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The purpose of this study was to provide some preliminary data about the information-searching behavior of the physician in order to (1) facilitate the development of models describing the search behavior and (2) provide the behavioral data necessary for the development of effective information retrieval systems for use by the medical profession. In this report, the relationship between various factors that are involved with the physician's information- searching behavior are graphically displayed in a model, while a second figure diagrams the various sources of information, with the physician as a center point. To provide data for a small part of the overall system shown in the model, an exploratory study was conducted to obtain background information about the physician's information-searching activities. Based on interviews held with internal medicine specialists on the staff of a large metropolitan hospital, sources of information for these physicians were identified and the use of these sources was examined. Suggestions for future studies and activities involve collecting additional validating data, using this behavioral data in developing a theory, and eventually developing information services for the physician designed to improve his information-searching behavior. (JB)

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INFORMATION SEARCHING BEHAVIOR OF PHYSICIANS

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ABSTRACT

This paper describes two studies made of certain aspects of the information searching behavior of physicians. An attempt is made to describe those parameters that would affect the development of an information retrieval system for physicians. The physicians studied were internal medicine specialists on the staff of a large metropolitan hospital and having some private practice. Sources of information were identified and the use of these sources by these physicians was studied. It is felt that this information is particularly pertinent to the development of information retrieval systems in medicine.

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INFORMATION SEARCHING BEHAVIOR OF PHYSICIANS

by

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INTRODUCTION

The purpose of this study was to provide some preliminary behavioral data about the information-searching behavior of the physician. This data should help to provide the insight necessary to develop models describing this information-searching behavior. In addition, this kind of behavioral data is necessary for the development of effective information retrieval and data retrieval systems for use by the medical profession. The point of emphasis is the need for user behavior knowledge prior to information retrieval system development.

Underlying Theory and Previous Work

The medical profession is not completely unaware of some of its shortcomings. It is attempting to improve the situation but because of the scope of the problem it is running into some difficulty. Five years ago, Dr. Gunnar Gunderson, then President of the American Medical Association, in referring to techniques for updating phsyicians, made the very strong statement "if other techniques fail, then we may have to resort to compulsory periodic re-licensing of doctors." Here we find a realization by the AMA of the existence of physicians who are unable or even unwilling to keep

themselves updated. Physicians should know more about their own field and also be kept informed about the latest activities in the other specialized areas.

This problem of obtaining up-to-date information is currently approached in several ways. Many doctors have contact with teaching hospitals and may even devote one day or afternoon a week to that hospital. It is often a low-paying proposition but the return is measured in terms of the contacts made with the newer techniques in the field. One problem is that teaching programs exist in only a few hundred of the 7,000 hospitals in the United States. Another approach that the physician can make is to attend local Medical Society lectures, usually averaging one or two per month. Annual medical conventions or one or two-week post graduate courses are also available. He may also subscribe to a dozen or so medical journals. However, there are over one thousand journals in the United States devoted to medicine.

One surgeon carefully compiled data showing it impossible for a person reading at an average rate to cover all of the principle journals in general surgery even if he devoted every evening in the month to this task. Thus, he could not finish the current month's journals before the next month's would be published. Another approach to the problem is the use of AMA and pharmaceutical house digests. There are even digests available on magnetic tape to be played to the physician in his car while driving from one patient to the next. It was found in a recent study that about 30% of those physicians surveyed take little or no part in

educational programs, but rely primarily on the detail men of the pharmaceutical houses.

Actually, much of the information that affects the physician is transmitted in the form of a communication to him from several sources. The patient, of course, is his prime and most important source of information. He also receives information from other physicians, from pharmaceutical house representatives, from medical literature, and in professional meetings. The attempt, therefore, of this study was to help to determine and measure some of the communication input to the physician. In addition to this communication input, there is comparable communication output.

