Clinician Information Activities in Diverse Ambulatory Care Practices

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Ambulatory care is assuming an increasing role in health-care delivery. Yet, most health-care information systems were developed for the acute-care setting. To address the needs of ambulatory care, developers need a comprehensive understanding of the information-related activities of clinicians in heterogeneous outpatient practices. We studied the information activities of clinicians in seven diverse (primary-care, specialty-care, faculty, and independent private practices) ambulatory care sites. The results of our study allow us to characterize clinicians' information-related activities, their perceived information needs, and their satisfaction with computer resources. Developers of health-care information systems can use the results to design applications for clinicians in ambulatory care.

INTRODUCTION

Responding to the market pressures of managed care, health systems continue to deliver more care in the ambulatory care setting. Developers of health-care information systems must gain a better understanding of clinicians' activities in the outpatient setting in order to effectively address their information needs. Ambulatory-care practices are heterogeneous in many respects. Primary care, specialty care, faculty practice, and independent private practice potentially have different patient populations, different physician specialties, and different practice styles. We needed a comprehensive approach to studying the information-related activities across diverse practice sites.

Based on our prior experience and the experience of others using observational methods [1,2,3,4,5], we used a multi-method assessment approach to evaluate the information activities of clinicians in diverse outpatient clinical sites. In this paper, we present our combined results from the sites.

AMBULATORY CARE SITES

We studied seven different clinical sites: a large (36-member) general internal medicine faculty practice, three small (5-10 person) independent internal medicine group practices, a cardiology faculty clinic, a neurology faculty clinic, and an urban care clinic.

INFORMATION NEEDS ASSESSMENT METHODOLOGY

We described our information needs assessment methodology in a previous paper [1]. Briefly, our assessment methodology consisted of the following components: 1) Observational studies, 2) Semi-structured interviews, and 3) Surveys.

Observational Studies

At our initial clinical site, a large faculty internal medicine practice, members of a clinical evaluation team conducted direct observations of clinicians during normal clinic operation. During the observation period, the researcher unobtrusively "shadowed" the study subject and manually recorded notes on every activity observed. Activities were coded by identifying information-related events, the individuals and communication medium involved, the reason for the event, and the context of the event.

Based on data elements identified in the initial coding framework, we developed a time allocation tool to streamline data collection of observations at the other clinical sites. The revised method of data collection also allowed us to quantify the time spent on each activity. Members of our clinical evaluation team observed clinicians in two-hour blocks, recording events at one-minute intervals. When sufficiently large numbers of representative activities are observed, the percentages of activities observed can be used as a surrogate for the actual percentage of time the activities occur [6]. Neither patient- nor physician-identifying information were recorded. Institutional Review Board approval was obtained for observations to occur in the exam room with the informed consent of the patient.

We observed 38 clinicians (34 attending physicians, 3 nurse practitioners and 1 physician assistant) during 159 patient encounters at seven sites.

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Semi-Structured Interview

We conducted interviews to: 1) validate information obtained from other data collection techniques; 2) explore new information needs; and 3) identify functional requirements and measurement opportunities.

We used a semi-structured interview tool which required open-ended responses. Each interview was conducted one-on-one for an hour in a private office. All interviews were tape recorded, transcribed, and coded for functional requirements.

We performed 33 individual interviews of attending physicians across all sites.

Surveys

We developed a self-administered survey to assess users' perceptions about computer resources in three areas: 1) current use and experience with computers, 2) satisfaction with available computing resources in the clinic, and 3) perceived value of various functions of a future information system. The survey consists of 33 closed-end questions using a Likert-type scale. Internal consistency reliability was assessed by split-half techniques. We administered the same survey at all the sites.

We distributed 399 surveys to the sites and 212 (53%) were returned. We administered the survey to the entire health care team. Surveys were coded by job category.

RESULTS

In the following sections, we report on the results of the information-related activities assessment from all seven sites.

Results of Time Allocation Study. During 76 hours of observation, we coded 4541 minutes of activities. The clinicians' activities were divided among several categories (Figure 1). Talking activities included direct verbal and phone communication with patients, clinic staff or professional colleagues. Reading activities included review of the patient data, administrative memos, or clinical reference materials, and listening to voice mail messages. Writing included charting clinical data, performing written communication with patients or colleagues, performing dictation and completion of administrative forms (e.g., charge vouchers). Additional categories included examining patients, performing procedures, and other activities (e.g., activities that were not directly observed at the patient or clinician's request).

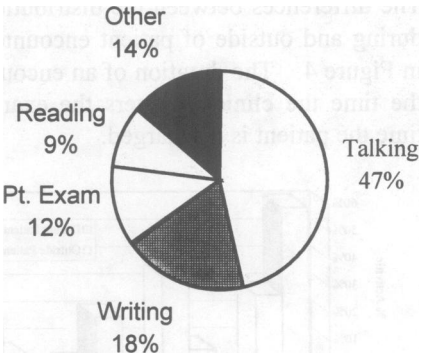

Figure 1: Average Distribution of Observed Clinician Activities (N=4541 minutes)

The mean clinician/patient encounter time across all sites was 17.32 minutes, but the inter-site variation was significant (p=0.02) (Figure 2).

