

UNITED STATES ARMY  
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A STUDY TO DETERMINE WHETHER THE REACH  
COMPUTER SYSTEM OR A LIMITED COMPUTER SYSTEM  
IS BEST SUITED FOR THE BAPTIST HOSPITAL OF  
SOUTHEAST TEXAS, BEAUMONT, TEXAS

The writer wishes to express his sincere appreciation  
and his gratitude to Mr. Guy H. Dalrymple, Administrator of  
the Baptist Hospital of Southeast Texas, and to his staff

for the cooperation in the conduct  
of this study. A Problem Solving Project Report  
Submitted to the Faculty of

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In Partial Fulfillment of the Business  
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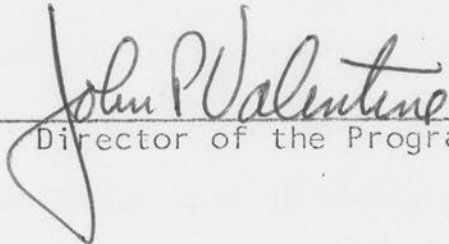
Major Edward J. Black, Jr., MSC

Waco, Texas

August, 1969

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APPROVED BY THE U. S. ARMY MEDICAL FIELD SERVICE SCHOOL:

  
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A Problem Solving Project Report

APPROVED BY THE PROJECT ADVISOR: Faculty of

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In Partial Fulfillment of

Requirements for the Degree



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TEXAS

Major Edward J. Black, Jr.

70 pages August, 1969

ABSTRACT

The problem was to determine whether the REACH computer system or a limited computer system is best suited for the Baptist Hospital of Southeast Texas, Beaumont, Texas.

The research methodology used included personal interviews with selected hospital personnel, a review of the hospital's accounting records and financial statements, and a review of the literature in the field of hospital administration.

The study concluded that the computer record keeping system best suited for the Baptist Hospital is the REACH system, designed by National Data Communications, Inc., Dallas, Texas; that the REACH system would pay for itself in reduced hospital costs; and that the REACH system would aid the hospital to improve the quality of patient care.

The study recommended that the hospital adopt the REACH system, institute an information and education program to acquaint hospital personnel with the system, and have the hospital's attorney conduct a study of the legal implications of computerizing medical records.



## ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation and his gratitude to Mr. Guy H. Dalrymple, Administrator of the Baptist Hospital of Southeast Texas, and to his staff for the cooperation and assistance rendered in the conduct of this study.

Special acknowledgment is due Mr. Roy G. Huckaby, Administrative Assistant; Mr. Robert E. Warren, Business Office Manager; Mrs. Agnes Jordan, Accountant; and Mrs. Mary K. Neichoy, Medical Records Librarian.

The Baptist Hospital of Southeast Texas is licensed by the Texas State Department of Health and is fully accredited by the Joint Commission on Accreditation of Hospitals.

In 1968, the hospital began construction of a 100-bed facility adjacent to the existing hospital. The new building will serve primarily as a maternity and gynecology unit and will contain a separate unit for teenagers. This new unit will bring the hospital's capacity to 423 beds and bassinets.

As a church-affiliated hospital, the Baptist Hospital takes its creed from Proverbs 3:27:

Withhold not good when it is due when it is in the power of thine hand to do it.

#### HISTORICAL SKETCH

The Baptist Hospital of Southeast Texas was established by charter on November 24, 1945. The hospital is owned and operated by the Baptist General Convention of Texas.

The Baptist Hospital was initially opened as a 125-bed hospital and received its first patients on October 15, 1949. The construction in 1958 of two 5-story wings containing 148 beds and 50 bassinets brought the hospital to its current capacity of 323 beds and bassinets.

The hospital is located on a twenty-acre tract of land adjacent to Highway 90 in Beaumont, Texas, at the traffic circle, where highways lead to all parts of Southeast Texas.

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<sup>1</sup>Jewel Hoberley, et al., Records Retention and Control, a pamphlet prepared for the Comptrollership Foundation (New York: Comptrollership Foundation, Inc., 1957), p. v.

## CHAPTER I

### INTRODUCTION

We are fast becoming a nation of record keepers. Because of the increased volume and cost of retention, it has become a top management problem, needing top management guidance.<sup>1</sup>

One of the major problems facing every hospital in the United States today is increasing costs. One factor contributing to this rising cost is the increasing complexity, volume, and cost of maintaining hospital records.

As modern medicine has increased in sophistication and healing capabilities, it has demanded more and more reports from laboratory, x-ray, and all other service departments in the hospital. The passage by Congress of the Social Security Amendments of 1965 (Public Law 89-97) focused attention on the need for more accurate and detailed business office records. Public Law 89-97 provides that the Social Security Administration will pay "reasonable costs" for medical care

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<sup>1</sup>Jewel Moberley, et al., Records Retention and Control, a pamphlet prepared for the Comptrollership Foundation (New York: Comptrollership Foundation, Inc., 1957), p. v.

provided Medicare beneficiaries. In order to comply with Social Security Administration requirements, hospitals have had to seek methods of improving their record keeping procedures and to devise new methods of patient billing which will insure that the patient is billed for the actual cost of services rendered.

To further compound the record keeping and storage problems, as hospitals have become big business they have inherited many of the problems that confront other businesses. One of these problems is the growing volume of records that must be prepared and retained by the hospital.

Records are essential to the operation of the hospital; however, their preparation and maintenance yield high personnel costs. In the patient care areas, readily available, continuous, up-to-date medical records are essential if a hospital is to provide high-quality medical care to its patients.

Many hospitals have turned to computers as a means of providing a rapid method of accumulating accurate and detailed accounting records which will meet the requirements for reimbursement billing to Medicare third-party payors.

Early computer applications in hospitals were limited largely to business office functions and inventory control,

as these were the areas in which the computer manufacturers had had the most experience. In recent years the focus of attention has shifted to the problem of computerizing medical records. Most of the major computer manufacturers have conducted research and studies in an effort to develop a computer system which will replace the hardcopy medical record with a medical record maintained electronically by computer. These systems are attractive to the hospital as they can provide instant information on the patient and accurate billings to individual patients for the actual cost of services rendered.

Unfortunately, many hospitals have given insufficient attention to the cost of computer systems before they were installed. Many administrators have the illusion that the acquisition of a computer will automatically solve all of their record keeping problems. However, it must be remembered that a computer system must pay its own way through present savings obtained or future costs avoided.<sup>2</sup>

<sup>2</sup>Gilbert C. Jacobus, "Sorting Sense from Nonsense in Hospital ADP Programs," Hospitals, XLI (May 1, 1967), 33.

Source: Annual reports and financial statements, Baptist Hospital of Southeast Texas, Beaumont, Texas, 1963-1967.

## CHAPTER II

### THE PROBLEM

#### Conditions Which Prompted the Study

This project study was undertaken for the following reasons:

1. The cost of maintaining records in the Baptist Hospital, particularly medical records, has risen significantly over the past several years (Table 1). The

TABLE 1

#### COST TREND FOR MAINTAINING MEDICAL RECORDS AT THE BAPTIST HOSPITAL

Year	Patient Days	Medical Record Department Cost	Cost per Patient Day
1967	88,927	\$66,560	\$0.75
1966	84,678	52,507	0.62
1965	80,684	47,871	0.59
1964	76,449	46,052	0.60
1963	81,233	45,580	0.56

Source: Annual reports and financial statements, Baptist Hospital of Southeast Texas, Beaumont, Texas, 1963-1967.

administrator desires to improve the record keeping procedures of the hospital and feels that the utilization of some type of computer system might be the answer to increasing clerical workloads and costs. This is of particular importance because the hospital will be opening a 100-bed satellite within the next year, which will result in a

substantial increase in clerical costs unless some method can be found to reduce clerical workloads.