The following are some of the factors that could be considered in attempting to obtain better insight into the physicians information searching behavior:

1. Rate of arrival of patients
2. Servicing time of patients
3. Methods of recording data about the patient
   a. past history
   b. hereditary information
   c. clinical tests
4. Technique or philosophy of patient approach
5. Relationship with other physicians
   a. social
   b. professional

6. Relationships with pharmacists
    a. phone confirmations
    b. phoned prescriptions
7. Relationship with local hospital(s)
8. Relationship with service groups
    a. x-ray
    b. blood test, etc.
9. Relations with pharmaceutical houses
    a. detail men
    b. mailing lists
    c. journals
10. Professional journals
    a. time of reading
    b. content of reading
    c. amount of reading
11. National conventions
    a. attendance
    b. value
12. Post-graduate courses
    a. attendance
    b. value
13. Patient follow-up
14. Standardized patient tests or measurements
15. Book reading

Form of Relationships:

It was felt that the relationships between the above factors and the individuals involved is best described in the form of a diagram or model. Figure 1 and Figure 2 are possible models expressing essentially the same concept.

Figure 1 attempts to approach the information processing problem of a physician by describing the various information sources available to the physician. His basic knowledge is developed from his medical education, clinical knowledge, and the experience of others that he has gained at association meetings, conventions, etc. This information is accepted or rejected by a filtering process used by the physician whereby he stores away certain pieces of information as being important and rejects others as being unimportant or incorrect. He also maintains in his mind a disease-illness master data file where he essentially has tablulated the etiology, the syndrome, and the procedures for prevention, cure or alleviation of the disease or illness. These two sets of information are interconnected again through a filtering device. A second filtering device separates that information available to the physician from the patient, the pharmacist and from the hospital. Here we see in the center of Figure 1 the physician receiving and comparing information from his master data file with that provided by the patient. The patient is shown to provide information that falls into certain time categories such as present time equals to time zero giving such factors as outward appearance verbal description and measured description about the symptoms encountered

by the patient. Where $t \leq t_o$ we find that past history is available about the patient in terms of drugs administered, clinical tests, patient files, other physicians' comments, etc. In addition to this, we have patient hereditary factors where again $t \leq t_o$. Such information follows similar lines as the past history in that now we have hereditary factors about the families of the patient, etc. Information is then dispensed by the physician to the pharmacist and to the patient and for special tests. These all affect the patient as shown to the right whereby information is extended in the form of some result or lack of results. These results are fed back into the system as shown in Figure 1 and provide additional input for the physician master data file and his basic knowledge. Similarly, the information enters back into the patient's past history file.

Thus we find a very complicated description of the information processing behavior of the physician in his relationship with the patient and with others within his entire information environment. It is necessary, therefore, to provide some understanding and hopefully some quantification of the factors that are involved in this model. Earlier in this paper comments were made about the various factors that are involved with the physician's information searching behavior and Figure 1 is an attempt to graphically display these factors. A second figure, namely, Figure 2 shows a similar approach to the information problem and is essentially a description of the various sources of information with the physician as a center point. It should be noted that many of the arrows

which indicate flow of information are bi-directional arrows indicating a form of feedback and reinforcement.

General Design of Exploratory Study

Essentially, the purpose of this study was to obtain background information about the physician's information-searching activities. The sources of his information include the patient, association meetings, conventions, medical journals, personal contact with other physicians, and post-graduate courses. Thus this study represents only a very small part of the overall system as shown in our model.

Population:

It was decided to use the Internal Medicine Specialist because of his general availability in the local area and his similarity -- in terms of breadth of interests -- to a general practitioner.

There was no attempt to obtain a random sample. For this study, the major criterion was one of access to the physician.

Access:

Two approaches were used to gain access to the physicians. The first was by direct mail of individually typed letters to a small sample of local physicians.

The second access area was the faculty of a large medical school in the Chicago area. A preliminary interview with the director to explain the proposal revealed a complete willingness and desire to participate in the study. It was evident by the response that the medical school and the physicians in private practice were particularly interested in the

physician's information problem.

Interviews were arranged and an appointment schedule established for a total of 25 internal medicine specialists at the medical school. It was very interesting to note, again apparently reflecting the interest of the physicians, that only one physician was unable to participate in the interview and that all others, with the exception of two, were on time for their appointments.

Interview Design:

The interview design presented two major problems -- that of time limitation and of question design. The time limitation was created by a desire to minimize the physician's time loss and it was hoped that an offer of a short interview would encourage the physician to participate in the study. After consideration of the usual time allowed for patients it was decided that a time limit of fifteen minutes would be used for the interview.

