Making Sense of Health Information Technology

by

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Nursing
Duke University

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Reuben R. McDaniel

Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing in the Graduate School of Duke University

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ABSTRACT

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Abstract

Background: Hospital adoption of health information technology (HIT) systems is promoted as essential to decreasing medical error and their associated 44,000 annual deaths and $17 billion in healthcare costs (Institute of Medicine, 2001; Kohn, Corrigan, & Donaldson, 1999). Leading national healthcare groups, such as the Institute of Medicine, Agency for Healthcare Research and Quality, Institute for Healthcare Improvement, and the Leap Frog Group continue to advocate for increased use of HIT (AHRQ, 2010; Beidler, 2010; Institute of Medicine, 2001; Page, 2003; The Leapfrog Group, 2009), such as provider order entry and electronic health record systems, as a way to improve healthcare quality in hospitals. Even under intense pressure to adopt HIT, however, a mere 2% of US hospitals report having a comprehensive electronic health record system. Further, more than 50% of US hospitals have only rudimentary HIT systems (Jha et al., 2009). With the ARRA HITECH Act of 2009, the pressure on hospitals to quickly adopt HIT and achieve meaningful use is mounting.

While a large body of literature exists about HIT implementation, the majority is anecdotal case reports. The remaining studies investigated attitudes about HIT or the impact of HIT on patient care processes and outcomes. Thus, best strategies for implementing HIT in hospitals remain unknown. Study design choices, such as the use of self report data, retrospective data collection methods, subjects from single care units
or single healthcare professions further limit our understanding HIT implementation in complex hospital care settings.

**Methods:** This prospective, longitudinal case study used a novel approach, sensemaking, to understanding how project teams may work to implement HIT in an academic medical center. Sensemaking, defined as the social process of establishing the meaning of events and experiences (Weick, 1995), is associated with learning and problemsolving in research studies of healthcare and nonhealthcare settings. Through direct observation and document review I observed project team social interaction and activities over the course of the 18 month preimplementation phase of an HIT implementation project in a single tertiary care hospital.

**Conclusions:** In this study, I described team actions and activities that enhanced clinician team member sensemaking including: frequent, collective interaction with HIT and focusing team members’ attention on specific aspects of HIT function. Further, study findings demonstrated that team members’ perceptions of HIT and care processes varied across healthcare professions, management levels, and departments. Supportive social interaction from team leaders and members encouraged team member participation and resulted in members’ voicing observations, perceptions and attitudes about the HIT and hospital care processes. Sensemaking of HIT teams not only resulted in identification of needed HIT design changes, but also revealed assumptions and information which may prove critical to successful HIT implementation in hospital care
environments. Based on study findings, I suggested strategies for selecting and preparing HIT team members as well as for HIT team activities. This study advanced our understanding of how project teams function and bring about change in complex hospital care environments by not only identifying HIT implementation issues within but also describing the link between team member social interaction and implementation actions.
Dedication

I dedicate this work to my husband, Jay. You are my rock in the storm of life.

And to my girls, Katie and Elia, you bring me joy every day.
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1. Dissertation Introduction

Health information technologies (HIT) such as provider prescribing, medication administration, decision support and electronic health records are widely believed to make healthcare safer, improve healthcare provider decision making and conserve valuable healthcare resources (Institute of Medicine, 2001; Page, 2003). Yet, the implementation of and effective use of these systems varies widely (DesRoches et al., 2010; McCullough, Casey, Moscovice, & Prasad, 2010). Less than 50% of US hospitals report some form of HIT investment and even less (1.5%) have a comprehensive electronic health record system (Jha, et al., 2009). Due to variation in implementation and use, the expected improvements to healthcare remain largely unrealized (E. W. Ford, McAlearney, Phillips, Menachemi, & Rudolph, 2008; Garg et al., 2005).

Evidence of the effectiveness of HIT systems is growing (Bates et al., 1999; DesRoches, et al., 2010; Franklin, O’Grady, Donyai, Jacklin, & Barber, 2007; Jordan et al., 2009; N. Menachemi & Brooks, 2006; Nir Menachemi, Randeree, Burke, & Ford, 2008; Nightingale, Adu, Richards, & Peters, 2000). However, studies of hospital-based HIT implementation reported a number of dramatically negative consequences for healthcare providers and for patients including: altered communication and workload among providers; and delayed care, harm and even death among patients (Ash, Sittig, Campbell, Guappone, & Dykstra, 2006; Edmondson, Bohmer, & Pisano, 2001; Han et al., 2005; Koppel, Wetterneck, Telles, & Karsh, 2008). Although poorly studied in hospital
settings, the available research on HIT implementation attributes the low rate of adoption of HIT to conflicting user demands and expectations; lack of user involvement, poor interface design, and misalignment between system functionality and work process (Jones, 2003; Kuperman et al., 2007; Southon, Sauer, & Dampney, 1999; Stevenson, Barbera, Moore, Samore, & Houck, 2005). It is clear, however, from anecdotal and research evidence that implementing HIT is complex and relies heavily on social interaction among disparate stakeholders (Barber, Cornford, & Klecun, 2007).

Unfortunately, knowledge about the best methods to effectively implement HIT in hospitals remains under developed. Current recommended strategies often involve detailed “roll-out” plans that ignore hospital complexity and the social nature of implementation (Ash et al., 2007; Barber, et al., 2007; Bossen, 2007; Koppel, et al., 2008; Patterson, Cook, & Render, 2002; Schwalbe, 2002). Similar to translating evidence-based practices into clinical settings, HIT implementation research should help to identify reproducible, systematic strategies (Kirchhoff, 2004; Titler, 2004). Strategies which maximize the socially interactive capacity of HIT implementation teams may eliminate barriers to successful HIT use; promote adoption and integration of HIT in hospitals. Unfortunately, studies of HIT implementation strategies are largely absent from the literature and this may contribute to the slow and inconsistent adoption of HIT that we see in hospitals (Berner, Detmer, & Simborg, 2005; E. W. Ford, et al., 2008; Lapointe & Rivard, 2006). It is, therefore, critically important to better understand the social aspects
of implementation of HIT in hospitals in order to not only identify the issues
surrounding implementation of HIT in hospitals but to devise appropriate interventions
to improve adoption of these systems and achieve anticipated patient healthcare gains.

To develop problem-solving solutions and anticipate organizational
consequences of implementing HIT, hospitals often form project teams (Lemieux-
Charles & McGuire, 2006). It is assumed that when these teams are populated with
members who represent the varying needs of healthcare providers, that they will bring
new information into the team through their connections with others in the
organization, and that their combined activities result in successful team outcomes
(Anderson, Issel, & McDaniel, 2003; Ashmos, Huonker, & McDaniel, 1998; Hackman,
1990; Pinto, Pinto, & Prescott, 1993). However, the literature regarding project team
performance in HIT implementation is nearly silent on these issues. Thus, there are no
established best practices to guide HIT implementation team construction, function, and
team member interaction, yet hospitals will most likely continue to use teamwork as
their primary HIT implementation strategy.

To address the gaps in knowledge identified above, I completed a qualitative,
prospective, longitudinal case study using a novel approach to understanding the use of
project teams in HIT implementation. Sensemaking, the social process of searching for
answers and meaning which drive action, facilitates team understanding, learning,
problem solving and, ultimately the actions the team takes or does not take (Balogun & Johnson, 2005) in regard to system implementation. This dissertation has four aims:

(1) describe and compare sensemaking across multidisciplinary project teams whose members differ in terms of hierarchical role and discipline;

(2) describe how the sensemaking of multidisciplinary project teams changes over time;

(3) describe how multidisciplinary project teams' sensemaking influences the actions taken by the teams; and

(4) identify team member behaviors that facilitate and or inhibit the sensemaking of a multidisciplinary project team.

Background, theoretical framework, methods and findings are presented in three chapters, followed by a concluding chapter.

In Chapter Two, I present the research proposal in which I discuss the background and framework for the dissertation and describe the methods and the analysis plan. The manuscript for this chapter was published in Implementation Science in 2010.

Chapter Three reports the findings for research aims one, two and three. Findings describe social interaction and subsequent sensemaking of health care providers, or clinicians, involved in three HIT implementation teams. I discuss how my findings have implications for improving health care provider participation in HIT
implementations and for constructing HIT team membership. At present, this manuscript is being prepared for submission to a healthcare research journal.

Chapter Four addresses research aim four in which I explore the role of interpersonal behavior on team sensemaking. Findings describe both the positive and negative impact of social interaction on individual member willingness to give voice to issues and, in turn, the impact on team sensemaking. Based on these findings, I recommend strategies for promoting positive social interaction among team members, mitigating the effect of negative interpersonal behaviors, including negative leader behaviors, and empowering team members to manage the conflict which inevitably occurs during large scale organization change, such as HIT implementation. This manuscript was accepted for presentation at the Academy of Management 2012 Annual meeting.

In Chapter Five, I integrate the findings presented in Chapters Three and Four and describe implications for practice. Further, I address strengths and limitations of the study and propose next steps for research.
2. Making Sense of Health Information Technology Implementation: A Qualitative Study Protocol

2.1 Background

Hospital-based health information technology (HIT) implementation research is needed to identify reproducible strategies to eliminate barriers to HIT use and promote its adoption and integration (Kirchhoff, 2004). I found few studies of HIT implementation, and this absence may contribute to the slow and inconsistent adoption of HIT observed in hospitals (Jha, et al., 2009). This study will address two weaknesses identified in the literature on hospital-based HIT implementation: the absence of evidence about strategies to improve implementation and how to construct and manage project teams tasked with HIT implementation.

In this study, I will prospectively examine a multidisciplinary project team as it prepares to implement a HIT system in a tertiary care hospital. Due to a lack of literature on project teamwork specific to HIT implementation, I rely on the general literature about hospital-based project teamwork. I will use sensemaking to explain the social processes embedded in large scale organization change (Jordan, et al., 2009; Stensaker & Falkenberg, 2007; Weick, Sutcliffe, & Obstfeld, 2005), and qualitative methods to achieve the following aims: describe and compare sensemaking across multidisciplinary project

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teams whose members differ in terms of hierarchical role and discipline; describe how
the sensemaking of multidisciplinary project teams changes over time; describe how
multidisciplinary project teams’ sensemaking influences the actions taken; and identify
team member behaviors that facilitate or inhibit sensemaking of a multidisciplinary
project team.

