

SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA

FINAL REPORT

TO:

REGIONAL MEDICAL PROGRAMS SERVICE
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
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VOLUME I PROJECT SUMMARY

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PITTSBURGH, PENNSYLVANIA

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BHHS

SYSTEMS ANALYSIS
OF MEDICAL RECORDS
IN GEORGIA

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This project was conducted under contract HSM 110-70-349
awarded by the Regional Medical Programs Service
of the Health Services and Mental Health Administration

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Atlanta, Georgia

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PREFACE

The present volume, Volume I of a three-volume final report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, contains a discussion of the project results. This volume, entitled PROJECT SUMMARY, is submitted in accordance with the provisions of United States Public Health Service contract HSM 110-70-349. Volume II contains a review of the state-of-the-art in medical records systems, and Volume III contains a description of four analytical methods which can be used to evaluate procedures for processing, entering, storing, and retrieving medical record information. The project was conducted jointly by the Health Systems Research Center of the Georgia Institute of Technology and the Health Systems Department of Westinghouse Electric Corporation for the Regional Medical Programs Service of the Health Services and Mental Health Administration in the period July 1970 through September 1971.

The objectives of the project were to describe the state-of-the-art in medical records systems and to develop analytical methods for studying and improving medical records systems in health-care facilities. During the course of the project, twelve hospitals, five nursing homes, and one neighborhood health clinic were studied by the project team.

At each facility, data on the management and flow of medical record information were collected by using one or more of the four methods developed in the project. The purposes of the data collection were: (1) to test and refine the methods and (2) to construct a profile of basic information regarding the use and maintenance of medical records systems. During the course of data collection and methods development, two proprietary computer programs of the Westinghouse Electric Corporation were employed; these programs were the Network Analysis Method and Work Sampling Method. Also, the method described in Chapter 3 of Volume III was based largely upon the Hospital Staffing Methodology for Medical Records, which was developed at the University of

Michigan. Data regarding the state-of-the-art in medical records systems was obtained via direct inquiry to manufacturers and users of these systems. An extensive bibliography of journal articles and project reports was also prepared. Neither an examination of the medical-decision-making aspects of the medical record nor an analysis of the quality of the medical information residing in the medical record were included in the project. While these topics are important, their consideration was beyond the scope of the project.

The successful completion of this project was due to the efforts of various individuals, institutions, and groups to whom credit is gratefully extended. Important contributions were made to the project by the following on behalf of the Health Systems Research Center: John W. Coyle, Gerald L. Delon, Chris C. Efland, Terrance M. Patrick, James F. Smith, Karenan P. Stubbs, and Gerald B. Widegren. Major contributions were made to the project by the following members of the Health Systems Department: Charles C. Camp, Edwin E. Keelen, Frank W. Koenig, and Stewart F. Paterson. The present volume was written by Mr. Coyle.

Appreciation is extended to Dr. J. Gordon Barrow and the staff of the Georgia Regional Medical Program for their advice and cooperation. Also, acknowledgement is given to the several consultants and members of the advisory board to the project for their valuable contributions and active interest.

In particular, sincere appreciation is extended to the many medical records librarians, administrators, nurses, physicians, and other personnel who so graciously and generously contributed their time and thoughts to the project. Their busy schedules were interrupted for extended periods of time, and the project could not have been completed without their assistance.

Harold E. Smalley, Director
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CHAPTER I

INTRODUCTION

1.1 PURPOSE

The overall purpose of the project, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, was to conduct an analysis of patient medical record systems as currently established in a variety of health-care delivery settings, including hospitals, nursing homes, neighborhood health clinics, and private physicians' offices. The analysis was conducted with the long-term goal of developing the means of bringing medical record systems performance in line with medical and administrative information requirements.

1.2 OBJECTIVES AND SCOPE

The specific objectives of the project were (1) to develop analytical methods for studying and improving medical record systems in health-care-delivery facilities, and (2) to describe the state-of-the-art in medical record systems. The analytical methods were to be designed for application in systems analysis studies in which information would be collected on the operating characteristics of a facility's medical record system. Furthermore, the methods were to be straight-forward and not difficult to apply while, at the same time, yielding meaningful information, which would serve as the basis for modification of the system or for more thorough examination of some element of the system.

In achieving these objectives, the focus of the project was the management and flow of medical record information rather than the medical-decision-making aspects of the medical record or the quality of the medical information residing in the medical record. Specifically, the project was concerned with the personnel and procedures employed within the Medical Records Department of hospitals and also with the procedures for entering, storing, processing, and retrieving medical-

record-related information in nursing homes, neighborhood health clinics and private physicians' offices, as well as in hospitals.

1.3 BACKGROUND

In health care delivery facilities such as hospitals, nursing homes, neighborhood health centers, and doctors' offices, the timely availability of desired information is fundamental to the delivery of the most beneficent medical care and to the efficient operation of the facilities. Recognizing the importance of the health facility's information system to the physician and to the facility's administrator, and also realizing that the current information systems are generally inadequate, prompted the Regional Medical Program Service (RMPS) in 1969 to seek means of bringing medical information systems performance in line with medical and administrative information requirements. Since the medical record is the basic vehicle for the storage and transfer of information in health care facilities, RMPS decided that improvements in the use and management of the medical record should be stressed initially. This decision subsequently led to the award of a contract (PHS Contract Number HSM 110-70-349) to the Health Systems Research Center of the Georgia Institute of Technology to perform a systems analysis of the medical record as used in a variety of health care facilities in Georgia.

1.4 METHOD OF PROCEDURE

The specific objectives of the project were approached in the major steps described below:

1. Selection or design of an analytical method appropriate to studying the management, use, and flow of medical record information.
2. Test the method through application in one or more health-care-delivery settings.
3. Evaluate the method in terms of difficulty of application and value of the results obtained from applying the method.

4. Revise, test, and evaluate the method until satisfied that the method provides the necessary information while requiring the expenditure of as few resources as necessary.

5. Collect data on advanced systems and concepts which are suitable for application to the management and flow of medical-record-related information.

1.4.1 Development of Analytical Methods

The development of methods for application in analytical studies of medical record systems consumed a major portion of the resources which were expended in the course of the project. It was decided that analytical methods should be developed for use in studies of (1) the Medical Records Department, per se, (2) the use of medical-record-related information, and (3) the flow of medical-record-related information.

Two methods which can be used in studies of the Medical Records Department of a hospital were adapted or developed in the course of the project. These methods were the Michigan staffing method and work sampling. The Michigan staffing method, a technique for determining the proper staffing level for a Medical Records Department, was adapted from the Hospital Staffing Methodology for Medical Records (1), which is a rather lengthy procedure for manually computing the staffing level. A computer program was written to make the Hospital Staffing Methodology for Medical Records easier to use, and procedures and forms for collecting the required data were designed. The method, referred to as the Michigan staffing method after the University of Michigan, where the Hospital Staffing Methodology for Medical Records was originally developed, was tested in several hospitals. Modifications to the method were made when inaccuracies or limitations of the method were discerned during the testing.

Work sampling, one of the traditional techniques of industrial engineering, was adapted to determine how the resources of the Medical Records Department are consumed in performing work activities in the

department. A classification scheme of departmental work activities was devised and procedures and forms were developed for collecting the requisite data. This method was tested and refined in the course of using the method in several hospitals.

The third method developed in the project was designed to determine how the medical record is used on hospital nursing wards, in neighborhood health clinics, in doctors' offices, and other places where the medical record is used in recording or retrieving data. The method was developed to provide a means of determining who uses the medical record, for what purpose, for what period of time, and during which period of the day. Procedures and data collection forms were designed to collect the appropriate data, and a computer program was written to facilitate analysis of the data. The method, referred to as the observation technique, was used in several hospitals in order to test and refine the method.

The fourth method, which was developed in the project, was designed to collect data on the flow of medical-record-related information in health-care-delivery facilities. This technique, called communications network analysis, was originally based on the Network Analysis Method, a proprietary program of the Westinghouse Electric Corporation. The Network Analysis Method was found to be too cumbersome and time-consuming to be cost-effectively employed; consequently, this method was altered and refined during tests conducted in several hospitals and a neighborhood health clinic. Procedures and forms for data collection and analysis were designed for the communications network analysis method.

1.4.2 State-of-the-Art Review

Information on advanced systems and concepts which are being developed or applied to the management and flow of medical-record-related information was collected via direct inquiry to the developers and designers of the systems and concepts. Data was obtained from manufacturers of systems and components which are, or can be, used in recording, processing, storing, and retrieving medical information. Individual leaders

in the development of automated medical information systems were identified and their major contributions and future plans were described. Information was also collected on current projects which are concerned with medical record systems, and an extensive bibliography on medical record systems was constructed.

LITERATURE CITED

- (1) Bartscht, Karl G., Wayne H. Smith, Steven P. Gray, and William F. Howard, Hospital Staffing Methodology Manual MM-7 Medical Records, Hospital Systems Research Group, University of Michigan, January, 1968, 478 pp.

CHAPTER 2

DISCUSSION

2.1 PROJECT RESULTS

Four methods which can be used in analytical studies of medical record systems were developed in the course of the project, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA. The methods were developed for the use of hospital systems analysts, medical records librarians, administrators, and other individuals who are concerned with improving medical record systems and were designed for use in a variety of health-care-delivery settings including hospitals, neighborhood health clinics, nursing homes, and doctors' offices.

In addition, a review of state-of-the-art developments in medical record systems was conducted. Advanced concepts, systems, and equipment for medical records were identified and described, as well as medical record innovators and their current and planned projects.

Furthermore, in the course of testing, evaluating, and refining the analytical methods developed in the project, a considerable amount of information was collected in a number of health-care-delivery settings, particularly hospitals. Much of this information was too narrow in scope to report, as the data were essentially only of interest to the facility in which the data were obtained. Other data, however, were of general interest and consist of problems, suggestions, and trends obtained in interviews with hospital personnel. These latter data were assembled into a profile of basic information regarding the use and maintenance of medical record systems.

2.1.1 Analytical Methods

The four analytical methods developed in the course of the project were the Michigan staffing method and work sampling (applied to the Medical Records Department), the observation technique (for determining medical record utilization), and communications network analysis

(for collecting data on the flow of medical-record-related information). Each method was designed to be relatively simple and inexpensive to apply. The methods were developed to be useful in the analytical studies which should be conducted prior to attempting to determine what modifications, if any, should be made in a facility's medical record system. Each technique and the procedure for applying it and interpreting its results has been described in detail in Volume III, METHODS MANUAL, of the report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA.

2.1.1.1 Michigan Staffing Method

The Michigan staffing method is a technique for determining the proper staffing level for the Medical Records Department for the conditions which exist within the hospital. The method, which is specifically designed for use in hospitals, can also be used to predict departmental staffing as conditions, systems, and procedures within the hospital change. The method, which is based on the use of pre-established standard times for the elements of each work operation performed in the Medical Records Department, computes the standard staff time required for each direct work category in the department. The computed standard staff times can then be used in a comparison with existing staff times devoted to each direct work category to determine whether the department is properly staffed. Or, as previously indicated, the medical records librarian can use the computed standard staff times to plan for changes in the department staff level as she anticipates changes in work-load or considers modifications to existing systems and procedures.

2.1.1.2 Work Sampling

Work sampling is a technique for determining how staff time is utilized in the Medical Records Department and the percentage of departmental staff time expended in accomplishing each of the various work activities. While the Michigan staffing method does not include indirect work categories, such as administration, special studies,

and intra-departmental training, work sampling includes both direct and indirect work categories. Although work sampling studies can be performed to accomplish a variety of objectives, the specific work sampling procedure developed for this project is concerned with estimating the percentage of total departmental staff time devoted to each work activity with a prescribed confidence level and accuracy. The results, then, provide indications of those work activities which, percentage-wise, consume large amounts of total staff time; these work activities are those which should, logically, be examined first when the medical records librarian is contemplating changes in the systems and procedures within the department.

2.1.1.3 The Observation Technique

The direct observation technique is based on round-the-clock or eight-hour monitoring of medical record usage on a nursing ward in a hospital or in any other area where the medical record is used to record and retrieve medical information, such as a health clinic or doctor's office. The method provides results for a number of medical-record-usage parameters, including average utilization time per record, percentage of records pulled by type of user, frequency of records pulled by time of day, and so forth. In general, the method results in information on who uses the medical record, for what reason, at which time of day, and for what length of time. Analyses of the results may be used, for example, to determine the locations of input-output terminals if a computerized medical record system is being considered.

2.1.1.4 Communications Network Analysis

This method is an organized procedure for collecting the data necessary to characterize the flow of medical-record-related information in hospitals and other health-care-delivery facilities. In addition to quantifying communications flow parameters, the method yields narrative information on problems, suggestions, and trends related to

the medical record system as perceived by the personnel who manage and interact with the system. The method uses an interview technique to acquire information on the flow of medical-record-related data and on the operation of the medical record system. The method, therefore, assumes that those who use and manage the medical record system are capable of providing numerical estimates with a fair degree of accuracy. This assumption is not particularly harmful, since the method includes a means of detecting inaccuracies in the collected data, and because the analysis of the method results is based on an order of magnitude comparison among the results. The analysis provides information on areas of high communications activity, the utilization of the various transportation modes which exist within the facility, and departments which can benefit from changes in the systems and procedures used in the preparation and transportation of departmental communications related to the medical record.

If desired, the communications network analysis method can be modified such that the numerical information is obtained via counting techniques, which require the tagging of paper communications and log-in/log-out procedures for all communications. While such modifications will result in more accurate data being collected, the added expense, in terms of time and manpower, make such modifications difficult to justify given the analysis performed on the data. Furthermore, some departments will maintain logbooks on many of their communications for legal, billing, or administrative reasons.

Narrative comments on problems and suggestions related to the Medical Record Department or the medical record itself frequently point to improvements which can be easily made and which cause only minor disruptions to existing systems and procedures. Section 2.1.3 contains a further discussion of problems, suggestions, and trends.

2.1.2 State-of-the-Art Review

A survey of the state-of-the-art in medical record systems

was completed including the assembly of an extensive bibliography on medical records. The survey results have been documented in detail in Volume II, STATE OF THE ART REVIEW, of the report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA. Volume II contains sections on:

1. The general characteristics of manual, microfilm, and computerized medical record systems.
2. Advanced computerized systems for the maintenance and handling of medical records.
3. Major vendors of medical records systems and equipment.
4. Leading innovators in the development of automated medical record systems and concepts.
5. Current research and development projects which pertain to medical record systems.
6. The recent literature pertaining to medical records.

2.1.3 Data Analysis

The test, evaluation, and refinement of the four analytical techniques developed in the project generated a large amount of information pertinent to the operation of medical record systems in health-care-delivery facilities, in particular in hospitals but also in nursing homes, doctors' offices, and a neighborhood health clinic. Of all the data which were collected, the narrative comments regarding problems, suggestions, and trends related to the maintenance and use of medical record systems are of general interest, as well as being relevant to the individual hospital.

On the other hand, the numerical data, which were collected for the communications flow parameters, the utilization of the medical record on the nursing wards, and the distribution of work activities in the Medical Records Department, are misleading if aggregated. The reason for this is that the systems and procedures for managing and using medical-record-related information vary in the extreme from one hospital to another. Consequently, the available numerical data can not be used to construct a

data profile which represents a "typical" set of characteristics for the management and use of a "typical" medical record system within a "typical" hospital. Considering the great variation which was found in the sample (twelve hospitals) of hospital medical record systems examined in the course of the project, it is unlikely that any reasonably sized sample would produce a meaningful data profile. This statement, however, should not be taken to mean that the collected data are meaningless for, as explained in Section 2.1.1, the data are useful in pointing out areas for possible improvement in the medical record system of the facility in which the data were collected.

The Appendix to this volume contains an extensive listing of problems, suggestions, and trends which were obtained in interviews while employing the communications network analysis method in twelve hospitals and one neighborhood health clinic. The comments are sorted and grouped according to a categorization scheme developed by the Health Systems Department, Westinghouse Electric Corporation. Problems, suggestions and trends are each categorized according to one of the following comment types:

1. Medical Record
2. Forms Design
3. Operational Procedures and Personnel
(within departments)
4. Operational Procedures and Personnel
(between departments)
5. Education/Training
6. Facility Design
7. Equipment
8. Other

Each of the above comment types is further broken down into a series of descriptors as shown in Table 2.1. The descriptors serve the purpose of further delineating the comments into categories. For example, a comment of Type 1 (Medical Record) modified by the descriptor, Record, is a comment on the entry (or recording) of information in the medical record. Such a

TABLE 2.1 Comment Types and Descriptors
for Problems, Suggestions, and Trends.

Comment Type	Descriptor
Medical Record	Record (enter) Process Store Retrieve Transmit Distribute Utilize
Forms Design	Lengthen Shorten Change Content
Operational Procedures and Personnel (within departments)	Time Direct Cost Information Morale Control
Operational Procedures and Personnel (between departments)	Utilization Salary
Education/Training	Qualifications
Facility Design	Departmental Adjacencies Size Departmental Layout Building Location
Equipment	Design Cost Maintenance
Other	Can be used with any attribute

comment may appear in the listing of comments under problems, suggestions, or trends. One might expect that, of all the hospital departments, the Nursing Service would make the greater share of comments in this category. An inspection of the Appendix shows this to be true.

As a further example of interpreting the Appendix, a comment of Type 6 (Facility Design) modified by the descriptor, Departmental Adjacencies, is a comment on the proximity relationships between two departments. Such a comment may be a problem as on page A-17 of the Appendix, or a suggestion as on page A-28, or a trend, although a comment in this category does not appear in the Appendix under trends.

Notice that, within each category (defined by a comment type and descriptor) in the Appendix, the comments are grouped according to the department which was the source of the comment.

2.2 CONCLUSIONS

In this project, four methods were developed specifically for application in systems analysis studies of medical record systems in a variety of health-care-delivery facilities. These methods provide the hospital systems analyst, hospital administrator, and medical records librarian with the appropriate tools to conduct the initial analytical studies which should precede attempts to modify the systems and procedures used in entering, processing, storing, and retrieving medical-record-related information.

Also, the state-of-the-art in medical records systems was reviewed and documented with the intent of providing a source of information on advanced systems and concepts pertaining to the management and use of the medical record.

In the course of testing and refining the four analytical methods, a large amount of numerical data was collected on the management, use, and flow of medical record information. While it would seem possible to construct a profile of the management, use, and flow of medical record information from the data, the extreme diversity of operational procedures and personnel

patterns employed in the medical record systems of the various facilities precluded the formation of such a profile. The numerical data, however, are useful in pointing out areas for possible improvement in the medical record system of the facility in which the data were collected.

The information which is of the most general interest is the narrative comments obtained in the application of the communications network analysis method. Some comments are encountered repeatedly because those problems, suggestions, and trends which are on the minds of the personnel in one facility are similarly on the mind of the personnel in other facilities. Some of these comments pertain to poor forms design, lack of standardization, illegibility of information, and the inability to get the medical staff to adhere to the procedures established for the use and control of medical records. Consequently, the comments in the Appendix to this volume are probably the best representation of a basic profile of information on the use and management of the medical record.

APPENDIX

Problems, Suggestions, and Trends Obtained as Comments in Interviews with Personnel in Twelve Hospitals and One Neighborhood Health Clinic Using the Communications Network Analysis Method.

PROBLEMS

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Record	Medical Record Dept.	Admissions does not give patients full name properly, making chart difficult to locate. Doctors are too often lax in entering medical information into medical record.
	Business Office	Progress notes do not always jibe with the supporting material in the medical record. Not enough clinical data in computer system because of small staff. Only 49 percent of encounter forms have disease coded by physician.
	Nursing	Doctors frequently forget to countersign students' orders. Variability between physicians is great as related to completeness and legibility which affects MR quality. Nurse note dated on one sheet and continued to preceeding sheet requires a date which is sometimes left off. Seem to always be filling out drug requests, at least 50 requests each day. This is a 21 bed ward. A doctor is required to countersign his student's orders. The nurses have a hard time getting these signatures to complete the MR due to unavailability of doctor. Many old charts are misplaced or taken off by the doctor. Sometimes they are never found, no check-out system. When patient is discharged, Medical Record personnel are responsible for tracking down any lost MR's. Progress notes are generally incomplete. Problem with legibility of doctor progress notes. Nurses have trouble obtaining information on new patient from doctor. Nurses notes are inadequate.