It was then necessary to determine what questions would be asked and what interview format would be used.

It was felt that the best explanation of the general behavior of the physician could be obtained by simply asking him to verbally describe his week's activity in a rather brief period of time. Sample runs by the author and other non-medical personnel were made in an effort to determine the approximate time required to explain a week's activity. This approach was also based on three preliminary physician interviews ranging from

one-hour to one and one-half hours, made as part of the interview design. It was determined that four minutes would be sufficient time to briefly describe his activities for the week.

The fifteen minute interview was made up of four minutes for introduction and closing of the interview, seven minutes of questions, and four minutes for describing the week's activities. Problems, although not insurmountable, were encountered with this tight interview schedule but, as a whole, it ran quite smoothly.

One minor difficulty occurred during the interviews. This was the case in which the doctor got in the first word or question to the effect of "what is the study about," or "what are you trying to do," and essentially tried to interview the interviewer. This was usually circumvented by immediately handing the typed introductory sheet to the physician as part of the introduction and handshaking as he entered the interviewing room. The comment was also made to the physician, that this procedure helped to standardize the interviews.

The technique of the written questionnaire to be completed at the time of the interview, and the use of a recording device appeared to offer the best solution to the overall problem of the physician interview with its inherent time limitations.

Results

Shortcomings of design:

Perhaps the real shortcoming of the interview was the fact that more complete data was not obtained. This would be rather difficult when one considers the magnitude of the information-searching problem as outlined in the original system model.

For example, there was no significant amount of information obtained about the frequency and number of patients and the type of problems encountered in communicating with the patient. During supplementary conversations, one physician indicated no problems while another stressed the need to communicate effectively.

Some of the more interesting results were:

1. A ranking of the most popular journals:
   a. Annals of Internal Medicine
   b. New England Journal of Medicine
   c. American Journal of Medicine
   d. Journal of the American Medical Association
   e. Archives of Internal Medicine.
2. Abstracting services were subscribed to by one out of every five of the physicians interviewed.
3. Hours of reading journals seem to be somewhere between five and ten hours per week.

4. About 50% of those physicians interviewed had attended some special course or lecture during the past year with the average number of such events being four.
5. Approximately 91% of those interviewed had attended a convention during the past year with the average number of conventions attended being two.
6. Approximately 80% of the physicians interviewed had attended local medical society meetings. Of those attending, approximately 87% had attended 50% or more of the meetings.
7. Approximately two or three per week is the average number of specific consultations made by these physicians to other physicians about their patients. This is interesting with respect to the question of defining the physician's IR needs. There is also the question of the difference between data retrieval and information retreival (IR).
8. Approximately three to five referrals per week are made to technical material in relation to patients.
9. The physician apparently sees about two or three detail men per week and devotes five to ten minutes per man. He tries to see them as soon as is convenient, but one-fifth of the physicians wanted to discontinue these activities. Another 11% wanted to change the activities of the detail men.
10. Dictating machines were used in approximately 26% of the times that they could possibly have been used instead of some other method.

11. The physicians averaged five to ten phone calls per day but with a wide range of distribution.

It should be noted that the above results apply specifically to those physicians interviewed and no real conclusions can be drawn concerning the population of physicians in general, or even Internal Medicine Specialists within an urban area.

It would appear, based on some of the information obtained in this study, that a study of the physician as an information-processing system is possible.

With respect to information-processing by the physician, data is available concerning the popularity and readership of medical journals. It is interesting to note that the first three journals in popularity had readership (expressed in terms of percent of number of articles read) on the average slightly over 60 to 70 percent. For example, many physicians indicated that they read 100% of the New England Journal of Medicine as compared to a figure typically around 25% for the Journal of the American Medical Association. This readership data is of particular value in that it gives a starting point for further studies of the value of the information input to the physician from Journal sources.

A considerable number of additional interviews would be necessary in order to draw any significant conclusions of the detail man-physician relationship. Many factors affect this relationship, particularly the pharmaceutical house's reputation and the personal approach of the detail

man. It would appear from the comments made by the physicians interviewed that detail men do not answer a need of physicians, or offer significant additional data, as might be expected.

