Traditional Medical Records as a Source of Clinical Data in the Outpatient Setting

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ABSTRACT

We conducted an observational study at a university hospital clinic to determine the success with which physicians find patient information using traditional hospital records as the source of data. We recorded 168 consecutive patient cases presented to attending physicians by internal medicine residents, and analyzed the transcripts to identify questions indicating that the physicians could not find patient information in the medical record. In 81 percent of the cases, physicians could not find all the patient information that they desired during a patient's visit. We performed thematic analysis to generate a set of 15 prototypical questions asked by physicians regarding patient information. The multi-authored medical record system we studied did not provide effective access to patient information for physicians making clinical decisions in an outpatient setting. Improved methods for addressing prototypical questions arising in routine practice are needed.

INTRODUCTION

All physicians have experienced the frustration of fruitlessly seeking a piece of patient information in a bulky medical record. The traditional document that began as a personal record, maintained by the family physician to keep track of an individual's health over a lifetime, has evolved into a multi-authored creation that is intended to serve many purposes: "to recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance, and to justify interventions."[1] Physicians accordingly realize the central role that medical records play in supporting efficient and effective delivery of healthcare at reasonable cost, and we routinely see comments in the literature reflecting growing concerns that our traditional record system is no longer suited to serving the roles for which they were originally intended [2-6]. Despite these concerns, few empiric studies have characterized the shortcomings in ways that can usefully guide future improvements. Most physicians appear resigned to accepting the time-consuming process of foraging for data in the record, and later recording observations – tasks that may consume up to 38 percent of the physician's time associated with an outpatient visit [7]. With mounting pressures on physicians to improve the cost- and time-efficiency of patient-care encounters, tasks that often consume more than one third of the physician's time are logical targets for analysis and improvement.

The Institute of Medicine (IOM) completed an extended study of patient-record systems, motivated by precisely this sense that our bulky medical records of the past are hindering the quality and efficiency of the healthcare enterprise [8,9]. Although the IOM study found ample published evidence of dissatisfaction with current approaches to medical records, empiric data documenting and characterizing the extent to which paper-based patient record systems satisfy the practitioner's need for patient information could not be found. In this paper we seek to correct this deficit.

We used ethnography, an observational method employed in anthropology [10,11], to determine whether physicians were able to find patient information when relying on the current medical record system. Although difficulty finding desired information may occur either because data are missing from a chart, or because the data are present but cannot be located in reasonable time, our ethnographic observational approach did not distinguish between these two circumstances. Instead, we identified information needed to make decisions during a given patient visit. We also identified prototypical questions posed by physicians seeking information to make patient-care decisions, the answers to which were not found in the medical record. One goal of our study was to gain insight into the kinds of tools that could support answering these prototypical questions and thus better prepare physicians to make optimal patient-care decisions. To the extent that some data were simply missing from the chart, we recognize that tools to facilitate the capture and organization of necessary information are also required. Such tools, however, were not the focus of this study.

METHODS

Studies in medicine [12] and in other disciplines [13] have established that observational studies provide more complete details of work practice than do those based on subjects' recall as elicited in interviews or

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questionnaires. One of us (D. F.) developed the ethnographic design and carried out the data collection. Observations of actual outpatient visits formed the context for analyzing physician work in our study.

The study was approved by the institutional review board and conducted in the internal medicine clinic (IMC) of a university hospital. All clinic health-care professionals (27 internal medicine residents, 13 faculty physicians supervising residents, 3 nurses, and 4 clerical staff) agreed to participate. The residents were evenly divided among first, second, and third year post-doctoral physicians. In addition to the hospital record, the clinic maintains shadow records, containing copies of IMC progress notes, for all patients seen within the last 18 months. Both the patient's hospital record and clinic shadow record are requested by clinic staff in preparation for each patient visit. Computer terminals in the IMC allow health-care providers to retrieve laboratory-test results and radiology reports. Lab-test results are stored for 30 days in the computer. The residents discuss all patient cases with a faculty physician. During 16 afternoon clinic sessions, we recorded on audio tape three types of discussions: (1) residents' case presentations to attending physicians, (2) telephone and face-to-face conversations among clinic staff related to patient visits, and (3) physicians' verbal answers to brief interviews immediately following the patient visit regarding type of visit, availability of documents (both hospital record and shadow record), the list of active problems, problem acuity, missing patient data (laboratory-test results, medications, radiology reports, etc.), and diagnostic or therapeutic plans. We did not enter patient examining rooms, nor did we study interactions between patients and their providers.

