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A comparative observational study of inpatient clinical note-entry and reading/retrieval styles adopted by physicians

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ABSTRACT

Objective: The objective of this study is to understand physicians' usage of inpatient notes by (i) ascertaining different clinical note-entry and reading/retrieval styles in two different and widely used Electronic Health Record (EHR) systems, (ii) extrapolating potential factors leading to adoption of various note-entry and reading/retrieval styles and (iii) determining the amount of time to task associated with documenting different types of clinical notes.
Methods: In order to answer "what" and "why" questions on physicians' adoption of certain-note-entry and reading/retrieval styles, an ethnographic study entailing Internal Medicine residents, with a mixed data analysis approach was performed. Participants were observed interacting with two different EHR systems in inpatient settings. Data was collected around the use and creation of History and Physical (H&P) notes, progress notes and discharge summaries.
Results: The highest variability in template styles was observed with progress notes and the least variability was within discharge summaries, while note-writing styles were most consistent for H&P notes. The first sections to be read in a H&P and progress note were the *Chief Complaint* and *Assessment & Plan* sections, respectively. The greatest note retrieval variability, with respect to the order of how note sections were reviewed, was observed with H&P and progress notes. Physician preference for adopting a certain reading/retrieval order appeared to be a function of what best fits their workflow while fulfilling the stimulus demands. The time spent entering H&P, discharge summaries and progress notes were similar in both EHRs.
Conclusion: This research study unveils existing variability in clinical documentation processes and provides us with important information that could help in designing a next generation EHR Graphical User Interface (GUI) that is more congruent with physicians' mental models, task performance needs, and workflow requirements.

1. Introduction

Clinical notes are an essential communication tool for summarization, synthesis and decision making for patient care. In addition to direct patient care, notes are valuable for other functions such as medical education, research, billing, quality-assessment and medico-legal inquiries/compensations [1–3]. The importance of having high quality clinical notes was recognized in the 1960s by Dr. Lawrence Weed as part of the Problem-Orientated Medical Record (POMR) framework, which was key in the establishment of the *SOAP* (*Subjective, Objective* and *Assessment & Plan (A/P)*) note format and documentation of patient problems by organ systems [4]. Currently used common clinical note types include History and Physical (H&P) notes, progress notes, consult notes, operative notes and discharge summaries.

Clinical notes documentation is considered to be a core aspect of a patient's encounter and fundamental for health care delivery. While EHRs have enhanced direct access to patient data [5], clinicians continue to experience significant barriers in EHR usage, such as inefficiencies with structured data entry and retrieval, as we all as

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difficulty using and creating computerized patient documentation [1,6]. Free text entry in clinical documents is typically considered ideal for communication between providers and for presenting complex sets of facts, but can be laborious and time consuming to create in an electronic interface. On the other hand, structured data entry, which is typically more difficult to read and synthesize, enables the reuse of data for downstream applications such as quality improvement and research [2,7,8]. While clinicians appreciate the flexibility and efficiency of narrative free-text entry with the use of "copy and paste" or "copy forward" functions, they are challenged by long and verbose clinical notes that can be laborious to review or synthesize and could potentially contain erroneous information not appreciated during the documentation process.

There is growing interest in understanding the different aspects of clinical documentation processes such as their integration with workflow [8,9], structured versus free-text entry [2] and usability studies of EHR systems pertaining to creation and use of clinical documents [10]. In recognition of the importance of clinical documentation, recording electronic notes in patient charts is included as one of the menu objectives in Stage-2 of the Meaningful Use Program [11]. Also, the lack of standardization in EHR clinical documentation and display styles provides interface designers with an area of opportunity to re-design EHR systems [12–15].

Several researchers have previously examined tools and measurements to understand clinical documentation processes and potential areas of opportunity to improve clinical note quality. This includes development of validated instruments for assessing inpatient clinical documentation quality [16,17], techniques for generating clinical notes with clinically relevant information that is reusable and readable [1,16,18,19], and use of eye tracking to discover how the visual attention of physicians is distributed while reading electronic notes [20].

