Studying the Use of Informal Artifacts that Support ED Residents' Work to Inform EMR Design

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Abstract
Previous studies have described the phenomenon of "paper persistence" as an unintended consequence of implementing health IT systems, such as the EMR system. However, it has not been fully explored how paper use can actually serve as evidence of the importance of informal documentation practices in clinical work. We studied informal documentation practices by residents in an Emergency Department (ED). We found that informal documentation artifacts support essential characteristics of ED residents' work, such as coordinating information among care team members. Insights from our work can inform the discussion on the challenges and opportunities of integrating informal practices into formal EMR-based practices.

General Terms
Design

Introduction
The use of large health IT systems, including the Electronic Medical Record (EMR) system, are not always perceived as successful. Although creating a "paperless" system was a goal of EMR implementation, researchers have noted that creating paperless electronic workflows through EMRs is very difficult and

"paper persistence" post-implementation is pervasive in hospitals [4]. Paper persistence has been seen as a problem arising primarily from incomplete integration of health information technologies (HIT) with existing work systems. Prior studies [1, 2] give examples of the problematic paper persistence, such as using printouts from an EMR for documentation and transposing information back and forth between computer and paper forms.

However, unlike previous studies on incomplete integration of HITs, we focus on informal documentation practices and see the persistence of paper not as a problem in and of itself, but as evidence of the importance of these practices and a means through which we can better understand the crucial function of informal documentation in doctors' work in an ED. We define "informal documentation" as documentation activities that take place outside the scope of the official EMR system. A key feature of informal documentation artifacts is that they are *not archived after use* (e.g., triage note print-outs, notes kept on scraps of paper or jotted elsewhere). In contrast, "formal" documentation is defined as any documentation, paper or electronic, that is archived and thus forms part of an account of care that is retrievable for organizational, regulatory, or legal purposes.

In this paper, we present results from an ethnographic study at a large teaching hospital to examine the use of paper notes, as informal documentation artifacts, used by ED residents to support their central role of care collaboration. The role of a resident is to serve as an information coordinator in the patient care trajectory when managing medical tasks and communicating among various care team members, such as attending physicians, nurses, case mangers, and admitting residents. Our study reveals that informal documentation artifacts record and carry the information needed to facilitate residents' coordinating work and mobile workflow. In fact, these artifacts help residents to perform the three essential functions of their work in the ED: supporting awareness, recording and transferring information, and coordinating future plans.

Methods

This study was carried out at a large teaching hospital located in US. We conducted a comparative qualitative field study using ethnographic methods. All data was collected by a team of researchers, led by the author, who conducted in-depth observations and interviews with clinicians in each department. The goal was to gain an in-depth contextual understanding of how ED clinicians perform their documentation work, as well as the ways different artifacts were used to support these activities. We followed key personnel and artifacts, such as patients' paper charts and admission and discharge processes, to comprehend the general workflow of ED from various perspectives. We also observed various staff meetings and trainings pertinent to documentation. In total, 230 hours of observation was conducted over a period of 2 years. We studied 19 doctors (attending physicians and residents), 20 nurses and interviewed 23 clinicians in the ED. Interviews were recorded and transcribed for analysis.

Data were analyzed using qualitative data analysis to understand clinicians' documentation behaviors in the ED. For this qualitative analysis, the author reviewed raw audio and transcripts of interview data, field notes,

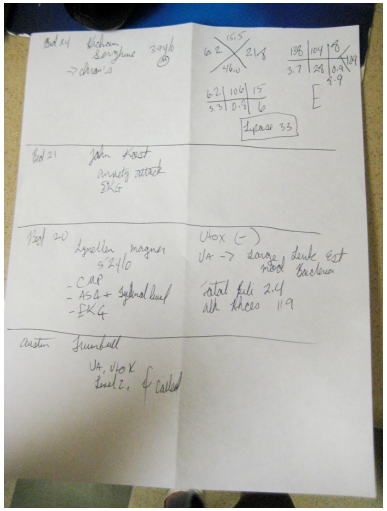

Figure 1. A personal note used by ED resident

and photos of artifacts for emergent themes using open coding [6]. After informal documentation practice was chosen as the main theme, we followed a process of comparing informal documentation artifacts. We coded types of information present on different artifacts, such as "planning future work," then re-analyzed artifacts with these categories in mind, thus refining and defining *categories* of informal documentation practice.