HIT implementation literature falls into three categories: anecdotal case reports,
effectiveness research, and research describing HIT impact in clinical settings. First, the
majority of hospital HIT implementation literature is anecdotal and lacks systematic
evidence for sound implementation interventions (DeVore & Figlioli, 2010; Fretschner,
Bleicher, Heininger, & Unertl, 2001). Second, HIT efficacy studies often discuss lessons
learned; however these lessons were explanations of findings, rather than empirical
observations (Lau et al., 1998; Paré & Elam, 1998). Finally, generalizability of HIT impact
studies is hampered by methodological concerns (Kaushal, Shojania, & Bates, 2003;
Koppel et al., 2005). The majority of studies used retrospective, self reported data,
focused mainly on HIT system users, usually physicians, and evaluated a single type of
HIT system, such as provider order entry. Thus, best implementation methods remain
largely unknown.

HIT impact studies identified unanticipated social effects, such as reallocated
work (Ash, Berg, & Coiera, 2004), interrupted work processes (Edmondson, et al., 2001;
Koppel, et al., 2005), altered information exchange, communication patterns, and
interpersonal relationships (Ash, et al., 2004; Beuscart-Zephir et al., 2005; Campbell, Sittig, Ash, Guappone, & Dykstra, 2006; Edmondson, et al., 2001; Koppel, et al., 2005), and in some cases, patient harm (Kaushal, et al., 2003; Koppel, et al., 2005). Studies have also found that hospital staff member’s perspectives about HIT processes for, and outcomes of, implementation varied by organizational identity (Ash et al., 2005), role (Doolin, 2004), and work unit (Lau, et al., 1998), causing variation in action. Care providers who perceived HIT as a threat, resisted using the HIT system (Bar-Lev & Harrison, 2006; Barber, et al., 2007; Lapointe & Rivard, 2005). Those who saw HIT as a benefit to patient care, on the other hand, used the system and advocated for system improvements (Aarts & Berg, 2006; Barber, et al., 2007). Thus, care providers varied implementation experiences combined with differing expectations, objectives, and needs may contribute to the slow and uneven adoption of HIT in hospitals.

Project teams have not been well studied, even though they are responsible for implementing HIT. Project teamwork is a popular strategy that hospitals use to create change (Devine, Clayton, Philips, Dunford, & Melner, 1999). To develop solutions and anticipate consequences of change, hospitals populate teams with members with different experience, skill, and knowledge (Pinto, et al., 1993). Diverse members bring new information to the team and they provide connections with others in the organization (Anderson, et al., 2003; Ashmos, et al., 1998). Thus, effective teamwork facilitates collaboration, coordinated effort, and task accomplishment (Edmondson,
al., 2001). Studies show that teams are usually better problem solvers than individuals perhaps because they represent the combined input of all members, or because team member interactions facilitate learning associated with shared expertise and social interaction (Cohen & Bailey, 1997; Edmondson, 1999; C. Ford & Sullivan, 2004; Nembhard & Edmondson, 2006).

During HIT implementation projects, hospitals need access to various knowledge and skills to uncover interdependencies and critical expectations, and to determine actions. Research on healthcare project teams noted that diverse membership and positive interpersonal interaction was associated with team innovativeness and positive organizational outcomes (Ashmos, et al., 1998; Irvine Doran et al., 2002; Leykum et al., 2007; Nembhard & Edmondson, 2006; Shortell et al., 2004). However, studies found that diverse perspectives also created conflict that was linked to poor team performance (Nembhard & Edmondson, 2006). It appears necessary to carefully manage relationships between people to achieve benefits of diversity. Interpersonal interaction and diversity of team membership, therefore, are an important focus of the proposed study; specifically, I focus on sensemaking processes of the team.

2.1.1 Theoretical Framework: Sensemaking

Sensemaking, a social process of searching for answers and meaning, drives the actions people take (Weick, 1995). Sensemaking occurs through verbal discourse between hospital staff members. Whether planned or unplanned, change challenges
people’s ability to understand what is happening, to anticipate what will happen, and to know what steps to take (Weick, 1995, 2001b; Weick, et al., 2005), suggesting that sensemaking processes may be more important than decision-making processes for successful change. Because HIT implementation in hospital settings does not occur in a linear fashion and includes unpredicted, unexpected outcomes, implementation team members cannot expect to make optimal decisions (Ash, et al., 2006; Beuscart-Zephir, et al., 2005; Koppel, et al., 2005). They are forced to make ‘good enough’ choices and adjust as new information becomes available and understanding of circumstances changes (Edmondson, et al., 2001). When compared to traditional linear perspectives on HIT-related change, such as decision making and diffusion of innovation (Rogers, 2003; Van de Ven & Poole, 1995), sensemaking may help us to better manage project team actions because it is a process that accounts for new information as events unfold and for social interaction and construction of meaning (Anderson et al., 2005; Balogun & Johnson, 2005; Gioia & Thomas, 1996; Maitlis & Lawrence, 2007).

Research on sensemaking in hospital studies suggests several things. Organizational role, such as nurse, physician, or manager, influences the sense that staff members make of events (Apker, 2004; Currie & Brown, 2003; Jensen & Aanestad, 2007). The sense that hospital staff members make influences their choices and actions (Blatt, Christianson, Sutcliffe, & Rosenthal, 2006; Thomas, McDaniel, & Anderson, 1991; Torkelson, Anderson, & McDaniel, 1996). Through discourse with other staff members,
hospital staff members construct the meaning of information and events and shape and reshape their understanding as events unfold and new information becomes available (Albolino, Cook, & O'Connor, 2007; Thomas, et al., 1991; Torkelson, et al., 1996). Project teamwork provides a formal mechanism for enhancing sensemaking. Through dialog, team members share varying perspectives on team tasks, construct the meaning of events as the HIT is implemented, and take action in response to evolving meaning. Through sensemaking, team members define what is happening, jointly revise their understanding, learn, and problem solve, setting the course for HIT implementation (Apker, 2004; Currie & Brown, 2003; W. L. Miller, McDaniel, Crabtree, & Stange, 2001). This view of sensemaking and the review of literature on project teams, thus serves as the basis for my methodological choices.

2.2 Methods

2.2.1 Design

I propose a qualitative, longitudinal multiple case study through which I will examine the evolving sensemaking of three multidisciplinary HIT project teams using direct observation and organizational document review. I will follow the activities of these teams throughout the pre-implementation phase of the project. I define this period as the time between team formation and the first time the HIT is used by hospital staff in the provision of care (Schwalbe, 2002). Through my choice of methods, I plan to address the following four weaknesses in prior research on hospital HIT implementation, project
teams and sensemaking: retrospective data collection; reliance on self-reported perceptions of HIT implementation; focus on single participant identity; and focus on single work units.

Following Institutional Review Board approval, I will contact the Chief Nursing Officer and Chief Information Officer to obtain permission to conduct the study. As an incentive, a consultation summarizing findings of the study with recommendations for future project teams will be provided to the organization and to the case study participants. Following a protocol described by Utley-Smith et al. (2006), the consultation will serve as a method of disseminating research findings directly to study participants in the form of a summary of research findings and some recommendations related to teamwork strategies for more effective sensemaking. Knowledge participants gain during the consultation may validate study participants’ project experience, influence decisions to participate in future projects, and enhance participants’ IT implementation skills (Teekman, 2000). Subjects in prior research have reported that they perceived a direct benefit from such consultations and recommendations (Utley-Smith, et al., 2006).

2.2.2 Setting

This study will be conducted within a single, academic, tertiary care hospital in the southeastern United States. Consisting of 834 beds in 33 nursing units, the hospital has a highly complex, interdependent care environment where changes in care practices,
such as HIT implementation, may result in unexpected consequences. The hospital decided to implement an HIT system, an electronic nursing documentation system, in its 33 nursing units. Because of the anticipated impact of this system, the hospital is forming a multidisciplinary project team comprised of nine sub-teams. Each sub-team will be tasked with a different aspect of the HIT project and staffed with a cross-section of clinical disciplines and functional business team members. Using selection criteria described below, each sub-team selected for inclusion will represent a single case. I anticipate that project team members will have little history of working together; thus, the unique knowledge each member brings to the team’s tasks may be largely unknown by other members of the team and team management processes will be necessary.

2.2.3 Sample Selection

2.2.3.1 Selecting case study teams

Prior research suggests that team members’ perspectives on HIT implementation may differ based upon their departmental affiliation, professional training, organizational role, and hierarchical level (Currie & Brown, 2003; Jensen & Aanestad, 2007; Maitlis & Lawrence, 2007; Stensaker & Falkenberg, 2007). Further, a team’s roles and responsibilities may shape the discourse, meaning, and actions taken during the project (Maitlis & Lawrence, 2007). Thus, to capture how sensemaking is influenced by team member diversity, I will select sub-teams of the larger project implementation team for in-depth case study using two criteria: the sub-team has a broad scope of project
responsibility within the larger project team and its members have different social identities. Three of nine project implementation sub-teams meet the criteria of broad responsibility and diverse membership and thus will be included in-depth case study: the executive team, the communication team, and the implementation team. The executive team (n = 9) will include administrative and clinical executives and directors from multiple departments, and has a broad scope in that it will provide resources for the project and ensure alignment of project goals with organizational strategic goals. The communication team (n = 11) will include administrative, clinical, and technical directors, managers, and staff representing many organizational levels, and has a broad scope in that it will produce all organizational communication about the project including minutes, articles, video, and web-based documents. The implementation team (n = 31) will include directors, managers, and front-line staff from nursing units, pharmacy, information technology, and hospital education, also representing many organizational levels. This team has a broad scope in that it will collect information about care practices, identify unit level information and care needs, and recommend modifications to the system in support of those needs.

The six sub-teams that will not be selected for in depth case study include the steering committee, the neonatal development team, the psychiatric development team, the device selection team, the training team, and the informatics team. These teams will have narrower scopes of responsibility (e.g., selecting equipment), or their membership
will be homogenous (e.g., all psychiatric nurses). To understand how the overall project is unfolding across the nine teams, however, I will collect published minutes from meetings held by the six teams not directly observed to include in analysis of documents. Further, during case study sub-team meetings, an update on the work of all nine teams will be summarized and presented. During the executive, communication, and implementation team meetings, I will capture this information in the field notes. Together, these documents and field notes will provide me with information about events and actions of other teams that I do not directly observe.