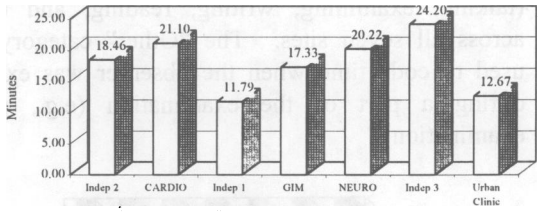

Figure 2: Mean Clinician/Patient Encounter Times

Of the 4541 minutes of coded activities, 2758 minutes occurred during the actual clinician/patient encounter. An encounter began with the clinician entering an exam room, and ended with the transition of the patient to the checkout desk. The average distribution of information activities *during* an encounter is depicted in Figure 3.

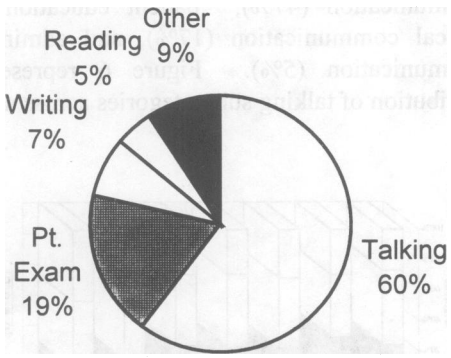

Figure 3: Average Distribution of Clinician Activities During an Encounter (N=2758 min)

The differences between the distribution of activities during and outside of patient encounters is reflected in Figure 4. The duration of an encounter lasts from the time the clinician enters the exam room to the time the patient is discharged.

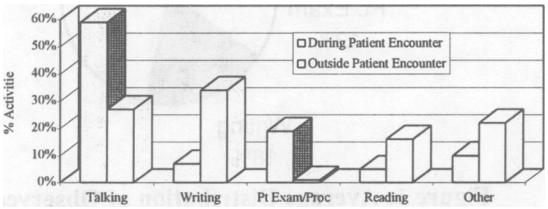

Figure 4: Distribution of Clinician Activities During and Outside of Patient Encounters

Figure 5 shows the distribution of global activities (talking, examining, writing, reading, and other) across all seven sites. The "Other" category was used to code time when the observer was excused during a part of the examination (e.g., pelvic examination).

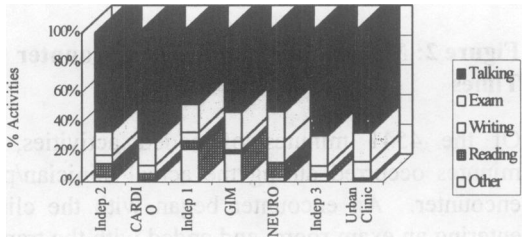

Figure 5: Clinician Activities Across All Sites

We further characterized the category of talking (n=2132 min), the predominant activity, into the following sub-categories: patient/clinician communication (47%), patient education (31%), clinical communication (17%), and administrative communication (5%). Figure 6 represents the distribution of talking sub-categories across all sites.

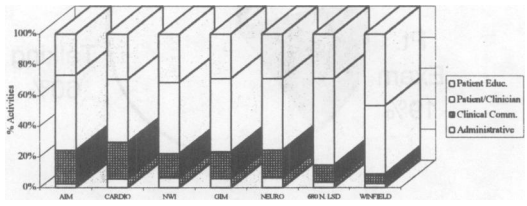

Figure 6: Sub-categories of Talking Activities Across All Sites

We observed the following sub-categories of writing (n=815 min): writing in the patient chart (45%), patient follow up (20%), administrative charting (13%), writing prescriptions and referrals (12%), dictation (10%), and computer data entry (3%). Figure 7 represents the distribution of writing sub-categories across all sites.

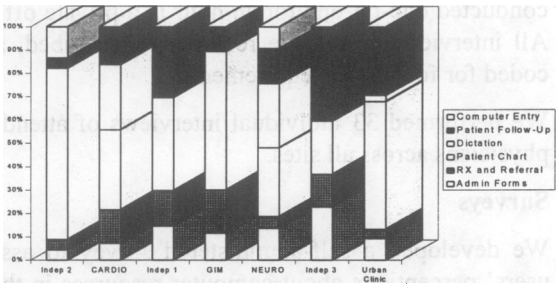

Figure 7: Sub-categories of Writing Activities Across All Sites

Breakdown of the reading category (n=398 min) yielded the following sub-categories: patient chart (42%), letters and memos (15%), clinical data via the computer (11%), voice mail (8%), reference (8%), administrative data via the computer (6%), appointment schedule (5%), and other (5%). Figure 8 represents the distribution of reading sub-categories across all sites.

