



Identifying patient-related information problems: A study of information use by patient-care teams during morning rounds



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ABSTRACT

Objective: This study identifies the types of patient-related information problems (PIPs) that patient-care teams encounter during morning rounds, and how those PIPs are identified and managed. PIPs are any issues related to patient information (e.g., wrong, missing, incomplete information) that affect the patient-care team's ability to perform their work. Not addressing PIPs can lead to workflow challenges, delayed patient-care decisions, and negative impacts to the patient.

Materials and methods: We employed qualitative data collection methods by shadowing patient-care teams during 29 morning rounds resulting in 155 h of observation. We observed the interactions between the rounding physicians and other patient-care team members, including: nurses, consulting physicians, care coordinators, pharmacists, social workers, and therapists.

Results: This study resulted in identifying seven types of PIPs that occur during morning rounds. Additionally, the study presents the different ways that participants identified and managed the PIPs.

Discussion: We discuss the potential negative effects of PIPs on the patient-care workflow. We also discuss socio-technical recommendations for organizational policies and training, as well as electronic health record (EHR) design improvements that could help patient-care teams more effectively identify and manage PIPs.

Conclusion: Hospital teams rely on accurate, available, and up-to-date information in order to make informed decisions on patient care. However, PIPs exist in EHR systems, paper documents, and verbal conversations. This study identifies a set of PIPs and how they are currently being identified and managed.

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1. Introduction

Patient-care teams are dependent on the availability of accurate information in order to make informed decisions about their patients. Morning rounds are an important time when the teams gather and discuss patient information in order to make decisions about diagnosis and treatment [11]. This is also a time when they deal with any problems that arise with the patients' information. We define *patient-related information problems* (PIPs) as issues related to clinical patient information (e.g., wrong, missing, incomplete information) that impact the patient-care team's ability to perform their work. The impact of PIPs can lead to additional work

[13], confusion about what treatments or procedures were done to the patient [2], delayed patient-care decisions [23], decisions being made on wrong, outdated, or incomplete information [9,23], and even medical errors that could harm the patients [2].

Researchers currently focus on what *causes* PIPs in hospitals [1,2,9–11,14,17,23,25,26] and the *impact* that PIPs can have on the workflow of patient-care teams [2,5,6,17,23].

1.1. Causes of PIPs

PIPs can be caused by both the design of electronic health record (EHR) systems and by its users. Due to the structured and rule-based nature of EHR systems, data standardization mechanisms (e.g., drop-down menus, text entry restrictions) are frequently used, which can lead to PIPs caused by the system design [2]. Koppel et al. [17] discuss how EHR design can result in fragmented displays that prevent a coherent view of patients' medications, inflexible forms that lead to wrong orders, and segregation of functional-

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ity that result in double dosing on medication orders. Additionally, other studies describe how a medication ordering system automatically selected the default dosing resulting in inaccurate medication requests [1] and an EHR system bug that truncated data entry fields resulting in lost patient data [26].

Users can also be the cause of PIPs. Data entry errors, including the use of copy-and-paste functionality, can lead to wrong or outdated information being proliferated throughout the system [2,9,11,25]. Additionally, Park et al. [23] and Collins et al. [9,10] describe how clinicians delay information entry when they are too busy to enter patient data into the EHR directly after seeing the patient due to tight schedules or frequent interruptions, which leads to information in the patient record being outdated or incomplete for extended periods of time. Furthermore, Collins et al. [9] describe how patient-care teams, especially in emergency settings, prefer quick verbal communication to transfer patient information among team members instead of formally entering it into the EHR because “it’s a lot faster and easier to just ask,” which can leave the patient’s EHR record outdated or incomplete (p. e145).