2.2.4 Measurement

2.2.4.1 Sensemaking

Sensemaking will be measured qualitatively using direct observations of the executive, communication, and implementation teams; and project document review. This approach will capture multiple perspectives and rich data on HIT implementation events (Edmondson, et al., 2001; Gioia & Thomas, 1996; Maitlis & Lawrence, 2007). I derived a set of sensemaking behaviors from a literature review (Currie & Brown, 2003; Gioia & Chittipeddi, 1991; Weick, 1993, 1995; Weick & Roberts, 1993; Weick, et al., 2005), which I evaluated in a preliminary study, and used to developed an observation guide (Appendix A) intended to capture sensemaking and subsequent actions (Weick, 2001a). I anticipate that through discourse in team meetings, members will share their unique knowledge (e.g., care processes within a department), their perspective on the HIT
implementation, and their interpretation of information and events (Raes, Glunk, Heijltjes, & Roe, 2007) that will then direct their actions (Blatt, et al., 2006). The observation guide will also facilitate documenting the actions the teams plan to take and their anticipated results as well as the teams’ reflections on the actions taken. Questions on the observation guide included the following: What information do participants share and how do they share it (e.g., past experience, information from others, hypothetical scenarios)? What interpretations, labels, and conclusions do team members express? What new ideas, decisions or proposed actions will be taken and by whom? What form does the discussion take? And, how do team members interact with each other? The document review guide (Appendix B) is designed to capture written discourse where the project team formally records and/or shares information with external constituents about the team’s goals and actions taken related to the HIT implementation. Data collection will include date obtained, description of the document, date of event or contact associated with the document, significance of the document, and a brief summary of the contents.

2.2.4.2 Participant demographic data

Team member demographic data (Appendix C) will be obtained by self-report at the time when participants are introduced to the study. Data collected will include current job title, current unit of assignment, tenure in their profession, tenure in the organization, tenure on the unit of assignment, highest educational level, highest
educational level in the profession, technology experience, gender, age, and ethnicity/race. These data will be used to explore variations in sensemaking because studies indicate that these are individual characteristics that are likely to influence sensemaking (Albolino, et al., 2007; Balogun & Johnson, 2005; Blatt, et al., 2006; Jensen & Aanestad, 2007).

2.2.5 Data Collection Procedures

2.2.5.1 Direct Observation

I will directly observe team meetings and activities (e.g., training sessions) throughout the study. During observations, I will observe and manually record verbal communications between team members, using field notes and jottings (Crabtree & Miller, 1999). These notes will be typed directly into a laptop versus being handwritten on paper and transcribed at a later time (Crabtree & Miller, 1999). I will also document observations, such as seating arrangement, note passing, and eye rolling. I will audio record the meetings to support the field notes and listen to the tapes to verify that the field notes accurately capture communications; the recordings will not be transcribed verbatim. All data will be tagged with date and time to capture emerging trends. Meetings will generally occur once a month and last approximately 60 to 90 minutes. Direct observations occur during regularly scheduled meetings pose minimal burden to participants. Field notes, jottings, and audio recordings are tantamount to meeting minutes. Electronic field notes will be formatted and imported into AtlasTI.
2.2.5.2 Documents

Documents related to the project (e.g., articles) and project records (such as meeting minutes, presentations, policies and procedures, and flyers), will be maintained by the HIT project team in a Lotus notes database, published to the hospital intranet for review by hospital staff members, and published in organizational periodicals and newsletters. These documents are produced by the committee and reflect the way in which they wish to represent their work to external constituents. I will access documents electronically or in printed form from the intranet, and add them to the study database. Document date will be used to facilitate placement in and retrieval from the study database. Once formatted, documents will be imported into AtlasTI and summarized following the guide (Appendix B). Documents will serve to corroborate and augment evidence from direct observation, or to contradict observational evidence (Crabtree & Miller, 1999; Currie & Brown, 2003).

2.2.5.3 Participant demographic data

Participant consent for use of demographic data will be obtained after I provide a review of the nature of the study, participant’s role, confidentiality, and the associated risk/benefits of participation. Participants will complete the survey tool described earlier (Appendix C). As new team members are added, I will follow the demographic data collection procedure. The survey will take approximately 15 minutes to complete, posing minimal burden to participants. The demographic data will be entered into
Microsoft Excel tables and accessed with SAS (v. 9.1) for analysis. Data analysis I will use qualitative analysis procedures recommended by Crabtree and Miller (1999). My research team contains experts in health informatics; organizational cooperation and fairness; and organizational sensemaking and learning. As I develop hypotheses for each research aim, I will conduct research team discussions to uncover bias and propose alternate perspectives on emerging themes.

2.2.6 Data Analysis

2.2.6.1 Code development

From the literature on sensemaking, I have developed an a priori set of codes (Appendix D). Coding reduces the data so that the data remain manageable, facilitating data clustering and laying a foundation for further analysis (Miles & Huberman, 1994). Through iterative review and ongoing discussion with my dissertation chair, I will refine the definitions of each a priori code. When a segment of text does not fit an existing code, I will ask, ‘What’s going on here?’ ‘What triggered this participant action?’ ‘What follows this participant action?’ ‘How might sensemaking explain what is happening?’ Through this open coding technique, I will further develop the codes. I will develop decision rules and definitions to guide the categorization of data, and record these in the electronic codebook (Crabtree & Miller, 1999; Miles & Huberman, 1994). To minimize the loss of meaning that may occur when reducing data, I will record all data
transition steps and retain original raw data, including meeting audio recordings, until the study is complete.

First, I will read the entire field note or document to get a sense of the whole and create an initial memo to capture my emerging impressions (Miles & Huberman, 1994). In a second reading, I will code units of text that described sensemaking events using my a priori codes. I will then create a second memo, summarizing initial ideas about the field note, documenting areas that need follow up (Miles & Huberman, 1994). Coded units will be sorted into categories and subcategories and analyzed for recurrent themes.

To address my research aims, I will use within-case and between-case analyses. To describe and compare sensemaking across multidisciplinary project teams, data will be analyzed for each case study sub-team so that I can gain a rich understanding of the sensemaking of each individual team (Eisenhardt, 1989). In the cross-case analysis, for this aim, I will organize each team’s sensemaking themes into three separate data matrices and compare across teams to establish similarities and differences among the teams. Because the three project teams’ members differ in professional and organizational identity, it is likely that the teams will differ in terms of the sense they make of new information and project events. To describe how the sensemaking of temporary multidisciplinary project teams changes over time, I will analyze themes in temporal sequence. Since sensemaking is shaped by experience, it is likely that sensemaking of the project teams’ members will shift following significant events. To
describe how multidisciplinary project team’s sensemaking influences the actions taken by the teams, I will organize the data matrices by the actions of each team in order to identify the antecedents and consequences of these actions. Finally, to identify which team member behaviors facilitate and or inhibit the sensemaking of a multidisciplinary project team, I will use open coding guided by the literature on project teams. Some examples of codes may include respect or openness to ideas. The coded data will be analyzed for themes that explain how team member behaviors either facilitate or inhibit team sensemaking.

2.2.6.2 Assuring rigor

I will use several established strategies to assure confirmability, dependability, and credibility (Crabtree & Miller, 1999; Miles & Huberman, 1994) in qualitative data collection and analysis. These are briefly described in Table 1. I will log all study material in a Microsoft Access database using a date/time/source stamp to facilitate access to these materials. This database will serve as the basis for an audit trail.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Strategies to assure criteria are met</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Confirmability:</strong></td>
<td>My dissertation chair and I (and later the research team) serve as the check and balance for uncovering assumptions and suggesting rival hypotheses.</td>
</tr>
<tr>
<td>unrecognized researcher biases are controlled</td>
<td>Member checks will be used to confirm findings.</td>
</tr>
<tr>
<td><strong>Dependability:</strong></td>
<td>Guides will be used for all data collection.</td>
</tr>
<tr>
<td>candidate performance remains consistent over time</td>
<td>I will meet bi-weekly with my chair to review data collection and refine techniques.</td>
</tr>
<tr>
<td></td>
<td>An electronic code book will be used to track all data transformations.</td>
</tr>
</tbody>
</table>
An audit trail will be established. Together with my chair, I will read and each code at least 50% of the field notes and compare coding. We will discuss and come to agreement about codes and interpretations.

| Credibility: results are plausible and authentic | Triangulation of data from multiple sources: direct observation (multiple healthcare disciplines and organizational hierarchical levels) and documents. Member checks will be used to confirm findings. |

### 2.3 Discussion

This study appears to be the first to prospectively examine a multidisciplinary HIT implementation project team and its sub-teams. Hospitals often form project teams to provide a formal mechanism for sharing different perspectives on events, in this case, an HIT implementation, and developing solutions to implementation issues. The project team in this study represents a huge organizational investment in that more than 100 people will be involved in the project. Rather than using traditional, mechanistic models for studying HIT implementation in hospitals, I propose an innovative perspective–sensemaking–that reveals embedded social processes that shape large scale organization change. Effective sensemaking facilitates team members’ understanding of what is happening, their learning, their problem solving, and, ultimately, the actions they take (or do not take) with regard to system implementation (Balogun & Johnson, 2005). Prior research linked these activities to successful HIT implementation in non-hospital settings (Balogun & Johnson, 2005; Jordan, et al., 2009; Stensaker & Falkenberg, 2007; Vogelsmeier, Halbesleben, & Scott-Cawiezell, 2008). This study will: identify HIT
implementation issues within the complex hospital environment and how team members deal with roadblocks and unexpected events; and describe the link between team member social interaction and implementation actions. These findings will lead to new methods of managing multidisciplinary project teams and implementing HIT in hospitals.

2.3.1 Strengths and Limitations

I recognize several limitations inherent in my design choices. My study will be conducted in a single, large-scale academic hospital, thus generalizability of my findings to other types of healthcare organizations may be limited. I will neither interview individual project team members about their project team experience nor will I observe their interactions with people outside of the teams. However, because the sense the project team makes of ongoing implementation events is dependent upon verbal exchange, I believe the choice to limit my observations to project team activities, such as meetings, will allow me to describe important discourse in sensemaking of HIT implementation. Finally, all project sub-teams will not be directly observed. However, I will note how my selected teams are keeping team members informed of other aspects of the overall project, and I will include documents from excluded sub-teams in my analysis.

Through my methodological choices, I aim to enrich the project team and hospital-based HIT implementation literature. Unlike many other studies, mine focuses
on the people responsible for HIT implementation and will capture the interpretations and actions of a diverse group of project team members. Rather than relying on participant perceptions of events and potentially unreliable, retrospective data collection methods, the prospective case study design captures:

1. Key antecedents and consequences of ongoing, evolutionary, social process of implementing HIT.

2. Key internal and external factors that influence project teams including team composition, team member interaction, and interaction between project teams and the larger organization.

