Abstract
Chronic care patients often experience repeated information exchange with their health providers during medical visits. In this position paper, we term the two-way information flow in between health consumers and professionals as patient-provider handoff. We identify four core research variables in studying the information flow process: temporality, information context, information media and information organization. Understanding these issues can facilitate the design of technologies for effective information flow during these critical handoff moments.

Author Keywords
Patient-provider handoff; illness trajectory, temporality, information media

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
There has been considerable research done in the study of handoffs in health practices, primarily due to the frequent challenges of information and communication during the transition moments. Prior literatures on handoffs almost exclusively focus on the collaborations between health professionals, e.g. nurse and nurse,
physician and nurse. However, handoffs also occur between consumers and professionals. In healthcare practices, repeated handoffs occur in the collaborative care of patients, with information being transferred from patients and/or caregivers to healthcare professionals, and reversely from professionals back to patients.

Patient-provider handoffs typically occur in the following scenario: at the beginning of a medical visit, a patient and caregivers present the homecare information to a doctor. Homecare information is exchanged through both verbal and physical artifacts, such as glucose readings, medication bottles, and reports of the patient’s feelings and discomfort from the past homecare cycle. The doctor will use patient’s homecare information to assist in making clinical judgments. At the end of the patient’s medical visit, clinical information generated by the doctor as well as nurses will flow back to patient to direct further disease management at home.

Guided by the illness trajectory concept that emphasizes the long-term and collaborative nature of healthcare practices [81], chronic care actually involves repeated handoffs from healthcare consumers to healthcare professionals, and reversely from professionals to consumers [2]. Yet, there has been very limited work that examines how healthcare information transitions between consumers, e.g. patients, and caregivers, and professionals, e.g. physicians, nurses, and other clinicians. In this position paper, we use the term patient-provider handoff to designate to the care transition between healthcare consumers and providers. The use of patient in this term also includes caregivers and other personnel who are also involved in the information and care transition process.

Designing technologies for patient-provider handoffs can be challenging since patients and caregivers may not have sufficient knowledge and expertise in preparing and communicating proper information with their healthcare providers. The actual handoff can be viewed as an information aggregation and information disaggregation process, where care-related information first needs to be assembled as a whole, passed along to the receiver, and then unpacked individual items for its intended use. While great efforts have been made in studying handoffs between professionals, less is known regarding the mechanism, challenges and design opportunities for handoffs between patients and providers.

Through prior literature on handoffs, we identified four research variables: temporality, information context, information media and information organization. These research variables raise a series of interrelated questions that call for deeper insight into the mechanisms, challenges, artifacts and processes of a patient-provider handoff. Examining these issues will help us to better understand the collaborative behaviors in patient-provider handoffs and to explore opportunities for designing technologies that support and enhance these practices. In particular,

**Research variables**

**Temporality:** Temporality has always a crucial factor for studying collaborative work [5]. In hospital work, handoffs follow a symmetrical timeline where shift changes happen every 12 hours. Regardless, the
information patients give to their providers during a handoff is accumulated over many weeks or months. Similarly, the information patients receive during their 20-minute medical visit or their hospital stay of a few days will be used as instructions for months of extended home care. The asymmetrical temporal structure of the patient-provider handoff presents great challenges for the information aggregation and disaggregation activities. In addition, the intensity of the information work occurring in clinical settings and consumer environments also vary significantly and demands further understandings.

**Information Context:** Although a variety of technologies are designed to track and monitor patients’ vital signs, exercises and glucose readings, health information exchanged during handoffs is highly situated and contextualized [1]. To this end, not only are medication lists handed over from patients to providers, physicians also need to know the reasons why patients take these medications, the dosage of these medications, and the effective prescription time periods. Similarly, knowing glucose readings alone cannot explain what leads to the fluctuation in blood sugar. Since patients and caregivers may not have the sufficient knowledge to record and communicate proper information, what information is relevant and how to record it are questions to be explored in designing information systems for patient-provider handoffs.

**Information Media:** Different from the handoffs in hospitals that are often mediated through a heterogeneous information media, ranging from EMR, paper charts, informal notes, to verbal communications [6], rarely has system design supported patient-provider handoffs. Patients and their caregivers also do not actively engage in creating their own information media to bridge the gaps. What do patients do to carry information to and from their healthcare providers? What are the common information and communication breakdowns during this process? What forms of informal information media can be introduced and designed to overcome the barriers in patient-provider handoffs?

![Figure 1: The Concept of Patient-Provider Handoffs](image)

**Information Organization:** Given the brief handoff process and the long, extended patient self-care period, the amount of health information needs to be exchanged during a patient-provider handoff can be overwhelming. Our prior research on the PHR system shows that many patients believed that the information in the PHR was not organized in the way they desired to use it, which consequently led to low system usages among patients. Considering that that information in the EMR and other hospital systems is typically organized in different levels of graduality, and by different usage patterns clinicians may have [3], the
information media for patient-provider handoff may need to consider information organization. Understanding the potential usage patterns of patients, caregivers and healthcare providers would allow system designs that fit with real user needs, and to facilitate timely access and appropriate use of information. Exploring this issue is critical for design, adoption and actual use of information media.

To that end, HCI researchers argue that cognitive artifacts, e.g., the doctor’s list, can provide continuous awareness among clinicians and can, consequently, remove tension from handoff transition moments [4]. Together, studies [4, 6] suggest a new possibility of reframing the handoff from a moment of sudden transition to the maintenance of continuous awareness among collaborators through the use of cognitive artifact.

**Study Plan**

We are in the process of studying patient-provider handoffs that are practiced among chronic patients and their providers in two different healthcare scenarios: regularly scheduled 20-minute doctor visits (outpatient visits); and relatively lengthy hospital stays (inpatient visits). We have chosen to focus on chronic patients for the reason that they are more likely to have frequent medical visits than patients without chronic disease, and that the information exchanged in their patient-provider handoff is critical to their care. We will deploy a multi-sited ethnographic study to understand the collaborative behaviors demonstrated in these handoff situations. In addition, we will explore the design of cognitive artifacts through deploying paper prototypes as probes and gather user perceptions through a pilot study.

**References**


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