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Record	Nursing	<p>Nursing aides can chart in the MR. The supervisor feels that the quality of the information in the nursing notes suffers because the aides are not properly trained and do not always chart pertinent information. This is also true to a lesser extent, of the other nursing staff.</p> <p>All forms generated are handwritten, including doctor's history, physical, notes, consultations - making them difficult to read, time consuming and hard to locate.</p> <p>Nurse seems to do a lot of unnecessary charting, writing nurses notes takes too much time.</p> <p>Nurses spend too much time transcribing - need another clerk.</p>
	OR	<p>Nurses notes are not complete or informative enough. Need more rationale and detail.</p>
	Pharmacy	<p>Terms used or abbreviations to denote drugs not legitimate abbreviations and pharmacist cannot always determine what is being ordered.</p> <p>Have been some errors in copying on the requests for data processing, but not enough to warrant getting rid of data processing.</p> <p>Drug request not always filled in completely. Have to be sent back to team to be completed.</p> <p>Pharmacist does not like "take as needed" on request. Doctor needs to be more specific.</p> <p>Doctors must sign separate prescription for narcotics, which wastes physician's time.</p>
	X-Ray	<p>No doctor ID on request from emergency room, thus cannot identify patient's doctor.</p>
	Other	<p>Encounter forms not being filled out correctly because they are filled out by several people.</p> <p>Many diagnoses are not being recorded on forms and there is much mis-copying on form.</p> <p>They have a problem getting the attending physician to fill out forms.</p>

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Process	Medical Record Dept.	Doctors often take excessive time to finish discharge summary.
	Business Office	If Medical Record Dept. does not provide information in timely manner, then medicare claims cannot be submitted.
	Admissions	Data process has increased medical record size at admission.
	Nursing	History not available for several days because of dictation.
		Dictation of Doc history, physical and OP notes take several days.
		Nursing is responsible for sending down complete chart of discharged patient and arranging it in correct order, which is not her responsibility.
		Nurses' notes should be limited to important notes only.
OR Dept.		Since patients MR is sent back to MR Dept., lab results of tests are also sent to MR Dept. when tests are completed. These slips are frequently not put on the patient's chart so that outpatient has to track them down in the MR Dept. when the patient returns.
		Sometimes when patient is dismissed the parts of his chart kept at his room are not placed with the rest of the chart and not sent to the MR Dept. The split chart in this hospital requires that the TPR and medication sheet, the I&D sheet, and the nurses notes be kept in a box hung outside the patient's door.
Pharmacy		Mistakes made on ward in transcribing physician's order from chart to pharmacy request. Wrong drugs sent at least once a day.
Other		Not enough control in past on the generation of patient numbers which caused a great duplication of patient folders.
Store	Medical Record Dept.	MR jackets sometimes get placed inside one another and are lost. One time 5 records were found inside one jacket.
		Information that is sent to MR to be stored in a check-out file is sometimes lost.

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Store	Medical Record Dept.	Anesthesia report not kept with rest of patient's medical record.
	Nursing	Storage of charts in different mobile baskets in four different categories makes it impossible to determine availability of charts and increases retrieval time.
		Because of nature of teaching facility and specialties of facilities, the patients require more acute care which results in larger medical records.
		The physical size of a medical record can be so great that it is difficult to keep it in the designated slot in the nursing station.
		Some charts get too thick and Ward secretary has to thin them.
	Other	Decentralization of the MR storage greatly decreases control.
Retrieve	Medical Record Dept.	Doctors notes are not legible and this hinders the processing of the medical records.
		Difficult to locate charts that are signed out to other team areas.
		Retrieve time is great when M.R. is not in Medical Record Dept.
	Nursing	Doctors won't use admission form for information. Insist on having old chart. This chart is stored across the street and sent to the MR Dept. then to the floor. The charts take a long time to get to the floor and many times are lost because of the routing through MR Dept.
		Problems with obtaining history and physical prior to surgery. Doctors bring them with them so that it is only accessible at the time of surgery rather than prior to. Often information is scanty and possibly several days old.
		Biggest problem is that the medical record is not available as often as needed because doctors have them out.

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Retrieve	Nursing	<p>Takes too much time to figure out doctor's orders due to illegibility. Too much time to trace doctor to get orders interpreted.</p> <p>Doctor frequently takes patient charts to their offices making it totally unavailable on the nursing unit.</p> <p>Medical record almost never in chart rack at nursing station because doctors have them.</p> <p>Trouble retrieving MR promptly from MR Dept. Many medical records lost.</p>
	OR Dept.	<p>Old charts are frequently missing, sometimes because the doctor checks them out prior to patient admission.</p>
	X-Ray	<p>It takes 3 days to enter a name in rotary file. Patients who had an X-Ray within the past 3 days are not in the system and it is hard to determine if a previous X-Ray was taken.</p>
	Pharmacy	<p>Since pharmacy request is a single-copy form and hence a "traveling" form, it is not always available to those who need it.</p>
	Other	<p>With the medical records in five different locations, means four more places from which record can be lost.</p>
Transmit	Medical Record Dept.	<p>Any component of the medical record that is processed in the M.R. Dept. and sent to the floor is hand carried by personnel of the Medical Records Dept.</p> <p>There is all too often a significant lag time getting the medical record to the doctor.</p> <p>Occasionally parts of the medical record are misplaced but this is due to human errors which cannot be controlled.</p>
	OR	<p>Sometimes the MR. Dept. will put a requested chart on the dumbwaiter and not notify the floor. Thus, no one knows to pick it up.</p>
Distribute	Medical Record Dept.	<p>The Medical Records Dept. does not send any documents in the pneumatic tube system, although it could be used to save travel time.</p> <p>Documents are received from other departments only occasionally by the pneumatic tube.</p> <p>Multi-routes for the same information causes problems.</p>

TYPE: Medical Records

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Distribute	Other	The creation of a mental health record denies other teams of patient data and duplicates storage.
Utilize	Nursing	<p>Everyone makes entries in medical records and every service generates its own form which creates some confusion.</p> <p>On admission a blank history form is placed in the chart. This is rarely used due to doctor's typed history being inserted.</p> <p>The student doctors monopolize the chart during the day making them generally unavailable.</p> <p>Doctor sometimes does not red flag charts to have orders transcribed.</p> <p>Too many people handle files and medical records cannot always be located.</p> <p>Kardex is used more than medical record by nurses and clerks on the nursing station, diminishing value of M.R.</p> <p>Lab results are often not up-to-date; either the staff did not put them on chart or lab did not send them back in time. Thus, as far as the OR is concerned, the chart is incomplete.</p>
	Other	<p>To insert information in chart RN must write her name and date on two cards, give them to clerk who gives her the record. Time consuming. RN tries to avoid checking out charts - therefore, many reports of borderline value are not put into chart.</p> <p>Random arrangement of the medical records wastes nurse and physician's time. This is primarily caused by lack of quality.</p> <p>Difficult to interpret medical record content for nutritional value because of many unrelated segments.</p>

PROBLEMS

TYPE: Forms Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Lengthen	Admissions	The newer forms have no room for charges in text. Adult questionnaire too lengthy. Takes about 40 minutes to get through one.
	X-Ray	Rotating file of patients number, name, birthdate, used in cross-reference for X-Ray jacket file doesn't have enough information and similar names are confused.
Shorten	Admissions	All the information recorded on the admission form isn't necessary.
	X-Ray	There is no need to have X-Ray request and X-Ray report form. Causes duplication of effort and bulk of paper.
Change Content	Business Office	Forms multicopy with carbon and imprint often does not come thru on business office copy because it is last copy. No standard insurance form for out-patient billing. Causes time loss and confusion.
	Admissions	Some of the abbreviations used on the pre-admitting form printed are not clear to patient. They do not understand what information is being requested. Many patients do not understand meaning of "third party agency" on insurance information card. Wrong (or no) information frequently supplied here by patient. People do not understand admission questionnaire contents.
	Nursing	Extra work to add patient sex, race, weight, blood pressure, medicare status to all EKG requests. The McBee edge punch card is used for all lab, X-Ray, pharmacy, and central supply requests without use of the edge punch feature. Maiden name of patient not on admission slip causes confusion.
	ER	Information on form is printed too small and is very detailed.

TYPE: Forms Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Change Content	Other	Radiology form has no area for date. The laboratory data cannot be easily xeroxed from the medical record because leafed records hide data.
Other	Business Office	The charge cards are not being properly filled out on the nursing unit. Many omissions made. Forms design is not assigned to any department with no central coordinating agency. This is needed to reduce the number of forms and their effectiveness. Carbon imprint on BO copy of some multi-part forms does not always come through When state or federal or hospital insurance forms changed, there is not enough information on how to use new form. Changes are frequent and cause much confusion.
	Admissions	Admissions use the forms for medical records every day but were never consulted during the design of the form.
	Nursing	Nursing staff has no voice in the design of forms used by them.
	Laboratory	With present lab forms the third and fourth copies are difficult to read. Handwritten reports are difficult to read.
	X-Ray	The fifth copy of the X-Ray request cannot be read if the person does not write hard enough when initiating the request.
	ER	Sometimes information does not come through on last carbon copy. Doctors complain.

PROBLEMS

TYPE: Operational Procedures and Personnel (within department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Time	Medical Record Dept.	When medicare was started, 75% of chief MRL was spent trying to meet requirements.
	Business Office	Is nonprofitable and time consuming to use collection agencies for uncollectible accounts, so does collection work herself. Takes up great deal of time, but results better. Does all charge posting by hand. No posting machine. Uses peg-board system which is time consuming. Would not be adequate system for larger facility.
	Nursing	Repeat of pharmacy request every three days creates unnecessary clerical work.
	Laboratory	Filing reports is a problem both in time and accuracy.
	X-Ray	Two typists are responsible for typing all X-Ray reports. If one is off, the typing and reports are delayed. This causes a backlog of one or two days for reports. These two clerks must type approximately 150 reports per day.
	Pharmacy	Receive requests sporadically and are notable to do best work because of peak loads.
	Other	Excessive delays in inserting lab and X-Ray results into medical records by team MR clerk.
Direct Cost	Business Office	Three people had to be hired just to complete forms required for Medicare-Medicaid. Medicare patients stay on an average of more than 60 days and Medicare will not pay any part of bill until patient is discharged. This causes a drain on hospital operating funds. With over 100 programs to maintain OP could use two additional programmers.
	Pharmacy	Unit dosage very efficient, but would be very costly for a large facility since pharmacy stations would have to be on every floor for optimum patient care. Are on formulary system and very inadequate. \$30,000 in drugs pilfered last year because of loose control over drugs.

TYPE: Operational Procedures and Personnel (within department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Information	Medical Record Dept.	Doctors offices call MR excessively to obtain information. As many as 50 calls per day have been received.
	Business Office	Medicare requires too much detail in billing data. Physicians are not coding diagnosis on the encounter form as required which make statistics invalid.
	Admissions	Doctors do not supply enough pre-admitting information so that admitting procedures can be simplified and faster. Patients have to wait to be admitted.
	Nursing	Don't have a method of checking off treatments on Kar-Dex. Would like to have some system of doing so.
	X-Ray	All secretarial work is processed by X-Ray technician. Doctors' handwriting is hard to interpret.
	ER	Doctor gets copy of emergency record on hit-and-miss basis.
	Pharmacy	Some of the prescriptions are lost when they arrive at pharmacy. There is no way of controlling these misplaced cards.
	Other	Family members unable to remember family number since head of household only had ID card. Duplicate copy of lab and X-Ray results are maintained by the team because of lack of confidence in medical records.
Morale	Medical Record Dept.	Med. Rec. Dept. is presently short on personnel. Turnover is a problem primarily due to low salaries.
	Business Office	All responsibilities rest on one person and others assume menial jobs. Too much work for one person.
	Nursing	Staff is family-like in its relations which can be a problem at times.
Control	Medical Record Dept.	House staff seems to be reluctant to adhere to strict MR procedures.

TYPE: Operational Procedures and Personnel (within department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Control	Nursing	The decentralization of specialties makes it difficult to control beds and nursing services. They have three general surgeons, opthalmology, orthopedics, thoracic, neurology and oral surgery subspecialties. Seems to be too many doctors for each patient.
	Laboratory	A problem in getting the personnel requesting the X-Ray to complete the form properly.
Utilization	Medical Record Dept.	Turnover in personnel causes a considerable lag time in transcribing. Some clerical work has to be done by administration members such as voluminous Xerox copying and is costly and time consuming.
	Business Office	Because staff is not trained prior to hiring, there is some overstaffing and built-in inefficiency.
	Nursing	The use of the metal chart holder to store the addressograph plate makes it difficult to use when chart is away from the nursing station. Could use another clerk on nursing unit to do routine paperwork.
	X-Ray	The X-Ray request being processed by the recpt. is the biggest bottleneck in the department.
	ER	Have to fill out ER form on every patient in ER Room. Form detailed and time consuming.
	Other	Considerable amount of nutritional coordinators time is spent in clerical and routine communication tasks. Patients were not properly processed initially which caused duplication of patient numbers. Having to fill out an encounter form for every encounter made very time consuming.
Salary	Medical Record Dept.	Salaries as a whole are below average.
	Other	Medical Records in each time is unpaid in relation to the amount of work performed.

PROBLEMS

TYPE: Operation Procedures and Personnel (between Departments)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Time	Medical Record Dept.	If the Medical Records Dept. must transmit the complete jacket to another area within the hospital, it is sent by the internal mail service, which is slow.
	Business Office	Lag time between discharge and physician's final diagnosis. Insurance claim made on final diagnosis. Information needed as quickly as possible from MR Dept. so forms can be filled out in business office.
	Nursing	Too many punched cards to fill out. Punched cards are needed for nearly all requests, lab tests, drugs, X-Ray. When ordering multiple units of blood from the bloodbank, a blood request form - plus an IBM card - must be filled out for each unit requested. For some operations, such as open heart surgery, this procedure is particularly combersome. Stat request and blood sample are not promptly done in many cases.
	Laboratory	Lab request for stat procedures come after doctors' rounds. Procedures are requested to be performed within the hour and the lab doesn't receive the request until 40 to 50 minutes have elapsed.
Direct Cost	Nursing	Each chargeable item is tagged with a charge which the user fills out and leaves at nurses station to be sent to billing. The doctors usually throw these away unused, thus the patient is not charged. Facility is operating at a loss.
Information	Medical Record Dept.	When a patient no longer occupies a bed the units assume they are discharged and send documents to Medical Rec. Dept. The patient may have been transferred to another unit and these documents are in the mail system where medical information cannot be utilized. Many patients come to the hospital without adequate documentation of previous medical history.
	Business Office	Need better communication with doctors to get final Rx report upon patient discharge. Poor communication between physician and business office.

TYPE: Operation Procedures and Personnel (between Departments)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Information	Business Office	<p>Rapport between claims department and Medical Records critical. Breaks down with every change of MR Librarian.</p> <p>Cannot get information necessary to complete processing of patient bill from other departments in time to complete bill at patient discharge.</p> <p>No communication between DP and Med. Rec.</p>
	Admissions	<p>The admitting diagnose written by the doctor in the ER is not legible and cannot be transferred to the Admissions forms.</p>
	Nursing	<p>Many patients in this ward spend several days in the ICU following surgery before returning to the ward. Certain information is recorded on a different form in the ICU. For example, temp and blood pressure are recorded on one form in the ICU and on another form in Ward 3W. Results in discontinuity and records, which leads to difficulty in following patient history for a patient's stay in the hospital. Doctors in particular complain about this.</p>
	OR	<p>Pneumatic tube system could be improved.</p>
	Laboratory	<p>Nurses do not complete lab form with vital information which causes lab personnel to make extra trips to the units.</p> <p>If doctor's name is not signed on lab request from ER, the lab must send their personnel to find doctors or check records to identify the doctor who ordered the test.</p> <p>Receive innumerable calls each day from wards asking for results of tests which have been done but not yet inserted in record which peaks between 4:00 and 6:00 P. M.</p>
	X-Ray	<p>Data processing does its reporting too soon and monthly volumes not accurate.</p> <p>-Ray request shouldn't be handwritten. It is difficult to read the writing and there is confusion on the patient's name.</p>
	ER	<p>No follow-up care for patient in ER so patient given paper with follow-up orders. Leads to problems in communications.</p>
	Pharmacy	<p>There is no designated person or method for carrying pharmacy requests or drugs from pharmacy to ward. Causes losses.</p>

TYPE: Operation Procedures and Personnel (between Departments)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Information	Other	Lack of coordination between admissions and teams caused record unavailability and duplication.
Control	Medical Record Dept.	Many patients are seen at the clinic that have not been registered at admissions. This is usually because all members of the family must register. The consequence for medical records is the inability to assign a patient number to the patient.
	Business Office	High turnover in billing dept. since it operates 7 days a week and personnel must work weekends.
	Other	Difficult to communicate operational changes to the five team areas.
Utilization	Medical Record Dept.	Dictation equipment provided by MR is only used regularly by one doctor in clinic.
		MR personnel must go to wards to get charts of discharged patients.
		The hospital has a messenger service, but it is not used to transmit records. Ward personnel go to MR to pick up records of patients with previous hospital stay. MR personnel go to wards to pick up charts of discharged patients and to insert transcribed material into the chart.
		Difficult to communicate with four separate Med. Rec. Rooms without central message distribution (center).
	Admissions	Only one person working part-time to handle all admissions.
	Nursing	Most of the communications between departments is by word of mouth and paperwork, forms, etc. are handcarried by the sender.
X-Ray		No one in the hospital has a key to the pharmacy and no full-time attendant generates borrowing of drugs and missed charges.
		Since no advance warning is given to the wards before the patient is picked up, sometimes the orderly will arrive to pick up a patient who is not properly prepared. If a blood test is needed but was not done, the patient will be taken to radiology anyway, and the blood team paged to draw blood in radiology.

PROBLEMS

TYPE: Education and Training

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Qualification	Medical Record Dept.	Transcription personnel with knowledge of medical terminology are difficult to hire. Ward personnel did not know how to obtain records during the night. A procedure manual has not been written so that the night supervisor has access to medical records when necessary. Not hiring trained personnel or retaining trained personnel for job openings. One person in department can neither read or write which creates many communication problems.
	Nursing	Teaching nurses to write good nurses note is difficult because of bad english background.
	X-Ray	They can get qualified radiologist, but not qualified X-Ray technicians.
	Pharmacy	Some team members not qualified to fill out orders for drugs but do it anyway. Orders are not filled because of improper order procedure. Nurses aides and ward clerks not properly trained to read medication orders.
Lengthen	Business Office	Insufficient staff in DP to properly train center staff of all procedures in source documentation.
Change Content	Medical Record Dept.	High turnover of personnel causes training problems. Training classes of more than one hour cannot be given since people cannot leave their jobs any longer. Of the six people in the filing room, none has been on the job more than one year

PROBLEMS

TYPE: Facility Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Departmental Adjacencies	X-Ray	The doctors use a room for dictation which has an open doorway to the jacket file area. This creates background noise and makes it difficult for the transcribers to hear the doctor's voice.
Sizes	Medical Record Dept.	The area provided for medical records will be totally inadequate in three years. The M.R. Room has adequate storage provided they adhere to their plans of microfilming records in 1971.
	Business Office	The business office is much too small and there is no storage space. Many files consist of large cardboard boxes. Need more office and storage space.
	Admissions	Department is too small with crowded offices. This hinders the operation of personnel. Not enough working space -- very cramped working conditions.
	Nursing	Not enough working space at the nursing station. Consequently, if the unit had another clerk, who is needed, there would be further cramping of an already crowded station. Nursing station is too small. Nursing station is too small. Could complicate utilization of MR.
	Laboratory	There is a shortage of space and no plans for expanding the department in the immediate future.
	X-Ray	Facilities are too small for X-Ray Department. There will not be enough storage for X-Ray films in five years. Size inhibits working efficiency. Department was too small when hospital opened.

TYPE: Facility Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Department Layout	Medical Record Dept.	Layout of departmental functions cause excessive personnel travel.
	Nursing	Large nurse unit of 56 to 58 patients difficult to manage.
	OR	The OR is located in an open area utilized by all nursing functions and separated only with a curtain.
	Laboratory	The lab has no designated place for their refrigerators so they are placed in the aisles of each lab.
	X-Ray	<p>The department does not have a process room for floro mixtures and this must be done in the hall.</p> <p>The facilities consist of an X-Ray Procedure Room and two small development rooms. There is no storage or clerical room. This is shared with a nursing unit and other space is provided in another building.</p> <p>Pneumatic tube is located on wrong side of room.</p>
	Pharmacy	Facility design restricts expansion.
Building Location	X-Ray	The jackets and viewers are not in the same building as the X-Ray equipment.