3. Key ways in which internal and external factors actually influence project team processes.

4. Key ways in which project team processes facilitate team task accomplishment.

The resulting in-depth, rich description of HIT implementation will facilitate determining how sensemaking differs among project teams, how sensemaking develops over time, what information and events teams respond to, what meaning is constructed, and what actions result from that meaning. Thus, this study will make a significant contribution to advancing the understanding of how project teams function within the complex hospital care environment and bring about organizational change.
3. Facilitating Sensemaking: HIT Interaction, Identity, Attention and Summarizing

3.1 Background

Numerous research studies note that HIT implementation in hospitals often results in unintended and unexpected outcomes. (Brender, Ammenwerth, Nykänen, & Talmo, 2006) such as lack of equipment or equipment failure (Barber, et al., 2007; Georgiou, Ampt, Creswick, Westbrook, & Braithwaite, 2009; Lau, et al., 1998; Littlejohns, Wyatt, & Garvican, 2003; Stevenson, et al., 2005); conflicting organizational objectives (Aarts, Doorewaard, & Berg, 2004; Bar-Lev & Harrison, 2006; Littlejohns, et al., 2003); altered and fragmented clinical information representation (Aarts, et al., 2004; Barber, et al., 2007; Campbell, et al., 2006; Koppel, et al., 2005; Lapointe & Rivard, 2005); difficulty in system design to support care processes (Bar-Lev & Harrison, 2006; Barber, et al., 2007; Doolin, 2004; Koppel, et al., 2005; Lapointe & Rivard, 2005; Lau, et al., 1998; Littlejohns, et al., 2003); failure to identify and understand care processes (Ammenwerth, Mansmann, Iller, & Eichstädt, 2003; Barber, et al., 2007; Koppel, et al., 2005); and failure to anticipate HIT effects on the organization (Aarts, et al., 2004; Ash, et al., 2007; Georgiou, et al., 2009; Koppel, et al., 2005). Many findings suggest that uncertainty, ambiguity and “unknownness” are at the root of unexpected HIT implementation consequences. Unknownness is the sense that the future is incomprehensible and cannot be anticipated (Fleeman, 2002). For example, system designers and system users were unaware that oxygen was missing from a prescribing system until a month after it was
used in the clinical setting (Barber, et al., 2007). Further, using HIT systems in complex hospital environments often reveals hidden communication processes such as nurses’ use of sticky notes to remind physicians to reorder medications (Koppel, et al., 2005). This communication process was overlooked during HIT design and system designers did not become aware of this reminder process until users detected medication errors related to expired antibiotic treatments. Thus many aspects of how HIT impacts hospitals remain unknown until clinicians actually use these systems in practice and the consequences become observable.

Obviously hospitals and care providers alike prefer to discover these aspects of HIT prior to implementation in the hopes of improving system function and preventing patient harm. Thus researchers recommend including clinicians in HIT design and implementation processes as a method of discovering possible pitfalls (Barber, et al., 2007; Berwick, 2003; Brender, et al., 2006; Paré & Elam, 1998). During implementation, clinicians, defined as direct patient care providers, will need to not only learn how the HIT functions but also gain a sense of how the HIT might affect them and their work. Although studies indicated greater acceptance of HIT when clinicians are involved in the design and implementation process, the effect of participation remains largely unknown (Barber, et al., 2007; Paré & Elam, 1998). Further, HIT implementation literature lacks guidance regarding best methods of engaging clinicians in HIT implementation activities. Due to the complexity found in hospitals (i.e. varied
healthcare roles performing interdependent healthcare processes) and the fact that HIT research suggests healthcare staff do not interpret or react to HIT in the same way (Jensen & Aanestad, 2007), I suggest that clinician involvement must go beyond simple interviewing or surveying. Thus teamwork, a formal mechanism for gathering a cross-section of clinicians and facilitating knowledge discovery, may improve hospitals’ ability to design effective HIT and anticipate and prevent negative effects associated with implementation. Research suggests that team work is successful in facilitating change in hospitals (Edmondson, 2003b; Shortell, et al., 2004). Thus a major aim of this study was to examine clinician involvement in HIT implementation team work and identify strategies that promoted discovery of potential HIT implementation effects on clinicians and healthcare organizations.

3.1.1 Theoretical Framework

Sensemaking is the social process of identifying and interpreting information and events, developing meaning and, based upon subsequent understanding, taking action (Maitlis, 2005; Maitlis & Lawrence, 2007; Weick, et al., 2005). Studies of change in hospital settings note that sensemaking processes supported staff’s efforts to define what is happening, revise their understanding, learn, and problem solve (Apker, 2004; Balogun & Johnson, 2005; Currie & Brown, 2003). Facilitating sensemaking during HIT implementation, therefore, may improve hospitals’ discovery of divergent needs, tacit
Teamwork promotes sensemaking during HIT implementation in several ways. First, teamwork promotes communication through talking, conversation and argument. When teams are staffed with a cross-section of hospital staff members, their ongoing dialog reveals the diverse knowledge, experiences and interpretations held by each person. Dialog gives teams an opportunity to identify discrepancies between team members’ expectations of HIT function and implementation activities. Studies have found that facilitating these sensemaking processes leads to improved understanding and problem solving (T. E. Beck & Plowman, 2009; Edmondson, 2003b). Second, team members have permission to disengage from their day to day work and pay attention to implementation tasks and the HIT itself. Research studies note that clinicians may not notice HIT design flaws while involved in day to day care giving activities (Barber, et al., 2007; Lapointe & Rivard, 2005). Thus, creating a setting for sustained engagement with the HIT and implementation activities may improve hospitals ability to detect discrepancies between HIT function and actual care processes (Peute & Jaspers, 2007). Through ongoing engagement with HIT and each other, team members can test actions the team is about to take and evaluate the results of actions already taken in a sustained, ongoing manner (Edmondson, 2003a, 2003b). Thus teamwork is an opportunity for
discovery which may minimize negative HIT implementation consequences for both clinicians and patients.

During HIT design, managers and designers hope to identify what is missing, should be changed, or could be removed. They desire to identify disconnects and misalignments between the system and current care and communication processes. They seek to identify ways in which the system might improve care and communications processes. Thus, sensemaking processes, which are enhanced by team work, facilitate the opportunity to address these HIT implementation goals. Sensemaking is about individuals sharing what they know, it is about individuals’ interaction revealing hidden facets of care; and it is about individuals’ willingness to act and examine what they have done. I used to believe that the point of seeking clinician feedback about HIT was to identify what the HIT was missing and to ease users’ fears. This study suggests, however, that, in a team setting, clinician interaction with HIT animates the interaction between members in ways that reveal assumptions about HIT function, divergent clinical care process needs and even suggests organization wide issues.

3.2 Methods

3.2.1 Design

HIT implementation literature indicates that problems emerge as users work with HIT. Further, results from sensemaking research reveal its social, iterative nature (Balogun & Johnson, 2005; Gioia & Chittipeddi, 1991; Maitlis & Lawrence, 2007).
Combined, these literatures underscore a need for research methods that facilitate both sustained engagement with the research setting as well as data collection methods that capture social interaction. The results I present here are from a qualitative, longitudinal, multiple case study during which I prospectively observed three HIT teams during the 18 month preimplementation phase of an HIT project in a single hospital. The preimplementation phase was the span of time between the official launch of the project and the first day the HIT was used in a clinical setting. I believed multiple cases would give us the broadest view of sensemaking during HIT implementation (Adams, Blandford, & Attfield, 2005; Eisenhardt, 1989).

### 3.2.2 Setting

This study took place in a southeastern United States academic medical center. Southern Academic (alias) had extensive HIT experience, including in-house development of their hospital information system, psychiatry system, and internet-based laboratory results display. They also had purchased and implemented commercially available HIT systems for obstetrics, emergency medicine and physical therapy. In 2007, Southern Academic launched a nursing documentation system implementation project which replaced an existing system in its intensive care units (ICUs) and converted paper-based intermediate care units to electronic documentation. I received permission from hospital executives to conduct my study and subsequently obtained institutional review board approval.
3.2.3 Subjects

Southern Academic chose approximately 100 hospital staff members to join one of nine project sub-teams. Each sub-team had different project responsibilities and was staffed with members from different departments and with different professions and clinical responsibilities. Table 2 contains a brief description of each team’s goals, members’ professions and members’ departments. Thus Southern Academic offered an ideal setting in which to examine the ways in which clinician participation and team work facilitated sensemaking processes necessary to identify, understand and resolve potential negative consequences of HIT implementation.
Table 2: HIT Implementation Team Responsibilities and Membership