1.2. Impacts of PIPs

Medical Informatics researchers have long studied the impacts that PIPs can have on the patient-care workflow. Some of these impacts include delayed procedures [17], confusion about what treatments a patient received [2], medical decisions being made based on wrong or outdated information [23] and even the occurrence of medical errors that could harm patients [2,16,27]. The most critical impact that PIPs can have on patient-care is when they lead to medical errors that negatively affect the patient. In hospitals, a medical error is any mistake in administering or failing to administer patient care that may adversely affect the patient [27]. There are many hospital-related taxonomies that classify the types of medical errors that occur in the hospital in order to better understand how they happen and how they can be prevented from occurring in the future [13,17,27,29,31]. Many of these medical error taxonomies include types of patient information problems (e.g., wrong, missing, outdated information) that led to clinicians making a medical error.

Due to the pervasive implementation of HIT systems into hospitals, medical informatics researchers began investigating how HIT systems played a role in contributing to medical errors. In 1999, a report by the Institute of Medicine even stated that medical errors are caused by “*faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them*” [16]. This report motivated researchers to take a closer look at how HIT systems could lead to medical errors and has resulted in the development of HIT-related medical error taxonomies that have allowed system designers and practitioners to anticipate the unintended consequences that system design can have on medical errors [13,17,26,29,31]. According to these taxonomies, PIPs that exist in these health systems were listed as one of the reasons why medical errors occur.

Consequently, it is important that we not only examine what causes PIPs and their effects on workflow but also identify the different types of PIPs. By doing so, we can then begin to develop workflow and design solutions to address the specific types of PIPs. In order to do this, we undertook a qualitative research study of patient-care teams and their information use during morning rounds to start to identify the different PIPs that occur in the electronic health record (EHR). Furthermore, since there is still a limited understanding of how these PIPs are managed by patient-care teams, we also wanted to investigate how the patient-care teams identify and manage these PIPs from a workflow perspective. Therefore, this study focuses on classifying the types of PIP that arise during morning rounds and examining how the patient-

Table 1
Study participants by role.

Participant role	Number
IM attending	5
IM resident	19
IM intern	5
Care coordinator	3
Pharmacist	2
Nurse	60
Consulting physician	15
Therapist	4
Social worker	3
Total	116

care teams identify and manage the PIP that they encounter. Our study extends the existing research on the causes and impacts of PIPs to include how patient-care teams identify and manage PIPs that they encounter during daily patient rounds.

2. Materials and methods

2.1. Setting and participants

Our study was conducted in the in-patient ward of a large teaching hospital in northeastern United States. The hospital has 551 beds and admits more than 25,000 patients per year. The first author shadowed 5 Internal Medicine (IM) physician teams in the in-patient ward of the hospital during morning rounds. These teams were led by an attending physician (“attending”) and included residents and interns. During the morning rounds, a care coordinator also rounded with the team and a pharmacist rounded with the team once a month as part of a multidisciplinary rounding initiative at the hospital. The shadowing also included observing the physician teams’ interactions with other members of the broader patient-care team, including nurses, consulting physicians (e.g., cardiology, neurology), therapists (e.g., occupational, physical), and social workers.

A total of 116 participants were observed during the study (Table 1). The IM team, care coordinators, and pharmacists were directly shadowed by the researcher who followed them throughout the hospital during their daily activities. Other members of the patient-care team were also observed and informally interviewed when they interacted with the IM physician team during the study. These other staff members were only included as study participants if they were involved in the discussion or management of a PIP.

The patient-care teams communicated, documented, and managed patient information using a variety of information sources, including:

- **Electronic health record (EHR) system:** Participants accessed this system using desktop computers at nurses’ stations and in workrooms, laptops carried during rounds, mobile devices (e.g., iPads, tablets), and the nurses’ computers-on-wheels (COWs) located in hallways.
- **Verbal communication:** Participants had conversations about patient information either face-to-face or on the phone (mobile and desk phones).
- **Paper-based notes:** Participants used “Patient Care Summary” reports printed from the EHR during rounds to make notes about changes in the patient’s status or tasks they needed to do for the patient. After rounds, any patient-related information was then documented in the EHR.

The EHR is the primary and preferred method for documenting patient data in the hospital. The hospital uses the Cerner Corporation’s Millennium EHR system, including the PowerChart, FirstNet,

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