PROBLEMS

TYPE: Equipment

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Design	Nursing	<p>The card machine does not stamp charge slips clearly so than an RN must go through them when data processing sends them back for identification. Many times it is impossible to do and the charge is lost.</p> <p>Many times the chart is not available or the clerks do not have time to update the chart, thus this is done late at night and the addressograph card stamping disturbs the patients and is one of their major complaints.</p> <p>Tube system is inefficient.</p>
	Laboratory	<p>The pneumatic tube system fails frequently and the carrier is sent to the wrong station.</p> <p>Forms are designed to be compatible with the equipment. The equipment was not ordered by the original staff. Most equipment has been replaced and most forms have been replaced causing waste of time and money.</p>
	X-Ray	<p>Pneumatic tube system fails too often to use effectively.</p>
Maintenance	Medical Record Dept.	<p>The pneumatic tube system has not worked for the past two years.</p> <p>Pneumatic tube systems fail and X-Ray requests are held in the systems.</p>
	ER	<p>Have to hand carry all documents because pneumatic tube system doesn't work properly.</p>
Other	Medical Record Dept.	<p>The pneumatic tube system is under utilized by Medical Records.</p>
	Business Office	<p>There is no particular person responsible for coding the business office electrofile and very often it is miscoded, making retrieval by machine operation impossible. Then cards have to be hand retrieved.</p>

SUGGESTIONS

TYPE: Medical Record

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Record	Medical Record Dept.	Forms arrive at MR without proper identification. All forms should have patient's name or number. The ward clerk should have the responsibility of checking for form's completeness.
	Nursing	Change order of medical records to have clinic sheet, doctor orders and nurses notes as first three pages. Doctor should list patient ailment and reason for medication on chart. Nursing assistant should not chart. Team leader should. Only vital, not routing, information should be charted.
Process	X-Ray	DP should wait till end of month before making reports.
	Pharmacy	There would be less errors if prescriptions were filled from doctor's orders. Suggestion - that a copy be sent to pharmacy rather than the card filled by nurse.
Retrieve	Nursing	Recommends that old chart for re-admission are not routinely pulled and sent nurse station. Only on request by physician.
Transmit	Nursing	Old MR should be transmitted to the nursing station on all admissions.
Utilize	Medical Record Dept.	There should be a special medical team responsible for walking patients. This would help MR in standardizing procedures and utilizing resources uniformly.
	Nursing	RN would like to have a better way of flagging doctors' orders.

SUGGESTIONS

TYPE: Forms Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Lengthen	Nursing	Duplications of green admission slip needed for private doctors and nursing homes needing patient information.
		Want admission office to add Medicare number to face sheet.
Shorten	Admissions	Need to have shortened form for reevaluation instead of using lengthy initial evaluation form.
		Need to shorten form for admission.
	Nursing	Need for more forms to cut down on writing.
	X-Ray	X-Ray request could consist of one sheet of paper.
		Should combine request into one form because three copies of X-Ray request disposed of anyway.
Change Content	ER	The number of forms that the ER sends to the lab could be reduced by designing a new form since the density per current form now being filled out is very low.
	Medical Record Dept.	The physician committee frequently suggests changes of forms.
	Business Office	Want to develop a new form to go in chart next to discharge summary for doctor to write patient diagnosis. Form would relieve problem of having to wait as long as two or three weeks to file insurance claim because of lack of diagnosis. Would also save from having to go to medical record department to get diagnosis from patient chart in order to file claim.
		Could use a maternal and infant care project form because cases of this more frequent. Have to hand-write this information or type it on bill now.
		Need standardized insurance form for all hospital patients.
		Want more copies in authorization and invoice for vocation rehab. patients because have to Xerox copies now.
		Need standardization of charge slips from different functions.

TYPE: Forms Design - Suggestions cont'd.

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Age Content	Admissions	<p>Should arrange wording to be completely written out so that forms for pre-admission can be filled out accurately and completely.</p> <p>The ER admission form should have birth date, not age. The birth date is required on insurance forms and the business office must question patient about age again.</p> <p>Wording should be simplified on admissions questionnaire.</p> <p>Should read "name of insurance" or something similar on face of admission form.</p>
	Nursing	<p>List of standard medications should be put on surgical check list form. Nurse could check appropriate med. and duplication and writing cut down.</p> <p>Would like to implement a new care plan that would be placed in MR.</p> <p>There should be a general form used for all entries to reduce the physical size of a medical record.</p>
	X-Ray	All important data could be recorded on X-Ray report form and eliminate the request form.
	ER	Need to enlarge printing on ER form and rearrange information according to categories.
	Pharmacy	Would like to change the current form used for pharmacy requests.
	Other	<p>Two different forms for X-Ray request and report are unnecessary.</p> <p>Laboratory summary sheets would be helpful in review of patient record.</p>
Other	Business Office	<p>Need better carbon on forms to insure readability.</p> <p>Want to go to McBee brand of request forms for better control.</p> <p>Need forms control because of frequent changes by staff.</p>

TYPE: Forms Design - Suggestions cont'd.

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Other	Laboratory	The lab would prefer using NCR paper rather than carbon paper because the carbon forms must be handled prior to processing test and it leaves carbon deposits on their hands.
	Nursing	Physicians Ofc. pre-natal rec. should be standard and more comprehensive. Recommends pasting X-Ray reports on sheet such as lab reports.
	Pharmacy	Replace pharmacist's request with copy of doctor's orders.

SUGGESTIONS

TYPE: Operational Procedures and Personnel (within the department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Time	Pharmacy	Teams should schedule sending of requests to pharmacy.
Information	Business Office	Need to use a 3-sided, open-top business office jacket with information in chronological order and a checklist in front of jacket to check charges already posted.
	Admissions	Would like all pre-admitting information filled out by patient before he arrives at hospital admission desk.
	Nursing	Would like a 5 day summary of patient's condition prior to surgery. This should be done within 24 hours of surgery. Abbreviations should be standard.
Control	Business Office	Want charges to be written on request by department rendering service to insure accuracy of amount of charges. Charges now done on nursing unit by clerks. Teach others responsible duties and divide work loads for better and faster operations.
	Nursing	Prefers computerized listing of lab tests and results over retention of lab slips which are received initially reporting test results. In this ward, lab slips are frequently removed when computerized listing is received. Thinks that the hospital should decide which system will be used and eliminate the other.
	Pharmacy	Need to go to unit dosage in team situation to insure accuracy of dosage.
Utilization	Business Office	Business office needs to become automated to process routine charges.
	Admissions	Need a qualified nurse to determine emergencies from non-emergencies in admissions to save time and properly allocate time of personnel.
	Laboratory	The lab must provide tech for specimens and blood from floor. They feel a special person could be trained for this to reduce cost by keeping higher paid tech in lab.

TYPE: Operational Procedures and Personnel (within the department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Utilization	X-Ray	One darkroom between two X-Ray rooms could utilize a full-time darkroom technician.
Other	X-Ray	The log book is a duplicate of record file copy and should be purged. They have logs since 1947.

SUGGESTIONS

TYPE: Operational Procedures and Personnel (Between departments)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Time	Medical Record Dept.	SMA receiving unit to replace lab teletype would eliminate Medical Record Dept. from having to transcribe the data onto SMA form.
	Business Office	Additional DP staff could effectively coordinate DP services between all units.
	Admissions	Admissions should send preadmitting information to insurance department before patient arrives so it can be verified before patient is admitted.
	Nursing	Imprint of 3 x 5 card for Medical Record Dept. should be done by Admissions Department.
		Waste of time for the RN to sign every chart at the beginning and end of each shift. A waste of time for nursing staff to personally deliver lab and X-Ray request to that department.
Information	Pharmacy	Pharmacy should be able to stock nursing stations routinely without having to handle stock requisition papers. Handling papers takes up pharmacists' and nurses' time.
	X-Ray	To avoid having to go back to ER to get doctor's name, ER should record specialist's ID number without fail.
	Pharmacy	Need to establish better communication between doctor and pharmacy to eradicate mistakes in filling orders for discharged patients.
		Nurse station should forward a copy of the doctor's orders to the pharmacist. This would decrease the error in interpretation of the doctor's orders since the pharmacist is better qualified to read orders. Should establish a consistent and reliable method of transporting pharmacy request and charges.
Control	ER	Combine authority and responsibility for the ER and out patient clinic for better communication and control.
	Other	Need zip card to imprint patient which is filed in the medical chart.

SUGGESTIONS

TYPE: Education and Training

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Qualification	Other	Physicians should be better trained to cope with the social, economic and ethnic problems found in the catchment area of the comprehensive health center.
Change Content	Nursing	Would like to have conference with doctors as well as RNs on shift change reports.
	Other	Someone should instruct physicians on how to properly use forms and code. More stress should be placed on teaching preventive measures to the patient.

SUGGESTIONS

TYPE: Facility Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Department Adjacencies	Business Office	Business office should be located centrally for the convenience of the patient and not necessarily near Medical Record Dept.
	X-Ray	Darkroom should be located in center or between X-Ray rooms.
	Pharmacy	Satelite pharmacies on wards are good if you have room.
Departmental Layout	Nursing	Layout of wards requires two or three units to share same nursing.
	ER	Need separate room for charging and paying operations. All done in RN station of ER Room. Large volume of patients per day and overcrowded.
	Pharmacy	Need new facility design for better flow of traffic and more room.

SUGGESTIONS

TYPE: Equipment

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Design	Nursing	Tube system could be improved.
	Other	Want to get away from card system.

TRENDS

TYPE: Medical Record

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Record	Medical Record Dept.	Hopefully the problem oriented weed system will be implemented at a later date to improve quality of the medical records.
	Nursing	<p>Plan to implement Hurst-POMR which will change MR procedures.</p> <p>The concept of the problem-oriented Medical Record was introduced five months ago to this ward. The nurses and clerks like the idea. It improves understanding of patient's condition.</p> <p>The problem-oriented Medical Record will improve nurse understanding.</p>
	Other	The director is presently working on a problem sheet form which he would like to implement.
Process	Medical Record Dept.	MR will eventually be given the responsibility for maintaining Emergency Room records.
	Nursing	<p>Order of Medical Record changed on ward to improve use by nurse.</p> <p>Two nurse teams per unit improves patient care and nurse notes in Medical Records.</p> <p>The staff is in the process of trying to implement internal changes in communications and procedures concerning MR.</p> <p>Dictation has greatly improved doctor input to MR by the use of a remote pneumatic system.</p>
Store	Medical Record Dept.	<p>Formerly records were stored in closed cabinets. Open shelf filing has made access much more simple.</p> <p>The storage at MR is being decentralized to teams which will keep active patient files while the main MR department stores inactive files.</p> <p>Color coding and terminal digit filing has cut down significantly on filing errors.</p>

TRENDS

TYPE: Medical Record

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Store	Nursing	Would like to see medical record on microfilm. Some patients have medical record which consists of several volumes. When a medical record of this size is sent to wards with a patient, it occupies too much space. Microfilm viewers could be used on the ward to look at patients prior admissions medical record.
Retrieve	Nursing	Supervisor has ordered chart dividers as the records on this ward tend to be lengthy, thus impairing rapid use.
Utilize	Business Office	The problem-oriented medical record will enhance the use of the medical records by team physicians and provide a better record for computerization.
		Medical record audit will be used in the future to improve quality of patient record and patient care.
	Nursing	Nursing service is trying to set up a committee to rate nursing notes and try to upgrade them.
		POMR will improve nurse's understanding of patient thru problem list.
	Other	Prior to decentralized record keeping, many charts were missing, wrong numbers were placed on information sheets concerning patient, and transmission time was greater.
Other	Other	The director feels that in the future other outside institutions will be auditing their medical records.
		In the future this floor will handle Medicare patients only which may change current MR procedures.

TRENDS

TYPE: Forms Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Shorten	Nursing	Supervisor is working on a new form which will combine several old ones in CCU.
Change Content	Business Office	Want to begin using the standard A-92-R billing claim form. This will take place of several forms now being used.
	Nursing	<p>Nursing service has been working on a medication form which should save RNs some time in charting. All floors are on the unit dose drug dispensation. Two other forms containing TPR, I&D, and RN's notes will also have to be changed as a result.</p> <p>In process of changing nursing forms.</p> <p>TPR graphic sheet is being changed to allow for one week of data to be entered beginning on Sunday each week.</p> <p>Pediatrics is in the process of creating a new nurse's worksheet which will include J&O, TPR, and nurse's notes. The J&O will be recorded hourly and each sheet runs through A 24.</p> <p>Pharmacy slips will soon change due to change to unit dose. Nurse would like color coded chart sheets and lab sheets.</p> <p>New phar. request will save on pilferage by nurse staff.</p> <p>This floor is trying out a nursing problem sheet to be inserted into the chart;they are also trying out a new graphic sheet covering seven days instead of five.</p>
	Laboratory	They are in the process of changing their lab requests. This will be the first change in the history of the hospital.
	X-Ray	The X-Ray request was changed three years ago and will continue to change to meet the hospital demands.
	ER	ER form redesigned within last year.

TRENDS

TYPE: Forms Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Change Content	Pharmacy	<p>New pharmacy form will eliminate transcription of doctor's orders.</p> <p>Have designed new form to be used with unit dose system that will be running record of drugs administered to patient and will become part of patient's chart upon discharge.</p> <p>New pharmacy form will improve doctor-pharmacy communication.</p>
Other	Other	<p>Have changed to a special pediatric admitting form and nursing note.</p> <p>Mental Health to begin developing their own forms.</p>

TRENDS

TYPE: Operational Procedures and Personnel (within the Department)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Time	Business Office	Want and need computer to produce a totaled summarized statement to send to insurance companies because they won't accept a daily report. Totals done by hand now.
Direct Cost	Medical Record Dept.	Are hopeful to eventually use a computer capability for indexing using P.A.S. system.
Information	Pharmacy	New pharmacy form will require phone calls to pharmacy on patient discharge. Going on unit dose system February 1971 and designed new pharmacy request form.
Control	Other	Pharmacist wants to go to unit dose system to make charging easier and increase sanitation and accuracy of dosage.
Utilization	Pharmacy	More use of pharmacy technician is coming.
	X-Ray	Will implement the Ames visible filing system in three or four months. Only those X-Ray jackets used after installation of the system will be converted.
	ER	Going to initiate a triage area with a nurse directing patients to proper areas for treatment in the ER.
	Other	Plan to hire full-time medical record clerk to coordinate and manage medical records.
Other	Business Office	Proposal has been made to microfilm paid-out records. This would be storage and retrieval system.
	Pharmacy	Chance that a pharmacist will go to floor and supervise administering of drug to patient to insure accuracy of dose.

TRENDS

TYPE: Operational Procedures and Personnel (Between departments)

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Information	Business Office	Data Processing is developing a patient profile that will be given to team prior to patient appointment to improve accessibility of medical data.
	Pharmacy	Will be filling orders from copy of physician order in the pharmacy in the near future.
Control	Pharmacy	Pharmacy should fill physician orders from a direct copy of the order. Would reduce errors since pharmacists acquainted with terms used. Would remove nurses from order cycle and give them more time to devote to nursing duties.
Utilization	Nursing	POMR would improve nurse care greatly.
Other	Pharmacy	Drug losses have decreased with the implementation of unit dose.

TRENDS

TYPE: Education and Training

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Change Content	Nursing	Starting next month the staff RNs will begin classes on RN charting.

TRENDS

TYPE: Facility Design

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Size	X-Ray	Plans for expansion 1971. Plans for the addition of 2-0 beds in four or five year call for the expansion of Radiology into Pharmacy and part of the Emergency Room. In-patient and outpatient waiting and service areas will be separated in the new design.
	ER	Plans have been made for a new ER to accommodate increasing volume of outpatients and emergencies.
Department Layout	Medical Record Dept.	The medical room was designed for microfilm storage.
	X-Ray	New facilities will be designed on basis of predicted workload.

TRENDS

TYPE: Equipment

<u>DESCRIPTOR</u>	<u>SOURCE</u>	<u>COMMENT</u>
Design	Medical Record Dept.	<p>Dictation equipment, teletran, has five input locations - 1 per nursing unit and 1 in medical records which improves stenographic throughput.</p> <p>The Xerox machine has been a significant addition to the Medical Record Dept. Now rather than sending the original record out, a copy may be sent. Copies are acceptable for court cases.</p> <p>Need an automated master patient file for 125,000 medical records.</p> <p>Power files for this size hospital are a luxury but director says now she "wouldn't do without one". Improves retrieval of very active files.</p>
	Business Office	<p>Each room in the future should be equipped with a closed circuit camera and monitor to permit 2-way visual communications.</p> <p>Expect to have IBM2790 terminals in nursing stations within one year for laboratory orders.</p> <p>Starting work on hooking up autoanalyzers to computer. Expect to have it tied in by beginning of 1971.</p> <p>Business manager predicts the Business Office will be on computer for billing in three to five years.</p>
	Nursing	<p>Mixed feelings about computerized lab results on terminal in ward, which is planned for near future. Where will the terminal go? No room. However, the terminal should eliminate many calls to the lab for lab results.</p> <p>Director is screening equipment with administrator. Several computers for patient information are being considered.</p>
	Laboratory	<p>Within a year they will be using only computer system for the lab report, for all inpatient reports except for blood bank, bacteriology and special procedures.</p> <p>Computer system is way to go in the future although it will buy the lab almost nothing. It will help in research studies, also it will give current, fast data to wards.</p>
Other	Laboratory	<p>Expects to have computer to handle lab requests and reports.</p>

SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA

FINAL REPORT

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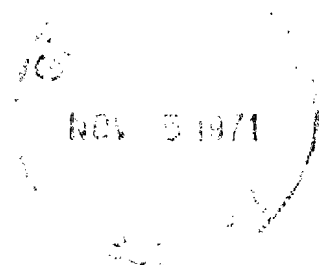
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VOLUME II STATE OF THE ART REVIEW

HEALTH SYSTEMS RESEARCH CENTER
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA

HEALTH SYSTEMS DEPARTMENT
WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PENNSYLVANIA

SEPTEMBER 1971



SYSTEMS ANALYSIS
OF MEDICAL RECORDS
IN GEORGIA
FINAL REPORT

This project was conducted under contract HSM 110-70-349
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VOLUME II
STATE OF THE ART REVIEW

Health Systems Research Center
Georgia Institute of Technology
Atlanta, Georgia

Health Systems Department
Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

September 1971

PREFACE

The present volume, Volume II of a three-volume final report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, contains a survey of the state-of-the-art of medical records systems. This volume, entitled STATE OF THE ART REVIEW, is submitted in accordance with the provisions of United States Public Health Service contract HSM 110-70-349. Volume I contains a summary of the project, and Volume III contains a description of four analytical methods which can be used to evaluate procedures for processing, entering, storing, and retrieving medical record information. The project was conducted jointly by the Health Systems Research Center of the Georgia Institute of Technology and the Health Systems Department of Westinghouse Electric Corporation for the Regional Medical Programs Service of the Health Services and Mental Health Administration in the period July 1970 through September 1971.

The objectives of the project were to describe the state-of-the-art in medical records systems and to develop analytical methods for studying and improving medical records systems in health-care facilities. During the course of the project, twelve hospitals, five nursing homes, and one neighborhood health clinic were studied by the project team.

At each facility, data on the management and flow of medical record information were collected by using one or more of the four methods developed in the project. The purposes of the data collection were: (1) to test and refine the methods and (2) to construct a profile of basic information regarding the use and maintenance of medical records systems. During the course of data collection and methods development, two proprietary computer programs of the Westinghouse Electric Corporation were employed; these programs were the Network Analysis Method and Work Sampling Method. Also, the method described in Chapter 3 of Volume III was based largely upon the Hospital Staffing Methodology for Medical Records, which was developed at the University of Michigan. Data regarding the state-of-the-art in medical records systems was obtained via direct inquiry to manufacturers and users of these systems. An extensive bibliography of journal articles and

project reports was also prepared. Neither an examination of the medical-decision-making aspects of the medical record nor an analysis of the quality of the medical information residing in the medical record were included in the project. While these topics are important, their consideration was beyond the scope of the project.

