The Changing Concept of Medical Records

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THE STETHOSCOPE is a device consisting of a tube—rubber or other material—which bifurcates at one end. Attached to the bifurcated ends are small ear-fitting devices made of metal, hard rubber, or plastic. Attached to the other end are variously designed cone or disk-shaped devices. The stethoscope may be worn draped around the neck and over the chest or carried in a pocket. The stethoscope was designed to detect sounds and may be used for this purpose. It is also a device which the physician can use to help him deliver quality care to his patients. There is no assurance, however, that its use by a physician or others will result in better care for the patient.

The medical record is a device consisting of a set of documents in which data and information are recorded, and which are filed in a storage area. The documents may be hard copy, film, magnetic tape, punchcards, or other. The recorded data may be graphic or alpha-numeric in form. The medical record was designed to store information concerning the patient and his care and may be used for this purpose. It is also a device which the physician can use to help him deliver quality care to his patients. There is no assurance, however, that its use by a physician or others will result in better care for the patient.

In recent years, knowledgeable and competent individuals and groups have shown increased interest in the medical record. The Report of the National Advisory Commission on Health Manpower (*1*) expressed the belief "that there is an urgent need for an improved capability to provide medical records for the patient." Much of the significant work being directed at improving this capability is characterized by a radical restructuring of the medical record system. Action is in the direction of the "patient data bank" described by Garwin (*2*). Implementation is being carried out by people like Weed (*3*), with his problem-oriented medical record, and Acheson (*4*), with his system of record linkage.

In this paper I explore some of the changes in man's ecosystem which have caused the medical record to become increasingly important and indicate briefly a few of the fundamental conceptual changes which have developed in response to this need.

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Man's Changing World

Despite significant efforts to update medical record systems through technological devices, such as power files, audiotapes for transcription, microfilms, electronic data processes, and CRT real-time read-outs, medical records are essentially anachronistic. Medical record systems are out of step with the times, not because the systems have not adapted to modern operational techniques but because they have failed to adapt to changing requirements for the medical record because of a changing world. Yoder and associates (*5*) stated this problem as follows: "Some of the cultural characteristics of the present day Western World must also be considered in the design of a medical record system."

The medical record tends to be an "event" or "incident" record rather than a "personal" or

"individual" record. Despite this shortcoming, the record could function more effectively a few decades ago than it can today. What are some of the recent changes in man's ecology which have brought this about?

Specialization by physicians. A significant change has taken place in the physician's vocational characteristics. Today's physician tends to be a specialist, and the general practitioner is a disappearing species. The practical consequence of this is that the specialist treats a patient during a medical event for a specific pathological condition. He is not familiar with the patient's total health picture. The fragmentation of the patient's medical profile tends to increase as the specialties do, and the specialties increase decade by decade. This is not intended as a criticism of the phenomenon; fragmentation through specialization is a necessary consequence of the knowledge explosion.

Inadequacies in medical records were partly compensated for in the past by the much higher probability that the attending physician was a "family doctor" or general practitioner who was more familiar with the patient than is today's physician. He probably knew the patient over a longer period of time, he probably had treated the patient for many medical events rather than only for specific categories of medical events, and he was probably more familiar (on a direct rather than an interview basis) with the patient's ecological system (home, work, family).

Today's specialist cannot fall back on nonmedical record information. His professional environment is such that his experiences will not generate such information. The contemporary physician must, therefore, rely to a much greater extent on the medical record. But the medical record which is essentially an event record rather than a personal medical record is inadequate precisely because of that reason. It is inadequate because it is a fragmented record.