2. The Baptist Hospital was selected as the site for a test of a completely computerized hospital information system. The test is being financed by a research grant of two million dollars provided by the Honeywell Corporation and National Data Communications, Inc. The test will be conducted by National Data Communications, Inc., beginning in November, 1968. The research grant is to be used to provide the computer equipment to the hospital and finance the test to include: installation of equipment, training of hospital personnel in the operation of terminal devices, and programming of the system. However, the administrator desires to know if his hospital can afford such a computerized record keeping system or if a limited computer system would be better suited to his institution.

## Statement of the Problem

The problem is to determine whether the REACH computer system or a limited computer system is best suited for the Baptist Hospital of Southeast Texas, Beaumont, Texas.

## Objectives

The objectives of this study are:

1. To analyze and describe the existing record keeping procedures of the Baptist Hospital.

2. To discuss two proposed methods of utilizing computer applications to improve the record keeping procedures of the Baptist Hospital. The discussion will be limited to two computer applications which represent the extremes of a continuum of possible computer applications. The MI system represents the minimum economically feasible system, while the REACH system represents the maximum possible system.

Other computer record keeping systems would simply be variations of one of these two systems.

## Criteria

Factors relative to the solution of this problem are:

1. The computer system recommended must be economical in terms of personnel and equipment and must be within the capabilities of those who are to use it.

2. All major changes must be evaluated for total hospital impact. The provision of support to treatment, diagnostic, and nursing service functions must be the primary consideration.

3. The system recommended must be easy for physicians and nurses to enter and to request information from.

4. The computer system must insure the privacy and the integrity of the patient information entered into the system.

#### Limitations

The system recommended cannot increase record keeping costs by more than one dollar per patient day.

#### Facts Bearing on the Problem

Data bearing on the problem are:

1. The Baptist Hospital of Southeast Texas is a non-profit, short-term, acute general hospital operating 323 beds and bassinets.

2. A 100-bed satellite hospital being constructed by the Baptist Hospital is scheduled for opening in July, 1969.

3. The testing of the REACH computer system is scheduled to begin at the Baptist Hospital on November 1, 1968.

4. The occupancy rate at the Baptist Hospital has been approximately 85 per cent for the last five years.

Assumptions

The following assumptions are made:

1. National Data Communications, Inc., will be able to get the REACH computer system to function to the satisfaction of the administrator and the staff of the hospital.
2. The present occupancy rate of the hospital will continue in the future.
3. A computer-operated drug control system will reduce drug losses at the nurses' stations by a minimum of \$30,000 annually.
4. The occupancy rate in the satellite will be the same as the occupancy rate in the existing facility.
5. The hospital will allocate sufficient funds to install a computerized record keeping system if the cost falls within the limitation set by the hospital administrator.
6. The identification badges proposed by National Data Communications, Inc., for identifying physicians and nurses to the computer system will satisfy existing legal requirements and the requirements of the Joint Commission on Accreditation of Hospitals for signatures on medical records and physicians' orders.
7. National Data Communications, Inc., will be able to develop an acceptable system for placing physicians' and

nurses' notes into the electronically maintained medical record.

#### Definition of Terms

The following terms are defined as used by the author:

1. Automatic Data Processing (ADP)--Any machine system for mechanically recording, processing, summarizing, and reporting data. This includes punched card equipment and electronic computers.

2. Cathode Ray Tube (CRT)--A picture tube similar to a television picture tube on which information stored in the computer can be displayed.

3. Disk Storage--A data storage device using magnetic disks in which all stored information is immediately available for access by the computer.

4. Hardcopy Records--All hospital records which are handwritten or typed.

5. Hospital Records--All records maintained by the hospital to include medical records, accounting records, and inventory records.

6. Input/Output--A general term for equipment used to communicate with a computer and the data involved in the communication.

7. Medical Record--An orderly written report of a patient's complaint, history, physical examination, diagnostic findings, treatment, and final results.

8. MI--Medical Information. The shared computer system designed by Medical Information, Inc., to provide accounting and financial reporting services to member hospitals.

9. Online--A term used to describe a computer system in which the operation of peripheral equipment, such as disk storage and terminal devices, is linked directly to and is under the control of the computer.

10. Random Access--A data storage device in which the data is arranged in such a manner that the computer can retrieve any desired data instantaneously.

11. REACH--Realtime Electronic Access Communications for Hospitals. The total hospital information system designed by National Communications, Inc., which is to be tested at the Baptist Hospital of Southeast Texas.

12. Realtime--The processing of information or data instantaneously so that the results of the processing are available to influence the process being monitored or controlled.

13. Reminder Notices--The messages sent to service departments by the computer to remind personnel of pending

action or the need for action, e.g., a reminder to the nurse that a particular patient is due to receive medication.

14. Shared Computer System--A computer system which is designed to provide computer service to more than one customer.

15. Terminal Device--An input/output device used to communicate with the computer. The device is used to place data into the computer and to retrieve data stored in the computer system.

### Research Methodology

In conducting this study three methods of data collection were used, as follows:

1. Personal observation and interviews.--The author observed in detail the existing methods of record keeping in the Baptist Hospital. Interviews were conducted with the assistant administrator, the business office manager, the accountant, and the medical records librarian to determine the methods used to prepare and maintain medical records and accounting records. Interviews were also held with the administrator to determine what limitations, if any, he had placed on proposed solutions to the problem.

2. Cost and workload data.--Cost and workload information was collected from the accounting records and the

financial statements of the hospital to determine the cost of maintaining medical records and to determine the possible savings which could be realized through personnel reductions.

3. Review of the literature.--A review of the literature on computer usage within the hospital field was conducted.

social and scientific progress of civilization requires sound hospital management. The complexity of hospital management was emphasized by Doctor MacEachern when he wrote:

The science and art of hospital administration are growing more and more complex due to the rapidly extending field of hospital service and the advances of scientific medicine. And they will ever increase in complexity because the twentieth-century hospital must keep pace with the social and scientific progress of civilization.

The need for more efficient management will continue to grow in keeping with the progress being made not just in medicine but also in all fields.

The impact of science, medicine, and technology upon man during the twentieth century has been more profound than

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<sup>1</sup>Malcolm T. MacEachern, Hospital Organization and Management (3rd rev. ed.; Chicago: Physicians' Record Company, 1957), p. xiii.

### CHAPTER III

#### REVIEW OF THE LITERATURE

The modern hospital, regardless of its size, is one of the most complex organizations in existence. The continuing social and scientific progress of civilization requires sound hospital management. The complexity of hospital management was emphasized by Doctor MacEachern when he wrote:

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<sup>1</sup>Malcolm T. MacEachern, Hospital Organization and Management (3rd rev. ed.; Chicago: Physicians' Record Company, 1957), p. xiii.

during any other period in man's long history. The computer--a product of this period--has a greater potential for human advancement than any other invention in history.<sup>2</sup>

Over the last several years an abundance of literature describes the growing use of computers in the health care field and the various applications for which computers have been used. The list of possible computer applications in the hospital is lengthy. One author lists eighty possible uses for computers in the hospital. These applications range from nursing service through pharmacy service to scheduling anesthesia procedures.<sup>3</sup>

In 1962 the American Hospital Association conducted a survey of member hospitals to determine the extent of computer usage. Replies from 6,049 hospitals indicated that 422 were using some type of automatic data processing equipment. Of this number only 39 were using computers. A similar survey conducted in 1965 indicated that some 250 hospitals were utilizing computers.<sup>4</sup>

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<sup>2</sup>Dorothea Courtney, "Management Disillusion: Its Sources and Solutions," Hospitals, XLI (May 1, 1967), 46.