The successful completion of this project was due to the efforts of various individuals, institutions, and groups to whom credit is gratefully extended. Important contributions were made to the project by the following on behalf of the Health Systems Research Center: John W. Coyle, Gerald L. Delon, Chris C. Efland, Terrance M. Patrick, James F. Smith, Karenan P. Stubbs, and Gerald B. Widegren. Major contributions were made to the project by the following members of the Health Systems Department: Charles C. Camp, Edwin E. Keelen, Frank W. Koenig, and Stewart F. Paterson. The present volume was written by Mr. Camp.

Appreciation is extended to Dr. J. Gordon Barrow and the staff of the Georgia Regional Medical Program for their advice and cooperation. Also, acknowledgement is given to the several consultants and members of the advisory board to the project for their valuable contributions and active interest.

In particular, sincere appreciation is extended to the many medical records librarians, administrators, nurses, physicians and other personnel who so graciously and generously contributed their time and thoughts to the project. Their busy schedules were interrupted for extended periods of time, and the project could not have been completed without their assistance.

Harold E. Smalley, Director
Health Systems Research Center
Atlanta, Georgia
September 28, 1971

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CHAPTER I

STATE OF THE ART IN MEDICAL RECORD SYSTEMS

1.1 INTRODUCTION

The medical record system is a file of medical data which provides:

- Historical data on past illnesses and treatment
- A statistical base of disease incidence and treatment methods
- A means of auditing physician health care delivery
- Information for the collection of charges incurred during hospitalization.

This document is concerned with systems using innovative techniques in medical record procedures and not with the specific medical content of the record. The various medical record systems can be characterized by:

- Input and retrieval methods
- Transmission characteristics
- Storage procedures.

1.2 MANUAL HARD COPY MEDICAL RECORD SYSTEMS

1.2.1 Input Methods

The most common medical record systems found in today's health care facilities are manual systems using hard copy (paper). All data are recorded by the physician or ancillary personnel. A variety of forms are used, which are loosely filed in a manila folder or sectioned by type of information within the folder. In more sophisticated manual systems, the physician or other professional dictates summary information, which is then typed and reviewed by the physician prior to its inclusion in the medical record. Such a system is installed at St. Luke's Methodist Hospital in Cedar Rapids, Iowa. At St. Luke's physicians can dictate medical data from any telephone in the hospital's dial system or from telephones in their offices or homes through central recording units in the hospital's Medical Records Department.¹ St. Vincent's Hospital and Medical Center,

¹Toussaint, Jack L. "Central Dictation System Promotes Complete and Legible Medical Records," Hospitals, J.A.H.A., Volume 40 (January 1, 1966), pp. 44-45.

New York City, also uses a central memory dictation system.² Most manufacturers of central continuous tape dictation devices recommend the inclusion of stand-alone dictation devices.

1.2.2 Retrieval Methods

Retrieval methods are dictated by the degree of accessibility of various records. As the record's age increases, the storage location becomes more remote. If a record is accessed several times a day, it will be stored near the user position. The record may stay in a location from five to twenty-five years or more, at which time it may be purged and placed in a more remote storage site. Once placed in an archival location, records are not generally retrieved, except for emergency or rare research activities. Color coding, terminal digit filing, power files, and automatic retrieval mechanisms aid in accessing medical records.

1.2.3 Transmission

The primary method of transmitting hard copy data in modern hospitals is to install a pneumatic tube system between work stations. Mechanized carts, gravity chutes, dumb waiters, and various types of conveyor systems are also used to transmit medical records. The Mayo Clinic in Rochester, Minnesota, uses a combination of gravity chutes, dumb waiters, conveyor belts, and pneumatic tube systems to transmit medical data among the outpatient clinic, two inpatient facilities, and a central record storage area.

Several facilities have installed an automated track-guided powered cart (Mosler Telelift) to transport medical records between selected locations in the hospital. Others are using the Telelift System as a general materiel handling system which incorporates the transmission of medical records.

1.2.4 Storage Characteristics

Open file, terminal digit storage is the most common method of storing hard copy medical records. In terminal digit indexing, active

²Kanon, Don. "Patient Information Utilizes Central Dictation," Hospitals, J.A.H.A., Volume 43 (October 1, 1969), pp 56-57.

medical records are divided into 100 files according to the last two digits in the medical record number. For example, a record numbered 263,421 would be written as 26-34-21, and would be filed according to "21" -- the terminal division. Since the same amount of old and new files will likely be allocated to each of the 100 divisions, file expansion is easy. To aid clerks in locating records and to prevent misfiling of information, a color may be assigned to each digit in the terminal division and the files would be marked accordingly. The use of social security account numbering coupled with a terminal digit method is presently being explored.

Medical records are usually stored in several locations during their lifespan; for example, the record of an inpatient's previous episodes of inpatient care may be stored in a central file, and his current active records located on the ward. In a dual record system, the inpatient record is stored in one location while the outpatient record is in another. As a result of multiple-location filing, access may be difficult.

Some very costly systems are available that automatically box and mechanically shelve record data, but none is operational in a hospital at this time. Such a system is Remington's Rand-Triever II, which automatically retrieves records and transports them to a console location. The operator requests files or containers by using a seven-digit code via digital keyboard or by inserting a punched card under an electronic sensor. The coded containers deliver up to fifteen file folders to the console station. The storage modules (shelves) for the file containers can extend horizontally almost indefinitely and vertically up to 22 feet, with only 15 inches clearance required between modules. Up to fifteen thousand file folders can be stored in one hundred square feet of storage space.

To save space in the file room, mobile storage units are available. By mounting rows of files on mobile bases, or dollies, the file rows can be pushed against each other (reducing the space needed) and separated to form an access aisle only when necessary.

1.3 MICROFILM MEDICAL RECORDS SYSTEMS

The most common hospital microfilm systems use a photographic process of recording hard copy information on 16 millimeter film. The data may be stored on the microfilm roll, aperture cards, or microfiche. Microfilm

can be processed in 35 and 70 millimeter sizes. Microfilm is most commonly used for archival purposes; medical records are normally 10 to 25 years old before they are microfilmed and placed in limited access storage areas.

1.3.1 Input Methods

The primary method of manufacturing microfilm is to photograph original or duplicate hard copy. A more sophisticated method is to generate the microfilm directly from digital computer data -- computer output to microfilm (COM). COM is not used in any current medical record systems, since no operational system has complete medical records in machine-readable form. (See Section 1.5.1)

1.3.2 Transmission

The easiest way to transmit microfilmed information is to use a manual or mechanical transport system between the storage and user locations. The most advanced transmission method is by a closed circuit television system, such as the Sanders Diebold Systems 500 and 550. The Washington Medical Data Center is planning to install the Mosler 410 linked to an IBM 360 computer. This system will make current microfilmed data immediately available in remote locations via video monitor.

1.3.3 Storage Characteristics

The storage requirements for microfilm are very similar to those of hard copy data, but because of the reduced size, several innovative techniques have been used. Microfilm can be embedded in an IBM or aperture card and then stored and retrieved automatically by using the data punched into it. Microfilm rolls can also be indexed and searched automatically. There are several methods of storing and retrieving microfiche or microfilm which are nearly automatic. The most sophisticated method is the Mosler System 410, mentioned above. Although available in various configurations, the Mosler System generally stores the microfiche in small boxes. The boxes are addressed by the computer and then mechanically retrieved to a position where they are automatically extracted, reproduced, or viewed via closed circuit television.

1.3.4 Retrieval Requirements

To use microfilm data, a reader that conforms to the microfiche used or a means of producing hard copy from the film is necessary. Consequently, microfilm will not be readily useable in all hospital locations, unless the physician or other medical record users have some type of device to display the recorded information. Microfilm readers range in price from eighty to several thousand dollars.

1.4 COMPUTERIZED HARD COPY MEDICAL RECORDS SYSTEMS

1.4.1 Input Methods

In systems which use both computers and hard copy, the computer serves as a communication device for medical record inputs. For example, an EKG may be analyzed and temporarily stored in a computer, or the computer can be used to collect and summarize laboratory data for display on the nurses' ward or outpatient area. Hard copy, on the other hand, is normally generated for information such as laboratory results, pharmacy requests, or accounting data. The hard copy is then stored in the manual medical record file system. In most systems, a machine-readable form such as magnetic tape is also generated for additional summarization and accounting procedures.

1.4.2 Retrieval Methods

If the information is in a computerized form, it may be retrieved by the various methods discussed in the communications state of the art, such as teletype, cathode ray tube, or the common IBM card. If the data are not in the computer process form, the retrieval requirements are the same as those for manual hard copy.

1.4.3 Transmission

Transmission of data from the computer system to the manual system will normally reflect the operating characteristics of each facility, which may be messenger, teletype, pneumatic tube, or electronic communication.

1.4.4 Storage Characteristics

Selected portions of the medical record may be stored in a computerized system; for example, the laboratory data may be stored in the

computer for up to fourteen days, at which time a summary report is printed out and stored in the manual record folder.

1.4.5 Users of Computerized Hard Copy Systems

Danderyd Hospital in Stockholm, Sweden, has computerized the medical records of 1.4 million patients, and the country's 14 other hospitals will eventually hook up to the computer center. The computer will soon schedule patient admissions and use of facilities such as operating rooms and test laboratories. "Ultimately, country health planners say, the Danderyd system will encompass every aspect of medical management, control and treatment for two million people."³

Julius Korein at the New York University Medical Center has developed a system for "entering minimally structured narrative medical data into a computer using the Variable-Field-Length (VFL) format technique."⁴ The system can be used for narrative medical data and medical services, clinic, and other types of documents.

Three levels of computer processed data are used: (1) on-line real time which involves immediately retrievable data (ID data, patient appointments, and data essential for urgent patient care); (2) on-line demand in which response time may vary but is usually rapid and which is used for data entry; (3) off-line, batch which usually takes several hours and possibly days and is used for data analysis.

In on-line, demand a teletype interacts with the large computer system (Univac 1108, 131 K core). In on-line, real time, the teletype or CRT terminal interacts with a large computer system via a smaller satellite computer (Digital Equipment Corporation PDP 8 K core). Off-line capture of data is via paper tape or magnetic tape typewriters.

³Medical World News, (December 12, 1969), p 28.

⁴Julius Korein, "The Computerized Medical Record: The Variable-Field-Length Format System and its Applications," presented at the IFIPs TC 4 Conference, April 1970. Published 1970.

The Permanente Medical Group in Oakland, California, is also using a variable-length, variable-format medical record to permit the continuing collection and storage of all essential inpatient and outpatient data.⁵ The medical record is organized on a tree-branching-structured basis and contains identification, administrative, and medical data sections. The medical data section is partitioned into patient visits and includes items such as medical history, tests, and diagnoses.

An IBM 2321 Data Cell Drive is used for permanent storage of active medical records. But when a patient is under actual care in the hospital, his record is moved to random access disc drives (IBM 2311 Disc Drives) which offer more rapid access. Input devices include CRT visual display terminals, punched cards and paper tape, keyboards, and electric typewriters recording directly on magnetic tape.

1.5 COMPUTERIZED SYSTEMS NOT REQUIRING HARD COPY

Using today's technology, a totally computerized medical record system requiring no hard copy is possible, but no hospital is currently using such a system. One of the first attempted was the Lockheed System, designed to develop a completely computerized patient-physician interactive system at the Mayo Clinic. The system, though, was never implemented at the Mayo Clinic because of a lack of federal developmental assistance. Although several systems on the market today claim to be totally computerized, they do not generate the entire medical record.

1.5.1 Computer Microfilm Systems

In a completely computerized system, medical records can be stored in microfilm generated by the computer. This system is commonly called COM -- computer output to microfilm. The expensive storage requirements of computers are avoided by lower cost microfilm storage; however,

⁵ Davis, Lou S.; Collen, Morris F.; Rubin, Leonard; and Van Brunt, Edmund E. "Computer-Stored Medical Record." Reprinted from Computers and Biomedical Research, Volume 1 (May 1968).

the conversion of digital information to microfilm is currently very expensive. No hospital systems are currently using this type of conversion, although it was previously attempted by National Data Communications. The input, transmission, storage, and retrieval requirements would be the same as those of the computerized hard copy system discussed above.

1.5.2 Computerized Videotape Record Systems

Joseph Saxl has proposed a hospital information system based on the concepts of visual image retention, computerized access, and immediate decentralized visual display. Chart data would be input via video camera, and addressing information via a touch-tone keyboard. Computer output would be displayed on a video screen or printed by an electronic copier.⁶

1.6 TOTAL MEDICAL RECORD SYSTEM

The most unique total medical record system under development is that of Dr. Lawrence Weed at the University of Vermont. Dr. Weed's problem-oriented patient record, which is well suited for computerization, separates the medical record into four major divisions: (1) the data base; (2) the problems list; (3) treatment plan; and (4) discharge summary. Each problem identified with a patient is sequentially numbered, and all laboratory, radiographic, diagnostic, and treatment procedures are given for the associated problem. This method of record keeping is currently being introduced at several medical schools.

⁶Saxl, Joseph. "An Innovative Medical Information Storage and Retrieval System." Hospital Progress, February, 1971, pp 46-48.

CHAPTER 2

INNOVATIVE RECORD KEEPING SYSTEMS

2.1 INTRODUCTION

Six computer systems representative of advanced techniques in medical records and hospital data management are described below. They have had considerable impact on the health care market, and each is currently installed in one or more hospitals in the United States. For a comprehensive listing and product line description of manufacturers of medical record and hospital data management systems, see Chapter 3.

2.2 NATIONAL DATA COMMUNICATIONS CORPORATION'S REAL-TIME ELECTRONIC ACCESS COMMUNICATIONS FOR HOSPITALS (REACH) SYSTEM

REACH is a totally integrated communication and data management system which allows direct access to the computerized data base via a specially designed cathode ray tube (CRT). A user identification card in conjunction with twenty function keys located at the left of the CRT screen allow the physician, nurse, or technician to select standard phrases, which can be used to store a patient's medical record. Standard phrases may be used to request laboratory procedures and results, patient's condition, and radiographic and x-ray procedures. If required, a pharmacy label will simultaneously be printed in the pharmacy.

Most medical or administrative data can be handled by the programmed statements on the CRT screen. Used along with a standard typewriter keyboard, the function keys can also enter information such as pre-admission, scheduling of ancillary services, patient accounting, or narrative medical data. Nurse's notes, doctor's orders, patient history, and narrative progress notes can be typed into the patient's record by typists or ward clerks. Information is made available on a "need to know" basis; all staff members have identification numbers which give them access only to appropriate data.

2.3 THE IBM CORPORATION'S MEDICAL INFORMATION SYSTEM PROCESSOR (MISP)

The MISP package, the most widely used hospital information system, is an executive control program capable of providing message switching and a communication network from remote terminals on a real-time basis. MISP requires a 32K core memory, is designed for DOS (Disc Operating System) and OS (Operating System) and is programmed for both the IBM 360/30 series of computers and larger systems. It is currently operating on IBM Models 30, 40, and 50.

Data entry and output are primarily from IBM 1092/1093 programmed keyboards and the 1052 typewriter, not CRT screens. Another input/output component is the split-screen optical-image device which shows fixed data projected from a 16 millimeter film strip cartridge on the right side and transparent overlays on the left. The operator communicates with the computer using a light-sensitive probe to touch the appropriate information displayed on either the left or right or both sides of the screen. A CRT (Model 2260), with or without light-pen device, is available and is being used at several locations for admissions procedures and rapid file access applications.

Application programs such as the Shared Hospital Accounting System (SHAS) are available from IBM and from the Hospital Information System Sharing Group, Inc. The Sharing Group is a nonprofit group of IBM system users that exchange application programs and experience.

2.4 BURROUGHS CORPORATION ON-LINE MEDI-DATA SYSTEM

The Burroughs system, based on a totally time-shared concept, can serve 1,500 beds in multiple locations. Its major advantage is that remote sites can use large scale computers. Each hospital may have up to 250 terminals. All hospital teletypes (R035) are controlled by a small in-house computer (B300) which interfaces with the central data processing facility. The central facility has three maximum core capacity Burroughs 5500 computers.

The user can directly interface with the central files by using a CRT and a typewriter keyboard. A specially trained terminal operator (ward clerk) may enter all orders and results into the CRT terminal;

expanded orders are immediately printed at the service area. The doctor's handwritten orders and patient history are maintained in the conventional ward chart.

Departmental work schedules, statistical logs or test results, patient bills, and administration reports are available through an information retrieval program at each CRT terminal. Results of work done by auxiliary services, such as test results, are transmitted to the central computer facility and redirected to the appropriate nursing station where the printout is manually inserted in the patient's chart.

2.5 TECHNICON MEDICAL INFORMATION SYSTEM (FORMERLY LOCKHEED MIS-I)

The Technicon system is a centralized medical data service center that serves hospitals within a 50-mile radius. Each hospital is provided with natural language interactive CRT terminals using a light sensing pen and typewriter keyboard. The Technicon System, which can serve up to 2,400 beds, combines the time-sharing concept previously discussed in the Burroughs System with rapid access to the time-shared 360/40 computer by all system users. A distinct advantage of the system is the efficient data formulation and review procedure for physicians at the CRT terminals. Quiet inktronic print terminals manufactured by A. B. Dick Company are available. System operation is very similar to that of the systems discussed above.

2.6 THE MEDELCO COMMUNICATION SYSTEM "T.H.I.S."

This system is used primarily for data input and transmission, rather than for on-line data retrieval. Card readers feed data from coded, pre-punched cards into the central processor. The central processor then sorts the data and instantly transmits it to appropriate print terminal locations throughout the hospital. For example, to schedule a patient for radiology, a nurse would place the patient's identification card and card-punched instructions to radiology in the card reader at the nursing station. Information is printed at the nursing station for verification and simultaneously transmitted to radiology for scheduling. This same action would initiate the transmission

of diet change information to the kitchen and the calculation of patient charges which are stored in the central processor until the end of the day. Charges are generated in a daily batch output compatible with most batch-oriented computer systems.

2.7 PROBLEM-ORIENTED MEDICAL INFORMATION SYSTEM (LAWRENCE L. WEED, M.D.)

The Problem-oriented Medical Information System (PROMIS) Laboratory, currently located at the Mary Fletcher Unit, Adams Residence, Burlington, Vermont, is the most unique medical record developmental concept to date. Dr. Weed has restructured the traditional medical record to make it problem-oriented and has developed the software which computerizes the narrative and numeric data. The "Problem-oriented Medical Record" exists in a Control Data Corporation 1700 computer with appropriate peripheral hardware. The record is broken down according to present illnesses, progress notes, flow sheets, problems list, admissions summary, discharge summary, and history and physician data.

The Control Data Digiscribe Cathode Ray Tube and the Computex 100 unit (with Digiscribe attachment) is the principal input medium using a dynamic branching technique developed by the PROMIS Laboratory. Data is input via standard format statements appearing on the CRT screen by touching a touch-sensitive strip on the face of the tube. Data also may be entered via the standard typewriter keyboard attached to the CRT. All patient care related data can be entered or retrieved by this method on a selection basis by physicians or specified allied health professionals.

The system does not currently interface with the pharmacy, clinical laboratory, radiology, or other ancillary support areas. However, the communication network requirements can be easily handled by Setran Software. Once the total communication network is expanded from one ward to all its supporting areas, a ward by ward expansion will be undertaken until a total hospital information system is implemented.

2.8 SYSTEMS MODIFICATIONS

Many health care facilities have a particular modification of one of the alternative medical record systems discussed above. These differences result from personal preferences, hardware differences, type of health care provided, and local legal requirements. No system has completely eliminated hard copy. However, as the medical information systems become more complex and computerized, the volume of hard copy transmitted and stored decreases. This also applies very emphatically to microfilm systems.

CHAPTER 3

MANUFACTURERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE

3.1 INTRODUCTION

The major vendors of medical record and hospital information systems and equipment are listed in Section 3.2. Additional vendors can be found in the various trade journals and seen as exhibitors at health-related trade shows. Section 3.3 contains matrices which summarize the results of a questionnaire sent to these manufacturers in order to identify the major vendors selling to medical record departments. Manufacturers not responding to our state-of-the-art survey are presented in Section 3.4. These manufacturers are included in order to identify as many as possible of the users and producers of innovative medical records systems.