Key findings

The EMR system implemented at our field site serves as an official record system for the entire hospital and the information documented in the EMR is archived and stored digitally. Although the EMR is expected to result in a "paperless" hospital work system, consistent with past findings [2,3,5], our finding showed that clinicians in the ED used papers extensively after implementation. Particularly, ED residents predominantly utilized informal documentation artifacts, such as a triage note copy from the EMR system or a blank paper to use as personal notes (Figure 1) in their work. We identified informal documentation artifacts serves three crucial functions in ED residents' work. These include the high complexity of the work (*supporting awareness*); the fact that work is highly contextual and mobile (*recording and transferring information*); and the fact that many interdisciplinary providers and members must work together and must coordinate their actions accordingly to care for patients (*coordinating plans*).

Supporting awareness

The first critical role of informal documentation is to aid ED residents' awareness for current patients' status by creating abstracted accounts from a patient's larger medical chart. An abstracted account provides a quick overview of a patient's situation, which allows a resident to easily aware of the current status about all of his/her patients. Formal EMR documentation practices collect of a huge amount of information about a patient and provide a high level of detail about the patient. However, in the time pressured ED work, residents often need an information source that contains only the most important facts to allow easy and quick access. Since ED residents directly interact with patients compared to attending physicians and are expected to know real-time information about multiple patients, it is essential to be aware of the "big picture" – knowing what is going on with every patient they manage. For example, on personal notes, residents jotted down only basic information for each patient (e.g. age, chief complaints, medical history), and they frequently edited or updated their notes to record new procedures and medications. Some residents drew tables to organize multiple patients' information at once. Thus, informal documentation provides ED residents' awareness of current, quick overview by allowing them to create their own system to abstract key information.

Recording and transferring information

Another function of informal documentation is to help ED residents record and transfer information from the bedsides or hallways to the EMR and appropriate care team members. ED residents are expected to move around and check up on their patients on an ongoing basis as well as to "keep up" with their documentation work and to keep other care team members "updated." However, this is not always possible, particularly given the unpredictable and complex nature of medical work. For example, in ED, when residents have to see 3-4 patients in a row at busy times and receive frequent

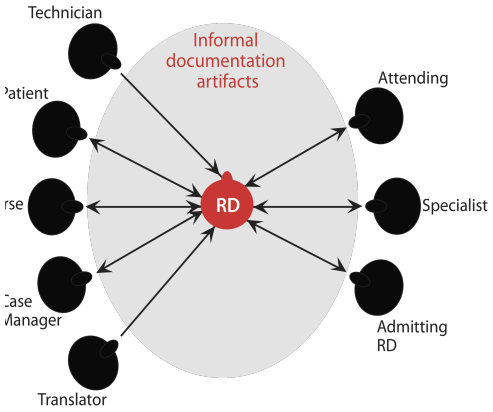

Figure 2. ED resident as an information coordinator among various care team members

verbal updates from nurses and technicians in the hallways, this on-going information could easily be forgotten before it is documented. Information is captured using informal documentation before it is forgotten so that it can be documented in the formal patient record at a later time or reported to the appropriate care team members. Thus, information documentation serves to help residents record and transfer critical on-going information they cannot immediately document in their mobile work.

Coordinating future plans

ED residents also utilize informal documentation to facilitate the coordination of future plans among multiple patients and care team members. Compared to other units, ED is a time-pressured environment with short patient turnaround time and on-going care for multiple patients. ED residents are expected to constantly perform time-sensitive coordination work to handle the treatment of multiple patients and collaborate with different patient care team members, such as attending physicians, bedside nurses, charge nurses, translators, technicians, admitting residents, case managers, and specialists (Figure 2). Each care team member usually approaches the residents first to report updates or look for information related to patient care. Therefore, much of the responsibility of coordinating and planning tasks falls on the residents.

However, this future planning work is not appropriately supported by the current EMR design. In our study, we observed residents had to note down possible future actions that may need to be taken based on the patient's current situation. For instance, an ED resident circled admitting resident's name and one of the lab orders and for a patient to remind himself to check so that he can promptly know where to admit this patient or who to call for consultations if the result was positive. The use of informal documentation allows residents to prepare for upcoming tasks by prepping equipment for possible procedures, informing appropriate care team members, and checking available resources, hopefully preventing possible errors due to failure to anticipate an emerging situation.

Conclusion

We studied informal "documentation" practices, not informal "communication" per se. However, our study shows how informal documentation continues to play an important role in the highly collaborative, mobile, and time-pressured work of ED residents in patient care process, which is not properly supported by current formal EMR-based documentation practices. This discussion can clearly continue in the workshop.

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