<table>
<thead>
<tr>
<th>Name</th>
<th>Responsibilities</th>
<th>Members’ Roles</th>
<th>Departments Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive (n=5)</td>
<td>• Provide strategic direction</td>
<td>Nurse (4)</td>
<td>Nursing (1)</td>
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<tr>
<td></td>
<td>• Secure project resources;</td>
<td>Physician (1)</td>
<td>Academic (1)</td>
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<tr>
<td></td>
<td>• Resolve organization-wide conflicts</td>
<td></td>
<td>Clinical Informatics (1)</td>
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<td></td>
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<td></td>
<td>Nursing Informatics (1)</td>
</tr>
<tr>
<td>Steering (n=32)</td>
<td>• Oversee implementation and design plans;</td>
<td>Administrative (5)</td>
<td>Accreditation (1)</td>
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<td></td>
<td></td>
<td>Ancillary services (5)</td>
<td>Adult Care (7)</td>
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<tr>
<td></td>
<td>• Resolves department level issues;</td>
<td>Nurse (18)</td>
<td>Clinical Informatics (1)</td>
</tr>
<tr>
<td></td>
<td>• Approve policies; procedures and communication strategies</td>
<td>Pharmacist (3)</td>
<td>Health Information Management (1)</td>
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<td></td>
<td></td>
<td>Physician (1)</td>
<td>Hospital Education (2)</td>
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<td></td>
<td>Nursing Informatics (1)</td>
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<td></td>
<td>Nursing Practice (1)</td>
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<td>Nutrition (1)</td>
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<td>Obstetric Care (1)</td>
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<td>Pastoral Care (1)</td>
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<td>Patient Resource Management (1)</td>
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<td>Pediatric Care (1)</td>
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<td>Performance Improvement (1)</td>
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<td>Pharmacy (2)</td>
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<td>Quality (1)</td>
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<td>Respiratory Care (1)</td>
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<td></td>
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<td>Risk Management (1)</td>
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<td></td>
<td></td>
<td></td>
<td>Social Work (1)</td>
</tr>
<tr>
<td>Implementation ((n=20))</td>
<td>Nurse ((19))</td>
<td>Cardiology ((1))</td>
<td></td>
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<td>-----------------------------</td>
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<td></td>
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<tr>
<td>• Identify work process issues</td>
<td>Technology ((1))</td>
<td>Medicine ((1))</td>
<td></td>
</tr>
<tr>
<td>• Propose work process changes;</td>
<td></td>
<td>Neurology ((2))</td>
<td></td>
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<tr>
<td>• review, recommend and approve</td>
<td></td>
<td>Nursing Practice ((1))</td>
<td></td>
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<tr>
<td>system design and configuration;</td>
<td></td>
<td>Nursing Informatics ((7))</td>
<td></td>
</tr>
<tr>
<td>• conduct user testing;</td>
<td></td>
<td>Oncology ((2))</td>
<td></td>
</tr>
<tr>
<td>• develop go-live plan; approve</td>
<td></td>
<td>Pediatrics ((3))</td>
<td></td>
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<tr>
<td>training and device selection plans</td>
<td></td>
<td>Surgery ((2))</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Technology ((1))</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication ((n=11))</th>
<th>Marketing ((1))</th>
<th>Cardiology ((1))</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop and implement</td>
<td>Nurse ((10))</td>
<td>Hospital Education ((1))</td>
</tr>
<tr>
<td>communication strategies, plan, and</td>
<td></td>
<td>Neurology ((1))</td>
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<tr>
<td>project policies and procedures</td>
<td></td>
<td>Nursing Informatics ((3))</td>
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<td></td>
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<td>Nursing Practice ((1))</td>
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<tr>
<td></td>
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<td>Pediatrics ((1))</td>
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<td></td>
<td></td>
<td>Public Relations ((1))</td>
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<tr>
<td></td>
<td></td>
<td>Surgery ((2))</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Training ((n=12))</th>
<th>Nurse ((12))</th>
<th>Cardiology ((1))</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop training plan, training</td>
<td></td>
<td>Hospital Education ((1))</td>
</tr>
<tr>
<td>content and user training aids</td>
<td></td>
<td>Medicine ((1))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neurology ((1))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nursing Informatics ((5))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nursing Practice ((1))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oncology ((1))</td>
</tr>
<tr>
<td>Activity</td>
<td>Participants</td>
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<td>--------------------------------</td>
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<tr>
<td><strong>Equipment Selection</strong></td>
<td>Engineer (1), Finance (2), Nurse (9), Technology (1)</td>
<td></td>
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<tr>
<td>$n=14$</td>
<td></td>
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<tr>
<td>• Conduct end user needs</td>
<td></td>
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<tr>
<td>assessment;</td>
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<td>• Recommend equipment purchase</td>
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<td>plan</td>
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<tr>
<td><strong>Psychiatric Design</strong></td>
<td>Administration (1), Nurse (6), Social work (1), Nursing Informatics (2), Nursing Practice (1), Psychiatry (4), Social Work (1)</td>
<td></td>
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<tr>
<td>$n=8$</td>
<td></td>
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<tr>
<td>• Develop HIT system content</td>
<td></td>
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<tr>
<td><strong>Neonatal Design</strong></td>
<td>Nurse (11), Neonatal (6), Nursing Informatics (2), Nursing Practice (1), Pediatrics (2)</td>
<td></td>
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<tr>
<td>$n=11$</td>
<td></td>
<td></td>
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<tr>
<td>• Develop HIT system content</td>
<td></td>
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<tr>
<td><strong>System Support</strong></td>
<td>Nurse (11), Nursing Informatics (9), Vendor (2)</td>
<td></td>
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<tr>
<td>$n=11$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Manage day to day project</td>
<td></td>
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<tr>
<td>tasks</td>
<td></td>
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</tr>
<tr>
<td>including system installation,</td>
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<td>vendor communication, sub‐team</td>
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<tr>
<td>activities, system configuration</td>
<td></td>
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<td>and testing, implementation</td>
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<td>tasks</td>
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</tbody>
</table>
Based on my understanding of sensemaking and of HIT implementation, I used a theoretical sampling strategy to guide selection of teams for direct observation. Theoretical sampling “collect[s] data from places, people, and events that will maximize opportunities to develop concepts in terms of their properties and dimensions, uncover variations, and identify relationships between concepts” (Corbin & Strauss, 2008, p. 143). Thus I chose teams whose goals had the broadest organizational impact and, therefore, relied on knowledge discovery. Further, teams had to enact strategies to understand and manage project challenges to be successful. I chose three teams with the broadest project responsibilities and greatest diversity among members: executive team (ET), communication team (CT), and implementation team (IT). I also recognized the need to remain informed about the project as a whole. I used two strategies to stay informed of the activities of the six teams not selected for direct observation. First, during meetings, team members received a presentation describing the work of all other sub-teams. I recorded these updates in my field notes. Next I collected documents (e.g., agendas, minutes and presentations) from the teams not selected for observation and included them in the analysis. Members of the three teams selected for direct observation received a brief informing them of the research study and were consented for use of their demographic data. Two team members declined to have their demographic data included.
3.2.3 Data Collection

Sensemaking data were collected through direct observation of scheduled team activities, such as meetings, retreats, and training sessions and through document analysis. To guide data collection, I developed a direct observation guide from a review of the sensemaking literature and refined the guide based upon analysis of the first several observations (Corbin & Strauss, 2008). The guide focused data collection on core elements of sensemaking including social interaction between members, information and knowledge sharing, interpretation, and action planning, execution and evaluation. The observation guide is described fully in a previous publication (Kitzmiller, Anderson, & McDaniel, 2010). During direct observation, I entered field notes and jottings directly into a laptop, recording what participants said as well as their nonverbal communication (e.g., sighing, laughing, groaning). I also audio recorded each team meeting and used these recordings to validate that the field notes accurately captured team member communication. However, these were not transcribed verbatim. Once finalized and formatted, field notes were imported into ATLAS.ti. Team meetings occurred once (ET and CT) or twice (IT) a month, and generally lasted between 60 to 90 minutes. Retreats and training sessions were longer, lasting 4 to 8 hours. I collected approximately 43 hours of observational data during 29 team activities.

Sensemaking data were also collected through documents produced by project teams. I collected 132 documents (e.g., agendas, minutes, presentations, and handouts)
in both electronic and paper form. Paper documents were converted to electronic format; all documents were imported into ATLAS.ti for coding. Documents served as an additional source of data about team sensemaking since these documents represent what the team chose to share with the larger organization. Further, documents served to corroborate and augment evidence from direct observation, or to contradict observational evidence (Currie & Brown, 2003). Participant demographics were collected at the time of consent.

### 3.2.4 Data Analysis

Because of my desire to understand how clinician participation shapes the sensemaking of HIT implementation teams, I began the analysis by first reviewing the literature on sensemaking during organizational change. From this literature I developed and defined a set of a priori codes based upon sensemaking processes such as paying attention (i.e., cues); sharing individual perspective (i.e., interpretation); developing understanding (i.e., interpreting); and team action (i.e., experimenting). I read each field note, coding them using the a priori codes. My dissertation chair read all of the data and independently coded more than 10% of the study documents. Further, during bi-weekly meetings, we jointly reviewed all of the coding. If we found disagreement between our coding, or we found segments of data that did not seem to fit the a priori codes, we discussed these findings and potential new codes and came to consensus. We added new codes when appropriate. In this manner, we reviewed 100%
of study documents. I entered all codes, definitions and decision rules into the
codebook, recorded all data transitions steps, and retained all original raw data (Corbin
& Strauss, 2008).

3.2.4.1 Categories and Themes

I extracted coded text segments into matrices to aid data analysis (Miles &
Huberman, 1994), examining them to determine major categories. To ensure I
understood the context and meaning of coded segments, I continually referred back to
the full field notes. I used the matrices to sort categories by different dimensions
including individual team, team member profession and team member department. I
then compared categories across teams, and various team member characteristics, to
identify similarities and differences. Finally, I sorted issue categories chronologically to
identify which themes were predominant at what time period and to evaluate why
certain themes moved into the foreground of the team’s attention. I frequently returned
to the full field notes to gain a greater understanding of how and why certain themes
were similar and different across the teams.

3.3 Results

I present the findings in four sections that describe the teams’ sensemaking
behaviors: (1) increasing participation; (2) organizational identity; (3) focused attention
and; (4) information and experience. Overall, I found that clinician team member
sensemaking differed when team members were working directly with the HIT
compared to when they were only discussing the HIT. First, clinician team members asked more questions, made more observations and offered more interpretations when interacting directly with the HIT. Second, clinician observations and interpretations of the HIT were more likely to reflect their direct care provider identity, providing greater information about the implications for the HIT for carrying out day to day care responsibilities. Third, I also found that two team member actions: focusing team attention and summarizing current state positively affected team sensemaking processes. Fourth, when clinician team members were looking at the same aspect of the HIT at the same time they engaged in a greater degree of social interaction, such as dialog, about specific care issues, which, in turn, promoted discovery of potential pitfalls of the HIT. Fifth, as teams iteratively explored complex HIT functions, a periodic summary of the team’s current understanding aided team updating, which resulted in greater understanding of the interdependency between the HIT and the care environment, incremental learning and problem solving.

### 3.3.1 Team Interaction with HIT

Because these findings all relate to how the team members interacted with the HIT during team activities, I will briefly describe how this interaction occurred. It is important to note that no single team interacted with the HIT during every meeting. All teams attended the initial 8 hour kick off meeting. During this meeting, a member of the vendor company demonstrated the HIT followed by a question and answer session.
Members of the ET and CT observed a single demonstration of the system, just prior to go-live. The IT, however, observed demonstrations of the HIT during approximately 50% of their meeting time. I also noted that team members interacted with the HIT in one of two ways. Primarily, team members observed an image of the system projected on a screen at the front of the conference room while a nurse informaticist demonstrated how to use the software. Just before implementing the HIT on the first clinical unit, IT members spent a day in the technology training room where each member had the opportunity to independently use the software for the first time.