<sup>3</sup>Thomas P. Weil, "80 Basic Applications for ADP Equipment," Hospitals, XLI (May 1, 1967), 81-84, 89.

<sup>4</sup>Courtney, "Management Disillusion," p. 46.

The first comprehensive study of potential usage of computers in the hospital was reported by Wertz in 1962.

The study was conducted at the Baylor University Medical Center, Dallas, Texas. The major findings of the study were:

1. General purpose, not special purpose, computers are required for hospitals.
2. The computer must have a random access capability (be able to update files as events occur and respond to inquiry for specific patient information).
3. The computer will first be applied in the business office, for such applications as patient accounting, payroll, etc.<sup>5</sup>

The early computer applications in hospitals were largely in the areas of patient statistics, diagnostic indices, and accounting. The accounting applications included payroll, accounts payable, accounts receivable, and general ledger. These applications have progressed through more sophisticated business type applications to the point where most accounting functions can be handled completely by computers.<sup>6</sup>

As computer technology progressed, attention turned

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<sup>5</sup>Frederick E. Wertz, "Electronic Data Processing for Hospitals--Current Practices and Future Trends--Part I," Hospitals, XXXVI (May 1, 1962), 48.

<sup>6</sup>Crofford O. Vermillion, "Data Processing Methods," Hospitals, XLII (April 1, 1968), 37.

to the more difficult problem of expanding computer-assisted data processing into the patient care areas. Early attempts to extend computer applications into the medical records area were limited largely to providing assistance in the computation of hospital medical statistics. These statistics included such items as the number of discharges, days of care, deaths, deliveries, abortions, stillbirths, average length of hospital stay, etc.<sup>7</sup>

Recent developments in computer technology have made it feasible to maintain medical records completely by computer. This includes physicians' and nurses' observations, procedures, and conclusions.<sup>8</sup>

A number of computer systems have been tested in an attempt to develop a system which will maintain medical records entirely by computer. However, all of these systems are still experimental in nature and as yet no hospital has converted to a fully computerized medical records system.

The problems encountered by initial attempts to computerize medical records were concerned with how to put

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<sup>7</sup>Edward J. Thoms, "Don't Be Afraid of Medical Records on Computers," Hospital Management, CII (October, 1966), 31.

<sup>8</sup>David E. Olsson, "Automating Nurses' Notes--First Step in a Computerized Record System," Hospitals, XLI (June 16, 1967), 69.

patient care data into the computer. Many input methods were tried, including punched cards, punched-paper tape, and typewriters connected directly to the computer. All of these methods proved to be either too slow or too time consuming or required typing skill on the part of physicians. Recent developments in the field of computer hardware have largely overcome the drawbacks of the earlier input methods.<sup>9</sup>

Computer manufacturers have developed input/output systems utilizing a cathode ray tube (CRT) which is attached to the input/output terminals to display information stored in the computer. The CRT terminal is used to input information into the computer system and for inquiry and output of information from the system.<sup>10</sup>

The literature indicates that there is some reluctance on the part of many physicians, nurses, and clerical personnel in the hospital to accept automation. This distrust of computers can destroy the system's effectiveness unless it can be overcome. The way to overcome this distrust is to

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<sup>9</sup>Stanley E. Jacobs, "Swiftly Advancing Technology Taxes Administrative Know-How," Hospitals, XLI (May 1, 1967), 41.

<sup>10</sup>Leonard W. Cronkhite, Jr., "Patient Location Control as a First Step Toward a Total Information System," Hospitals, XLI (May 1, 1967), 108.

inform all hospital personnel as completely as possible about the computer system and what their roles will be. In this way hospital personnel feel they are a part of the plans, and many misconceptions can be dispelled in advance.<sup>11</sup>

There are many reasons for hospitals to consider the use of computers. The major reasons are to improve the quality of patient care and to reduce costs.<sup>12</sup> Weil states that the two most important functions of a computer system in a hospital are to:

1. Improve the quality of patient care by a more effective utilization of personnel, supplies, and material.
2. Assist in the management of a hospital to allow for the best care at the lowest cost to the community.<sup>13</sup>

One of the primary areas for cost savings in the hospital is in the area of personnel costs. Approximately two-thirds of a hospital's operating expenses are for wages and

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<sup>11</sup>Walter L. Bennett, "A Viable Computer-Based Hospital Information System," Hospital Management, XIII (April 1, 1967), 43.

<sup>12</sup>Mark S. Blumberg, Computers for Hospitals (Menlo Park, Calif.: Stanford Research Institute, 1963), p. 1.

<sup>13</sup>Thomas P. Weil, "Will Computer Installations Improve Quality of Patient Care?," Hospital Management, CIV (September, 1967), 42.

<sup>17</sup>Jacobus, "Sorting Sense from Nonsense," p. 35.

salaries.<sup>14</sup> The computer can reduce clerical workload and thereby effect cost savings through reduced personnel costs.<sup>15</sup>

Possibly the best opportunity for cost savings is the automatic processing of physicians' orders, an activity that accounts for approximately 20 per cent of a hospital's operating costs when the orders are processed manually. Lane states that "an online system which captures data at the nurses' station level and that fully automates all subsequent record keeping can reduce this percentage significantly."<sup>16</sup>

A third area for significant dollar savings through the use of a computer is drug control. One study showed that the lack of proper control over drugs at the nurses' stations resulted in an annual loss of some \$32,000. Computer-operated drug control systems have been shown to reduce these losses to a level where they are no longer significant.<sup>17</sup>

The utilization of computers has been shown to offer many advantages to the hospital. These include:

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<sup>14</sup>Henry N. Pratt, "The High Cost of Hospital Care Is Going Higher," Hospitals, XXXII (June 1, 1958), 41.

<sup>15</sup>Baldwin G. Lamson, et al., "A Hospitalwide System for Handling Medical Data," Hospitals, XLI (May 1, 1967), 77.

<sup>16</sup>Robert A. C. Lane, "Success of Shared Facility Hinges on Adept Planning," Hospitals, XLI (May 1, 1967), 95.

<sup>17</sup>Jacobus, "Sorting Sense from Nonsense," p. 35.

1. Reduced costs.
2. Increased effective nursing time.
3. More efficient use of other medical and para-medical personnel.
4. Improved patient care.
5. More accurate and timely reports for management.<sup>18</sup>

Although the computer can handle many routine tasks and do them faster and more accurately than humans can, it must be remembered that the physician, the nurse, and the administrator remain the decision makers on all matters of importance and, particularly, on all matters related to patient care.<sup>19</sup>

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<sup>18</sup>William Siler and Henry Korn, "A Working Total Information System Is at Least a Year Away," Hospitals, XLI (May 1, 1967), 99; Bennett, "A Viable Computer-Based Hospital Information System," p. 43.

<sup>19</sup>Jacobus, "Sorting Sense from Nonsense," p. 33.

Accounting records are maintained in three locations within the hospital: (1) the business office, (2) the accounting office; and (3) the purchasing agent's office. Medical records are maintained by the medical records department.

Business Office

The business office maintains the accounts receivable for all patients. At the time a patient is admitted to the hospital, the admitting clerk initiates a patient ledger card and a patient statement. These two records are sent

## CHAPTER IV

## DISCUSSION

The following discussion will describe the record keeping system currently in use at the Baptist Hospital and will present two proposed methods of applying computer techniques to improve the record keeping system.