As soon as one case was completed, the observer began recording the next available case. Our goal was to record as many verbal interactions as possible for a given patient visit. For example, if we recorded a resident's case presentation for a patient visit, we then recorded all follow-up interactions of the physician with other sources of patient information regarding that patient's care (e.g., a physician's telephone calls to ancillary departments, interactions with nurses concerning that patient, and calls to other physicians who had participated in the patient's care).

Medical transcriptionists translated the 35 hours of tape recordings into 502 pages of text. All patient names or other identifying information was deleted from the transcripts prior to analysis.

Data Analysis

We reviewed transcripts for evidence that physicians could not find patient information that they felt they needed. We analyzed only cases of return patients (visits by patients who had been seen previously in the institution). If a physician could not find a patient datum in the record, this was considered one data-deficit unit (DDU). As mentioned earlier, our observational study design did not include having the investigator thoroughly review patients' charts to distinguish between the case where a patient datum was actually in the chart, but the physician could not find it, from the case where the datum was not recorded in the chart. We felt this distinction was not relevant for the purpose of this study, since the effect on clinical practice was the same – data were not able to be found when physicians looked for them in order to make clinical decisions on a patient during a given patient visit.

We performed a systematic analysis of similarities and differences across data-deficit units, using thematic analysis. We grouped data-deficit units into categories via an iterative refinement process by looking for similarities in the questions physicians asked as they searched for missing patient information. For example, the following illustrates a data-deficit unit:

> Attending: Did anyone do an echo? Or do we have any evidence of that?
>
> Resident: Um, well it would be nice to know if he had an echocardiogram or not done while he was in the house. But, unfortunately...we don't know.

This text extract was subsequently grouped with other data-deficit units in a category typified by the question: "Has a specific diagnostic test ever been performed on this patient?" We formulated a *prototypical question* for each category of data-deficit units.

RESULTS

In 136 of the 168 (81%) case presentations, physicians did not have all the information they would have liked to have available in order to make patient care decisions during the current visit. We found 538 data-deficit units (mean number per case 3.7, range 1-20) in the 136 cases where some patient data was missing. Of the 538 data-deficit units, 370 (69 percent) data items were generated at our own study institution and could have been expected to appear in the hospital chart. The other 168 units involved data regarding patient-care encounters at other institutions or practices where the patient had been seen.

Difficulty Finding Patient Information in the Record

Clinic shadow records or hospital records were available to the physicians in 95 percent of patient visits. Despite the general availability of the record, however, physicians could not locate all the information they sought within the record, since 82 percent of the data deficit units occurred when the record was available. Eighteen percent of the DDUs arose in the 5 percent of visits where no records were available during the patient visit. Foraging through the record to extract relevant information often required more time than providers were willing to invest.

Types of Patient Data Affected

We identified the following categories of data-deficit units: laboratory-tests/procedures (36 percent), medications/treatments (23 percent), history (31 percent), and other (10 percent). The last category included deficit units such as insurance constraints that affect decision making during that visit.

Physicians' Strategies for Coping with Missing Patient Data

Physicians used three coping strategies to deal with missing patient data: (1) searching alternate sources of patient information, (2) making clinical decisions without the desired information, and (3) relying on the patient or family members to report the missing information.