Implications

A. Medical Journal Information Receipt, Storage and Use

From this study it would appear that a contribution might be made if one were to further study the information-processing as performed by the physician through the reading of medical journals. Information theory, in terms of the input to the physician and his possible retention and use of the information provided might be readily applied. A similar approach could be extended to other information sources such as abstract services, medical society meetings, conventions, and perhaps even detail men visits.

The approach might be one of comparison in order to determine which source provides a physician with the greatest retention of key points or the most applications of the data retained. Time is the major consideration concerning the expense to the physician. The measure of effectiveness for the different sources are two in nature -- one for retention, and one for application. They would essentially be ratios of the information retained by the physician to the information available, or key points available, in the article.

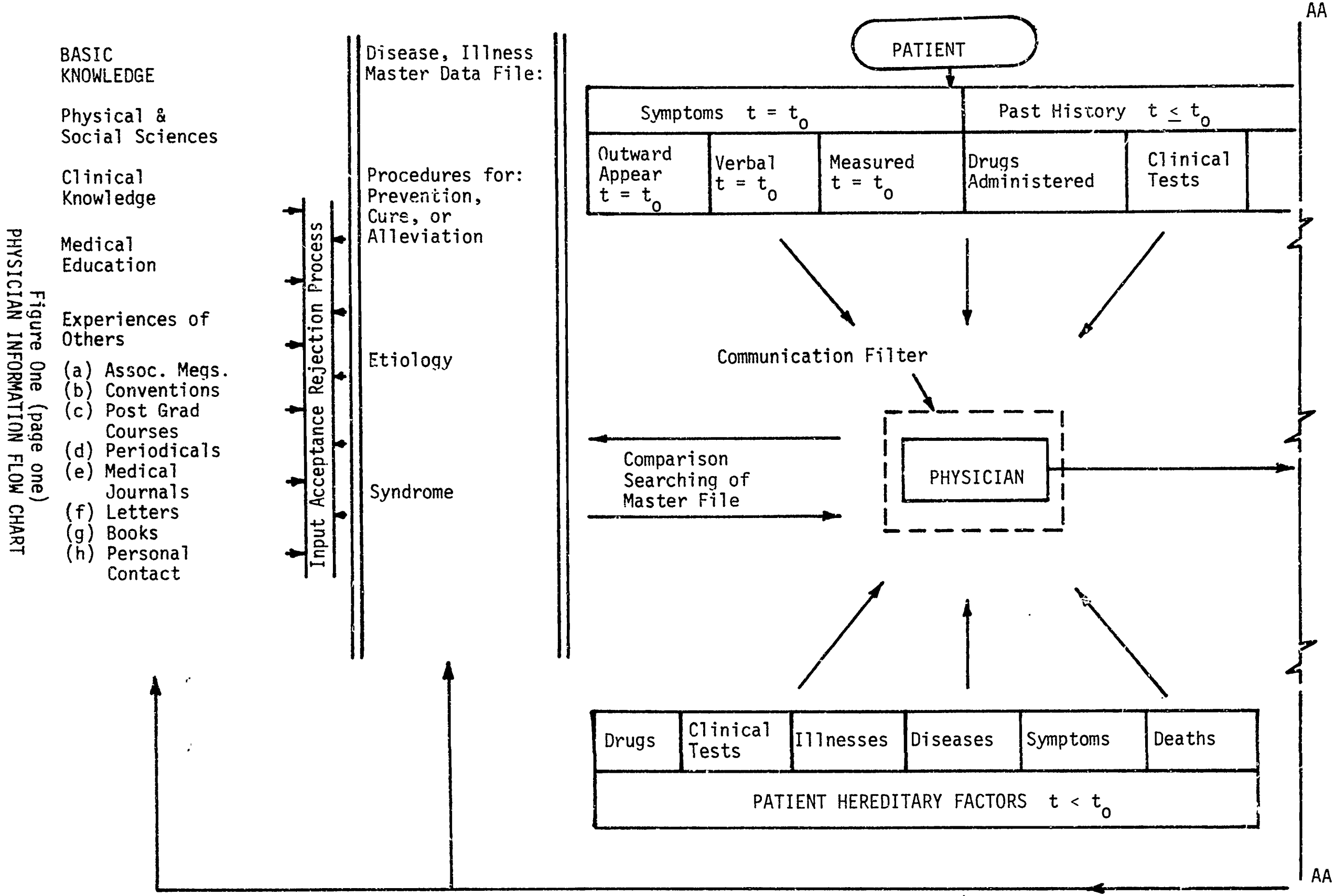
The measure of effectiveness of applications of the material would be somewhat more difficult. This could also be a fraction expressed in terms of the number of actual applications of information obtained from the

article over the distribution of possible application areas.