The Current System

The record keeping system currently used by the Baptist Hospital is basically a manual system. All records-- accounting, medical, and inventory--are prepared using hard-copy written forms. The only machine procedures used in the system are Burroughs posting and proofing machines. The hospital does not use any automatic data processing equipment, either punched card or computer. Accounting records are maintained in three locations within the hospital: (1) the business office, (2) the accounting office, and (3) the purchasing agent's office. Medical records are maintained by the medical records department.

Business office

The business office maintains the accounts receivable for all patients. At the time a patient is admitted to the hospital, the admitting clerks initiate a patient ledger card and a patient statement. These two records are sent to the accounts receivable section of the business office, where they are placed in the active file. The active accounts receivable are filed by floor, ward, and room number. The accounts receivable section uses Burroughs posting machines to update and to check the patient accounts.

The accounts receivable section maintains the individual accounts for all patients. Posting of charges to the patient accounts is made from medication and service charge slips sent to this section from the nursing service, the laboratory, the radiology department, the physical therapy department, the pharmacy, central supply, and the emergency room. When the charge slips are received in the accounts receivable section, they are sorted manually by floor, by ward, by room number, and, finally, by patient.

The posting machine operators pull each patient's ledger card and statement from the file and place them in the posting machine. The operator first enters the previous balance shown on the account, then enters the daily

room charge, and finally posts each separate charge slip. The machine lists each charge separately, totals the current charges and the previous balance, and prints the new balance of the account on both the ledger card and the patient statement. As a part of the accuracy check, the posting machines also list the new charges on a separate list and provide a total of all new charges entered on the patient accounts.

When all of the accounts have been processed, the charge slips are given to another clerk for listing on the proof machines. The listing from the proof machine is compared to the check listing from the posting machines, and any errors are corrected.

The Baptist Hospital has a contract with the Professional Men's Association (PMA) to provide financing for those patients who are not covered by hospitalization insurance or Medicare and who wish to pay their hospital bill on an installment basis.

When a patient is being discharged, the business office is notified, and the accounts receivable section contacts all service departments to determine if there are any charge slips for that patient which have not been posted. Any charge slips for the patient being discharged which are in the service departments are handcarried to the business office. The patient's account is then updated, and the patient's statement is taken to the cashier's office. The patient ledger card is placed in a separate file, where it is maintained until the account is paid or is transferred

to the Professional Men's Association for collection.

The business office also has the responsibility for preparing reimbursement billings to third-party payors for those patients covered by Blue Cross or other commercial hospitalization insurance plans. Those patients covered by Blue Cross or commercial hospitalization insurance are interviewed at the time of admission and sign the necessary reimbursement forms. After the patient has been discharged, the business office completes the forms and forwards them to the appropriate insurance company for payment. Any amount not covered by insurance is billed directly to the patient.

Professional Men's Association

The Baptist Hospital has a contract with the Professional Men's Association (PMA) to provide financing for those patients who are not covered by hospitalization insurance or Medicare and who wish to pay their hospital bill on an installment basis.

At the time of admission, the patient, or a member of the patient's family, is interviewed to determine if the hospitalization will be covered by either insurance or Medicare. Patients who have neither of these and who will not be able to pay the bill in full upon discharge are directed to

Payable Distribution Journal. This record constitutes the

to the PMA office, which is located directly across the hallway from the admitting office. PMA will work out the details with the patient or the family for a time-payment plan to cover the hospital bill. At the time of discharge, the hospital's accounts receivable for these patients are transferred to PMA on a discount basis. Depending upon the circumstances of the individual case, PMA pays the hospital either 80 per cent or 90 per cent of all collections made on the account.

PMA is basically a collection agency which relieves the hospital of the cost of collecting from those patients not covered by some type of hospitalization insurance or by Medicare. The Baptist Hospital feels that it is cheaper to pay PMA to collect the accounts than to do so itself. The hospital also feels that it is a better public relations policy, since all correspondence on the account is sent out by PMA rather than by the hospital.

#### Office of the purchasing agent

The purchasing agent's office maintains all inventory records and the detail accounts payable for all supplies and services purchased by the hospital. All invoices received for purchases made by the hospital are posted to the Accounts Payable Distribution Journal. This record constitutes the

hospital's detailed accounts payable. A copy of this journal is provided to the accounting office for posting to the general ledger on a monthly basis. The purchasing agent also provides the accounting office with a detailed list of the cost of all supplies issued from central stores to each department of the hospital on a monthly basis.

The inventory records maintained by the hospital consist of Remington Rand "traveling requisition" cards. All receipts from vendors and all issues to various hospital departments are posted to these cards. This system provides a current balance on hand and usage data on each item of material stocked by central stores.

#### Accounting office

The accounting office maintains the hospital's general ledger, its cost distribution ledger, and its payroll records.

The business office provides the accounting office with a daily total of all patient charges by revenue-producing department, a daily summary of cash receipts, and the amount of courtesy discounts which have been allowed. The accounting office records these items in the appropriate general ledger accounts. The hospital's general ledger chart of accounts corresponds closely to the chart of accounts recommended by the American Hospital Association.

The accounting office maintains payroll records for all hospital employees and prepares the hospital's biweekly payroll. Based upon individual payroll slips provided by all departments in the hospital, the accounting office calculates the hospital's payroll and writes payroll checks for all hospital employees.

The accounting office uses a Burroughs posting machine to prepare the master payroll and individual payroll checks and to update the employees' earning records. The master payroll is subtotaled by department and posted to the cost distribution ledger.

The cost distribution ledger contains a separate section for each department in the hospital. This ledger is used to prepare the expense portion of the income and expense statements of the hospital.

On a monthly basis, the purchasing agent provides the accounting office with an Accounts Payable Distribution Journal. From this journal, the accounting office makes entries in the general ledger accounts payable control account and in the cost distribution ledger and prepares checks for the payment of the accounts. As noted above, the detailed accounts payable records are maintained by the purchasing agent; the accounting office maintains only a general ledger control account on accounts payable.

Medical records department

The medical records department is responsible for the assembly, the completion, the storage, and the safeguarding of all medical records prepared in the Baptist Hospital.

At the time a patient is discharged from the hospital, the patient's medical records are sent to the medical records department, where a clerk assembles the documents in the prescribed order. The record is then checked to determine if all required documents have been included and if they are all complete. The clerk prepares a "lack sheet" on which are listed forms and reports which are either absent or incomplete. This includes such items as patient history, operation report, signatures, physical examination report, and discharge summary, which require action by the attending physician.

After the record has been checked, it is dated and placed in the "Physician's Room" adjoining the medical records department for completion by the physician. The attending physician, under medical staff bylaws, is allowed thirty days to complete the record. If the record has not been completed within twenty days, the medical record librarian sends the physician a written request to complete the record within ten days. Under the medical staff bylaws, any

attorneys, insurance companies, and relatives.

physician who is delinquent in completing the records on his patients has his admitting privileges suspended, except for emergencies and maternity cases.

After the records have been completed, they are filed in register number sequence in the medical records library. The hospital maintains the original medical record for five years. At the end of five years the record is microfilmed, and the original is destroyed.

The medical records department has the responsibility for recording and reporting all patient statistics. This includes the number of admissions, discharges, deaths, births, and patient days. Separate categories of statistics are maintained for Medicare and non-Medicare patients. The department also prepares all reports, such as birth and death certificates, required by the Texas State Bureau of Vital Statistics and the Jefferson County Medical Examiner.