3.2 INDEX OF MANUFACTURERS

Vendors of medical record support systems and hardware are categorized below according to the following product types:

- Hospital information systems
- Communication systems
- Laboratory information systems
- Microfilm systems
- Filing systems

3.2.1 Hospital Information Systems

Anthony J. J. Rourke, Inc., Hospital Consultants

Automated Health Systems

B-D Spear Medical Systems

Bio-Chemical Procedures

Bunker-Ramo Corporation
Computer Instruments Corporation
Com-Share, Inc.
Control Data Corporation
Hospital Automation
IBM Data Processing Division
Litton Automated Business Systems
McDonnell Douglas Automation Company
Medical Information, Inc.
Medicus Corporation
Mediquip Corporation
Medlab Computer Services
RCA Corporation
Sanders Associates, Inc.
Shared Medical Systems
Spectra Medical Systems, Inc.
Symbronics Systems, Ltd.
Technicon Medical Information Systems, Inc.

3.2.2 Communications Systems

Dictation, Inc.
Telaugograph Corporation
Teletracer International Corporation
Victor Comptometer

3.2.3 Laboratory Information Systems

Bio-Medical Computer Service, Inc.

Bio-Logics, Inc.

Laboratory Computing, Inc.

3.2.4 Microfilm Systems

Arcata Microfilm Corporation

Eastman Kodak Corporation

Mosler Information Systems

3.2.5 Filing Systems

Smead Manufacturing Company

Standard Register Company

Supreme Equipment and Systems Corporation

Visirecords Division of Berry Right Corporation

3.3 MEDICAL RECORD SUPPORT SYSTEMS AND HARDWARE

In the following matrices, the point of contact, current product or systems, and products projected over the next five years are listed for each manufacturer of medical records support systems.

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
Automated Health Systems 1588 Gilbreth Rd. Burlingame, Calif. 94010	Don Segal	Automated history taking devices have been used at Children's Hospital, San Francisco, since February, 1971, and a clinical lab system will be operational at the San Francisco General Hospital in September, 1971. The Automated Health Systems concept includes the use of prototype CRT terminals and the mobile document reader. All programs are written in M.U.M.P.S. (high level language, dynamically allocated, tree-structured disc filing system). The system is currently operating on PDP-15 and PDP-11 computers.	A total multiphasic screening hospital. Also building and clinic scheduling systems.
B-D Spear Medical Systems 35 Dear Hill Road Waltham, Mass. 02154	B. Rodman Tuttle Director of Marketing	The B-D Spear pharmacy and laboratory information system uses real-time cathode ray tube displays at the departmental level.	A total hospital information system using the B-D Spear 300 Computer.
Bio-Medical Computer Services, Inc. 360 Hamm Building St. Paul, Minnesota 55102	John R. Krismer Executive Vice President	Bio-Medical Computer Services has designed registration, admissions/discharge/transfer/census, medical records, accounts receivable, pharmacy, and laboratory subsystems. Fifteen applications are currently being implemented. The hospital information system includes CRT-Finger Touch Switching and the hard copy printer concept using a pre-formatted method. Selections are made from the CRT by touching the screen.	Fifteen new applications.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
The Bunker-Ramo Corp. Oliver Plaza Suite 726 Pittsburgh, Pa. 15222	Samuel M. Begg MIS Representative	Bunker-Ramo provides devices and Series 200 and 2200 data displays to hospitals across the country that are implementing total hospital information systems. The systems are currently used with the IBM 360/40, IBM 1440, IBM 1800, IBM 360/30, and other hardware in the design of on-line hospital information systems. Subsystems include laboratory, admissions, medical records, accounts receivable, patient records, psychiatric records, pharmacy, dietary, patient monitoring, and others.	Unknown
Com-Share, Inc. 1910 Cochran Rd. Manor Oak #1 Pittsburgh, Pa.	William J. Barkley, III	Com-Share provides time-shared services on a nationwide basis using the Xerox Data Systems Model 940 computer. The basic software package available to hospitals is the Multiple Analysis Retrieval System (M.A.R.S), which is a retrieval and analysis system for tabular data structures. Hospital packages currently in operation include the Patient Information and Retrieval System, Analog Simulation of the Human Circulation System, and several dose programs for radiation therapists. Terminals currently used in the hospital are the GE Datanet Terminal and the Teletype ASR 33 Terminal.	Unknown

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
Control Data Corp. 8100 34th St. Minneapolis, Minn. 55440	John W. Oden	The Control Data Corporation has currently installed intensive care and physiological monitoring, automated clinical laboratory, hospital administrative and medical records, and EKG analysis systems. Installed systems use the CDC 1700/1700/3170 Computer and the 1700/1700/CYPER/70. Real-time computer input devices such as the teletype, controlled data CRT mark/sense readers, special input consoles for automated lab, and others are available. These are slowly being integrated into a structural transaction-oriented operating system capable of using a totally shared data base.	Multiphasic screening, medical orders, medical records, and administrative systems.
Hospital Automation 400 Washington Street Hartford, Conn. 06106	R. Peter Ericson	Hospital Automation provides on-line master patient records, automated nursing notes, Minnesota Hartford personnel assay, and Minnesota Multiphasic personnel inventory systems using the IBM 1440 Computer with Bunker-Ramo Model 200 video terminals. CRTS are located in medical records, admissions, nursing supervisor's area, executive area, pharmacy, data processing, one nursing unit, and a demonstration area. The pharmacy currently has one teletype. The system has been in operation for over five years and is in the process of conversion to Univac hardware.	A total hospital information system using time-sharing and a data base management system.

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
International Business Machines Data Processing Division 10401 Fernwood Road Bethesda, Md. 20034	Robert W. Kukla Health Care Systems	IBM software and hardware currently serve numerous customers with both batch and remote terminal subsystems in medical information and administrative applications. Hardware includes the IBM 1440 series; IBM 360/30 through IBM 60/65; the IBM 370/135, 145, 155, 165; and the IBM 1800 main frame computer. Real-time devices include CRTs; remote batch terminals such as 2770, 2780, F/3, 360/20, 1130; lower speed interactive terminals such as 1050, 2740, and 2741; optical image unit 2760; remote intelligence processors (EG system/7); and programmable terminals (3735).	New developments in patient care, clinical education, and research areas. Emphasis will be on tailoring ability, sharing concepts, and integrating all subsystems under common data base and executive programs.
Litton Automated Business Systems Carlstadt, New Jersey	Don Ferguson	Litton Industries currently produces several source data collection systems as well as conversion equipment. The main products are the 9600 card converters and the 64 optical mark readers, which are supported by the EBS 1231 and 1241 computers with main core memories ranging from 8K to 16K. The Litton edge-punched card is used in many hospitals as a source data acquisition system. Edge-punched cards in conjunction with the 9600 card converters and other equipment are the primary means of collecting patient charges for laboratory and x-ray procedures.	A totally automated hospital system.

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
McDonnell Douglas Automation Company 1124 N. Berkley Ave. Bureau, Illinois	Walter S. Huff, Jr.	McDonnell Douglas provides a complete line of hospital communications and accounting systems using the IBM 360/50 computer series and associated software. Peripheral devices include IBM four-phase CRT 1050 terminals and 105092 multiple keyboard terminals. Applications include admitting, reservations, discharge system, radiology ordering and reporting system, pharmacy ordering and medication scheduling system, and accounting and administrative programs. The company markets nationally to over 50 hospitals and 125 terminals. Each hospital customer uses its own file.	Central supply, dietary, surgery, therapies, and clinical investigation subsystems will be designed and implemented, lab equipment will be automated using the IBM System 7.
Medical Information, Inc. 6011 Harry Hines Blvd. South Western Medical Ctr. Dallas, Texas	E. L. Kirklen Marketing	Medical Information serves 38 hospitals in Texas, Oklahoma, and New Mexico. Operational applications are inpatient and outpatient billing, accounts receivable, payroll, and general ledger. The service entails 09 batch mode processing using IBM 1050 terminals at the hospitals and two IBM 360/40 computers at the central location in Dallas, Texas. All information is transmitted via dedicated telephone lines. Current system cost is approximately \$1.00 per patient day including all applications, terminal equipment, and line costs. An educational system is maintained for users and is essential to operating the data processing system.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Medicus Corporation 1104 Expressway Tower Dallas, Texas 75206	Allen S. Grier	The Medicus Corp. is currently involved in the design of hospital systems including business office management and laboratory information systems using the BSL Clin Data System and IBM 360/30/40/1800 computers. The Medicus Corp. is currently developing a total medical information system for individual as well as multiple uses.	Projected subsystems include all patient care areas.
Mediquip Corporation 205 Touchy Ave. Parkridge, Ill. 60068	David W. Lindsay Regional Sales Manager	Mediquip provides an automated diagnostic physiological laboratory examination system with multiple testing stations. This modular system has built-in expansion capability. No special wiring or other hook-ups are needed since all the systems will plug into a standard 115 volt, 60 cycle electrical outlet. A basic system, consisting of one physiological measurement console, one centerex (hearing/vision console), two interexes (automated history takers), and one computer, can process three patients per hour. It will cost \$159,500 or can be leased for \$4,659 per month including all maintenance, parts, and labor. The average cost per patient, at a rate of 24 patients per day, is \$8.80. The system is currently installed in: Desplains, Ill.; West Side VA Hospital, Chicago, Ill.; Doctors' Hospital, San Diego, Calif.; and Rouge Valley Hospital, Medford, Oregon.	None Available

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Medlab Computer Services 5308 E. South Street Salt Lake City, Utah 84102	Dr. Gerald L. Davey	Medlab has software available on the Control Data 1700 Computer for sub-systems including heart catheterization, pre-admission screening, intensive care monitoring, pulmonary care unit monitoring, operational monitoring, and the chemistry lab. These real-time computer systems use the CRT terminal, the 40-lines-per-second printer, the teletype terminal, and the IBM selectric typewriters.	Subsystems development, such as medical records, blood bank, pharmacy, and patient accounting.
RCA Cherry Hill, N. J.	Dennis Lucas, Manager Medical Marketing	RCA is marketing hardware called H.H.A.P., that can provide accounting and administrative systems, payroll, personnel, and scheduling. RCA also has a laboratory information system which is batch-oriented and capable of EKG analysis. The RCA main-frame configuration in hospitals normally consists of RCA Model 2 with 65K memory or the RCA Model 6 with 262K of memory. RCA hospital systems use the real-time concept and teletype CRT or other remote input hardware.	A total laboratory information system with on-line instrumentation. A total hospital information system, including pharmacy, dietary, business systems, and patient care, which will be offered on a time-shared area-wide basis.
Anthony J. J. Rourke, Inc. Hospital Consultants 26 Overlook Circle New Rochelle, N.Y. 10804	Donald R. Benson, V. P.	Hospital computer consulting on various stages of computer use and application development is provided to numerous hospitals.	None

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Sanders Associates, Inc. Daniel Webster Highway South Nashua, N.H. 03060	Edwin A. Gaskell Management Systems	<p>The Sanders CLINI-CALL hospital data management system can be readily interfaced with computers such as those of Univac, IBM, NCR, Control Data Corporation, and many others which can store large amounts of data. The system provides real-time communications on an inter-departmental basis using the Sanders CRT terminal with photopen. The system also uses the Sanders Association FOPS (file-oriented programming system), which reduces the need of typewriter keyboard input by as much as 85 percent. Inpatient and laboratory records can be stored in the disc file for real-time retrieval and access. The system is completely modular; it can be installed with as few as eight terminals and can expand to 32 terminals without modification of the software or hardware configuration. Rearrangement of the computers and associated memories will allow expansion to 128 terminals. The minimum system configuration would cost approximately \$200,000 installed.</p>	Total hospital information management system

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Shared Medical Systems 650 Park Avenue King of Prussia, Pa. 19406	John Marshall, V. P.	This professional company provides hospital communities with on-line data processing services for patient billing, accounts receivable, the general ledger and financial reporting system, the cost allocation system, the financial responsibility and budget control system, the payroll/personnel system, accounts payable, fixed asset accounting, inventory, clinical data processing, medical records, and EKG analysis. An IBM 1050 terminal normally located in a business office or admissions area is interfaced with the IBM 370/155 Computer.	Unknown
Spectra Medical Systems, Inc. 1121 San Antonio Road Palo Alto, Calif. 94303	W. E. Chapman, III, M.D. President	Spectra Medical Systems is designing a medical information subsystem for a "physician acceptable" total hospital information system. Medical information subsystems presently installed include pharmacy, lab, admissions, medical orders, nursing inputs, lab inputs, inventory control, active orders maintenance, patient billing, dietary, radiology, pathology, activity reports, certain areas of central inhalation therapy, physical therapy, and EKG. The Spectra System is a real-time system, using color-video terminals with attached light pen and keyboard manufactured by Computer Communication, Inc. A 300-line-per-minute electric printer is attached to the video terminals which are used at all hospital locations.	Projected subsystems include automated histories, computer aided diagnostic histories, and certain office business systems.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Symbionics Systems, Ltd. 550 Berry Street Winnipeg 21 Manitoba, Canada	B.A. Hodson President	<p>The SOLIS provides a problem-oriented programming language for real-time automated hospital information systems. Communication is via CRT systems.</p> <p>The software is written in FORTRAN and is applicable to IBM 360 and Control Data Corporation 6500 computers. The system has also been converted to the French ICL 1903A and 1904E. It can be placed on any computer of sufficient size similar to the IBM 360/40 series. No systems are currently installed.</p>	Totally automated hospital information system using CRT video screen input-output devices. Symbionics has a joint margin arrangement with RCA for hospital information systems.
Technicon Medical Information Systems, Inc. (Subsidiary of Technicon, Inc.) 590 E. Middle Rd. Mountain View, Calif. 94085	Clinton T. Eldridge Manager	<p>Technicon provides a totally automated medical information subsystem using the IBM 360/40 and 360/50 main frame computers with radial terminals at all nursing stations, laboratory, radiology, pharmacy, and EKG/EEG departments.</p> <p>The following subsystems are in prototype operation at El Camino Hospital in Mountain View, California: physician, nursing, laboratory, radiology, medical records, pharmacy, admissions, EKG/EEG, pulmonary medicine, physical medicine, respiratory therapy, and food service/dietary.</p> <p>Hospital accounting services are also provided to several hospitals throughout the country. (Formerly Lockheed Medical Information Systems.)</p>	All subsystems will be implemented at new hospitals in the next few years.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Computer Instruments Corp. 92 Madison Avenue Hempstead, N. Y. 11550	John Kristoffersen Sales Manager Medical Electronics Division	Computer Instruments markets the necessary electronic equipment for real-time transmission of EKG data. The dat-ek unit acquires EKGs for computer processing. The dat-ek has self-contained tape storage leads and patient identification. The tel-ek receiver receives and displays EKGs which have been transmitted over conventional or data phone lines. In addition to the standard strip chart type receiver, Computer Instruments also manufactures FM magnetic tape deck receivers. The tel-ek transmitter, receiver, and cassette tape deck cost approximately \$4,500 each. The minimum tel-ek configuration can be purchased for \$1,675 each.	Unknown
Dictation, Inc. 3654 Henderson Blvd. Tampa, Fla. 33609	Lewis E. Wells President	Telephone dictation is transcribed on a 24-hours-per-day basis. Complete word processing of all medical record reports is provided. Charges are \$6.00 per 1,000 words transcribed. Over-night air mail service of transcribed material is provided to most cities in the United States. As much as \$3.94 per 1,000 words transcribed can be saved over conventional in-house transcription.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
The Standard Register Company Dayton, Ohio 45401	E.W. McCalley National Coordinator Hospital Market Industry Marketing	Standard Register's line of source record punch devices provides data collection devices specifically built for the hospital market and currently used by over 200 hospitals. The system can use pre-punched and embossed plastic cards as the source data entry point for automated information systems. These devices are marketed with complete support in terms of design of forms needed and assistance in planning the models to be applied. Standard Register also maintains a nationwide service organization.	Unknown
Telaugraph Corp. 8700 Bellanca Ave. Los Angeles, Calif. 90045	David M. Swerdlin Marketing Services Dept.	Telaugraph has a device for instantly transmitting handwritten material to an unattended receiving device. It is often used to transmit a request for medical records from an outpatient department admitting office to the medical records department. The transcriber may be leased for \$30 per month including maintenance, or purchased for \$1,250 with maintenance provided at additional cost. Existing telephone lines or 22 gage copper wires are used to connect each transcriber with a transceiver. The system is installed in more than eighty hospitals nationwide.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEM

Company	Point of Contact	Current Product or Systems	Future Products
Teletracer International Corporation 42-25 27th St. Long Island City, N.Y. 11101	Leon Levy National Sales Manager	Teletracer provides a wide variety of wireless communication devices used for pocket paging, nurse call, remote television, doctor's register, intercom and closed circuit television. Systems can be designed for communication between the outpatient department and admissions and between nursing units and the medical records department. The system costs from several hundred to several thousand dollars, depending upon the system's complexity.	Unknown
Victor Comptometer Corporation 3900 N. Rockwell St. Chicago, Ill. 60618	Herbert R. Harges Manager, Market Development	The electro-writer provides facsimile transmission of a written message between two points with a transceiver or transmitter and a receiver device. The system is currently used between any two points within a hospital, such as the medical records department and the emergency room, the medical records department and the nursing unit, or the medical records department and the meeting office.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: LABORATORY INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Bio-Chemical Procedures 12020 Chandler Blvd. North Hollywood, Calif. 91607	Carl Schenk	Computer services are provided primarily in the chemical laboratory processing, reporting, and billing areas. Also provided is a short-form preparation practice management report with patient billing. These systems use the PDP-12 clinical laboratory data acquisition system and the IBM 360/40 System with teletype and on-line transmission between satellite laboratories and clients.	Unknown
Bio-Logics, Inc. 1 Research Rd. Salt Lake City, Utah 84112	Spencer M. Ure	Bio-Logics provides a clinical laboratory computer that may be accessed by any hospital's central processor for medical record processes. The Data General "Nova" computer is used. All test inputs, either manual or on-line, will be identified using the Bio-Logics costing identification program. Inputs are by the mark sense/punch card reader, teletype, and keyboard graphics systems. The processing system helps ensure positive identification in addition to serving in classical hospital applications.	Separate satellite computers are planned for use in radiology, admissions, and other data source centers with on-line input to a mass storage center.