To find patient information not readily available in the record, providers searched alternate sources of patient data (e.g., checking the clinical laboratory-test results on a computer terminal, rummaging through laboratory-test report bins, or calling another provider) in 42 percent of data-deficit units. In the remaining cases, the providers relied on patient or family reports in 26 percent, and made do without the information they were seeking in 32 percent. The preceding statistics sum to 100% because they reflect the final strategy used (in cases where more than one strategy was employed) by each provider to cope with the problem of missing information. We did not assess the reliability of patients' reports, which sometimes can be problematic, as illustrated in the following excerpt:

> Resident: She was started on tetracycline, but she was told that it was yeast. It doesn't make sense.

When physicians were not able to obtain all the desired information to make decisions, they sometimes deferred those decisions to a follow-up visit. In the interim, they requested the missing information again, reordered some diagnostic tests, and in some cases made decisions without having all the available information.

Prototypical Questions Concerning Patient Information

We analyzed the three most important categories of frequently missing patient information (results of tests and procedures, medications and treatments, and active problems or past medical history) to develop prototypical questions that physicians ask regarding patient information. These questions and their relative frequencies within the four DDU categories are listed in Table 1.

DISCUSSION

Physicians studied in our hospital-based practice setting could not find relevant patient information in 81 percent of outpatient visits. Part of the problem is caused by absent charts, but we also discovered that physicians had difficulty finding information even when the charts were available.

By observing practicing physicians and their use of available information to make decisions regarding care of specific patients, we were able to assess the adequacy of the medical record system as the primary source of patient data. Other observational studies have looked at physicians' needs for domain information [12] and at physicians' information requests for (broadly defined) information during clinical teaching rounds [14]. In the latter study, 52 percent of the questions asked during teaching rounds pertained to individual patients. Our study quantified the prevalence of failing to find patient information in the medical record, and characterized, in the form of prototypical questions, the type of information sought in the outpatient setting.

Review of the prototypical questions which arose during decision making in actual practice revealed a need for more than simple access to patient data; physicians sought data in its clinical context. For example, when asking about a patient's past experience with antihypertensive medications, the physician is not just interested in a list of medications (access to simple data), but rather is also interested in how the patient's blood pressure responded and whether the patient had any adverse effects or complications from the therapy (data in a clinical context). The traditional record is ill-suited to provide answers to prototypical questions, such as: "Has this patient ever been on medication X? If so, when, for what reason, and with what response?" Yet, these are precisely the types of questions posed routinely during clinical decision making, demonstrating a need for improved access to patient information. Methods for integrating and analyzing patient information are needed in order to answer many of the prototypical questions we recorded.

At the institution where we conducted our study, laboratory-test results were not kept on-line past 30 days, after which printed results were assumed to be available in the hospital chart. The relatively short time that lab test results were available on the computer contributed

Table 1: Distribution of Prototypical Questions

Categories of questions (percent of total questions)	Questions	Percent of data-deficit units within category
Results of tests and procedures (36%)	What were the results of a specific diagnostic test or procedure?	36%
	What tests or procedures were done by other providers? Why were they done?	20%
	Was there adequate follow-up?	14%
	What was the trend of the laboratory-test results?	11%
	Has a specific diagnostic test ever been performed on this patient?	10%
	What is the status of routine health-care maintenance for this patient?	9%
Medications and treatments (23%)	What medications have been prescribed for this patient? By whom? For what reasons?	54%
	What responses to medications have been observed in the past?	32%
	What medications and dosages has the patient been taking?	15%
Active problems and past medical history (31%)	What was done by another provider?	49%
	What past problems has this patient had?	19%
	What active problems does this patient have?	9%
	What evidence led to the diagnosis of a specific disease?	9%
	What symptoms and signs of a specific problem have been documented in the past?	8%
	What medication allergies does this patient have?	6%
Other (10%)		

to the relatively high number of laboratory-test results that were unavailable to clinicians during the outpatient visits. Furthermore, many departmental test results were not available through the laboratory terminals, such as results from electrocardiograms, treadmill tests, echocardiograms, pulmonary function tests, arterial blood gases, nuclear medicine tests, and others.