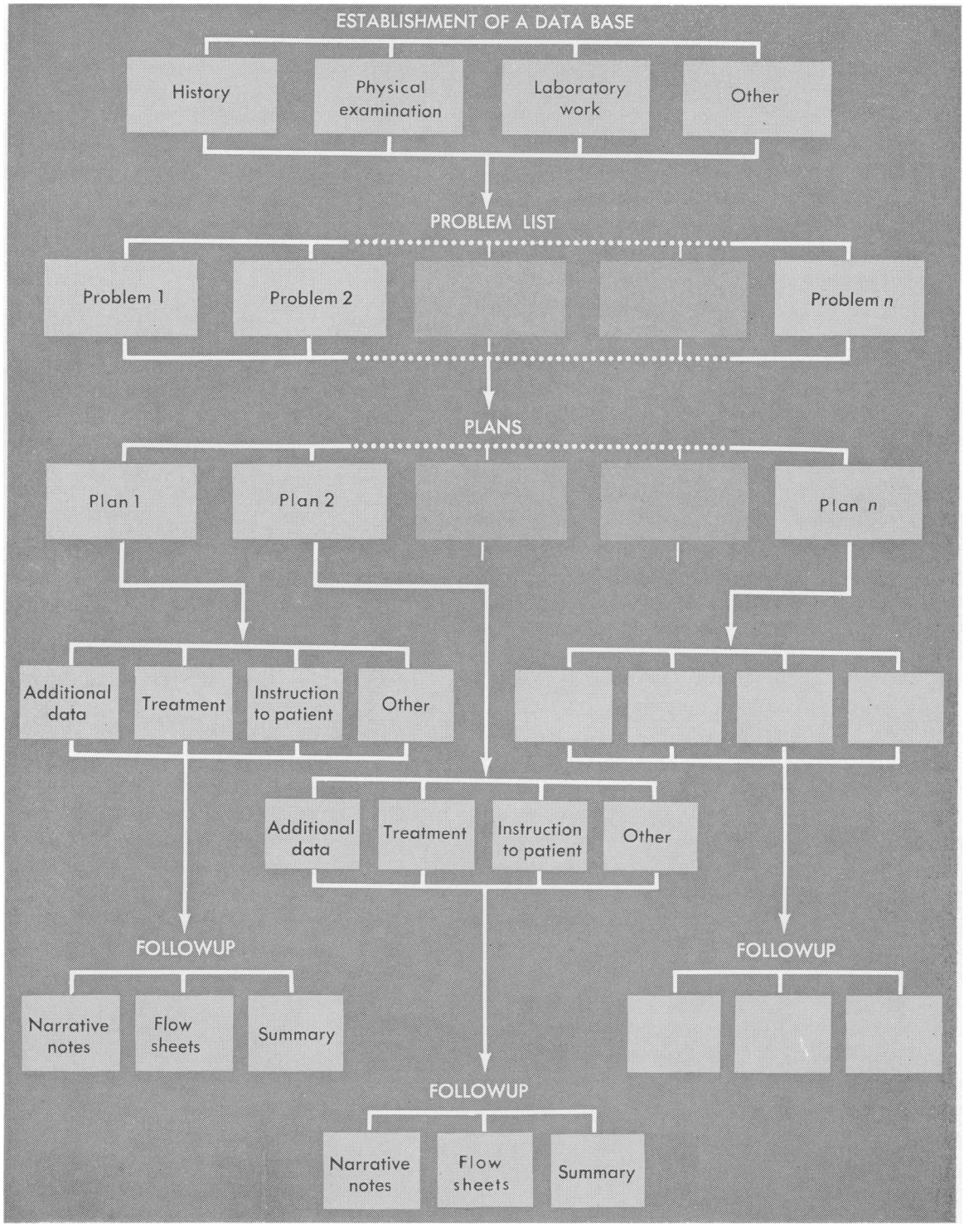
The trend toward specialization and its effects is not a simple phenomenon. Many covariables complicate the matter. Both the general practitioner and the specialist averaged more home visits in the past than today. Some present-day specialities, such as psychiatry, pediatrics, and internal medicine, retain a family-community focus; that is, awareness of an ecological niche is maintained in treating the patient. The generic term "patient" describes a set of subgroup patient classes which can be identified in terms of educational and socioeconomic factors. The interaction of each patient with the health care delivery system is a function of his subgroup membership. These and other factors indicate that the problems under discussion cannot be related to specialization in terms of a simple cause-effect relationship. With the trend toward specialization and technological advancement, the record for a medical event may be more thorough and sophisticated today. This is not the point in question, however, if it is still an event record rather than a patient record.

Barnett (*6*) phrased the problem somewhat differently, but succinctly: "Once when a single clinician or small group managed a patient's care, the individual record was of minor importance. Now, however, it is vital."

Mobility of patients. The patient's mobility and spatial location characteristics have changed significantly. In other words, the average person moves more frequently and farther per move than did his recent forebears. Yoder and associates (*5*) consider this to be a "chief" characteristic of today's culture which must be considered in designing a medical record system. The statistics are impressive: one-fifth of the general population moves annually, and the average family moves once every 7 years. Under such circumstances it is difficult to maintain continuity of care by a family physician, by a group of physicians (specialists), or by an institution. The medical record becomes increasingly important under these conditions because it can provide the structural framework for continuity and comprehensiveness of care. But if there is no patient or personal record and only a multiplicity of single-event records exist (at multiple locations), the only record to move with the patient probably will be that of the last (chronological sequence) significant event. Again we are faced with a situation in which the concepts underlying medical records have not changed over the decades, whereas the empirical factors involved have changed significantly.