The medical records department operates a central typing pool to transcribe physicians' discharge summaries, consultation reports, operation reports, patient histories, progress notes, and physical examination reports. The medical records department also has the responsibility for preparing replies to all requests for information on former patients. This includes requests for information from attorneys, insurance companies, and relatives.

The Medical Information System

The Medical Information (MI) system proposed by Medical Information, Inc., is a shared computer system which is designed to provide accounting and financial reporting services to member hospitals.

The MI system consists of an IBM 360 computer with random access storage and tape drives located in the offices of Medical Information, Inc. The hospital would be linked to the central computer facility by means of an IBM 1050 teleprocessing system. The IBM 1050 teleprocessing system consists of a keyboard printer and a card reader. The hospital would also have keypunch machines for preparing punched cards for input into the system.

The MI system would include the following applications:

1. Accounts receivable.
2. Patient billing.
3. Medicare cost allocation.
4. Payroll preparation.
5. General ledger.

Input of information into the MI system is through the use of punched cards transmitted to the central computer using the card reader. Information and reports to the hospital would be punched in the hospital on the keyboard printer.

Under the proposed MI system the hospital would have to establish a data processing section to keypunch cards, transmit cards to the central computer, and receive reports transmitted to the hospital from the central computer on the keyboard printer. All information to be put into the system would be sent to the data processing section, where it would be transferred to punched cards and transmitted to the central computer. This includes information on admissions, discharges, patient charge slips, insurance coverages, and other financial data required for the system.

Hospital requests for information from the system would be handled in the same manner; i.e., the request for information would be sent to the data processing section, where a card would be punched and transmitted to the central computer. The requested information would be sent to the hospital by means of the keyboard printer.

The MI system would provide the following information and reports to the hospital:

1. General Ledger.
2. Medicare Cost Allocation Report.
3. Patient statement.
4. Diagnosis Delinquency Analysis--a list of accounts which require a final diagnosis for insurance billing purposes.

5. Accounts Receivable Analysis--a list of all accounts receivable.

6. Insurance Accounts Receivable--a list of accounts receivable from insurance companies.

7. Daily Patient Census--a list of patients by physician and a list of unoccupied rooms as of midnight each day.

8. Biweekly payroll computation.

The proposed MI system would contain a complete list of charges for all medications and services which the hospital has available for its patients. This would eliminate the necessity for manual pricing of individual patient charge slips. The input from the hospital would include only an identification of the patient and the medication or service provided the patient. The computer would automatically price the items and charge them to the patient's bill.

The adoption of the MI system would eliminate the requirement for the five personnel currently maintaining accounts receivable and the two personnel in the general accounting office. However, Medical Information, Inc., estimated that the hospital would require a minimum of seven personnel to staff the data processing section for the current workload and a minimum of ten personnel to staff the section after the opening of the satellite.

(See Table 2 for an analysis of personnel requirements with the MI system). Therefore, there would be no savings through personnel reductions at the current workload against which to offset the additional cost of the MI system.

TABLE 2  
PERSONNEL REQUIREMENTS IN SELECTED RECORD KEEPING DEPARTMENTS OF THE BAPTIST HOSPITAL, MI SYSTEM

Department	Personnel as of 4-30-68 <sup>a</sup>	Estimated Personnel Requirements After Opening of Satellite <sup>a</sup>		Estimated Personnel Savings
		Manual System	MI System	
Admitting Office	6	8	8	. . . .
Patients' Accts	5	7	. . . .	7
General Acctg	2	3	. . . .	3
Medical Records	19	25	25	. . . .
Insurance Billing	6	8	4	4
Data Proc Section	. . . .	. . . .	10 <sup>b</sup>	(10)
TOTAL	38	51	47	4

<sup>a</sup>Selman Clark, Associate Administrator, private interview held at the Baptist Hospital of Southeast Texas, Beaumont, Texas, May, 1968.

<sup>b</sup>Based upon personnel estimates provided the Baptist Hospital of Southeast Texas by Medical Information, Inc., MI System, p. 33, and annual wage scales in effect at the Baptist Hospital of Southeast Texas at the time of the study.

As shown on Table 2, the implementation of the MI system would result in personnel savings after the opening of the satellite through a reduction of clerical personnel required to process insurance billings.

Table 3 shows that the MI system would provide a

TABLE 3

PERSONNEL COSTS IN SELECTED RECORD KEEPING DEPARTMENTS OF THE BAPTIST HOSPITAL, MI SYSTEM

Department	Current Annual Cost <sup>a</sup>	Estimated Cost After Opening Satellite <sup>b</sup>		Estimated Cost Savings
		Manual System	MI System	
Admitting Office	\$ 20,100	\$ 26,700	\$ 26,700	. . . .
Patients' Accts	18,800	25,400	. . . .	\$25,400
General Acctg	9,600	13,200	. . . .	13,200
Medical Records	66,600	86,700	86,700	. . . .
Insurance Billing	25,200	33,600	16,800	16,800
Data Proc Section	. . . .	. . . .	48,000	(48,000)
TOTAL	\$140,300	\$185,600	\$178,200	\$ 7,400

<sup>a</sup>Obtained from: Financial Statement, Baptist Hospital of Southeast Texas, Beaumont, Texas, April, 1968.

<sup>b</sup>Calculated from: Table 2, Personnel Requirements in Selected Record Keeping Departments of the Baptist Hospital, MI System, p. 33, and annual wage scales in effect at the Baptist Hospital of Southeast Texas at the time of the study.

savings of approximately \$7,400 through the elimination of the requirement for four clerical personnel in the insurance billing section after the opening of the satellite.

It should be pointed out that no employee of the hospital would be discharged as a result of implementing the MI system. The administrator of the hospital indicated that those personnel whose positions would be eliminated by the MI system could be transferred either to positions in the data processing section or to the new clerical positions created by the opening of the satellite. Therefore, there would be an actual savings of \$7,400 to the hospital in personnel costs, while no employee would be discharged, since the clerical positions created by the opening of the satellite would have to be filled whether or not a computer system is installed.

Medical Information, Inc., has quoted a standard price of 50 cents per patient day to operate the MI system regardless of the number of patient days generated by the hospital. This would amount to some \$44,000 to \$45,000 per year, based upon the 1967 workload, and some \$57,850 per year after opening the satellite. This cost is within the \$1 per patient day cost limitation placed on proposed solutions by the hospital administrator.

Since the MI system includes only financial record keeping and reporting and relies upon punched cards for input of data into the system, it would not aid in solving the problems the administrator indicated the hospital is having with lost and late charges, poor inventory control, and increasing cost of maintaining medical records.

The major advantages of the MI system are as follows:

1. Elimination of erroneous pricing of medications and services provided patients.
2. Elimination of manual procedures for maintaining financial records.
3. Provision of more timely financial and statistical data to hospital management.

The major disadvantages of the MI system are as follows:

1. Increased cost of operations.
2. Only financial applications included, which does not relieve the problem of medical records or inventory control.
3. Continued manual preparation and handcarrying of charge slips, which will not alleviate the problem of late and lost patient charges.

#### The REACH System

REACH--Realtime Electronic Access Communications for

Hospitals--is a shared computer system designed to provide member hospitals with a computer operated total hospital information system. The REACH system, designed by National Data Communications, Inc., is designed to link dynamically all essential hospital activities--patient care, administration, education, and research.

The REACH system consists of a Honeywell DDP-516 computer, a 450-line-per-minute printer, and a 9.2-million-character disk storage device located in the hospital. The hospital computer would be linked on a realtime basis to a high-speed Honeywell H-2200 computer and a 300-million-character disk storage device located in the offices of National Data Communications, Inc. The central computer system would also include magnetic tape drives and a 1300-line-per-minute printer. The central computer system would have an alternate H-2200 computer identical to the main system to provide backup capabilities in the event of equipment malfunctions.