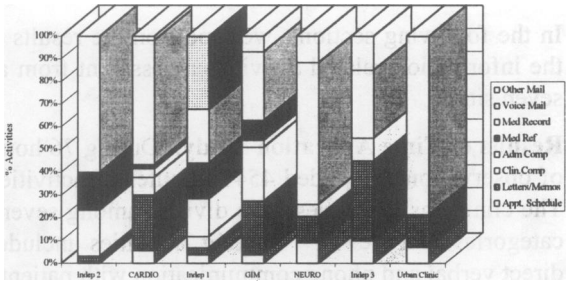

Figure 8: Sub-categories of Reading Activities Across All Sites

Results of Interviews. We interviewed 33 attending clinicians and abstracted the interview data for functional needs. The most common needs are listed in Table 1. Clinicians were allowed to identify more than one functional requirement.

Table 1: Top Functional Requirements Identified During Interviews (N=33)

Functional Requirement	Freq
Access to diagnostic-test results	21/33
Display of problem list	10/33
Display of active medications	10/33
Mechanism to communicate to team members	10/33
Assistance with patient education	8/33

Results of Survey. Self-rated computer skill levels averaged 2.97/5.0 (5=expert), suggesting an intermediate level of computer experience.

The clinicians' baseline satisfaction with current computer resources (depicted in the star diagram in Figure 9) was relatively poor (sd ranged from 1.0 to 1.3). The computer resources consisted of terminals in shared areas to access lab-test results and patient appointment schedules. Lack of sufficient numbers of computers, lack of training, lack of technical support, and poor ease-of-use all contributed to the poor rating.

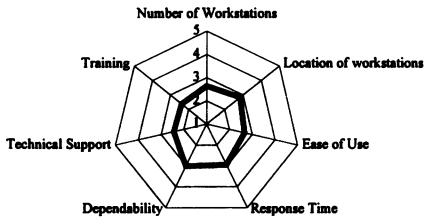

Figure 9: Clinicians' Baseline Satisfaction with Current Computer Resources (N=73)

Clinicians used a 5-point scale to rate the desirability of certain functions in a future computer system. Clinicians rated the ability to access diagnostic test results, display a medication list, obtain abnormal test result alerts, access patient schedules and retrieve dictated notes the highest. A summary of these results is presented in Table 2.

Table 2: Clinicians' Desired Functionality for Future Computer Systems (5.0=extremely desirable)

Future System Functionality	Mean (sd)
Access diagnostic-test results	4.89 (.34)
Display medication list	4.63 (.82)
Alert on abnormal test result	4.60 (.95)
Access patient appointment schedule	4.53 (.75)
Retrieve dictated notes	4.52 (.67)
Display/modify current problem list	4.36 (.90)
Alert on drug interaction	4.34 (.80)
Access demographic information	4.33 (.92)
Generate patient care follow-up reminders	4.28 (.91)
Generate patient care instructions	4.28 (.84)

SUMMARY

Prior to this study, we did not have an analytical tool to characterize information-related activities in different ambulatory care sites. Our multi-method approach provides us with techniques to determine time spent on various information-related activities, clinicians' perceived information needs, and overall satisfaction with computer resources available to them.

By analyzing clinicians' information-related activities, we gained insight into what activities consume clinicians' time. We used length of time spent in an activity as an indicator for where information technology might provide tools to increase providers' efficiency or effectiveness. One of the interesting findings from this study, for example, is the fact that regardless of the clinical practice type, physicians spend substantial time performing patient education and instruction. Yet, tools to support them in this activity are meager or non-existent. In response to this finding, we are developing computer-based tools to provide custom-tailored patient educational materials.

It is also clear that clinicians spend a substantial amount of their time retrieving data from and putting data into the paper-based chart. Despite the amount of time clinicians spend working with the chart, previous studies have shown that physicians have difficulty finding information in the paper-based

chart [2,7,8,9]. Helping clinicians manage data more effectively and efficiently is a goal of well designed information technology applications.

While the global categories of information activities are similar between the practice types, there is significant variation in the sub-categories of activities. The differences in specific activities, however, tend to be more a reflection of their practice style (e.g., use of dictation, use of voice mail for patient messages, writing consultation letters) than qualitative differences in their information needs.

Based on the findings from our study of seven diverse ambulatory care sites, we developed a set of high-level functional requirements that are summarized below:

- Need for integrated access to patient information
- Need for summary information (e.g., problem lists, medications, demographics)
- Need for mechanism to communicate in a timely and efficient manner among health care team members.
- Need for effective means of providing patient instructions and education
- Need for convenient access to computer workstations with good training and technical support

We are developing and acquiring applications that support these information needs. After we deploy the applications, we will measure the impact of the information tools by using the metrics described in this paper, as well as other metrics under development to assess the clinical impact.

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