In order to improve our understanding of empiric behaviors of physicians around clinical documentation use and generation, the goal of this study was to discover different styles of physician inpatient note-entry as well as reading/retrieval styles in two different EHR systems in two observed settings and to extrapolate potential factors associated with different behaviors/styles of system use. In addition, this study aims to ascertain and compare the various time to complete key tasks of clinical note documentation.

2. Methods

2.1. General description and setting

A participant observation ethnographic field study approach, supplemented with post-observation online surveys, was employed to collect data about the routine, day-to-day activities of participants/users in a naturalistic setting [21]. While this approach does not offer a controlled experimental setting, the method was chosen since it provides a rich, realistic, and holistic view of the users' routine by immersing in their environment. This immersion helps in gathering additional detailed information, which users can sometimes inadvertently fail to communicate overtly with other more interactive or controlled (e.g., laboratory-based) methodological approaches. Various similar observational study methodologies have been widely used in scientific research, including healthcare [22–26].

Approval for this study was obtained from the University of Minnesota Institutional Review Board and from the Veterans Affairs Research and Development Committee. Internal Medicine resident physicians were observed interacting with two different EHR systems, Epic and Veterans Affairs Computerized Patient Record System (CPRS), in naturalistic inpatient environments, at the University of Minnesota Medical Center (UMMC) and Minneapolis Veterans Affairs Health Care System (VAHCS) respectively, at various times and days including on-call and off-call days. Since residents spend most of their time interacting with EHRs in workrooms, particularly performing clinical note documentation, the majority of observations were made there.

Table 1
Summary characteristics of research participants.

Characteristics	UMMC* H1	VAHCS* H2
Female (%)	4 (66.6%)	3 (50%)
Male (%)	2 (33.3%)	3 (50%)
Mean age	31 (±3.6)	29.5 (±1.6)
Mean years in training	2.8 (±0.4)	3 (±0.6)

* UMMC-Hospital (H1); VAHCS-Hospital (H2).

2.2. Study sample

Residents (2nd through 4th years), enrolled in Internal Medicine Categorical or Internal Medicine Combined programs, were recruited for the study. Interns, medical students, advanced practice providers and other clinical staff were excluded. Participants were recruited after obtaining their verbal assent. Detailed characteristics of research participants are summarized in Table 1.

2.3. Data collection

Qualitative and quantitative clinical documentation process data was collected focusing on clinical note data entry and reading/retrieval tasks. Direct observation was used to collect data regarding user behaviors, their workflow and EHR usage centering on different uses and tasks associated with clinical documentation.

Residents follow different call and day schedules at UMMC and VAHCS (Fig. 1). To account for this variability, each participant was observed over different call routines and times of the day. The majority of field notes were taken while residents were doing clinical documentation in their workrooms.

The total observation time was greater than 110 hours. Details about observation times are provided in Table 2.

Field notes were taken on an electronic tablet through a time-stamped application called "Timestamped Field Notes Application version 3.0" [27]. The data was later transferred to an encrypted device and stored on a secure PHI-compliant server. We also collected hard copies of note templates (H&P, progress note and discharge summaries), consumed by each participant, for post-hoc data analysis purposes. At the end of observations, an electronic semi-structured survey regarding user perceptions about EHR clinical documentation practices was administered. The survey contained multiple choice and open-ended questions on note styles, note documentation, workload and electronic interface usage. Each study participant filled out the survey once with a 100% response rate. The purpose of conducting the surveys was to collect useful benchmark data on physicians' workflow, their preferences and perceptions about clinical documentation processes. Participants were provided with a nominal gift certificate ($50) for their participation.

2.4. Data analysis

Ethnographic Content Analysis (ECA) was performed with integrated qualitative-quantitative research designs [28] using "NVivo version 10.1.3" [29]. Observations performed on multiple days and times were examined iteratively in order to generate broader generalizations.

Observations and data parsing were primarily done by RR, a physician and health informatician and by GH, a health informati-