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: LABORATORY INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Laboratory Computing Inc. 4915 Monona Drive Madison, Wis. 53716	G. Philip Hicks, Ph.D. President	Laboratory systems using the PDP-12 and Linc 8 computers with teletype and cathode ray screen input devices are currently avail- able. They have up to 12 terminals and 24 instrument channels with a 2,000 patient data file.	Unknown

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: MICROFILM SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Arcata Microfilm 740 Chatham Rd. Winston-Salem, N.C. 27103	David B. Carmichael General Manager	The main service provided to hospitals is the filming or microfilming of retired medical records. Arcata also provides microfilm viewing devices through a subsidiary known as the Atlantic Corporation and the Hospital Microfilming Company. The various divisions provide complete microfilm processing including strip, microfilm, and microfiche, using COM (Computer-output-microfilm).	Unknown
Eastman Kodak Corp. 2857 Banksville Rd. Pittsburgh, Pa. Home Office: Rochester, New York 14650	D.B. Perkins District Sales Manager	Eastman Kodak carries a full line of microfilm processing, storage, retrieval, and display systems. Microfilm format includes the roll magazine, microfilm, microfiche, and microstrip.	Unknown

PROVIDERS OF MEDICAL RECORDS

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: MICROFILM SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Mosler Information Systems 40 W. 40th St. New York, New York 10018	Joseph A. Kerr Assistant Director of Marketing	<p>The Mosler System 410 is an automated microfilm storage and retrieval system, using computer hardware such as an IBM 360/40, Varian 6201, Westinghouse 2550, or GE 4225. Microfiche documents can be retrieved on a real-time basis; access time averages less than ten seconds. The time-sharing feature allows multiple users to share a common or multiple data base. Remote access through high resolution closed circuit TV, as well as a through a multitude of other output devices is possible. The system's capacity is 200,000 microfiche per storage module. The system is presently installed in the University of Missouri Medical Center, using closed circuit TV output for medical abstracts. Future applications are designed for patient records at other locations.</p>	Storage and retrieval of x-rays and other documents which can be stored on microfilm.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: FILING SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
The Smead Manufacturing Company 600 E. Tenth St. Hastings, Minn. 55033	T.P. Mayer	A full line of manual file systems is available, including terminal digit file folders with color codes and pre-numbered carrying schemes, file shelving, file dividers, and file inserts.	Unknown
Supreme Equipment and Systems Corp. 170 53rd St. Brooklyn, N.Y. 11232	I.L. Moss, Vice Pres. Sales	The roll-out Conserve-All file is the basic manual filing system. The CONSERV-A-TRIEVE is an electronic hard-copy, high security filing system. It has an electronically controlled conveyor with a picker that moves horizontally and vertically between facing banks of optically coded modules in which individual metal file boxes are stored. Upon a signal from a central keyboard, the desired metal file box is extracted and moved to the work station for filing operations. An electronic stand-alone disc memory with cathode ray terminals, sold under a trade name of Recall 1, is also available. This filing system can be integrated with any system to provide high-speed cross-reference between account name and account number.	Unknown

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: FILING SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Visirecords, Division of Berry Right Corporation, Copiague, Long Island, N.Y. 11726	Joel J. Shulman Manager, Marketing Services	Visirecords provides shelving and forms specifically designed for hospital records, stock maintenance, preventive maintenance, and appointment systems. Systems are also available for the proper storage and use of computer input media as well as for manually assisting computer-type record maintenance. Current products include barrel type card file systems for cross-reference, heavy access files, tray units, insulated safe units, open trays, work tables, strip files, card files, file tables, drawer files, and shelf files.	Unknown

3.4 MANUFACTURERS NOT RESPONDING TO THE STATE-OF-THE-ART SURVEY

Central Bank Computer Bureau 1527 Webster Street Oakland, California 94612 Jack Dunn	Hospital shared data processing services
Compucare, Inc. 8550 W. Bryn Mawr Chicago, Illinois 60631 Peter J. Marsh	Development and operation of information systems exclusively for hospitals
DeJur Amsco Corporation Northern Blvd. & 45th St. Long Island City, N.Y. 11101 Len Hayes	Complete combination dictating/transcribing systems
DMS Computer Industries, Inc. 661 Palisade Avenue Englewood Cliffs, N.J. 07632 Joseph A. Geraghty	Hospital accounting systems
DuKane Corporation 103 N. Eleventh Avenue St. Charles, Ill. 60174 Frank Johnson	Complete line of communications systems for hospitals
Edstan Automatic Registrars 2956 Rubidoux Blvd. Riverside, Calif. 92509 David Verner	Bed status systems
Honeywell, Inc. Electronic Data Processing Div. 60 Walnut Street Wellesley Hills, Mass. 02181 Maurice I. O'Connell	Computer systems with hospital community health care programs
Information Management Technology, Inc. 912 Third Avenue, South Fargo, North Dakota 58102 Charles Hill	Hospital computer accounting and information services
Infotronics Corporation Houston, Texas	Lab Systems

Magnavox Systems , Inc. Park 80 E., Parkway at Interstate 80 Saddle Brook, New Jersey 17662 W. R. Bigger	Telecommunications
Mead Johnson Medical Services, Inc. 2402 Pennsylvania Avenue Evansville, Indiana 47721 Donald O. Hoefling	MD Systems offering a complete physician billing system and insurance form preparation.
Medelco, Inc. 200 E. Irving Park Rd. Wood Dale, Ill. 60191 R. T. Roeser	Total Hospital Information System (T.H.I.S.)
Moore Business Forms, Inc. 1100 Interstate Hwy. 35 E S. Denton, Texas 76201 Eldon Wiese	Our Transcorder System M-100.
Motorola Institutional Electronics 4545 W. Augusta Blvd. Chicago, Illinois 60651 Al Schmid	Electronic management systems
Philips Business Systems, Inc. (A North American Philips Co.) 100 E. 42nd Street New York, New York 10017 Hank Griffen	Norelco Medical Dictation System
Physicians' Record Company 3000 S. Ridgeland Avenue Berwyn, Illinois 60402 Ron Kuchta	Medical record and department requisition and charge slips
Raytheon Company 141 Spring Street Lexington, Mass. 02173 Hugh Bannon	Data-Select hospital information system
Records Handling Systems 1680 River Road Des Plaines, Illinois 60018 Bernard S. Black	Patient chart holders and chart dividers for the hospital nursing station
Wells Television, Inc. 251 Park Avenue South New York, New York 10010 H. Scher	WELLPLEX system with surveillance, nurse-view, closed circuit, and color

CHAPTER 4

PROPOSERS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS

4.1 INTRODUCTION

The following matrix summarizes the results of a questionnaire sent to personnel we could identify as having made a major contribution to automated information systems. The list, of course, is not exhaustive. Questionnaire recipients were asked to list currently automated sub-systems, real-time computer input devices and their locations, files shared by multiple users, the mainframe computer used, and additional systems planned over the next five years. Section 4.2 lists individuals and institutions not responding to the questionnaire. These individuals and their addresses are given so that our list of proponents of automated medical record systems would be complete and anyone wanting additional information could contact them directly.

4.2

PROPERTIES OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned Over Five Years	Remarks
Prof. Sixten Abrahamsson Göteborg University Medicinargatan 9 S-400 33 Göteborg Sweden	Patient administration (admission, waiting list), and chemical laboratory, bacteriological laboratory, and booking systems.	CRT terminals with hard copy facility are used throughout. By the end of 1972 there will be over 100 CRTs.	Direct access file (1.5 million people) shared by all medical users in the greater Stockholm area. Each hospital has separate "active" patient files in the central computer.	2 Univac 494, 131K + 65K. (1 word = 5 characters).	Most hospital functions suitable for computerized operation.	The Bunderyd system (1,000 beds) will be incorporated into the new Huddinge Hospital (eventually 1,600 beds) in March 1972. It will then be extended to include all major hospitals in the region. Already a few functions, for example, waiting lists, are used on the regional level.
C. H. Altshuler, M.D. Pathologist St. Joseph's Hospital 5000 W. Chambers St. Milwaukee, Wisc. 53210	Laboratory.	Teletype Model 33.	None at this time.	Clas 300 Computer, 16K.	Total hospital information system using CRTs as physician input/output device.	The Clas Laboratory data processing system has been expanded to include the PALL (Programmed Accelerated Laboratory Investigation) and the SLIC (Selective Laboratory Information Center) Systems to improve clinical diagnosis.
Robert L. Baker Texas Institute for Rehabilitation and Research The Texas Medical Center Houston, Texas 77025	Admissions/discharge, inpatient care scheduling, pulmonary functions testing, blood gas analysis, and disability profile.	CRT in main nursing station, medical records, clinical laboratory, cardio-pulmonary laboratory, physical therapy, occupational therapy, admitting office, and scheduling office. Typewriter in scheduling office, admitting, computer applications office, and main nursing station.	All on-line data is stored in a file accessible from every terminal (if permitted).	IBM 360/50, 1,128K.	Urology clinic reports, outpatient appointment scheduling, patient financial clearance, inhalation therapy, and pharmacy.	
G. Octo Barnett, M.D. Laboratory of Computer Science Massachusetts General Hospital Boston, Mass. 02114	Clinical laboratory, automated medical history, ambulatory medical record system, and physician advisor.	Teletype and CRT in chemistry, bacteriology, medical record room, and OPD. High speed printer in chemistry and bacteriology.	All files.	DEC PDP-9, 32K (3 parallel machines).	Pharmacy (doctor's orders), physician entry of narrative notes, radiology scheduling and reporting system, and tumor registry.	Special language, MUMPS, has been very valuable. MUMPS and application programs are now marketed by several time-sharing bureaus and by DEC and are used by 16 to 12 other hospitals.
Walter L. Bennett Senior Systems Engineer The Institute of Living Hartford, Conn. 06106	Master patient record and logistics of patient care (admissions, transfers, discharges, diagnoses, medical orders, nursing notes, doctor notes, and others).	Bunker-Ramo CRTs, teletypes, typographs, Comp plotter (pharmacy, d.p., psycho-physio lab, admissions, nursing supervisors, and medical records).	Master patient record, personnel file.	IBM 1440, 16K, Linc-8; DEC PDP-15, 24K.	Extension of current systems as greater capability (hardware) is installed.	

PROPERTIES OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS (CONT.)

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned over Five Years	Remarks
Maraden S. Blois, M.D. University of California San Francisco Medical Center Medical Information Systems San Francisco, Calif. 94122	An advanced clinical laboratory reporting system.			Probably a network of mini-computers rather than a single large computer.	Bacteriology lab reporting, cytology reporting, diagnostic radiology reporting, admissions and discharge, and pharmacy systems.	
Jerome Boyer Conemaugh Valley Memorial Hospital Johnstown, Pa. 15905	Laboratory only.	Analog signals from automated chemistry and Coulter S. Five teletypes in lab.	None.	PDP 12, 8K with 500K word disk.	Patient records.	
Kenneth Brenner Director of Operational Services Lutheran General Hospital 1775 Dempster St. Park Ridge, Illinois 60068	Lab -- DNA Computer.	None.	None.	Honeywell 1250.	Total information system.	
Salvatore Cerruto Director, Records Information Kings County Hospital Center Clarkson Avenue Brooklyn, New York 11213	Amplex Corporation will install a video-file system linking 30 or more record areas to a central video tape file. Outpatient and inpatient records will be available on CRTs and in hard copy.	None.	None.	Amplex Systems Controller. 40K	None.	The Amplex System is a computer-controlled video tape access device.
John M. DeGroot Assistant Director for Electronic Data Processing Missouri Regional Medical Program Columbia, Missouri 65201	"Automated Physician's Assistant" components including automated patient history, automated EKG, radiology reporting system, FACT Bank information retrieval system, automated blood pressure, and management information system for fiscal management of grants.	IBM 2260 CRT.		IBM 360/50, 512K; XDS Sigma 3, 32K.		
James L. DeLong, Admin. Bess Kader Hospital 5055 North Greeley Avenue Portland, Oregon 97217	Health plan membership file, purchasing, inventory, accounting, and payroll systems.	None.	None.	Leased time from service bureau, IBM 360/30	Total hospital information system (HIS).	Mervyn Greenlich, Ph.D., Director of Research, is developing new software.

PROGRESS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS (CONT.)

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned over Five Years	Remarks
Paul R. Finley, M.D. Clinical Pathologist Fairview Hospital 2312 South 6th St. Minneapolis, Minn. 55406	14 systems in three hospitals.	Teletype in pharmacy.	All files within system.	Univac 9400.	Total M15.	System in lab is essentially electronic data processing.
John W. Eoff, M.D. Chairman, Department of Clinical Pathology University of Alabama Medical Center 619 South 19th St. Birmingham, Ala. 35233	Clinical laboratory reporting system.			IBM 360/50, 512K; IBM 1130, 8K (laboratory).		
Richard K. C. Hsieh Chief, Health Services Research USPHS Hospital 3100 Wyman Park Drive Baltimore, Maryland 21211	Berkeley Scientific Laboratory CLINDATA System (lab), health evaluation center (multi-phasic testing), inpatient medical information system.	SMA-12/20 Autoanalyzer (lab).	Laboratory and medication files.	PDF-8 CPU; 3 CDC 1700 CPU; 1 CDC 915 Optical Page Reader.	Admissions, inventory, and supply systems.	
J. Paul Morris Associate Administrator Monmouth Medical Center Long Branch, New Jersey 07740	Laboratory, radiology, pharmacy, central supply order-ing, nursing instructions, admissions, and dietary.	IBM 1092 and 1093 pro-grammed keyboards and 1052 typewriters.	Patient data file.	IBM 360/40, 128K, 2413 with 5 drives, two 2401 tape drives, under DOS.	On-line unit for medical records, ambulatory patient services, laboratory and radiology results reporting, O.R. nursing station, and miscellaneous ancillary services such as EKG, EEG, EEC, inhalation therapy, and rehabilitation.	Because of local conditions the 1092s and 1093s are in a "pool" available to the nursing stations via dedicated telephone lines. The 1051 printer is at the nursing station. The economics of using CRTS at the nursing units are being explored. There are 1092s and 1093s in the laboratory, radiology, pharmacy, central supply, dietary, and admissions.
Charles K. Nagy, M.D. Director of Computer Center University Hospital 750 Harrison Avenue Boston, Mass. 02118	Medical Information System which stores, maintains, and retrieves administrative and medical information on all patients.	None at present.	Patient billing file and payroll-personnel file.	IBM 360/40, 65K to be increased soon to 131K.	Possibly on-line admissions, laboratory automation, and pharmacy.	
Jan Polissar, M.D. Automation Consultant 8501 Rayburn Rd. Bethesda, Maryland 20034 (301) 530-5903	Automated disease and operation index system. When the discharge summary of diseases and operations is typed, the information is captured on magnetic tape and computer processed to produce a D40 index with many new features.	None.		CDC 3200 and IBM 360/65.		

PROHIBITS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS (CONT.)

Person to Contact	Current Subsystems	Real-time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned Over Five Years	Remarks
PROMIS Laboratory Mary Fletcher Unit Adams Residence Burlington, Vermont 05401 (802) 864-7441	The total Problem-Oriented Medical Record (including all narrative and numeric data, present illnesses, progress notes, and flowsheets) on a general medical ward and gynec ward. Operational since July, 1970.	3-Digiscrbe (touch sensitive screen), CRTs (CDC 211) on ward, 1-Digiscrbe CRT (COMPUK 100) in doctor's office in Maine over phone lines (4800 bps).	Display library of the structured branching logic displays used to generate and retrieve all narrative and numeric data. Patient's structured medical record file.	Two CDC 1700s with 32K--one on-line, one developmental. Each configuration has: 5-834 disks (7.2 x 10 ⁶ characters), 1/42 printer, 2-609 (9 track 1800 RPI) tape units, 1745-1 display controller with /-211 CRT Digiscrbe terminals (only on one system), OSE Data Set Multiplexor with CDC 3180 Digiscrbe terminals and COMPUK 100 terminals (also with the Digiscrbe attachment).	System will first expand to supporting areas of one ward. Then ward-by-ward expansion will begin for the total hospital.	
Allan Pryor Latter Day Saints Hospital Salt Lake City, Utah 84103 Anthony J.J. Rourke, M.D. Special Assistant to the Director Building 10, Room 1N-222 National Institutes of Health Bethesda, Maryland 20014 (301) 496-2773	Lab, multiphasic screening, intensive care records, and coding of diseases. Laboratory, medical record discharge diagnosis file, anatomic pathology diagnosis file.	Beehive terminals and data sets give access to every room in the hospital. IBM 2741 terminals in medical records, nursing, clinical pathology, and administration.	Patient data files -- medical records. Within the next year, we expect to have clinical pathology files, medical record discharge diagnosis files, anatomic pathology files, and admissions-bed census files on line and integrated.	CDC 3300, 32K. CDC 3200, 32K; IBM 360/65, 1.5MK x 2; IBM 360/50, 512K x 2.	Complete medical record. Admissions, pharmacy, clinical bacteriology, clinical serology, outpatient scheduling, and physician's order and facility scheduling in inpatient and outpatient areas.	

4.3 INDIVIDUALS NOT RESPONDING TO THE QUESTIONNAIRE

Individuals and institutions not responding to our questionnaire are listed alphabetically by area of interest: hospital information systems, laboratory information systems, and medical records. The specific interest of each contract is listed in the right-hand column.

4.3.1 Hospital Information Systems (HIS)

James M. Anthony, Jr. Daughters of Charity Hospitals, Northeast Jamaica Estates, New York	HIS
Mrs. Marion Ball Assistant Director, Medical Computing Activities Temple University Philadelphia, Pennsylvania 19140	HIS
George J. Bartel Administrator Monmouth Medical Center Monmouth, New Jersey	HIS
Glenn H. Clark University of Tennessee School of Medicine Memphis, Tennessee	HIS
L. W. Cronkhite Children's Hospital Medical Center Boston, Massachusetts	HIS
John Donnelly, M.D. Institute of Living 400 Washington Street Hartford, Connecticut 06108	HIS
Charles D. Flagle The Johns Hopkins University Baltimore, Maryland	HIS Evaluation Methods
Walter S. Flynn Controller David Weiss Convalescent Hospitals Los Angeles, California	Small Hospital Computer Systems

E. R. Gabrieli, M. D. Director Clinical Pathology and Clinical Information Center E.J. Meyer Memorial Hospital Buffalo, New York	HIS
Bernard C. Gluech Institute of Living Hartford, Connecticut	HIS
The Herner Company Hospital Automation Project 2431 K Street, N.W. Washington, D.C. 20037	HIS Consultant
Walter S. Huff, Jr. Sisters of 3rd Order of St. Francis Peoria, Illinois	HIS
Harry O. Humbert Associate Vice President The Roosevelt Hospital New York, New York	HIS
Goeffrey G. Jackson Assistant Director Peter Bent Brigham Hospital Boston, Massachusetts	HIS Costs
Raymond B. Lake Memorial Hospital of Long Beach Long Beach, California	HIS
Dr. A. B. Lindberg University of Missouri Columbia, Missouri	HIS
E. W. McCalley Special Markets Manager The Standard Register Company Dayton, Ohio	Input Devices
Mr. J. R. Petters Computer Applications Group Eugene Wuestoff Memorial Hospital P.O. Box 6 Rockledge, Florida 32955	HIS

J. E. Schenthal Tulane University New Orleans, Louisiana	HIS
J. Peter Singer Associate Arthur Young & Company San Francisco, California	HIS Consultant
Warner Slack University of Wisconsin School of Medicine Madison, Wisconsin	HIS
William A. Spencer, M.D. Texas Institute of Rehabilitation and Research Houston, Texas	HIS
James W. Sweeney, Ph.D. Director, Computing Centers University of Oklahoma Norman, Oklahoma	Management Information Systems
Carlos Vallbona M.D. Department of Community Medicine Baylor College of Medicine Houston, Texas	Shared HIS
Edmund E. VanBrunt, M.D. Medical Data Systems Kaiser Foundation Research Institute Oakland, California	HIS
Kenneth Walz Administrator Saginaw General Hospital Saginaw, Michigan	HIS
Dr. L. L. Weed University of Vermont School of Medicine Burlington, Vermont	HIS

4.3.2 Laboratory Information Systems

Howard Abrahamson Fairview-Southdale Hospital Minneapolis, Minnesota	Lab Systems
Central Pathology Laboratories Sacramento, California 96819	Lab Systems
Centralized Laboratory Long Island, New York	Lab Systems
Thomas C. Chapman Clinical Research Center National Institutes of Health 9000 Wisconsin Avenue Bethesda, Maryland 20014	Lab Systems
Clinical Laboratories St. Louis, Missouri 63110	Lab Systems
Vance C. Demong North Memorial Hospital 3320 Lowry Avenue Minneapolis, Minnesota 55422	Lab Systems
Nelson F. Evans University Hospital 750 Harrison Avenue Boston, Massachusetts 02118	Lab Systems
Dr. P. R. Finley Fair View Hospital 2312 S. Sixth Street Minneapolis, Minnesota 55409	Lab Systems
Fred K. Fish Nassau Hospital Mineola, New York 11501	Lab Systems
Dr. S. A. Goldblatt Conemaugh Valley Memorial Hospital Johnstown, Pennsylvania 15905	Lab Systems
Dr. Phillip Heiks University of Wisconsin Hospital 1300 University Avenue Madison, Wisconsin 53706	Lab Systems

Edwin J. Hinman USPHS Hospital 3100 Wyman Park Drive Baltimore, Maryland 21211	Lab Systems
Harold H. Hixson University of California Hospital 3rd and Parnassus San Francisco, California 94122	Lab Systems
John H. King University of Tennessee Hospital 1924 Alcoa Highway Memphis, Tennessee 37920	Lab Systems
William Kreykes Hennipen County Hospital 5th and Portland Streets Minneapolis, Minnesota 55415	Lab Systems
Lakey Clinic Boston, Massachusetts 02210	Lab Systems
Sr. Mary Laureen St. Vincent Hospital 2447 N. W. Westover Road Portland, Oregon 97210	Lab Systems
Moses Cone Hospital Greensboro, North Carolina	Lab Systems
Sr. Agnes Marie Paul Saint Francis Hospital 929 N. St. Francis Avenue Wichita, Kansas 67214	Lab Systems
Dr. Hugo C. Pribor, M. D. Institute of Laboratory Medicine Perth Amboy General Hospital Perth Amboy, New Jersey	Lab Systems
Swedish Hospital Seattle, Washington	Lab Systems

Dr. Arthur E. Rappoport, M. D.
Director of Laboratories
Youngstown Hospital Association
Youngstown, Ohio

Lay Systems

Sherwood D. Smith
Lakeland General Hospital
Lakeland, Florida 33802

Lab Systems

Frederick B. Sperry
St. Louis City Hospital
1515 Lafayette Avenue
Saint Louis, Missouri 63104

Lab Systems

Dr. J. U. Straumfjord
University of Alabama Hospital
619 19th Street
Birmingham, Alabama 35233

Lab Systems

Mr. Gail L. Warden
St. Luke's Presbyterian Hospital
1253 W. Congress
Chicago, Illinois 60612

Lab Systems

Charles B. Womer
Yale-New Haven Hospital
789 Howard Avenue
New Haven, Connecticut 06504

Lab Systems

4.3.3 Medical Record

Gordon M. Derzon
Assistant Commissioner
Kings County Hospital Center
481 Clarkson Avenue
Brooklyn, New York 11203

Video File
MR

Alvin R. Feinstein
Yale University School of Medicine
New Haven, Connecticut

Quality of
MR Data

Burgess L. Gordon, M.D.
American Medical Association
Chicago, Illinois

MR Content

John L. Juergins, M. D.
Joseph M. Kiely, M. D.
Mayo Clinic
Rochester, Minnesota

Computer-
Based MR

James L. Muse
Administrator
Jess Parrish Memorial Hospital
Titusville, Florida

MR Pages-
on NCR System

4.3.4 Miscellaneous

James O. Beaumont
Manager, Advanced Systems Development
IBM Corporation
San Francisco, California

Patient
Monitoring

Grouer C. Bowles, Jr.
Director of Pharmacy
Baptist Memorial Hospital
Memphis, Tennessee

Pharmacy
Systems

Dr. Gerald L. Davey
President
Medlab Computer Systems
Salt Lake City, Utah

Multiphasic
Screening

Dr. Robert Feldman
Permanente Medical Group
Oakland, California

Multiphasic
Screening

Mrs. Shirley A. Fish
P.O. Box 311
Boston, Massachusetts

Medic Alert
Foundation

J. Goldman, D. Sc.
Chairman, Dept. of I. E.
University of Missouri
Columbia, Missouri 65201

Computer
Scheduling

Dr. John B. Henry
Director, Department of Pathology
State University of New York
Syracuse, New York

Multiphasic
Screening

Robert H. Richart, Ph. D.
Department of Medical Methods Research
Kaiser Foundation Research Institute
Oakland, California

MIS
Evaluation
Methods

Thomas P. Weil, Ph. D.
Director
Graduate Studies in Health Science
University of Missouri
Columbia, Missouri 65201

Hospital
EED

CHAPTER 5

CURRENTLY FUNDED RECORD KEEPING PROJECTS

5.1 INTRODUCTION

The Science Information Exchange, the information retrieval service of the Smithsonian Institute, provides narrative descriptions of current research programs. In response to our request for information on hospital and health care facility record keeping, we were sent a list of programs, which we divided into 11 categories according to functional application within the realm of medical records and hospital information systems.