### 3.3.2 Increasing Participation

When observing or directly using the HIT, clinician team members noticed and bracketed more often than when they were not interacting with the HIT. Noticing and bracketing entailed singling out what is different and drawing attention to it (Weick, 1995). In the case of clinicians’ observation of the HIT, they questioned HIT functions, gave examples of care responsibilities, voiced documentation needs, and offered interpretations twice as often as when they were not observing the HIT (Figure 1). Further, a larger number of individual clinician team members participated in team dialog about the HIT when interacting with it. This finding was consistent across all three teams, even though the ET and CT interaction with the HIT consisted of only a single meeting.
Figure 1: Clinician Noticing and Bracketing per Team Meeting (no HIT vs. HIT)

Thus more information about the hospital care environment became available for team members’ consideration.

3.3.3 Organizational Identity

Clinician team members raised different issues depending on whether or not they were interacting with the HIT. Direct care staff members’ questions and concerns shifted from implementation tasks, such as the project schedule and equipment planning, to examining HIT functions in relation to patient care responsibilities. The frequency with which categories of issues were raised is shown in Table 3, comparing themes for when the teams were or were not interacting with the HIT.

<table>
<thead>
<tr>
<th>Table 3: Direct Care Provider Themes: with and without HIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Interacting with HIT</td>
</tr>
<tr>
<td>Implementation processes and schedule</td>
</tr>
<tr>
<td>Computer equipment plans</td>
</tr>
</tbody>
</table>
Clinicians approached learning the software in terms of work responsibilities, seeking to answer the question, “How do I get my work done?” Often they did so by giving examples of care tasks they must complete.

Medicine Staff Nurse: How do we make notes to describe something in relation to collected data? Like the patient ambulated and the heart rate is elevated?

Surgical Staff Nurse: We often have more than one [tube] and [they are in] more than one location, for example by pluerovac. These are numbered and documented against.

Physician: Do we have standard processes for titration of different drugs and how you...record that [points to screen]? [For] titrating, the initial order remains the same, [initial rate & dose].

Responsibility for complying with standards of care, hospital care protocols and regulations also served as a frame of reference for identifying needed changes in the HIT system. In the following examples, team members noted what was missing in the current HIT design in regard to using restraints with patients.

Medical Staff Nurse: What about [adding] restraint alternatives?

Medical Staff Nurse: You need [restraint] location.
They also noted differences between types of care units, differences which would need to be designed into the HIT in order to meet the needs of the various patient care areas.

Surgical Staff Nurse: There is a difference between medical-surgical restraints and behavioral. The order form is separate, as is the plan of care and focused note but otherwise it is on the flowsheets in the adult setting.

At first glance, questions from team members simply appeared to be one method team members used to explore and learn how the new HIT functioned. However, through questioning, members also revealed their care actions (e.g. ambulating patients); their documentation responsibilities (e.g., restraints) and, ultimately, their expectations of the HIT.

**3.3.4 Focused Attention: Uncovering Tacit Knowledge**

When a diverse group of clinicians simultaneously focused on the same HIT content, multiple perspectives became available as each member shared their experiences and knowledge on the same subject. In the following example, IT members were invited to review the design of safety documentation. The HIT was projected on a screen at the front of the conference room, as a nurse informaticist operated the system. A nurse from the neonatal intensive care unit (NICU) was the first to raise questions and share her units’ safety practices.

NICU Nurse: do we have to document that the code sheet is by the bed? Pediatrics has a size appropriate code sheet pre-calculated for the child. This [documenting that the sheet is by the bedside] is part of the patient safety check list. This is our standard practice.
An adult ICU nurses noted that their patient care unit documented safety checks differently: “We have a generic sheet for the unit. You know, that the crash cart has been checked.” The nurse informaticist member demonstrating the system asked the pediatric nurse, “Is this [pediatric code sheet] different from having a crash cart in the room or on the unit?” By seeking clarification, the informatics team member stimulated a conversation about documenting safety checks. As can be seen in the following quotes, clinical members from different care units shared their practices.

Nurse Manager: On our step down unit we do not, on paper, no one documents equipment that is kept in the hallway. Now if we have equipment specific to the patient, like a tracheotomy tray...

Adult ICU Nurse 2: It [the existing HIT] has a box and we chart that equipment is available.

Adult ICU Nurse 3: Well Ambu bags aren’t on the charge nurse check list and now we have to do it and document patient rounds every hour!

Adult ICU Nurse 4: [Physiologic] monitors and monitor volumes are also documented. We met with a team on this safety issue.

Through conversation, different information became available for team members’ consideration. In turn, the team determined that they documented two types of checks: individual patient and clinical unit. The IT leader suggested that the current practice of documenting both kinds of safety checks in individual patient care records might serve as a reminder to nursing staff to complete these tasks, “A lot of this is considered safety; a way to reinforce [remind] ourselves.”
This observation was confirmed when another nurse stated that her unit routinely audited individual care records for compliance. The IT Leader then proposed that team members should return to their units and determine how safety checks were completed on their respective care units.

**IT leader:** Sounds like we have quite a difference between pediatric and adult units. Please check the medication administration record so that we have a better understanding of what is on that sheet for safety as well.

As I examined team member observation of various HIT content and the subsequent team interaction, a pattern emerged. First, members noticed and bracketed inconsistencies between HIT design and their current practices. Then members noticed and bracketed inconsistencies between each other’s care practices, often identifying larger, possibly problematic organizational issues. Thus when they interacted with the HIT as a group, sensemaking was very productive. In contrast, when members were given their own computer and encouraged to independently explore the HIT, team member interaction differed. Individuals noticed and bracketed inconsistencies between HIT design and their own practice. However, perhaps because team members were each looking at different content and screens, they did not raise multiple observations on the same topic, did not notice differences between care practices of individuals or engage in dialog about differences. This approach to having team members interact with the HIT did not, therefore, facilitate sensemaking. Thus, it appears that the combination of attention to the same topic and social interaction among diverse team members allowed
team members to identify variation in care and documentation practices that may have resulted in unexpected consequences for HIT users.

3.3.5 Information and Experience: Updating

Often the effects of HIT on clinical care processes are discovered after clinicians begin to use HIT in the day to day delivery of care (Barber, et al., 2007; Koppel, et al., 2005). I found that frequent, ongoing experiences with the HIT, combined with information from diverse team members promoted team updating. Updating is an iterative process, where in sensemakers revise existing beliefs as they encounter new information and experiences (Maitlis & Sonenshein, 2010; Molina, 2010; Rudolph, Morrison, & Carroll, 2009). In the IT, updating led to collective understanding of care practices, in depth appreciation of the potential impact of complex HIT function on the clinical user and influenced several team actions. The following example demonstrates how updating occurred and, based upon revised beliefs about a specific HIT function, describes what actions the team decided to take.

Over the course of three meetings and four months, the IT learned how the HIT feature “copy” worked, determined its probable impact on clinicians and clinical work, and developed a strategy for its ongoing use once the HIT was used within the care environment. First I describe the context.

The existing intensive care HIT flowsheet had a “default” function. This function automatically filled in, or populated, data from an existing column into a new column.
System users then reviewed the accuracy of the data and accepted (i.e. save) or changed the data as appropriate. Nurse leaders noted that there were risks associated with “defaults” current use.

CT Nurse Manager: [One] problem with the new people is that they are constantly accepting defaults. They verbalize that the pedal pulses are not good, but when I go to their note they are documenting 2+ because that’s what the nurse before them did.

ET Nurse Director: we hear about it all the time from preceptors. Newer nurses believe that the nurse before [her] is more experienced so they trust what she says, instead of doing the full assessment themselves.

Thus, the “default” function in the existing HIT appeared to promote inaccurate documentation among inexperienced, new staff nurses. However, based upon dialog among IT members, staff nurses clearly expected that the new HIT would have similar “default” functionality.

Surgical ICU Nurse1: These [Foley care & pin care] are tasks versus just assessments. It will default, right?

Medical ICU Nurse 1: For this part [of our assessment], why can’t we just go to the cardiovascular part [of the flowsheet] and have it default that piece?

Because the “default” function worked differently in the new HIT, a nurse informaticist demonstrated it for the IT. Together the team learned that system users actually copy and paste data from one column to another. Further, users could copy just their own data or another users’ data. Most importantly, the informatics nurse operating the HIT directed IT members’ attention to a new risk introduced by the copy function.
Informatics nurse 1: So, I pick up the patient at 10 and want to carry forward all the charting from 9 am. I right click, chose copy, and it will populate the next time spot, here. I can save it all or I can change things and store it. However, even though I’m here in the vital signs section, I actually am copying everything that was charted [on this tab] at 9 AM [scrolls down to reveal more charting that was copied]. [A general groan comes from the team.]

As team members observe how “copy” works, they verbalized their interpretation of the new risk:

Nurs56S: so…whether you see it or not.

Informatics nurse 1: whether you see it or not. [Again, an audible groan came from various members of the team]

Nurs56S: frightening.

Informatics nurse 1: hmmm, well… that’s kind of painful because you’re likely to store [save] stuff you didn’t see, or you have to go look.

As IT members spent time exploring the HIT further, entering and copying data from one time point to another, several nurses echoed the same concerns raised by nurse managers in the CT and ET.

Nurse educator: There are people that do accept “defaults” and don’t read what they are accepting.

Adult Step-down Nurse: but the person before you did it [made an error], and the person before them did it. I mean you can have someone [repeating] that for the next 5 days!

Nurse IT trainer: I’m worried about the accuracy …like today, it’s the left elbow and the next person charts the left arm.
However, three benefits to staff nurses emerged from ongoing dialog. First, nurses explained that the ‘copy’ function saves them documentation time.

Pediatric ICU Nurse: if you have 8 IV’s and chest tubes that you would have to start from scratch every single time. This is huge.

Surgical ICU Nurse 2: Agree, if you have 8 lines and 4 drains, you don’t want to have to rechart each one.

Pediatric ICU Nurse: it is much easier

Surgical ICU Nurse 2: and much faster

Second, the “copy” function facilitated nurse team work. In this example, the team gained a greater understanding of how nurses share care and documentation responsibilities.

Surgical ICU Nurse 1: its 1:30 in the afternoon. I get a patient back from the OR that’s bleeding and I’m taking care of them for the first hour. And then my other nurse helps me and charts the first assessment as I holler out what I want in there. So at 4 o’clock, I’m caught up and want to enter my second assessment, then [I need that nurses’ notes to copy over].