Although we studied only a single clinic and a single institution's medical record system, it is reasonable to assume that the data provided here would be typical of those for other hospital-based clinics, particularly in academic settings where care is often distributed over a large number of providers who share a single patient chart. Compared to patients in the university medical center clinic where we conducted our study, patients seen by small group practices are more likely to see the same physician consistently. In another study, however, physicians found that their own entries in the medical record were as difficult to read as was information entered by others[2]. Furthermore, failure to find information from consultants' reports would be a prevalent problem in either setting. Also, demographics of group practice are changing rapidly, with more providers practicing in larger groups where multiprovider care (and charts) are the rule, as they were in our study group.

Our results raise questions that require further investigations. What are the cost and quality implications of making decisions without the results of tests that were ordered and performed, but whose results cannot be found? How do we justify the cost or risk of a diagnostic test, if clinical decisions are then made without knowledge of the results? How many tests are ordered because the results of a previous test cannot be found? What are the risks of changing a patient's medication without an accurate medication history? Since we did not follow the course of individual patients, we could not determine the actual impact of decisions having been made without specific information. Only a longitudinal study could provide formal data on how missing data or limited access to information affect patient-care outcomes. However, our data justify concern that the current medical record system is negatively affecting both the costs and quality of health care. Organizations and agencies interested in these issues should consider the effect of the medical record on the quality and cost of clinical decision making.

Information can be unavailable because the chart is missing, or because either the data were not recorded in the chart or the physician could not find the data in the chart. In the latter case, there are several reasons why a physician may not find the information, including a lack of time, a lack of ability, or a lack of motivation. Although we cannot guarantee that a more meticulous search for a longer period of time would not have allowed the physicians to uncover more information, the purpose of the study was to determine how successful physicians are when attempting to find the patient information for which they expressed a need when discussing a patient's case with an attending physician in routine clinical practice. Practical considerations certainly limit the physician's ability to gather data. The residents were evenly divided among first, second, and third year post-doctoral physicians and thus had varying levels of expertise and experience coping with data limitations. One might consider that the extra time residents have to see a patient (60 or 30 minutes, depending on whether the patient is new to the clinic or returning to a familiar provider) might compensate for less developed coping strategies for finding information. Alternatively, it is possible that residents are better at finding information than attendings (since they use the chart more extensively due to their intensive clinical work), but such distinctions were not the point of our study and we have no data to support their discussion. Although we did not review the medical records to distinguish between cases where physicians could not find the information (for whatever reason) when it was in the chart, from those cases when the data were not recorded in the chart, the impact of not having the information when decisions were made was the same. Any plans to improve upon this situation must consider both these possibilities, and tools are needed to alleviate both causes for missing information.

Even though our study identifies a problem without documenting a solution, the prototypical questions we derived do suggest that information-management methods which help practitioners find relevant information contained in the medical record may address some of the weaknesses of current record-keeping systems. The Institute of Medicine's Study on Improving the Patient Record concluded that the computer-based patient record is an essential technology for health care [8]. The report stressed, however, that their notion of a computer-based record system was more than simply an electronic version of the paper-based record. It should provide tools to manipulate, format, and display information in flexible ways to support physicians making clinical decisions on their patients. Certainly, automatic capture of data which already exist in electronic form (e.g., pharmacy data, discharge summaries) would help computer-based patient records to be more complete in terms of these types of data. Furthermore, with careful attention to the user interface, it may be possible to have physicians enter information in the computer-based record that is not currently recorded in the paper chart, such as reasons for prescribing a certain medication. For the cases where the primary data originate from another institution, regional or even nationally linked records will be required.

The results of our study show that physicians have great difficulty finding relevant patient information using traditional, multi-authored records. Methods to retrieve patient data and tools to put data in their clinical context will be required to answer effectively the prototypical questions we identified. Improving the patient record system will ultimately have a profound effect on health care, as the record is central to clinical decision making.

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