These categories are:

- Chronic illness and rehabilitation
- Community-wide health care
- Diagnostics
- Hospital information systems
- Medical records and patient information
- Monitoring systems
- Pathological and laboratory data
- Patient population studies
- Pharmacy
- Psychiatry and mental health
- Records research.

For each program, the project title, principle investigator, recipient institution, and report summary are given. The report summary has been abstracted for this report.

5.2 CHRONIC ILLNESS AND REHABILITATION

Computer Recording of Clinical Data of Non-Operated Scoliotic Patients

Dr. P. R. Harrington

Baylor University
Medical Rehabilitation Research
and Training Center
P.O. Box 20095
Houston, Texas 77025

This project is to obtain, store, and statistically analyze clinical data of non-operated scoliotic patients.

Computer Recording of Clinical Data of Operated Scoliotic Patients

Dr. P. R. Harrington

Baylor University
Medical Rehabilitation Research
and Training Center
P.O. Box 20095
Houston, Texas 77025

This project is to develop a computer program for identifying, storing, and manipulating data obtained from operated scoliotic patients.

Demonstration of a Hospital Data Management System

Dr. W. A. Spencer

Texas Institute for Rehabilitation
and Research
1333 Moursund Avenue, Box 20095
Houston, Texas 77025

The hospital information system developed at the Texas Institute for Rehabilitation and Research will be extended to provide:

- (1) standardized care plans for specific chronic illnesses;
- (2) tailoring of the standard plans to the patient's own disability;
- (3) description of patient progress;
- (4) documentation of the chronology of complications;
- (5) automatic resolution of conflicts in scheduled care plans; and
- (6) refined estimates of hospitalization costs.

Extension of Simplified Coding System to Record Client Termination and

Follow-Up Data

Dr. M. Tseng

West Virginia University
Vocational Rehabilitation Research
and Training Center
Institute, West Virginia 25112

This project is to determine what information on client completion of rehabilitation training are to be included in the coding format.

5.2 CHRONIC ILLNESS AND REHABILITATION (cont.)

Research Data Bank for the Research and Training Center

Dr. T. Gust

University of Pittsburgh
Vocational Rehabilitation Research
and Training Center
16 Cathedral of Learning
Pittsburgh, Pennsylvania 15213

This project is to establish a data bank of rehabilitation client data for PRC and RT-14.

Sample Research Project on Computer Processing of Clinical Data

Dr. L. C. Vallbona

Baylor University
Medical Rehabilitation Research
and Training Center
P. O. Box 20095
Houston, Texas 77025

This project is to develop a data processing system for clinical research data in the proposed stroke program.

5.3 COMMUNITY-WIDE HEALTH CARE

Improving Medical Care Functions of a Medical Center

Dr. J. A. Bryan

University of North Carolina
School of Medicine
Chapel Hill, North Carolina 27514

This project is concerned with describing the primary and continuing medical care delivered to outpatients in a teaching institution. A computerized information system is being developed for demographic and other data collected in an on-going study of the clinic population.

Research and Evaluation of a Community Health Program for Prepaid

Family Health Care

Dr. I. S. Falk

Community Health Care Center
New Haven, Connecticut

This project aims to develop a method of determining the prevalence and characteristics of health insurance as well as a system for recording health insurance data.

5.3 COMMUNITY WIDE HEALTH CARE (cont.)

An Urban Comprehensive Health Care Information System

Mr. C. Foreman

Denver Department of Health
and Hospitals
Denver, Colorado 80204

This program has developed the outlines of the Urban Comprehensive Health Care Information System for use in the city-wide, decentralized Neighborhood Health Program. During Phase I, completed in July, 1970, manual methods for handling patient medical records were improved and the Shared Hospital Accounting System and the Computerized Master Patient Index were implemented. Included in Phase II (this grant) will be programming and hardware costs for a Patient Activity Information System and a Health Care Scheduling System.

5.4 DIAGNOSTICS

Coding of Electrocardiograms on Data Cards for Rapid Retrieval

Dr. A. S. Gear

United States Veterans Administration
Hospital
1201 Broad Rock Road
Richmond, Virginia 23219

Using a key punch card rapid retrieval system, this project established eight separate categories of EKG diagnosis and coded approximately 24,000 EKGs accordingly. The resulting card file will enable the staff to pull numerous EKGs based on a particular diagnosis and use them for comparative purposes.

Computer Classification of Pulmonary Disability

A. B. Ruffner

United States Army
Medical Research and Nutritional
Laboratory
Denver, Colorado

This project is to design a system for classifying disability in patients with pulmonary diseases, and test it on a production basis.

5.4 DIAGNOSTICS (cont.)

Development of a Community Wide Health Information System to Assist in

Maternal and Child Health Program Planning

Dr. E. Siker

Community Health Division
State Department of Health
165 Capitol Avenue
Hartford, Connecticut 06115

The Maternal and Child Health Information System developed in New Haven by the area linkage of census data, health survey data, vital records, and obstetrical records will be continued and expanded. The techniques developed will be tested by the Southern California Regional Information Study in Los Angeles.

Evaluation of Health Services in a Black, Poor-Core City Area

Dr. A. Haynes

National Medical Association
Foundation
Washington, D. C.

A health service research unit in the Shaw Urban Renewal Area of Washington, D. C., will:
(1) develop a record system to provide data for studies of quantity, quality, and cost of services; (2) establish guidelines about selected community mortality; and (3) measure the effect of services in terms of cost, availability, community participation, and ability to attract local people to health careers.

Improvement of Methodology for Clinical Evaluations

Dr. A. R. Feinstein

Yale University
School of Medicine
333 Cedar Street
New Haven, Connecticut 06510

This project will assemble and analyze data on the clinical course and management of cancer and other degenerative diseases; construct improved taxonomic systems for classifying and storing data; clinically integrate computers into data management; and develop better methods for predicting prognosis, evaluating therapy, and administering therapeutic care. Additional diseases under consideration will be diabetes mellitus and arthritic disease.

5.4 DIAGNOSTICS (cont.)

Nuclear Medicine and Scanning - Computer Methodologies

J. H. Harmon

Oak Ridge Associated Universities
Oak Ridge, Tennessee 37830

The ORAU computer (IBM 1800) is being applied to the repetitive calculations necessary for statistical studies of standard laboratory procedures and to testing new approaches to medical research problems.

5.5 HOSPITAL INFORMATION SYSTEMS

Assimilation of Technological Change in a Hospital

Professor B. Goldstein

Rutgers -- The State University
School of Arts
Old Queens Building
New Brunswick, New Jersey 08903

This project is to determine the impact of a hospital-based computer-assisted medical information system on the hospital in general and on the nursing station in particular. Studies include how the new system should be introduced, how work at the nursing station should be reorganized, and how authority and administrative responsibilities should be adjusted.

Demonstration of a Shared Hospital Information System

W. S. Huff

Sisters of 3rd Order of St. Francis
700 N.E. Glen Oak Avenue
Peoria, Illinois 61603

This project is to demonstrate the usefulness of a regional hospital information system in relation to clerical workload, communications, and informational response.

Development of a Computer Based System for Data Storage and Retrieval

Dr. R. E. Matthews

University of Minnesota
School of Medicine
1305 Mayo
Minneapolis, Minnesota 55455

This project is to develop a computer-oriented system for storing and retrieving patient data, producing routine reports, and processing data for research. Demographic, diagnostic, and therapeutic coding data have been selected for initial input.

5.5 HOSPITAL INFORMATION SYSTEMS (cont.)

Hospital Computer Project

Dr. G. O. Barnett

Harvard University
Massachusetts General Hospital
Fruit Street
Boston, Massachusetts 02114

Using a time-shared remote-access computer system, this project is to develop several modules of a hospital information system including automated laboratory test reporting, computer-based medical records, automated medical histories, medication ordering, computer-assisted patient diagnosis and management, and entry of physician-generated progress notes.

Hospital Data System - Automated Retrieval for Improved Admissions and Utilization

Dr. C. Lebo

Presbyterian Hospital of the Pacific
Clay and Webster Streets
San Francisco, California 94115

This project is to develop an automated data retrieval system for utilization review and scheduling of hospital admissions.

Hospital Information Systems, Optical Input/Output Recording

R. Garrett

Tulane University of Louisiana
Graduate School
New Orleans, Louisiana 70118

This project is to evaluate at least nine makes of visual input-output devices. Accuracy, reliability, compatibility, ease of operating, training requirements, and noise, sanitary, and safety factors will be considered.

Regional Computer Facility at the Texas Medical Center

Dr. R. T. Eastwood

Texas Medical Center, Inc.
Houston, Texas

The Common Research Computer Facility is a service-oriented computer center which provides a large-scale resource for medical, medically related, and life-science investigators. Support of library automation is planned, and the development of hospital information systems services is being investigated.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION

Ambulatory Scheduling - A Management Science Approach

Dr. J. F. Rockart

Lahey Clinic Foundation, Inc.
Boston, Massachusetts 02215

This project is to improve methods of scheduling patients through an ambulatory care group practice medical clinic in order to improve physician utilization and reduce patient waiting time.

Application of Computer Technique to the Cardiac Section of Children's Hospital of Pittsburgh

Dr. F. W. Baker

University of Pittsburgh
School of Medicine
M240 Scaife Hall
Pittsburgh, Pennsylvania 15213

This project is to establish a computerized diagnostic file for congenital cardiac anomalies. A pilot study is also planned on infants with transposition of the great arteries who have undergone balloon septostomy.

Computer Analysis of Narrative Clinical Data

Dr. J. Korein

New York University
School of Medicine
550 1st Avenue
New York, New York 10016

This project is to improve the quality and accessibility of narrative and numerical medical data. Variable-Field-Length formats allow data to be collected automatically in a computer-acceptable form as a by-product of the physician's dictation of routine reports, clinical research protocols, and hospital discharge summaries.

Computer Recording of Surgical Case Histories

Dr. H. B. Wheeler

United States Veterans Administration
Hospital
1400 Veterans of Foreign Wars Pkwy.
Boston, Massachusetts 02132

This project is to study automated collection of surgical case histories using computer techniques.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION

Computer Techniques in Patient Care

Dr. G. M. Clark

University of Tennessee
School of Medicine
62 S. Dunlap
Memphis, Tennessee 38103

Everything happening to a patient will be recorded, priced, and correlated so that record keeping, patient billing, cost accounting, inventory control, communications with other agencies, and relationship to outpatient care will be automatic by-products of the patient care program.

Continuation of the On-Going Self-Care and Patient Information System

Dr. N. Silberberg

University of Minnesota
Graduate School
322 Johnston Hall
Minneapolis, Minnesota 55455

A model for electronic retrieval of patient information is being developed.

Control of Operations by Scheduling Using Terminals

L. Cronkhite

Children's Hospital Medical Center
300 Longwood Avenue
Boston, Massachusetts 02115

This project is to develop computerized management skills for selected medical groups in the clinic areas. A structured medical record will be developed for each patient and will be maintained in an on-line computer file.

Demonstration of the Integration of Active Medical Records

Dr. R. E. Robinson

Wake Forest University
School of Medicine
Reynolda Station, Box 7323
Winston Salem, North Carolina 27103

Advanced natural language electronic data processing techniques are used to acquire and analyze the history, physical examination, progress notes, and other narrative information contained in the medical record. A clinical laboratory computer system processes on-line data obtained from multiple channel continuous flow analyzers and from the manual entry of test results from video

5.6 MEDICAL RECORDS AND PATIENT INFORMATION (cont.)

Demonstration of the Integration of Active Medical Records (cont.)

tape terminals. A digital data acquisition system handles clinical EKGs. The narrative text and laboratory data processing systems are being integrated with a medical center communications system.

An Electric Data-Processing System for Maternity Care

Dr. J. L. Burks

University of Chicago
School of Medicine
5801 S. Ellis Avenue
Chicago, Illinois 60637

This project will study whether electronic data processing can improve maternity care and pregnancy outcome. The project will monitor all routine and special laboratory tests of maternity patients; identify high risk patients; and provide on-line availability of patients' records, with predicted complications, management guidelines, and pertinent literature references.

An Experimental Approach to the Design of a New Medical Record

Dr. D. D. Kozoll

Hektoen Institute for Medical Research
Chicago, Illinois

This project is to develop an improved medical record, to survey techniques and equipment in the field of automatic information dissemination, and to devise a medical records system applicable to all health care institutions.

Federal Employee Health Program

R. Anderson

United States Department of Commerce
National Bureau of Standards
Washington, D. C. 20234

This project is to design and implement a complete information management system for health records in the Federal Employee Health Program.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION (cont.)

Management Review Program

G. E. Schunior

American Hospital Association
840 N. Lake Shore Drive
Chicago, Illinois 60611

An in-depth management review of the medical records function is being conducted; a method for evaluating innovative hospital management programs is being developed.

Navy Environment -- Symposium to Provide Information for Improving

Navy Medical Record Services

A. Paull

Decca Navigator Systems, Inc.
Houston, Texas 77027

The symposium will discuss the latest developments in the processing and analysis of patient data. Sessions will cover hardware, software, and applications of computers in the biomedical field, particularly the cardiovascular area.

Real Time Computer Services for Ambulatory Clinics

Dr. A. G. Jessiman

Peter Bent Brigham Hospital
721 Huntington Avenue
Boston, Massachusetts 02115

This project is to study the feasibility of implementing administrative aids for managing patient care such as automatically supplying relevant data for utilization review, physician workload, preventive medicine procedures, and diagnostic and therapeutic reminders.

Record Keeping for Evaluation of Cost Benefits of Ambulatory Health

Services Provided Residents of Low Income Areas (Abbrev)

Dr. M. L. Ingbar

Cambridge Department of Health and Welfare
1493 Cambridge Street
Cambridge, Massachusetts 02139

This project is to develop a record-keeping system which can be used in a cost-benefit analysis of alternative ways of providing outpatient care to the urban disadvantaged in Cambridge, Massachusetts.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION (cont.)

Study of Hospital Discharge Abstract Systems

Dr. K. L. White

Johns Hopkins University
School of Public Health
615 N. Wolfe
Baltimore, Maryland 21205

This project is to critically evaluate the major hospital discharge abstract systems in operation or under development in the United States, Canada, and Europe. Recommendations will be made for coordinating abstract systems in the United States, standardizing data analysis methods, and determining a basic model for reporting utilization.

Survey of Ambulatory Medical Care

Dr. A. J. Hampton

Lea Associates, Inc.
Ambler, Pennsylvania 19002

This project is to revise the patient record forms tested in the "Survey of Ambulatory Medical Care," work out the induction problems identified in that survey, and field test the results of the revisions.

Uniform Hospital Discharge Data - A Demonstration

J. M. Ensign

Health Services Foundation
Chicago, Illinois

The objective is to implement, on a small scale, a discharge data system filling the hospital's own record requirements and the third-party claim requirements, as well as providing much information needed by planning agencies to improve the quality of medical care and control rising hospital costs. The legal aspects of the uniform discharge data system will also be explored, and activities will be coordinated with the National Center for Health Statistics so data standards can be set.

5.7 MONITORING SYSTEMS

Automated Monitoring of Sick Infants

Dr. L. G. Veasy

University of Utah
Primary Children's Hospital
320 12th Avenue
Salt Lake City, Utah 84103

This project is to develop an automated system to monitor arterial blood gases and pH in acutely ill infants and to give a real time on-line display of results. A computerized record keeping system for monitored infants is being developed.

An In-Depth Evaluation of Medlab Patient Monitoring Systems

Dr. A. E. Wechsler

Arthur D. Little, Inc.
15 Acorn Park
Cambridge, Massachusetts 02140

This project is to evaluate the Medlab System at the Massachusetts General Hospital, Boston, Massachusetts, and the Patient Monitoring Facility at the University of Minnesota Hospital, Minneapolis, Minnesota. Studies on manpower utilization, cost effectiveness, quality of health care, and research and educational benefits are to be considered.

5.8 PATHOLOGY AND LABORATORY DATA

Automated Data Processing for Clinical Chemistry

Dr. G. Brecher

University of California
School of Medicine
551 Parnassus Avenue
San Francisco, California 94112

This project is to evaluate data input devices which can be used for entering laboratory results, such as teletype, key punched or mark-sensed cards, TV or CRT terminals, and the peripheral entry consoles developed under the initial grant.

5.8 PATHOLOGY AND LABORATORY DATA (cont.)

Computer Applications in Blood Component (Platelet Therapy)

R. Hsieh	This project is to automate the storage and processing of platelet transfusion data.
United States Department of Health, Education and Welfare	An IBM 7094 or an IBM 1401
Public Health Service National Institutes of Health	is used, and programs are written in Fortran IV.
Baltimore, Maryland	

Computerized Program for Reporting Results of Microbiology by a Laboratory

Geographically Removed from Patient Care Area

V. M. Young	A computerized reporting system for microbiologic data supplies printed reports for the patient's medical file and punched data cards for permanent hospital records.
United States Department of Health, Education and Welfare	
Public Health Service Hospital 3100 Wyman Park Drive Baltimore, Maryland 21211	

A Data System for Surgical Pathology

R. E. Robinson	This project is to continue developing an economically feasible method for storing and retrieving a large volume of surgical pathology data, both current and accumulated.
Wake Forest University School of Medicine Reynolda Station, Box 7323 Winston Salem, North Carolina 27103	

The Development of Machine Coding of Surgical Pathology Using the IBM

360/65 Computer

Dr. J. E. Todd	The IBM 360/65 is used to create a data file for surgical pathology diagnoses.
United States Department of Health, Education and Welfare	
Public Health Service National Institutes of Health Bethesda, Maryland 20014	

5.8 PATHOLOGY AND LABORATORY DATA (cont.)

Use of Computer to Improve Clinical Laboratory

Dr. D. Seligson

Yale University
School of Medicine
333 Cedar Street
New Haven, Connecticut 06510

This project is using automatic equipment and a computer in an attempt to perform better, faster, and more economical analyses on smaller samples and to rapidly present data in a good format.