The current “default” function supported nurses’ collective work. Finally, some nurses suggested that the copy function more acutely directed their attention to previous documentation than if the column were empty because the nurse must review each piece of data before saving it.

Neonatal ICU Nurse: That’s what’s nice about seeing the previous one. It also allows me to compare our assessment with the previous, while we are documenting. The patient has rales [severe pulmonary congestion] up to his nose and the previous assessment says clear and you’re like, what happened? It’s a flag, if you will.

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Surgical Step-down Nurse: It’s helpful because if you have someone with a huge wound and no one has documented it and now it’s a crater, there’s something that is missed.

From this stream of interpretations, the nurse informaticist summarized the teams’ updated interpretation of “copy” function. “so this is a huge time saver and you want to keep it…I hear the groans about ‘oh my gosh’ but [you] don’t [want to] discard this yet.”

To keep the copy feature but eliminate the safety issues, members launched into problem solving. Together they experimented with the HIT and identified two ways to lessen the risk of documentation errors. In the first option, the team would control which data elements could be copied. The second was to use the summary screen as a way to detect data that may have been mistakenly copied. When a user saves data, the system always presents a summary, or preview screen, prompting the user to review data prior to permanently saving it. As the meeting draws to a close, the team leader summarized what the team learned.

Team Leader: so what I’m hearing is that it is beneficial you can copy forward anybody’s work. [many members nod their head in agreement]. What I’m also hearing, is that we need decisions on what we think, what would be helpful to copy and what you should not copy…. from a clinical point of view. I think the other things is…technology doesn’t fix behaviors. That becomes then, everyone will be able to copy forward what we agree upon. Then we have to talk about the accountability and responsibility of doing that. And the expectations that when you copy forward you do read this information, that whatever you accept, you have read. We will have to put policy around that.

Then the nurse informaticist outlines the team’s next steps.
Nurse Informaticist 1: so, to sum up, we need to look closely at which rows we are going to restrict. Let’s come back with what we think we ought to do and get your reaction.

Thus I found a pattern of updating emerge within the IT. Over the course of the project, the team’s interpretation of both HIT functionality and care processes changed. Repeated and sustained interaction with the HIT, new information from team members, and frequent summaries of what was learned, combined to facilitate team sensemaking over time.

### 3.4 Discussion

HIT implementation is known to alter hospital care practices in unexpected ways. Thus, including clinicians in HIT implementation projects may improve hospital staff’s ability to identify, mitigate and avoid potentially disruptive, negative effects of HIT implementation. In this study, I used a sensemaking lens to examine clinician participation in an HIT implementation project in the hope of discovering better methods of engaging clinicians in implementation activities. Clinician sensemaking, that is, turning experiences, observations and interpretations into words to create shared meaning (Blatt, et al., 2006), is crucial to identifying expectations of HIT and anticipating the possible impact of HIT related change on clinical work. I found several factors animated, or fostered clinician sensemaking: interaction with HIT; diverse team membership; focusing team member attention; and summarizing what is known. Through sensemaking processes, clinicians revealed work practices and expectations of
HIT, identified possible HIT design pitfalls, and updated existing understanding and beliefs about both HIT functionality and day to day care practices. Longitudinal examination of HIT team activities allowed me to identify patterns of HIT engagement, team updating, and learning; patterns that would have gone undetected if I had used a cross sectional study design.

Prior research indicates that decision makers develop a better understanding of organizational issues when a variety of information, interpretations, impressions and perceptions are available and from this understanding, they make better decisions (Edmondson, et al., 2001; Eisenhardt, Kahwajy, & Bourgeois, 1997). Similarly, my research suggests that strategies that encourage clinicians to notice and bracket may be potentially important to HIT projects because these sensemaking processes provide access to a greater amount of information about the care environment. I found that clinician team members were more likely to speak up and did so more often when they were interacting with the HIT then when they were not. Further, HIT interaction allowed clinician team members to focus on how the new HIT would impact their day to day activities and could identify discrepancies between their care responsibilities and HIT design. Through bracketing, these members not only shared their observations and interpretations about HIT, they revealed valuable information about individual care practices. In this manner, clinician members provided information and interpretations for team sensemaking. Thus the team accumulated shared knowledge about the day to
day work carried out by direct care providers, and perhaps, came to know the hospital better. Access to information, observations and interpretations has been associated with improved team performance in health care and other organizations (Ancona & Caldwell, 1992; Choo & Johnston, 2004; Edmondson, 2003b; Edmondson, et al., 2001; Haas, 2006). Thus, HIT implementation teams should consider interacting with HIT frequently as this activity improves information exchange among HIT team members.

In this study, team members varied by organizational profession (e.g., nurse, physician, technologist), by organizational role (e.g., care provider, administrator) and by management level (e.g., staff, manager, executive). I found that when team members observed the same HIT content at the same time, their observations and perceptions of the HIT differed. Thus, multiple perceptions of the same event became available for team analysis. Further, clinicians noticed inconsistencies among care and work practices. Once team members were aware of inconsistencies, they often engaged in lengthy dialog about the care practice and identified larger organizational issues, such as variation in nurse safety practices. However, noticing discrepancies between team members only occurred when all members were focused on the same HIT content. When team members independently used the HIT, they rarely noticed the observations and interpretations provided by other team members. This led me to propose that guiding team member attention improves access to a variety of information and interpretations and may serve as a mechanism for understanding the varied HIT needs of clinicians and
coming to know the hospital care environment better. Similar to other studies examining sensemaking during organizational change, I found interpretation differs by organizational identity (e.g., nurse, physician, staff, manager) (Albolino, et al., 2007; Apker, 2004; Currie & Brown, 2003). This finding underscores the importance of including a variety of organization members in HIT implementation activities; a wider array of information becomes available to the team, which in turn, may improve team and organizational outcomes during HIT implementation.

Not only did members of my study teams contribute to the design of the HIT, their dialog about care practices suggested that larger organizational issues might be impacted by HIT implementation. I found that teams engaged in a pattern of updating when tackling particularly complex problems and that the pattern of collecting information, interpreting, sharing meaning and taking action spanned several months. My data indicated that team members updated their interpretation of both HIT function and care practices, which may result in necessary changes in both organization practices and improved HIT implementation outcomes. This finding supports prior research suggesting that ignoring the interrelationship between technology, people and the hospital may be one source of negative HIT implementation outcomes (Ash, et al., 2006; Edmondson, et al., 2001; Koppel, et al., 2005). Therefore, it is not enough to simply consider the design of the HIT as the only variable impacting HIT implementation success.
Maitlis and Sorensen (2010) suggest that not all team members will come to the same revised interpretations during sensemaking, threatening the teams’ ability to develop shared understanding and take collective action with regard to HIT design and organizational change. I found that the IT leader and nurse informaticists periodically summarized what the team had learned during ongoing dialog about a particular issue. They used phrases such as, “what I hear you say” and “here’s what we learned today” drawing the team’s attention to salient information. They then proposed and sought consensus on a set of actions the team would undertake. Thus it appears that the simple act of summarizing current understanding may facilitate team updating on a wide range of issues relevant to HIT implementation. Therefore, I suggest that incorporating summarizing as a formal team process may improve the teams’ ability to grasp new information, update beliefs about the organization, and determine appropriate actions to take next.

3.4.1 Implications for Practice

As indicated in the introduction, there are no best practices, or recipes, for successfully implementing HIT in hospitals. However, my results suggest a set of straight forward strategies which hospital-based implementation teams should consider when involving clinicians in HIT implementation activities.

1. *Staff HIT teams with members from different care roles (i.e., nurse, physician, pharmacist); different management levels (i.e., staff, manager, executive); and different departments (i.e.,*
patient care units, technology, administrative, medicine). This action will facilitate access to varying interpretations of and information about the hospital care environment and the HIT. My study, however, extends knowledge in this area to suggest that members be included who have dual identities such as nurses, physicians and pharmacists who work in technology roles.

2. Provide clinicians with frequent opportunities to interact with the HIT. HIT interaction actively engages team members in sensemaking about HIT design and current care practices. Through questioning, observing, and interpreting, clinicians will share valuable information about their direct care responsibilities and practices.

3. Guide team members through HIT content. This action causes all members to think about care processes in terms of the same set of information. Not only will members' social interaction increase, multiple interpretations and needs will emerge as members discuss their concerns. Team members will notice variations and identify potential barriers to successful HIT implementation.

4. Iteratively examine complicated HIT functions. Teams need time to understand how complicated HIT functions work and how those functions will impact the care environment. Thus repeated engagement provides more information to the team, allows members to learn and, therefore, determine which strategies they will use to problem solving.
5. *Routinely summarize teams’ current understanding of HIT implementation issues.* A summary of current issues allows team members to compare their perceptions with the team’s perceptions. Further, the summary will serve as catalyst for determining which actions should be taken.

### 3.4.2 Implications for Future Research

I identified two strategies, diverse team membership and focused team member attention, which have the potential for improving the productivity of sensemaking processes during HIT implementation. Thus I recommend conducting controlled comparison trials to examine the effectiveness of these strategies as a next step in sensemaking research. Methods used by Marks, Zaccaro and Matheiu (2000), who successfully used control trials to test the effects of leader briefings and team interaction on knowledge structures among undergraduate students, might be considered. Further, methods such as surveying, interviewing and direct observation are commonly used to determine clinician work process needs in HIT implementation yet little is known about the types of information collected and its subsequent importance to implementation activities. As a next step in developing methods of working with clinicians during HIT implementation, research studies might compare across established data collection methods (i.e., surveying, interviewing, observation and team work) to determine the types of data each method captures and their value to HIT implementation.
3.4.3 Strengths and Limitations

This study is among the first to suggest that team work is an optimal method of gathering diverse observations and interpretations of HIT implementation. My choice of methods where intended to avoid known limitations in the HIT, team work and sensemaking literatures. These limitations include: anecdotal case report; cross sectional design; retrospective self-report data; and settings and samples which examine only single subjects and single work units. While this study was designed to maximize participant diversity, in the end my teams were dominated by nurses and were, therefore professionally homogenous. Future research investigating the role of diversity in healthcare teams should consider team composition which includes, for example physicians, physical and respiratory therapists, and social workers in addition to diverse organizational roles and management levels. Findings for this line of research may extend current understanding of divergent perspectives on HIT in care environments. Finally, this study examined a single system implementation, nursing documentation, in a hospital setting. A next step in examining clinician participation in HIT implementation team work should consider investigations in different care environments, such as ambulatory settings.