The application distribution function might be made up of several terms, all of which would be a function of the number of patients treated by the physician. Thus, the function could be defined as the number of patients treated times the probability of a possible application area existing according to the application area distribution of the physician's patients. It would be necessary to break down the articles into application areas that would be all-inclusive.

The original purpose of this small study has been achieved in that some behavioral information has been developed about the information-searching behavior of the physician. What lies ahead is the collection of additional validating data, but more important, the use of this behavioral data in the development of a theory and the development of information services for the physician designed to improve his information-searching behavior.

Figure One (page one)
PHYSICIAN INFORMATION FLOW CHART



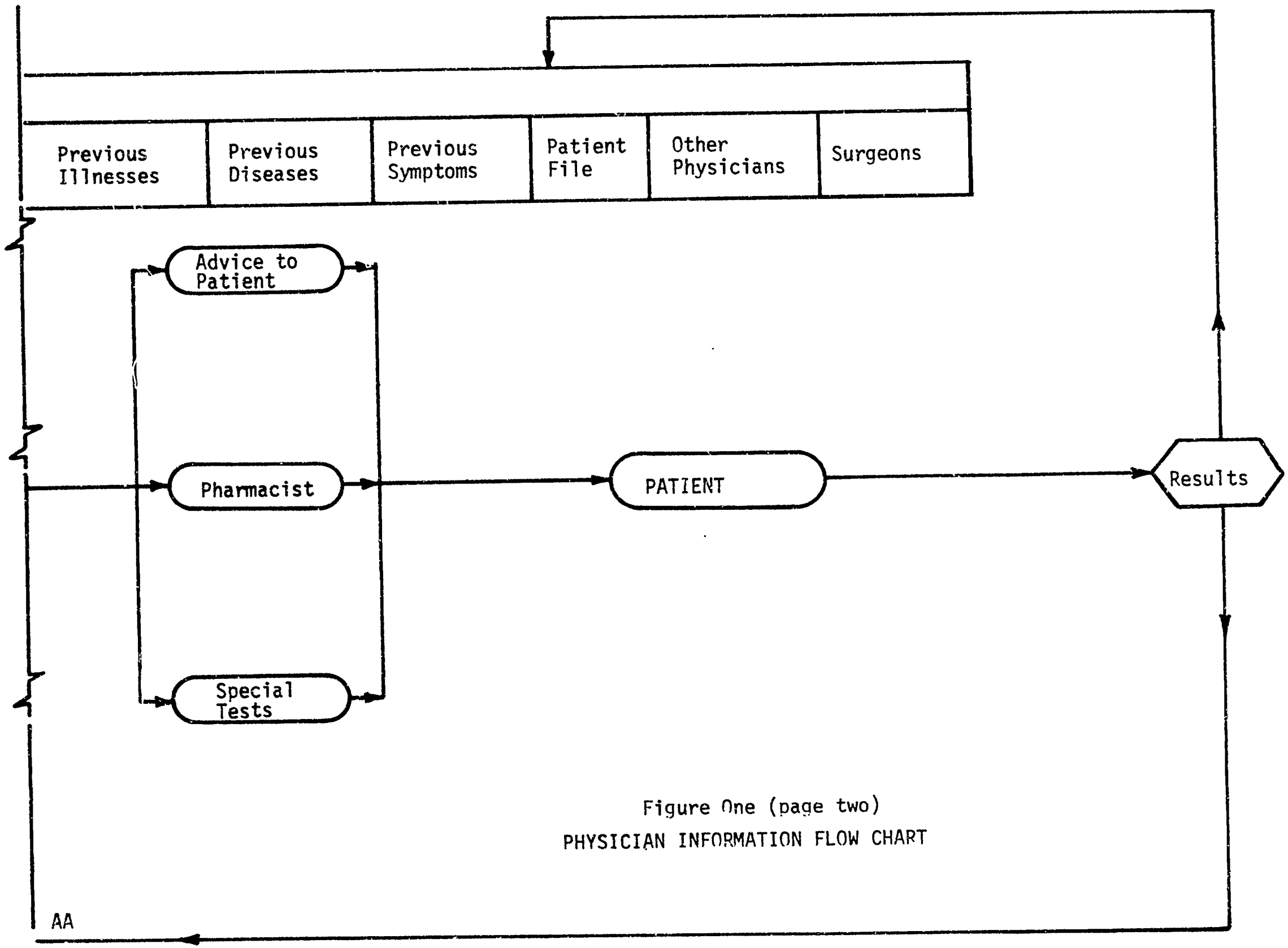


Figure One (page two)
PHYSICIAN INFORMATION FLOW CHART

RECORDS & FILES
- PERSONAL PATIENT FILE (MEDICAL HISTORY)
- SIMILAR CASE HISTORIES (PERSONAL FILE)
- SIMILAR CASE HISTORIES (OTHER PHYSICIANS' FILES)
- INSURANCE CO. HEALTH FILES
- MILITARY RECORDS
- SCHOOL HEALTH RECORDS
- EMPLOYERS' HEALTH RECORDS
- DENTAL RECORDS

LIBRARY SOURCES
- PERSONAL LIBRARY
- MEDICAL LIBRARY
- MEDICAL SOCIETY LIBRARY
- JOURNALS
- ABSTRACTS
- ABSTRACTING SERVICES
- DRUG CO. PAMPHLETS & CATALOGUES