Environmental changes. The environment itself has changed significantly and the rate of

Figure 1. The Weed problem-oriented medical record [1]



[1] The traditional medical record generally contains the same elements as the Weed problem-oriented medical record. It differs essentially in its lack of a formal logical structure and in its fragmentation in relation to the patient.

change has been continuously increasing. We have introduced radiation, lead, sulfur compounds, particulate matter, insecticides, wetting agents (detergents), and noise into the environment in increasing amounts. Beryllium, solvents, and other chemical agents experience spurts of use by consumer and industry, and toxic and pathological conditions can and do result from their use. Pharmacological agents and food additives are proliferating.

The relation between each person and his environment is described by a highly specific ecosystem. The etiology of many abnormal conditions are defined by that ecosystem. The data which describe a person's interaction with his ecosystem are recorded in many places—school health records, employment health records, military health records, dental office records, outpatient clinic records, physicians' office records, and emergency room records. The traditional medical event record of the hospital, toward which so much of the professional literature is directed, does not include much of that information. But when changing environment is related to changing patterns of disease, it is the medical record which may provide continuity to the etiological process. Medical record systems created in a time of relative environmental stability become even more inadequate if that environment is being rapidly modified.

Disease and pathological conditions. The spectrum of disease and pathological conditions has changed rapidly in recent decades. Smallpox, typhus, cholera, diphtheria, scarlet fever, and malaria were major causes of morbidity and mortality in previous decades. These diseases were characterized by a short lag between exposure to a causal factor and death or recovery. The disease was often abrupt in onset and brief in duration. But many of today's pathological conditions—heart and vascular disease, nontubercular respiratory disease, cancer, hypertension, diabetes, and so forth—are chronic conditions.

Both the etiology and the duration of disease are often long drawn-out processes. As stated by Acheson (*4*):

> Today time acts on a different scale. The predominant diseases creep upon us over years or decades, the onset may be insidious and the course prolonged. What matters are the habits of a lifetime . . . exposure to a toxic factor thirty years ago. . . . No single record made in one place or at one time can describe the evolution of such diseases. Whether it is required to study the etiology, evaluate the treatment or estimate the prognosis of these conditions, it will be necessary to accumulate information about people over long periods of time. Nevertheless, our system of public health intelligence (England's) remains, in principle, unchanged since 1837. It is organized in terms of events rather than in terms of the persons experiencing those events.

