

## Chapter 9

# Human-Centered Design for Health Information Technology: A Qualitative Approach

**Charlotte Tang**

*University of Calgary, Canada*

**Sheelagh Carpendale**

*University of Calgary, Canada*

### ABSTRACT

*This chapter presents issues that may arise in human-centered research in health care environments. The authors first discuss why human-centered approach is increasingly employed to study and to design health care technology. They then present some practical concerns that may arise when conducting qualitative research in medical settings, from research design, to data collection and data analysis, and to technology design. Many of these concerns were also experienced in their own human-centered field studies conducted in the last few years. The authors conclude the chapter by illustrating some of these issues using their own research case study that investigated nurses' information flow in a hospital ward.*

### INTRODUCTION

The health care domain has become increasingly complex in that there is ever “more to know, more to do, more to manage, more to watch, and more people involved” (Institute of Medicine, 2001a, pp.1). Thus this Institute has identified six specific Quality of Care objectives for improvement to achieve a higher quality health care system

(Institute of Medicine, 2001b, pp.41). They are briefly described as follows:

- Safe by “avoiding injuries to patients from the care that is intended to help them”.
- Effective by “providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those not likely to benefit”.
- Patient-centered by “providing care that is respectful and responsive to individual

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patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions”.

- Timely by “reducing waits and sometimes harmful delays for both those who receive and those who give care”.
- Efficient by “avoiding waste, including waste of equipment, supplies, ideas, and energy”.
- Equitable by “providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socio-economic status”.

Health care systems that achieve major gains in these six areas are expected to be better-equipped to meet the ever-increasing needs of patients. The application of health information technology has been shown to improve aspects of safety and efficiency (Bates and Gawande, 2003; Chaudhry et al., 2006). However barriers, including resistance to utilization, have also been reported to limit the adoption of health information technologies in the hospital setting (Jha et al., 2009). Therefore it has been suggested that to optimize their utilization and adoption, an iterative developmental-evaluative socio-technical and qualitative approach that recognizes the interrelationships between the practices of health care providers and technology is required (Berg, 1999).

In the following, we will first describe why human-centered approaches are appropriate for designing health information technologies. We then describe the concerns that may arise when conducting qualitative human-centered research in health care settings, as well issues that should be considered when designing health information technologies. Finally, we illustrate these issues and considerations using a multi-stage research that we conducted to investigate information flow in a hospital ward to better inform technology design.

## **HUMAN-CENTERED HEALTH INFORMATION TECHNOLOGY**

Technological solutions are increasingly designed and deployed to improve the provision and delivery of health care and we are now seeing an ever broader range of software, hardware and contexts of use. For example, while previously information technology was predominantly based in the consultation room, clinicians now have access to an increasing amount of information, including electronic health records, via devices such as desktops, PDAs, tablet PCs, and computers-on-wheels (e.g. McLoughlin et al., 2006; Cisco, 2007; Tang and Carpendale, 2008). The mobility of these devices means that they can be accessed on wards, by patients’ bedside and during ward rounds.

There has been increasing evidence that the use of health information technology (HIT) improves patient safety, quality, and continuity of care. For example, a CPOE (Computer Physician Order Entry) system deployed at LDS Hospital in Salt Lake City has been reported to reduce adverse drug events by 75% (Evans et al. 1998). HIT also has the potential to improve the use of resources, such as the use of EHRs that led to reduced laboratory and radiology test orders by 9% to 14% (Bates et al., 1999), reduced hospital admissions by 2% (Jha, 2001), and reduced excessive medication usage by 11% (Teich et al., 2000).

However, with information computing increasingly moving away from the desktop into hospital wards via mobile technologies, additional challenges to designing useful and usable technologies arise. Adoption has been an enduring problem for the introduction of health care technologies. Practitioner resistance and interference has been reported to account for 45% of the failure of computer based health information systems (Dowling, 1980). The perceived ease of use of a technology also has a significant effect on whether a clinician will use the technology as it has a direct effect

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