- EQUIPMENT CO. CATALOGUES

PHARMACEUTICAL HOUSES & EQUIP.
- BY: PHONE
  - DIRECT MAIL
- THROUGH DETAIL MEN

SOCIETY MEETINGS
- INFORMATION ON LATEST DEVELOPMENTS & TREATMENT TECHNIQUES

CONVENTIONS & CONFERENCES
- LATEST TECHNIQUES
- CONSULTATION WITH OTHER PHYSICIANS & AUTHORS OF PAPERS PRESENTED

LECTURES & SPECIAL COURSES
- LATEST INFORMATION ON TECHNIQUES & TREATMENT

PATIENT
- MEDICAL HISTORY
- SYMPTOMS
- PAST TREATMENT
- PERSONAL CHATS
- RECORDS OF PRIOR MEDICATION

CONSULTATIONS
- WITH: OTHER PHYSICIANS
  - SPECIALISTS
  - HOSPITAL STAFF
  - PATIENT IN HOSPITAL
  - MEDICAL SECRETARY

PHYSICIAN

LABORATORY
- X-RAYS
- TEST RESULTS
- LAB REPORTS
- SLIDES
- INFORMATION ON TESTS TAKEN
- COMPARISON OF RESULTS

JOURNALS
- ARTICLES

CONFERENCES
- PAPERS

PATIENT
- SHOTS, IMMUNIZATIONS
- PRESCRIBED MEDICATIONS & FREQUENCY OF USE
- INFORMATION ABOUT FUTURE VISITS, SERIOUSNESS OF AILMENT, DIAGNOSIS, PRECAUTIONARY MEASURES,
- RECOMMENDED VISITS TO HOSPITAL, LAB, OR SPECIALIST

OTHER PHYSICIANS
- CONSULTATIONS
- CHATS ABOUT LATEST DEVELOPMENTS & LITERATURE
- INFORMATION ABOUT LATEST DRUGS & USES
- SIMILAR CASE HISTORIES & HIS TREATMENT & RESULTS

LABORATORY
- TESTS HE DESIRES MADE, SPECIFIC INFORMATION, SLIDES, X-RAYS REQUESTED, SAMPLES TO BE TAKEN

SOCIETY MEETINGS
- LECTURES
- CONSULTATION WITH OTHER PHYSICIANS

PHARMACIST
- DRUG PRESCRIPTIONS
- DOSAGE & USE

EMPLOYERS & INSURANCE CO.
- PHYSICAL EXAM RECORD

PHYSICIAN INFORMATION FLOW CHART (B)
Figure 2