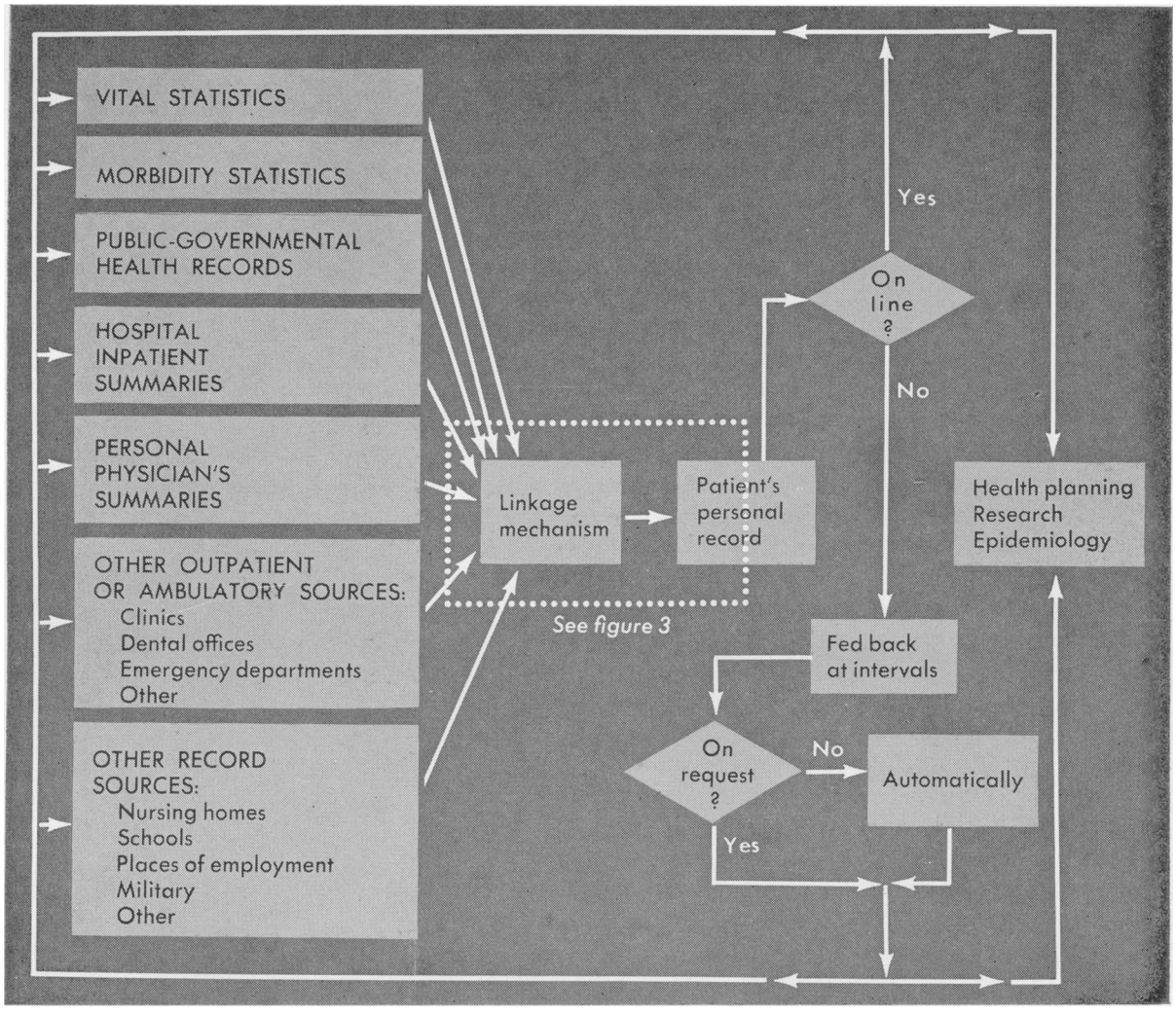
At question here is not the system, organization, or techniques of a medical record operation, but the concepts and principles underlying that operation. What is at fault is not that a medical record system may be technologically behind the times, but that most medical record systems have conceptual frameworks that are archaic because they are static.

A Changing Concept of Medical Records

In view of the ecosystem changes, it is apparent that no amount of technological sophistication will be a panacea for the ills of medical record systems. Technological innovation may be a necessary condition, but it will not be a sufficient condition for planning and designing good medical record systems. This view is reflected in a statement in the Report of the National Advisory Commission on Health Manpower (*1a*): "Nor do we have unbridled enthusiasm for new technology per se. Technology can be simply gadgeteering introduced for its own sake . . . what we have done in this preliminary screening is to try to learn enough about the health care system. . . ." A fundamental reorientation of what the medical record is and how it should be used will also be required.

Weed (*3*) has suggested implicitly that in solving the medical record problem a fundamental reorientation of what the medical record is and how it should be used will be required. He stated: ". . . we have with far-reaching consequences built a whole structure on certain principles which are in this book called into question." While recognizing that "manual methods of recording medical history and performing systems review present many problems," that is, while recognizing that technological innovation and good systems planning can alleviate many problems, Weed nevertheless

Figure 2. Acheson's scheme



recognizes the need for change in the underlying principles. Weed's reasons for reaching this conclusion are at first seemingly different from those of Acheson—Weed is concerned with the problem-oriented medical record (fig. 1).

One might be misled into thinking that Weed's and Acheson's proposals are incompatible because Weed advocates a "problem" record—and it might be argued that the problem record is really an event record, or a series of events—whereas Acheson proposes a "personal" record. The difference is more apparent than real. Both stress the importance of the medical record as a tool to be used in providing better medical care. Both believe the medical record can be modified to contribute to the solution of medical problems.