Use of Time-Sharing Computer Facilities for Correlating Clinical and Patient Data with Microbiologic Research Studies

Dr. G. D. Vermeulen

United States Department of Health,
Education and Welfare
Public Health Service Hospital
3100 Wyman Park Drive
Baltimore, Maryland 21211

A time-sharing computer facility is being used to record and sort clinical laboratory data for use in microbiology laboratory studies.

5.9 PATIENT POPULATION

Clinical Registry for Data Pertaining to Upper Extremity Spasticity in the Stroke Patient

Dr. R. Braun

University of Southern California
School of Medicine
2025 Zonal Avenue
Los Angeles, California 90033

This project is to collect clinical data on stroke patients with a spastic upper extremity in order to establish norms of function, identify prognostic factors, conserve health manpower, and reduce rehabilitation time and cost.

A Computer-Oriented Data Processing System for Dental Clinical Trials

Dr. J. P. Carlos

United States Department of Health,
Education and Welfare
Public Health Service
National Institutes of Health
Bethesda, Maryland 20014

This project is to develop a system for collecting and analyzing dental caries clinical trials using an NIH 360 computer system and a specially designed optical mark sense form.

5.9 PATIENT POPULATION (cont.)

Computer Treatment of Chronic Dialysis Information

Dr. F. K. Curtis

United States Veterans Administration
Hospital
4435 Beacon Avenue, South
Seattle, Washington 98108

Raw clinical data on chronic dialysis will be computerized, and additional computer programs will be developed to make existing data readily available in summary form. Methods for assessing treatment costs will also be devised.

Design and Test of a System for Collection and Statistical Analysis of

Data on Quadriplegic Patients

Dr. R. E. Carter

Baylor University
School of Medicine
1200 Moursund Avenue
Houston, Texas

This project is to design a system for collecting data on patients with spinal cord lesion and to statistically analyze the data. A remote 2260 on-line teleprocessing terminal is used for data input.

The Jerusalem Perinatal Survey

Dr. A. M. Davies

Hebrew University
Jerusalem, Israel

This project is to maintain a data bank of medical information on all pregnant residents of Jerusalem and their newborn infants for studies of morbidity, epidemiology, utilization, and planning of health services.

Programming in Support of Third National Cancer Survey

Mauchly and Company
330 Hungerford Drive
Rockville, Maryland 20850

The contractor is to maintain the Third National Cancer Survey computer system, generate data on cancer incidence, implement patient matching techniques to determine which individuals, out of about 400,000 patients, have identical or similar characteristics, and perform other supportive data analyses.

5.9 PATIENT POPULATION (cont.)

Natural History Heart, Cancer, Stroke in a Population

Dr. L. T. Kurland

Mayo Foundation
Rochester, Minnesota 55902

This project is to conduct epidemiologic and related clinical and pathologic studies built on the records of the Mayo Clinic and ancillary facilities. The occurrence and progression of disease in the community will be characterized for a period of at least 30 years. A storage and retrieval mechanism will provide ready access to data.

Studies of Improved Methods for Evaluation of Treatment in Cancer

Dr. A. R. Feinstein

United States Veterans Administration
Hospital
W. Spring Street
West Haven, Connecticut 06516

Revised coding criteria for lung cancer and a manual on coding techniques have been devised. The "conversational mode" computer program for prognostic estimation has been completed, and a "batch processing" computer program for prognostic stratification is being prepared.

5.10 PHARMACY

Establishing a Narcotics Register

Dr. D. P. Conwell

Medical and Health Research
Association
New York, New York

Reports on narcotics users are being used to establish a reliable, unduplicated count of addicts. The register, with appropriate validation components, is a potential source of incidence and prevalence statistics on addiction. Studies will be evolved concerning the use of services by these addicts and the evaluation of the various treatment programs in the city of New York.

5.10 PHARMACY (cont.)

A Proposed Study of Drug Utilization

Dr. R. F. Maronde

University of Southern California
School of Medicine
2025 Zonal Avenue
Los Angeles, California 90033

A patient drug file, documenting about 90 percent of the pre-prescription drugs dispensed to over 250,000 patients, will be set up, using on-line electronic data processing techniques. Prescriptions will be evaluated for the amount of drug requested, combination with other prescribed drugs, and directions provided the patient.

5.11 PSYCHIATRY AND MENTAL HEALTH

Computer Facilitation of Psychiatric In-Patient Care

W. L. Bennett

Institute of Living
400 Washington Street
Hartford, Connecticut 06102

A hardware and software package is to be developed that can be readily adapted for use in both psychiatric and general hospitals. The Digital Equipment Corporation's PDP-15 computer will be used.

Factors Influencing Patient Conformity to Staff Expectations

L. B. Spearman

United States Veterans Administration
Hospital
East 5th Street
Saint Louis, Missouri 63125

Data for measuring the major dependent and independent variables which influence patient conformity to staff expectation are being completed for computer processing.

Functional Analysis of a Psychiatric In-Patient Unit in a V. A. DM&S

(General) Hospital

Dr. R. L. Christensen

United States Veterans Administration
Hospital
150 Muir Road
Martinez, California 94553

Nearly 5,000 admissions to Psychiatry Service from 1957 to 1968 were coded. Recorded data included psychiatric and physical diagnoses, date of admission, length of stay, type of discharge, medications, type of treatment, and many other items characterizing the patient's history and current problems.

5.11 PSYCHIATRY AND MENTAL HEALTH (cont.)

A Multi-State Information System on Psychiatric Patients

Dr. E. M. Laska

Research Foundation for Mental
Hygiene
Albany, New York

This project is to provide an automated patient data system for mental hospitals and community mental health facilities and to provide multi-state summary statistics for evaluation programs and treatment procedures.

Profiles of Hospital and Community Stay for Neuropsychiatric Patients

Discharged 1953 - 1963

E. K. Tarpy

United States Veterans Administration
Hospital
Belmont Street
Brockton, Massachusetts 02401

The sample of neuropsychiatric patients was expanded to include data through 1969. Analysis of hospital and community stay will include time series, Markov chain process, and techniques developed by Morrison in his study of residence and subsequent risk of moving.

Programmed Evaluation in Community Mental Health Care

Dr. A. Zitrin

New York University
School of Medicine
550 1st Avenue
New York, New York 10016

Community mental health care will be quantitatively assessed by comparing the initial period of hospitalization and subsequent ward behavior of patients admitted to the Psychiatric Division of Bellevue Hospital as well as of patients in a control group.

5.12 RECORDS RESEARCH

Administrative Research in Automatic Data Processing

Dr. J. J. Matoole

United States Veterans Administration
Hospital
4101 Woolworth Avenue
Omaha, Nebraska 68105

Before the Council of Medical Education of the American Medical Association approves a post-graduate educational program, it requires statistics (number of beds assigned to each training program, average

5.12 RECORDS RESEARCH (cont.)

Administrative Research in Automatic Data Processing (cont.)

occupancy, staffing) on each specialty program. Because the requirements for inpatient beds vary from day to day in each specialty, a computerized program is to be developed to maintain data on each specialty and, on demand, to total all activities for any given time segment.

Bio-Medical Information Systems Design 06

T. E. Bauer

United States Army
Medical Research and Nutrition
Laboratory
Denver, Colorado

This project is to develop a digital computer-based information system for processing and analyzing military biomedical research information.

Research from Medical Records on a Hospital Computer

Dr. L. Leiter

Montefiore Hospital and Medical Center
111 E. 210th Street
Bronx, New York 10467

Two computer systems, the Basic Patient Description and the Laboratory Information System, will be used to study the interrelationships between diagnostic categories and laboratory test findings. Additional diagnostic and treatment data from the medical record may be incorporated into the magnetic-tape files so more refined investigations may be conducted.

A Study of Audiology Data Sheets Designed to Utilize Electronic Storage and Retrieval Techniques for Clinical Research

James L. Shapley, Ph.D.

Veterans Administration Hospital
4435 Beacon Avenue, South
Seattle, Washington 98108

Two hundred patients will be audiology examined, and the results computer processed to form a data bank valuable for investigating the relationships between hearing, loss and noise trauma, aging, medication, and disease. Data from existing audiology files will be transcribed.

5.12 RECORDS RESEARCH (cont.)

Optimum Utilization of Hospital Ancillary Services

Dr. D. Valinsky

City University of New York
School of Medicine
10 E. 102nd Street
New York, New York 10029

Mt. Sinai School of Medicine
New York, New York 10029

This project will continue to use operations research techniques to optimize the use of hospital ancillary services. Research will include developing a Flow Model descriptive of patient demands and a computer simulation system to rapidly determine the impact of input variations and management and operational changes.

CHAPTER 6

REPORT SUMMARIES FROM THE DEFENSE DOCUMENTATION CENTER

The following are reports on recent Department of Defense contracts pertaining to medical record systems. The author, title, recipient institution, reference number, and abstract are given for each report.

Beck, William Stanislaus, Automation for the Hospital of Tomorrow, Aerospace Medical Division, Brooks Air Force Base, Texas, AD-677 593.

With the increasing emphasis on automation and shortage of skilled personnel within the medical service of the United States Air Force, the necessity for developing a mechanized system to assist in hospital and medical management became apparent. As project engineer for developing a medical information system by computer operation, the author has researched literature, visited hospitals with computers, talked with computer hardware salesmen, and attended meetings and seminars on computer usage. This paper is an attempt to familiarize others interested in computer application for hospitals and the medical fields with my research. (author)

Beck, William S.; Creamer, Ronald A., Hospital Information System Feasibility Study, Aerospace Medical Division, Brooks Air Force Base, Texas, AD-676 005.

In recognition of the complexity in the basic operation of hospitals today and the shortage of skilled personnel within the medical services, a feasibility study has been initiated for developing medical information system by computer operation using the systems engineering approach. This report outlines the developmental program for a transactional hospital information system which would include all Air Force medical installations and related medical activities. (author)

Boehrer, Jane M.; Ray, Hugh J., Jr.; Bates, Arthur W., Jr., Medical Food Service Computerization Study, School of Aerospace Medicine, Brooks Air Force Base, Texas, AD-689 162.

A report is made of the first Air Force attempt to test the feasibility of using a computer to solve daily planning and reporting problems involved in medical food service. The computer system was designed to calculate, store, and produce yield-adjusted recipes, procurement orders, issue orders, costing, and inventory maintenance. The study was limited to only the regular diets for one week of a standard Air Force hospital three-week menu cycle. The plan was tested using actual operational data from the test hospital. (author)

Boehrer, Jane M.; Paladino, Lorraine S.; Hugh, J., Jr., A Study of Automation in the USAF Medical Food Service, School of Aerospace Medicine, Brooks Air Force Base, Texas, AD-708 739.

A model computer system was designed in support of Air Force medical food service and related medical service accounting activities. Completed subsequent to research reported in SAM-TR-69-11, the system automates the production of yield-adjusted recipes, AF form 287 subsistence request, AF form 543 food issue record, AF form 449 menu production request, and the maintenance of perpetual inventory and cost accounting of medical food service subsistence. Based on the cyclic menu, recipes, and subsistence item stock of the individual medical food service operation, the model system was tested at 3510 USAF Hospital, Randolph Air Force Base, Texas. Results confirmed many methods and formulas and pinpointed specific areas requiring further refinement to obtain an efficient, reliable, and accurate electronic data processing system requiring a minimal amount of maintenance man-hours. (author)

Creamer, Ronald A., The United States Air Force Hospital System, Electronic Systems Division, L. G. Hanscom Field, Massachusetts, AD-674 593.

The paper describes in general terms a concept for introducing computers to all USAF medical facilities. It defines in depth the functions, applications, and growth potential which can accrue within the

USAF hospital system. It also describes additional benefits possible on a regional and world-wide basis which could evolve from connecting the hospitals to a communication network. Research potentials of the system are also projected. (author)

Creamer, Ronald A.; Fagan, George A., An Evolutionary Plan for the Integrated USAF Medical Information System, Electronic Systems Division, L. G. Hanscom Field, Massachusetts, AD-679 544.

The planning document describes a method by which the integrated medical information system could evolve. The program is delineated into six categories: patient care facilities; regional (inter-hospital) activities; central (inter-regional) activities; research and education aspects; special projects; automated armed forces entrance and examination stations (AFEES) (induction centers). The first four categories are recommended to evolve sequentially whereas the special projects can be handled independently, and later be included as their development matures. The last category, automated AFEES, was included to imply an inseparable relationship between the initial medical record and the subsequent records generated during active duty; however, the automated AFEES is covered in more depth in other documentation. (author)

Deland, E. C.; Waxman, B., Review of Hospital Information Systems, Rand Corporation, Santa Monica, California, AD-708 427.

A modern metropolitan hospital, perhaps more than any other social institution, is dependent upon rapid and accurate information flow. Because, in the practice of modern medicine, correct information at the right time can be vital to save a life or prevent a catastrophe, the hospital is increasingly vulnerable to failures in the information set. Although the amount of information is burgeoning in parallel with medical-science research, interest in reliable, automated medical-information processing has only recently begun to grow. The paper reviews the current status of this country of automated hospital information systems, with particular emphasis on the involvement of the U. S. Public Health Service in the development and deployment of these systems. (author)

Deland, E. C.; Raub, W. F.; Stacy, R. W.; Waxman, B. D., Computers and the Delivery of Medical Care, Rand Corporation, Santa Monica, California, AD-682 952.

The volume is intended to be illustrative of the degree to which the computer is being effectively used in the delivery of medical care.
(author)

Fink, C. Dennis, Establishment of a Tumor Registry System for Louisiana: Proposals on Objectives, Capabilities and Structure, Human Resources Research Organization, Alexandria, Virginia, AD-711 249.

Tumor registry supervisors and secretaries and hospital administrators at nine Louisiana hospitals and clinics were interviewed to obtain information to guide the design and development of a central tumor registry and state-wide registry system. The study was conducted by the Human Resources Research Organization (HUMRRO) under the sponsorship of the Louisiana Regional Medical Program. Information was obtained on (a) local interest in the establishment of a state-wide registry system; (b) services which a central registry might provide; (c) the manner in which existing local registries are utilized; and (d) conditions under which hospitals would be willing to join the Central Registry System. Six hospitals and one community registry were identified as candidates for incorporation into the initial registry system. It was recommended that the registry system be organized around community registries with support provided by a central registry. The need for the registry system to concentrate on high-valued services and products was emphasized. (author)

Gelblat, Marvin, Computerized Storage and Retrieval of Cardiac Catherization and Pathology Data, Pennsylvania University, Moore School of Electrical Engineering, Philadelphia, AD-671 912.

The doctor who is mainly concerned with patient care has felt the impact of the computer only insofar as the results have added to the vast store of knowledge he must have readily available. In this paper the use of the problem-solving facility of the Moore School of the University of

Pennsylvania to eliminate a major phase of this information problem in the medical field is demonstrated. Patient records generated in the Cardiac Catheterization Laboratory and in the Surgical Pathology Department of the Hospital of the University of Pennsylvania are stored on magnetic disk and are available for immediate retrieval. With the idea that any operational changes brought about by the new computer technology should be kept to a minimum, flexowriters are used to convert automatically an edited version of the pathology record into machine readable form as the secretary types the final report. (author)

Syner, James C., A Computer Based Biomedical Information System, Army Medical Research and Nutrition Laboratory, Denver, Colorado, AD-681 893.

A digital computer based biomedical information system was designed to service the needs of physicians engaged in patient care and clinical research and scientists engaged in laboratory research. The system embraces all functions of information processing which include information collection, storage, retrieval, analyses and display. The principal goal of the project is to place these functions under the maximum degree of automation possible with existing hardware-software capabilities. At the time of this report the status of the system is best characterized as "semi-automatic." From the time of inception, and throughout implementation, the project has been carried out under the concepts, principles and techniques of the systems analyses. Experience has demonstrated that a total biomedical information system to service a complex medical facility such as the Fitzsimons General Hospital establishment will necessarily evolve through several generations of hardware-software alterations. There will probably never be a total solution to the problem but rather sequential events viewed as minor to major achievements representing progress towards an ever improving system. Progress is absolutely dependent upon support and participation from the professional staff, including both physicians and scientific investigators. (author)

Wolin, Burton, R.; Davidson, Roy; Doyle, Lauren B.; Wallace, Ruth, Feasibility and Demonstration Study for the Application of Micro-Image Techniques to Navy Radiology Services, Technomics, Inc., Falls Church, Virginia, AD-709 992.

The study explores the feasibility of applying mid-range (50-100 diameters reduction) microfiche technology to x-rays at Bethesda Naval Hospital. Purpose: to determine whether this technology can help to increase the efficiency of the delivery of health care as well as reduce some of the costs related to radiology. Present radiology procedures at Bethesda Naval Hospital were studied in detail. Tests were made of radiographic images reduced 56 diameters. Two theoretical system models were developed to assess the procedural implications of using microfiche. The film technology does not yet yeild wholly satisfactory images, but appears right on the verge of doing so. Procedurally, the use of fiche promises a flexible system that will effectively attack problems of lost or missing x-rays, of file space, and of physician and clerical time. System improvements unrelated to the use of fiche were explored. Tests in practice will be required to establish accurate cost/effectiveness measures. (author)

Zhukovskaya, E. A.; Koryakov, Information Retrieval Systems, Their Development Use and Application (Selected Articles), Foreign Technology Division, Wright-Patterson Air Force Base, Ohio, AD-716 521.

Contents: possibilities for using information retrieval systems in geology; information retrieval system for centralized record keeping for oncological patients.

The Use of Computers in Medicine, Volume 1, Defense Documentation Center, Alexandria, Virginia, AD-840 800.

The bibliography is a compilation of references from the DDC collection on the use of computers in medicine. The references are mainly concerned with the computer's application as a direct tool in medical research. The topics covered are: (1) computers in biomedical systems; (2) biological simulation; (3) biomedical monitoring; and (4) data analysis.

The Use of Computers in Medicine, Volume 2, Defense Documentation Center, Alexandria, Virginia, AD-675 600.

The bibliography is a compilation of references from the DDC collection on the use of computers in medicine. The references are mainly concerned with the computer's application as a direct tool in medical research. The topics covered are: (1) computers in biomedical systems; (2) biological simulation; (3) biomedical monitoring; (4) computer-aided diagnosis; and (5) data analysis.

Systems Analysis Study Towards a 'New Generation' of Military Hospitals, Volume V, Data Inventory, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania, Health Systems Department, AD-716 504.

The data collected during on-site visits to the three primary base level health care systems (Walson Army Hospital, Malcolm Grow Air Force Medical Center and Beaufort Naval Hospital) and the six secondary base level health care systems (Wilford Hall Composite, Womack Army Hospital, Jacksonville Naval Hospital, Dewitt Army Hospital, Oakland Naval Hospital, and March Composite) are summarized in this volume in the form of matrices, tables and figures. The data represented forms a major data resource for the systems analysis volume of this final report. The data inventory focused on the following hospital functions: information flow; patient flow; material flow; medical records summary; education and training; clinical laboratories; dietary; dentistry; dispensaries; medical records; pharmacy; outpatient department; radiology; registrar; and ward management. (author)

CHAPTER 7

BIBLIOGRAPHY

7.1 INTRODUCTION

The current literature (1968 to 1970) on medical record systems and procedures was reviewed using the computer search capability of the National Library of Medicine. A manual review was done of literature related to management and personnel in the Medical Records Department. The articles compiled in these two reviews have been collated and appear in Sections 6.2 through 6.8.

Medical record references concerning filing and numbering, medico-legal aspects, administrative responsibility, dictation and recording, patient records, and medical audit in the outpatient department are available from:

Office of Consultation on Hospital Functions
Health Facilities Planning and Construction Service
U. S. Department of Health, Education and Welfare
5600 Fishers Lane
Rockville, Maryland 20852

Commercially available bibliographical services that can provide in-depth searches for a specific title are:

- Bio-Sciences

Information Service of Biological Abstracts
200 Arch Street
Philadelphia, Pennsylvania 19103
Mrs. Phyllis V. Parkins

- Current Index to Conference Papers in Engineering; Life Sciences
Scientific and Technical Literature

CCM Information Corporation
909 Third Avenue
New York, New York 10022
Mr. Richard P. Kollin

- Chemical-Biological Activities
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