In its complete implementation, the REACH system would include the following applications:

1. Medication and service ordering for patients.
2. Patient scheduling.
3. Medication and service reminder notices.
4. Medical record maintenance and review.

5. Reporting of laboratory and x-ray test results.
6. Service department scheduling.
7. Patient billing.
8. Accounts receivable.
9. General ledgers.
10. Medicare cost allocation.
11. Medicare, Blue Cross, and other hospitalization insurance billings.
12. Payroll preparation.
13. Inventory control.
14. Patient census reporting.

Input of information into the system would be accomplished through the use of video-display devices (cathode ray tubes) attached to an alpha-numeric keyboard and character printer. The terminal device resembles a typewriter with a small television set mounted on top. In addition to the regular typewriter keyboard, a row of special-function keys is mounted on the terminal device.

Personnel authorized to utilize the terminals would be provided with a special identification badge which would activate the terminal and would identify the user to the system. The terminal would also have the ability to read patient identification cards for the purposes of inquiry and

of medication and service ordering. (See Appendix A for a detailed discussion of the operation of the terminal device.)

Terminals would be located at all nursing stations, the pharmacy, the laboratory, the radiology department, the business office, the medical records department, and the purchasing agent's office. The terminal devices would also be used for inquiry into the system for any information desired.

The normal requirements at the nursing stations would be to inquire into the system for information on a particular patient or to order medication or service for a patient. If information on a patient is desired, the user can select any part or all of a patient's medical record, which would be displayed on the cathode ray tube (CRT). If a physician wishes to order medication or tests for a patient, he would be shown a list of types of medications or tests available and can select the desired medication or test. The ordering of medication or tests would set in motion a series of actions by the system. These actions would include scheduling, reminder messages, and file updating. (See Appendix B for a more detailed discussion of the inquiry and order processing system.)

The REACH system would eliminate virtually all manual

record keeping in the hospital. One of the basic concepts of the system is that data need be entered into the system only one time. This single entry of data would update all records and files maintained by the computer. (See Appendix C for a list of the reports and files generated by the REACH system.)

The REACH system would completely eliminate the necessity for maintaining hardcopy medical records and accounting records. All information pertaining to a patient would be electronically entered in his medical record, and his bill would be charged for all medications given and all services performed. Simultaneously, the computer would update the inventory records maintained for central supply and the pharmacy. When some service, such as laboratory tests, is ordered for a patient, the computer would prepare specimen collection schedules, reminder notices, laboratory workload schedules, and test requisitions. When the tests have been completed, the laboratory would enter the results into the system; and the computer would automatically report the test results to the nursing station, enter the results in the patient's medical record, charge the patient's bill, and prepare a daily summary of test results for the patient, which is then available for review by the physician.

One of the major considerations of the hospital administrator is the operating cost of the REACH system. National Data Communications, Inc., has quoted a standard cost, regardless of workload, of \$2.25 per patient day to operate the system after the test has been completed.

Based upon the assumption that the hospital's current occupancy rate of 85 per cent will continue in the future and that the occupancy rate of the satellite will be approximately the same, the estimated future workload of the hospital would be approximately 115,700 patient days annually. A workload of 115,700 patient days would result in an annual operating cost of \$260,325 (115,700 patient days x \$2.25) for the REACH system. This is \$144,625 ( $\$260,325 - \$1 \times 115,700$  patient days) over the limitation placed on proposed solutions by the administrator of the Baptist Hospital.

As shown in Table 4, an analysis of personnel requirements in selected record keeping areas reveals that the requirements for thirty-five personnel would be eliminated by the implementation of the REACH SYSTEM.

Table 5 shows that the elimination of these personnel requirements would result in an annual savings in personnel costs of some \$125,900.

It should be pointed out that no employee of the

TABLE 4

## PERSONNEL REQUIREMENTS IN SELECTED RECORD KEEPING DEPARTMENTS OF THE BAPTIST HOSPITAL, REACH SYSTEM

Department	Current Personnel as of 4-30-68	Estimated Personnel Requirements After Opening of Satellite		Estimated Personnel Savings
		Manual System	REACH System	
Admitting Office	6	8	6	2
Patients' Accts	5	7	...	7
General Acctg	2	3	...	3
Medical Records	19	25	8	17
Insurance Billing	6	8	2	6
TOTAL	38	51	16	35

Source: Selman Clark, Associate Administrator, private interview held at the Baptist Hospital of Southeast Texas, Beaumont, Texas, May, 1968.

Selected Record Keeping Departments of the Baptist Hospital, REACH System, p. 42, and annual wage scales in effect at the hospital would be discharged as a result of implementing the

REACH system. The administrator of the hospital indicated that sufficient clerical positions would be created by the opening of the satellite to allow placement of all employees whose positions would be eliminated by the REACH system.

Therefore, there would be an actual savings to the hospital

The personnel savings of \$125,900, coupled with the

assumed annual savings of \$125,900 which can be

TABLE 5  
PERSONNEL COSTS IN SELECTED RECORD KEEPING DEPARTMENTS  
OF THE BAPTIST HOSPITAL, REACH SYSTEM

Department	Current Annual Cost <sup>a</sup>	Estimated Cost After Opening Satellite <sup>b</sup>		Estimated Cost Savings
		Manual System	REACH System	
Admitting Office	\$ 20,100	\$ 26,700	\$20,100	\$ 6,600
Patients' Accts	18,800	25,400	. . . .	25,400
General Acctg	9,600	13,200	. . . .	13,200
Medical Records	66,600	86,700	31,200	55,500
Insurance Billing	25,200	33,600	8,400	25,200
TOTAL	\$140,300	\$185,600	\$59,700	\$125,900

<sup>a</sup>Obtained from: Financial Statement, Baptist Hospital of Southeast Texas, Beaumont, Texas, April, 1968.

<sup>b</sup>Calculated from: Table 4, Personnel Requirements in Selected Record Keeping Departments of the Baptist Hospital, REACH System, p. 42, and annual wage scales in effect at the Baptist Hospital of Southeast Texas at the time of the study.

in personnel costs, while no employee would be discharged, since the new clerical positions created by the opening of the satellite will have to be filled whether or not a computer system is installed.

The personnel savings of \$125,900, coupled with the

assumed annual savings of a minimum of \$30,000 which can be expected through reduced drug losses from the nursing stations, would bring the cost of the REACH system within the limitation placed on proposed solutions by the administrator.

Additional cost savings can be anticipated as a result of implementing the REACH system. However, it is impossible to place a dollar value on these savings until the system has been in operation for a period of time. These savings would include reduction of overtime, elimination of lost patient charges, and elimination of erroneous pricing of medication orders in the pharmacy.

Other, nonmonetary benefits can be anticipated from the implementation of the REACH system. The primary nonmonetary benefit to be derived from the system is improved patient care. The REACH system will aid in improving the quality of patient care through more rapid reporting of various laboratory and x-ray test results and by relieving nurses of many clerical duties, thereby allowing them more time for direct patient care activities.

The major advantages of the REACH system are as follows:

1. Elimination of manual record keeping procedures, thus reducing personnel costs.

2. One-time entry of information and data into the system, thus eliminating duplication and reducing clerical workload.

3. Reduction of the amount of time professional personnel must devote to processing medication orders.

4. Provision of improved control over drugs at the nursing stations, thus reducing drug losses.

5. Elimination of lost and late charges for medications and services provided to patients.

6. Provision of more accurate and timely financial and statistical information to hospital management.

7. Improved inventory control in the pharmacy and central supply.

8. Elimination of erroneous pricing of medications and services provided to patients.

The major disadvantages of the REACH system are as follows:

1. Difficulty of gaining acceptance of an automated system and new procedures by physicians, nurses, and clerical personnel.