Weed's and Acheson's concepts, while stressing different aspects of the same subject, seem to be complementary in some respects. Given all the data generated by and about the individual person, which of it should be linked? Acheson (fig. 2) describes the mechanics and benefits of interlinkage but is not explicit about the criteria of choice—which data are linked and why? Are all data significant to the person's health record? If there are no guidelines for describing which data should be interlinked, the system may be overwhelmed. Yoder and associates (*5*) expressed this problem succinctly in

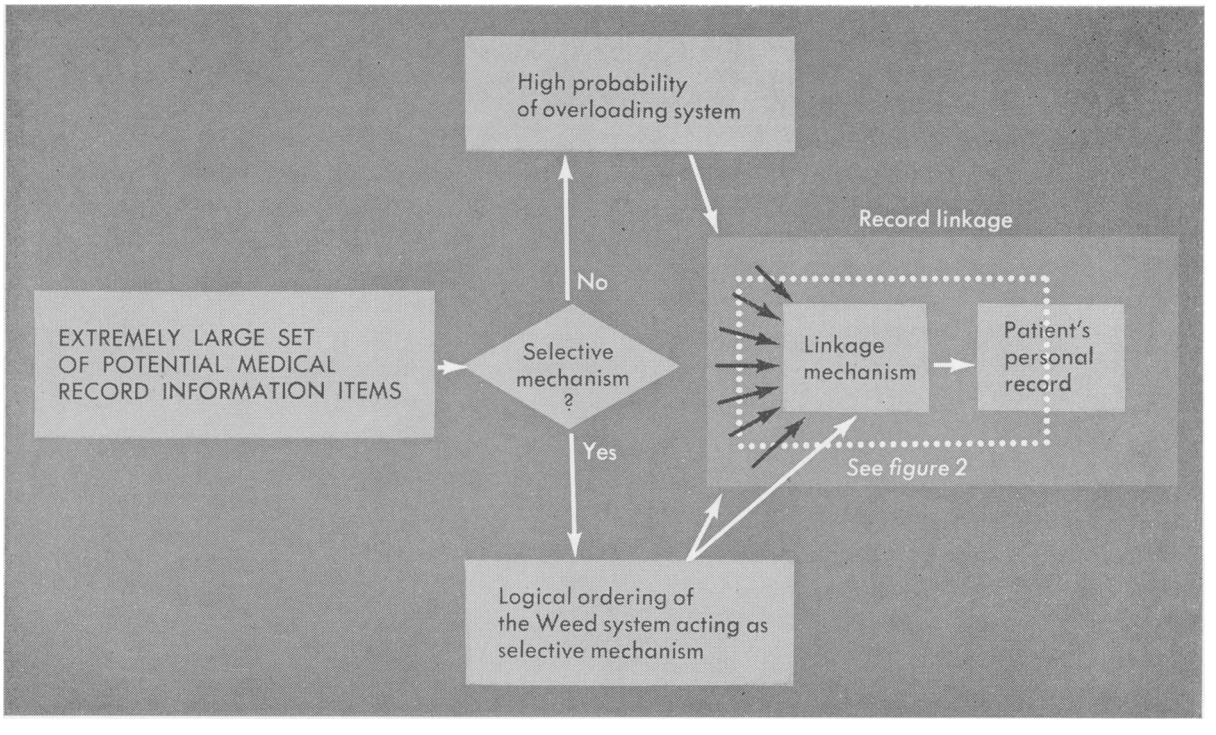
the statement that "it is thus seen that medical record information constitutes an extremely large set of potential items, only a small subset of which may be applicable to a given individual at a given time."

Weed's problem-oriented approach to the medical record might be used in establishing criteria for interlinkage. Acheson describes how to interlink, but describes what to interlink only in a generic sense. He defines medical record linkage "as the process of bringing together *selected data of biological interest. . . .*" Note that the italicized phrase is generic rather than specific. Which "selected data" and why? Weed's specific problem orientation could provide guidance as to the specific linkages to be established (fig. 3). Because of the quantity of data involved, some selection mechanism would be required until systems large enough to handle all potentially significant data are constructed. The problem-oriented structure may provide the selection mechanism which a linkage system would require.

Weed stresses the importance of a "practical system of communication for use in caring for all people. . . . Central in the present system of communication is the medical record. . . . In its current state it is an instrument full of serious faults." The importance which Weed places on the medical record as an instrument of communication is also true of Acheson. Acheson, concerned about the fragmentation of the personal health record, stated that "The point which requires greatest emphasis, however, is that *each* of these systems of records is separated from all the others by a *barrier to communication.*" Again, we are witness to a convergence of view by two of the more innovative students of the medical record.

But Weed and Acheson are not alone in stressing that the medical record should be a device for communicating selected data of health and medical interest in such a way as to affect continuity of care. Laird (*7*) stated that this emphasis on the medical record as a device for the communication of medically germane information reflects a current trend which is becoming more prominent: "The medical record long has been considered a repository of information that recorded the care that was administered to the patient along with the results of this care. Today, however, the medical record

Figure 3. Gertzog's thesis



is on its way toward expanded use for hour-to-hour communication...."

