transfer (ADT) is the starting point of most existing information systems. It is the point of first contact with the patient. Basic identifying and business data collected here together with bed assignment are the key to controlling patient distribution and traffic throughout the hospital. From the admitting desk, notification can be sent to the large variety of services which may later have contact with the patient. They include the nursing station, laboratory, radiology, pharmacy, dietary, the switchboard and information desk, the mailroom, the chaplain, the cashier, credit department, administration, medical records, central supply, or indeed all areas which will have some contact with the patients are now hooked into the system.

From the patient's viewpoint, as well as that of the attending physician, the nerve center of the hospital is the nursing area. The nursing area is the crossroad of communications concerning patient management. More than any other clinical area, communications constitute a major element of the nursing application. From the wards, messages may go almost anywhere in the hospital. Places frequently contacted include: the operating suite, laboratory, radiology, heart stations and electrocardiography, admitting and paging, central supply and pharmacy, dietary, the blood bank, medical records, a host of other support areas, and the doctors' lounge. The nurse must keep all of these straight, see to it that the patient is correctly treated and satisfied, facilitate the doctors' activities, and finally, document everything that has been done.

The communications function of the computer is clearly in its element here, but many hospital information systems provide specific nurse support as well. Typical nurse communications include placing and cancelling of laboratory as well as all other admitting orders, transportation requests, and patient transfers among many more. From the complex hospital information systems a variety of summaries are available such as order and medication lists, patient condition and critical lists, and various narrative reports from other areas.

Specific to the nurse may be computerized versions of her own notes, vital sign and fluid balance summaries, the nursing care plan and medication distribution schedules. No other service of the hospital faces so many different problems of coordination. The prime test of any medical communications system is how well it can move needed information into and out of the nursing station. The laboratory is one of
the chief providers to this area effecting the efficient care of the patient.

With all of the other service areas of the hospital, the hospital information system is doing its major job if it affords only good communication. However, communication consists of messages and messages require content. If incoming messages from the nursing station were the only function of a hospital information system, the problem of content would be confronted and solved at the nursing station. Reporting, on the other hand, requires something different from each area, something characteristic of the ancillary function. The difficulty in structuring messages from the ancillary areas often depends on the complexity of that area's data and the complexity of the use to which that message is put by the nursing service. It is for this reason that a complex system of subsystems are being developed to adequately support what has been described above as a Class B and C hospital information system. It is also important to point out that very little actual success has been made in integrating the laboratory Class A system into a Class B or C hospital information system. This is also true for pharmacy, radiology and other ancillary subsystems.

It is at this point that one might look more carefully at what a clinical laboratory subsystem is comprised of. This will show the reader why the complexity of integration has been so slow in being realized in the current state of the art picture.

The Clinical Laboratory's Needs

It has been found that the more successful clinical laboratory systems have been located externally for the central data processing center. In most cases, the actual computer has been resident in the laboratory under laboratory control and direction. It is here in the lab where most working documents, such as collection lists, labels, worklists, load lists, management and patient reports are generated.

Obviously, many functions are totally laboratory oriented and only the outcomes or results and fiscal information needs to be communicated to the overall Class B or C systems. Most of these functions are dedicated to hematology, chemistry, urinalysis, microbiology, etc.

Major installations that have been attempting a successful merger of Class A and Class B or C systems are the National Institute of Health, St. Barnabus Hospital in New Jersey, with the revelation of major difficulties both in hardware and software compatibility and people problems as well.

The role of the laboratory must be seen as an intricate part of a "total hospital operation."

It is indeed at present a distributed data processing sub-center which must be integrated into a well-planned and well-organized hospital information system.

The ground work is explained above. Now for an active discussion on the posed question, "The Clinical Pathology Laboratory and Its Relationship to a Hospital Information System."

Summary and Conclusion

The best way to comprehend the intricate tangle of systems that are found in the modern computerized health care setting is to keep foremost in mind their combined purpose. Hospitals exist to further patient welfare through supporting the activities of physicians and associated professionals. These professionals operate as a team and must have communication which is fast and reliable if the best job is to be done. The job done by each specially trained individual must be coordinated.

Information about the jobs done provides the content of messages that flow among members of the health team. The purpose of these messages can be best identified if one remembers that some of the information describes or characterizes the patient himself. Some describe things that are being done for or to specific patients. Some information is a step removed from the patient and characterizes the medical environment as a whole or pertains to the hospital as an institution. It is in patient data that one sees the success or failure as a medical organization. If the computer systems in hospitals are always considered with these basic purposes and relations in mind, their value, their strengths and weaknesses, and other potential will be appreciated. It is with these ideas in mind that we can enter the discussion on the topic assigned.

In time, it may be expected that all of the existing systems will be pruned and good features will be brought together as a true medical information system. The three classes of development will, in the future, continue to merge. Progress in medical records systems will undoubtedly lead to their combination with hospital information systems, and applications will be designed with increasing frequency to be compatible with communications. To this will be added communications links to facilities outside the walls of the hospital such as physician's offices, community health centers, and other hospitals.

The author would like to express her appreciation to the following individuals who provided invaluable assistance in preparing this paper: Roger E. Shannon, M.D., Samuel Raymond, M.D., Ph.D., Mr. Gary Hammon and Mr. Kent Demuth.