2. Training of all personnel, including physicians on the hospital staff, in the operation of the terminal devices used for inquiry and input of data into the system.

3. Increased cost of operations, although in the long run the system can be expected to effect savings which will completely offset the operating cost of the system.

#### Summary

One of the major problems confronting hospitals today is rising costs. The increasing cost of maintaining hospital records has been one factor contributing to the rising costs. In the Baptist Hospital, the cost of maintaining medical records alone increased by 21 per cent from 1966 to 1967.

This study examined two computer systems which have been proposed to improve record keeping procedures in the hospital and to reduce, or at least to stabilize, the cost of maintaining hospital records. The first computer system examined was the Medical Information (MI) system. The MI system is a shared computer system for financial applications.

The major advantages of the MI system are as follows:

1. Elimination of erroneous pricing of medications and services provided to patients.
2. Elimination of manual procedures for maintaining the hospital's financial records.

3. Provision of more timely financial and statistical data to hospital management.

The major disadvantages of the MI system are as follows:

1. Increased operating costs.

2. Provision for financial application only.

3. Continued manual preparation and handcarrying of patient charge slips.

The second computer system examined was the REACH system. The REACH system is a total hospital information system which would computerize all record keeping procedures in the hospital.

The major advantages of the REACH system are as follows:

1. Elimination of all manual record keeping procedures in the hospital, thus reducing personnel costs.

2. Provision of improved control of drugs at the nursing stations, thereby reducing drug losses.

3. Elimination of lost and late charges for medications and services provided to patients.

4. Elimination of erroneous pricing of medications and services provided to patients.

5. Provision of improved inventory control in the pharmacy and central supply.

6. Provision of more accurate and timely financial and statistical data to hospital management.

The major disadvantages of the REACH system are as follows:

1. Difficulty of obtaining acceptance of an automated system and new procedures by physicians, nurses, and clerical personnel.

2. Training of all personnel, including physicians, to operate the terminal device used for input/output of data in the system.

3. An initial increase in record keeping costs resulting from implementation of the system. However, in the long run the system could be expected to effect savings which would completely offset the cost of operating the system.

3. The REACH system will aid the hospital in improving the quality of patient care by providing more rapid reporting of laboratory and x-ray test results and by relieving the nurses of clerical duties, thereby allowing the nurses more time for direct patient care.

#### Recommendations

It is recommended that:

1. The Baptist Hospital of Southeast Texas adopt the REACH system.

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

It is concluded that:

1. The computer record keeping system best suited for the Baptist Hospital of Southeast Texas is the REACH system proposed by National Data Communications, Inc.
2. The REACH system can be expected, ultimately, to produce savings in clerical costs, drug losses, and pricing errors sufficient to offset the cost of operating the system.
3. The REACH system will aid the hospital in improving the quality of patient care by providing more rapid reporting of laboratory and x-ray test results and by relieving the nurses of clerical duties, thereby allowing the nurses more time for direct patient care.

#### Recommendations

It is recommended that:

1. The Baptist Hospital of Southeast Texas adopt the REACH system.

2. The Baptist Hospital of Southeast Texas institute an information and education program to inform all hospital personnel about the REACH system and what their roles will be when the system is implemented.

3. The Baptist Hospital of Southeast Texas have its attorney study the legal implications of the REACH system on medical records.

APPENDIX A

REACH TERMINAL DEVICE

## REACH TERMINAL DEVICE

The terminal device used for input/output with the REACH system is a video-display-cathode ray tube-terminal with an alpha-numeric keyboard and character printer. In addition to the regular typewriter keyboard, a row of special-function keys is located beside the video display. The special-function keys are used to activate the terminal and give instructions to the computer.

### APPENDIX A

## REACH TERMINAL DEVICE

Personnel authorized to use the terminal will be provided with a special identification badge which will activate the terminal and will identify the user to the system. The identification badges will also indicate to the computer which parts of the system the user is authorized access to. For instance, the badges issued to physicians will allow them access to their patients' medical records and to the service and medication ordering section of the computer. However, the badges issued to nurses will not allow them access to the medication ordering section of the computer. Badges issued to various personnel will limit their access to only that information which is necessary for them to carry out their duties and to which they are authorized access.

The terminal will also have the capability to recognize and read patient identification badges for the purposes of inquiry and of medication ordering.

REACH TERMINAL DEVICE

The following is an example of the use of the terminal device for ordering a service for a patient. The terminal device used for input/output with the REACH system is a video-display--cathode ray tube--terminal with an alpha-numeric keyboard and character printer. In addition to the regular typewriter keyboard, a row of special-function keys is located beside the video display. The special-function keys are used to activate the terminal and give instructions to the computer.

Personnel authorized to use the terminal will be provided with a special identification badge which will activate the terminal and will identify the user to the system. The identification badges will also indicate to the computer which parts of the system the user is authorized access to. For instance, the badges issued to physicians will allow them access to their patients' medical records and to the service and medication ordering section of the computer. However, the badges issued to nurses will not allow them access to the medication ordering section of the computer. Badges issued to various personnel will limit their access to only that information which is necessary for them to carry out their duties and to which they are authorized access.

order The terminal will also have the capability to recognize and read patient identification badges for the purposes of inquiry and of medication and service ordering.

The following is an example of the use of the terminal device for ordering a service for a patient: *therapy at the*

*time* A physician wishing to order physical therapy treatments for one of his patients will insert his identification badge into the slot on the terminal. The terminal device, recognizing the badge as belonging to Doctor Smith, will display a list of Doctor Smith's patients currently in the hospital. Doctor Smith selects the patient for whom he wishes to order by inserting the patient's identification badge into the terminal. The patient list is replaced by a display which lists such things as chart review, orders, and notes. The doctor selects the area in which he is interested, in this case, "orders." He is then provided with an index of orders such as medication, tests, treatments, and nursing service. "Treatments" is selected, and Doctor Smith is provided with a list of available treatments. From this list he selects "physical therapy." The number of treatments and the time of day the treatments are required are selected in a similar manner. When the order has been completed, the video display will present Doctor Smith with the completed

order for verification. If the physician is satisfied that the order is correct, he presses the "order" key on the terminal, and the computer takes over.

For this order the computer will automatically:

1. Schedule the patient with physical therapy at the time requested. Should there be a conflict in the patient's schedule or if it is impossible to schedule the treatment for any reason, the physician will be notified immediately at the terminal device.
2. Notify the physical therapy department of the appointment.
3. Enter the doctor's order in the patient's medical record.
4. Post the charge for the treatments to the patient's bill.
5. Notify any affected service department, such as transportation or dietary.
6. Remind the physical therapy department of the appointment prior to the patient's arrival.
7. Remind the nursing station to which the patient is assigned to prepare and dispatch the patient for treatment.
8. Request and accept reports from physical therapy for the information required for the patient's medical record.

A similar procedure would be followed for ordering medications and any other tests desired by the physician.

#### APPENDIX B

RECORD INQUIRY AND ORDER

PROCESSING SYSTEM

## REACH INQUIRY AND ORDER PROCESSING SYSTEM

The inquiry and order processing system of the computer is divided into two separate subsystems: (1) inquiry of various computer files and (2) order processing with its associated by-product generation of reminder messages, scheduling, file update, and general accounting.