Beard (*8*) stated that the medical record "serves as a means of communication among members of the health team." And, Dr. J. D. Porterfield, director of the Joint Commission on Accreditation of Hospitals, stressed that the medical record should have "sufficient detail to assure a high quality of *continuity of care*" (*9*). He also stated that the medical record should ". . . assure comprehension of the case by another physician if for any reason . . . care must be transferred."

The significance of Weed's and Acheson's thinking is that both propose a fundamental modification of the medical record. The medical record should be a device for solving medical problems and making possible the continuity of care by functioning as an effective system of medical communication. The medical record should not be, as it too often is, a collection of data which are both physically and conceptually fragmented. If there is any significant difference between the thinking of Acheson and Weed it is that Acheson is more concerned with physical fragmentation of the record, whereas Weed is more concerned with the conceptual or logical fragmentation of the record.

Conclusion

The average management scientist, the average health administrator, the average hospital, and the average physician continue to think of medical record problems as problems of an operational department within an organizational structure—usually the hospital. However, concern about the delivery of health care is being voiced by a growing chorus. They are concerned that inadequate patient care is a function of lack of continuity in patient care, which is a function of insufficient medical information on the patient, and that this in turn is a function of the medical record "system."

Perhaps the complexity of the medical record problem, and the need for action, can best be summarized by the statement of Ingbar and Taylor (*10*) that "Medical records are being improved and prospects for increased automation in their compilation and retrieval are bright," and the observation that we are ". . . scattering the information about a particular patient that might be required to provide personal care of high quality in a continuous, coordinated, and comprehensive fashion." These statements are not inconsistent because Ingbar and Taylor note, accurately, that "our increased knowledge is not being designed to relate to the system as a whole."

The works of Weed and Acheson demonstrate methodologies for using the medical record as a real-time communications device to provide continuity of care within the health care delivery system.

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Tearsheet Requests

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ATOMS CAN NOW BE SEEN

A technique enabling a single atom to be seen within a molecular structure has been devised by Albert V. Crewe, professor in the University of Chicago's physics department and the Enrico Fermi Institute, with the help of two graduate students, Joseph Wall and John Langmore.

The feat was accomplished with an electron microscope that was designed and built by Crewe under a contract with the Atomic Energy Commission. A particular contribution of this microscope is the use of a tiny tungsten point as the source of electrons. This source operates in what is called the field emission mode and requires an ultra-high-vacuum system of operation.

The visibility of atoms and their arrangement in molecules should enhance the work in many fields, especially medicine, biochemistry, and genetics. The technique would be particularly valuable in analyzing chromosomes and cancer cells.

In Crewe's microscope and in other scanning electron microscopes, a beam of electrons is passed through an object or specimen, and the electron's form reveals that specimen on the oscilloscope. The microscope was constructed so that a picture can be obtained by detecting electrons as they emerge from the specimen, using the electron current to control the brightness of the oscilloscope.

Since the microscope's resolving power is 5 angstroms, it was decided to construct various molecules containing heavy atoms with spacing greater than 5 angstroms to insure that the expected geometric arrangement could be achieved and to measure the visibility factor by visual observation of the signals from the detectors on an oscilloscope.

The chemical problem of placing atoms of uranium and thorium and the problem of isolating them was solved by Michael Beer, professor of biophysics at the Johns Hopkins University, Baltimore, Md. He devised the chemical mechanism necessary for isolating single atoms for detection.

In one experiment, two uranium atoms were placed on each side of a long organic molecule. In the second experiment, thorium atoms were incorporated in a long string of organic molecules. In each case, the atoms were placed on a carbon film 20 angstroms thick, one-tenth of a millionth of an inch. The electrons in the microscope which pass through the specimen interact with the atom and with the carbon film in a predictable and known way. The electrons are sorted into two different groups according to the kind of interaction they have undergone.

One group consists of electrons which have been deflected without a change of energy (velocity) and the other group consists of electrons which have interacted with the atoms of the specimen in such a way as to lose some energy, but are hardly deflected at all. Each of these groups of electrons are separately measured and the combination of these two measurements can provide instantaneously a measure of the atomic number of the atoms in the specimen which can be displayed on the oscilloscope. Pairs of dots appear when the carbon film with the uranium atoms are scanned. In the thorium experiment, chains of dots are revealed.

Schematic drawing of the high resolution scanning electron microscope which reveals single atoms of thorium and uranium