### APPENDIX B

#### REACH INQUIRY AND ORDER PROCESSING SYSTEM

Inquiry is the use of a terminal device to look at any information stored in the computer. Inquiry will not change any data in the computer and cannot cause rescheduling or updating of any file. The purpose of inquiry is simply to view available information.

The following is some of the information which can be obtained by inquiry:

1. Admitting data--all information supplied by the patient at the time of admission is available for review.
2. Patient history--the complete record of a patient while he is still in the hospital. This information is kept current at all times and is available for inquiry by the medical staff.

3. Reports and results--the reporting of the results of any test or service ordered for a patient.

#### 4. REACH INQUIRY AND ORDER PROCESSING SYSTEM tests

The inquiry and order processing system of the computer is divided into two separate subsystems: (1) inquiry of various computer files and (2) order processing with its associated by-product generation of reminder messages, scheduling, file update, and general accounting.

laboratory tests, and radiology procedures available in the hospital.

#### Inquiry

Inquiry is the use of the terminal device to look at any information stored in the computer. Inquiry will not change any data in the computer and cannot cause rescheduling or updating of any file. The purpose of inquiry is simply to view available information.

The following is some of the information which can be obtained by inquiry:

1. Admitting data--all information supplied by the patient at the time of admission is available for review.
2. Patient history--the complete record of a patient while he is still in the hospital. This information is kept current at all times and is available for inquiry by the medical staff.

4. General accounting.

3. Reports and results--the reporting of the results of any test or service ordered for a patient.
4. Patient's schedule--a complete list of all tests and services which have been ordered for a patient.
5. Discharge summary--a summary of the treatment given and the progress made by a patient while he is in the hospital. This summary is a part of the patient's medical record.
6. Service catalog--a complete catalog of all services, laboratory tests, and radiology procedures available in the hospital.
7. Medications catalog--a complete catalog of the drugs and biologicals available in the hospital's pharmacy, to include dosage, route of administration, and inventory information.

#### Order Processing

Order processing includes all of the by-product activities resulting from the act of ordering a service or medication for a patient.

The major by-products resulting from ordering are:

1. Reminder messages.
2. Scheduling.
3. File updating.
4. General accounting.

Reminder messages

Medications.--Medication schedules will be distributed to each nursing station at the beginning of each shift.

Throughout the period covered by the medication schedule reminder messages will be sent to the nursing station fifteen minutes before each medication is scheduled to be given to a patient. If a medication has not been given, the nurse may respond that she will administer the medication. This action will cause additional reminder messages to be sent to the nursing station at fifteen-minute intervals until the nurse either indicates that the medication has been given or indicates that she will not medicate. In either case, the computer will make an entry in the patient's medical record.

Stop order.--When a medication is of such a nature that only a limited quantity can be safely given, the REACH system will maintain a cumulative record of the amount of the medication given and will automatically notify the nursing station when the limit has been reached. Action will be required by a member of the medical staff either to continue or to discontinue the medication.

Doctor's reminder.

--The REACH system will automatically notify individual physicians that they have incomplete medical records and that action on these records is desired.

This reminder will be displayed to the physicians when they use their identification badges in any terminal device.

### Scheduling

All scheduling will be done automatically by the REACH system, and rescheduling will be accomplished during the period as changes occur. Schedules will be prepared for each day to include individual patient schedules of appointments and an appointment schedule for each service department in the hospital. This includes the scheduling of any equipment required and of any personnel required to operate the equipment. These schedules will be printed out in the affected service departments each morning to show the schedule for that day. Each department head has the authority to change the schedule to accommodate any change in the day's activity or to handle any emergency.

### File updating

File updating is the process of adding, deleting, and/or changing data in any of the files maintained by the computer.

### General accounting

The general accounting functions performed by the REACH system will be accomplished at the central computer site and, therefore, will not be a function of the computer

located in the hospital. The input/output of accounting information will be accomplished using the same type of terminal devices used at the nursing stations.

The accounting system will conform to the system recommended by the American Hospital Association and will include the following:

1. Payroll preparation.
2. Inventory control of medications and safety stocks, to include reorder messages to the pharmacy.
3. Inventory control over central supply, with reorder messages to the purchasing agent.
4. General ledger.
5. Statistical reports.
6. Trial balance and operating statements.

## REPORTS AND FILES GENERATED

### BY THE REACH SYSTEM

The following is a list of the reports and files generated by the REACH system:

1. Medical Record--All information will be stored in the random-access disk storage device until the patient is discharged. After the patient has been discharged the information will be available and can be called for when needed. A copy medical record can be produced on demand.

### APPENDIX C

## REPORTS AND FILES GENERATED

### BY THE REACH SYSTEM

2. Census List and Patient List.
3. Detailed bills for all patients.
4. Accounts Receivable Index and status.
5. Admissions, discharges, and death reports.
6. Patient Census by nursing unit.
7. Insurance Claims Pending Report.
8. Inventory Report.
9. Patient Census by physician.
10. Accounting Transactions Journal.
11. Patient Transfer Report.

12. Payroll calculation and preparation.

13. Revenue production by nursing unit.

14. Revenue REPORTS AND FILES GENERATED department.

15. Revenue BY THE REACH SYSTEM service.

16. Patient file to include:

The following is a list of the reports and files generated by the REACH system:

- a. All admission information.
  - b. All medical record information.
  - c. All billing information.
1. Medical Record--All information will be stored in the random-access disk storage device until the patient is discharged. After the patient has been discharged the information will be transferred to magnetic tape and can be called for when necessary. Also, a hardcopy medical record can be produced on demand.
    - a. Pharmacy--a list of all medications by strengths and units available.
    - b. Central supply--a list of all items available.
    - c. Laboratory service list.
    - d. Radiology and x-ray service list.
    - e. Nuclear laboratory service list.
    - f. Inhalation therapy service and materials list.
    - g. Operating room service list.
    - h. Anesthetic materials and service list.
    - i. Recovery room service list.
    - j. Delivery room service list.
    - k. Nursery service list.
    - l. Emergency room service list.
    - m. Rooms available.
  2. Census List and Patient List.
  3. Detailed bills for all patients.
  4. Accounts Receivable Index and status.
  5. Admissions, discharges, and death reports.
  6. Patient Census by nursing unit.
  7. Insurance Claims Pending Report.
  8. Inventory Report.
  9. Patient Census by physician.
  10. Accounting Transactions Journal.
  11. Patient Transfer Report.

12. Payroll calculation and preparation.
13. Revenue production by nursing unit.
14. Revenue production by service department.
15. Revenue production by type of service.
16. Patient file to include:
  - a. All admission information.
  - b. All medical record information.
  - c. All billing information.
17. Inventory files--with cost and billing price for:
  - a. Pharmacy--a list of all medications by strengths and units available.
  - b. Central supply--a list of all items available.
  - c. Laboratory service list.
  - d. Radiology and x-ray service list.
  - e. Nuclear laboratory service list.
  - f. Inhalation therapy service and materials list.
  - g. Operating room service list.
  - h. Anesthetic materials and service list.
  - i. Recovery room service list.
  - j. Delivery room service list.
  - k. Nursery service list.
  - l. Emergency room service list.
  - m. Rooms available.

- n. EEG, EKG, and EST service list.
- o. Dietary.

18. Scheduling--all service department scheduling will be handled automatically by the system to include:

- a. Notification of the requesting terminal that the patient has been scheduled.
- b. Notification of all service departments of appointments.
- c. Transmission of reminder messages to the service departments and nursing stations.
- d. Automatic rescheduling of appointments when the treatment or test cannot be performed for any reason.

19. Final patient bills--on demand at the time of discharge.

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