3.4.4 Conclusion

As the primary user of HIT systems, clinicians’ day to day work processes are especially vulnerable to disruptions associated with HIT implementation (Aarts, et al.,
2004; Barber, et al., 2007; Campbell, et al., 2006; Koppel, et al., 2005; Lapointe & Rivard, 2005). I examined clinician participation in HIT implementation teams and found that the effect of engaging clinicians in HIT implementation activities went beyond simply improving user acceptance, as some studies propose (Ammenwerth, et al., 2003; Brender, et al., 2006). Clinician interaction with HIT and with each other resulted in identification of needed HIT design changes. This study suggests that in a team setting, clinician interaction with HIT animates the interaction between members in ways which reveal assumptions about HIT function, divergent clinical care process needs and even suggests organization wide issues. Further, I found that a diverse group of team members revealed a variety of perceptions about both HIT functionality and daily work process which, in turn, had greater implications for the organization. Team members noticed differences in the conduct of work and through dialog about differences were able to identify and develop understanding for variations in care practices and determine if and what should be done about them. Thus, my findings: interaction with HIT; diverse team membership; focusing team member attention; and summarizing what is known fostered clinician sensemaking in ways which improved shared understanding of the larger care environment. Thus, strategies, such as populating teams with a variety of clinicians; frequent, guided interaction with HIT; sustained engagement with complex issues; and routine summarizing may improve HIT implementation outcomes.
4. Team Leader Behavior and Team Sensemaking in HIT Implementation

4.1 Background

Implementing health information technology (HIT) in hospital settings often results in negative, unanticipated disruption to healthcare providers’ interdependent work processes (Campbell, et al., 2006; Edmondson, et al., 2001; Kaushal, et al., 2003; Koppel, et al., 2005). Research shows that when intentionally implementing a new technology, such as computerized provider order entry, hospitals experienced unintended consequences such as reallocated work (Edmondson, et al., 2001); interrupted work processes (Koppel, et al., 2005); altered information exchange, communication patterns and interpersonal relationships (Beuscart-Zephir, et al., 2005; Campbell, et al., 2006; Edmondson, et al., 2001; Koppel, et al., 2005); and, in some cases, patient harm (Kaushal, et al., 2003; Koppel, et al., 2005). These unexpected disruptions may slow HIT implementation as staff members observe and make sense of emerging situations.

Researchers suggest that staff participation in HIT implementation processes is critical to success (Georgiou, et al., 2009; Kitzmiller, et al., 2010; Puffer et al., 2007). The sense healthcare staff makes of HIT implementation may provide insights necessary for multiple interpretations and meanings of change as HIT implementation events unfold. Thus, hospitals increasingly rely on multidisciplinary team work as a method of accessing knowledge, identifying possible disruptions in care, and planning strategies to
mitigate negative consequences associated with change (Edmondson, 2003b; Lemieux-Charles & McGuire, 2006; Tucker, Nembhard, & Edmondson, 2007). Prior research links teamwork to successful change perhaps because the social interaction between team members facilitates sensemaking, collaboration, coordination, and task accomplishment (Devine, et al., 1999; Edmondson, et al., 2001; Maitlis & Sonenshein, 2010; McGlynn et al., 2003).

While there has been a longstanding belief that including front line staff in HIT implementation projects would bring forth important issues and barriers, prior research suggests that simply forming teams to accomplish change is not enough to guarantee that members will participate (Edmondson, et al., 2001; Nembhard & Edmondson, 2006; Pinto, et al., 1993; Tucker, et al., 2007). I now suspect, therefore, that the relationship between team members and the quality of social interaction is crucial to facilitating team sensemaking. Unfortunately, there are few best practices or known guidelines for staff involvement in HIT implementation teams (Kitzmiller, et al., 2010; Yoon-Flannery et al., 2008). Thus, the purpose of this longitudinal case study was to examine how interpersonal behavior and social interaction influence team sensemaking and subsequent team actions during a hospital-based HIT implementation project. The findings of this study suggest that team members are highly susceptible to the leader’s actions and reactions. In spite of a leader’s best efforts, subtle interpersonal behavior can undermine efforts to inspire HIT implementation team members to voice issues. The
purpose of this paper is to describe both facilitating and blocking behaviors of team leaders and their impact on the teams’ ability to develop a shared understanding of specific project issues and take constructive action.

4.1.1 Theoretical Framework

Sensemaking is the process through which HIT team members share their experiences of change, develop a shared understanding of the effects of change on the organization, and determine which actions to take (Weick, 2005). In this context, sensemaking is defined as the process of turning “a flow of organizational experiences into words and salient categories that they can comprehend and then use...as a springboard for action,” (Blatt, et al., 2006, p. 898). Sensemaking is influenced by individual identity and experience, as well as the quality of social interaction between team members (Weick, 1995). Within hospitals, it is impossible to know the entire system, control the system or anticipate all the ways in which the system will respond to HIT implementation (Cilliers, 1998; McDaniel & Driebe, 2001). Thus, forming a multidisciplinary HIT project team facilitates sensemaking by bringing different viewpoints and different expertise together to discover what is known about a problem or task and to determine what must be accomplished to complete tasks (Weick & Quinn, 1999). Willingness to voice concerns and discuss HIT project issues, however, is essential to effective sensemaking.
Research findings in hospital settings linked dialog between healthcare team members to improved understanding and problem solving (Albolino, et al., 2007). For example, among operating room teams implementing new care practices, participation promoted access to team members’ unique knowledge and interpretation of events, ultimately influencing team interpretation and effective action (Edmondson, et al., 2001; Tucker, et al., 2007). For effective HIT implementation, hospitals will need to understand and know the meaning of interdependent work processes and critical organizational expectations and responses to determine what actions to take. Therefore, dialog between team members is essential to better understand team tasks and to create solutions that address emerging issues. Since sensemaking is shaped by discourse between team members, the degree to which team members participate in dialogue about unfolding implementation events directly impacts the sense the team makes.

Forming a team of diverse organizational members, however, does not guarantee that members’ unique knowledge and ideas are accessible. Research shows that even when encouraged to share their unique perspectives, people quickly move to common ground, consciously or unconsciously restricting access to the different, perhaps conflicting, knowledge they hold (De Dreu & Weingart, 2003). Gigone & Hastie (1993) and others found that rather than share unique knowledge, team members tended to focus on information that was held in-common, perhaps to avoid anticipated conflict (Grisoni & Beeby, 2007; Winquist & Larson, 1998). Further, studies noted that diverse
perspectives created conflict, a team process sometimes linked to negative experience and poor team performance (De Dreu & Weingart, 2003; Liang, Liu, Lin, & Lin, 2007; Wilkens & London, 2006). When team members fear ridicule for speaking up or rejection for making errors, they may withhold information (Baer & Frese, 2003; Mu & Gnyawali, 2003; Nembhard & Edmondson, 2006; Tucker, et al., 2007; Wilkens & London, 2006). Among hospital teams, those that managed conflict and created an environment conducive to open dialog experienced greater goal attainment than teams where members felt threatened (Irvine Doran, et al., 2002; Lemieux-Charles et al., 2002; Nembhard & Edmondson, 2006; Pinto, et al., 1993). These findings suggest team members’ willingness to share their unique perspective on HIT project events is contingent upon their perception that the team is a safe place to raise potentially conflicting ideas.

4.2 Methods

To observe the ongoing, evolutionary, social process of team sensemaking during HIT implementation I used a prospective, qualitative, longitudinal case study design (Anderson, Crabtree, Steele, & McDaniel, 2005; Crabtree & Miller, 1999; March, Sproull, & Tamuz, 1991; Siggelkow, 2007). I directly observed interactions between team members over the first 18 months of a HIT implementation project and thus, prospectively gathered several different perspectives, interpretations and actions on the same events.
4.2.1 Setting

Southern Academic Hospital (alias) is a large academic medical center with over 1000 beds and 1,400 registered nurses. In 2007, the hospital began implementing an electronic nursing documentation system, forming a large project team of about 100 people, dividing them into nine (9) sub-teams, each tasked with different project responsibilities. The goal of developing a rich description of the concepts of interest guided my selection of sub-teams. After assessing team membership and responsibilities, I chose teams that offered the greatest variation in member identity and team responsibilities; three of the nine teams, executive team (ET), communication team (CT), and implementation team (IT), fit the criteria and were included in direct observation. The other six teams not selected for direct observation had homogenous membership (i.e., all pediatric nurses) or a narrow scope of responsibilities (i.e., computer equipment selection). I documented all nine project team activities by reviewing project documents, such as meeting minutes and briefings produced by all nine teams.

4.2.2 Subjects

The Executive team (ET) had four major responsibilities: resourcing the HIT implementation project, ensuring alignment with strategic goals and integration with other hospital projects and resolving operational constraints. The five members of this team represented the top three management levels of the hospital (chief, associate chief,
and director), two professions (medicine and nursing), and several departments (nursing, medicine, information technology and academic). The communications team (CT) consisted of 11 members from different clinical backgrounds, management levels, and departments and had a role in managing communication about the project, a task particularly relevant to sensemaking (Kitzmiller, et al., 2010). Tasked with developing a communication plan, the CT was, essentially, expected to influence hospital staff’s perceptions with regard to this HIT implementation. The implementation team (IT) was responsible for identifying clinical work process issues, reviewing and approving the design of the HIT, participating in user testing, and approving computer device, training, and go live support plans. The majority of team members were intensive and intermediate care nurses from all of the clinical care units (i.e. oncology, medical, surgical, cardiac, and pediatric). They represent three hierarchical levels of the organization: staff, manager, and director. In all, study participants (n=36) were primarily white, female, staff nurses (Table 4). All were personally invited to participate in the study and signed informed consents.
<table>
<thead>
<tr>
<th>Team</th>
<th>Level (%)</th>
<th>Profession (%)</th>
<th>Department (%)</th>
<th>Gender (%)</th>
<th>Race (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>executive</td>
<td>Chief (20) Nurse (80) Academic (20) Women (80) White (100)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>n=5</td>
<td>Assoc-Chief (40) Physician (20) Nursing (20) Men (20)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Director (40) Tech. (60)</td>
<td></td>
<td></td>
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<tr>
<td>communication</td>
<td>Assoc-Chief (18) Nurse (91) Hospital Ed (9) Women (73) White (91)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>n=11</td>
<td>Director (18) Marketing (9) Nursing (55) Men (18) Unknown (9)</td>
<td></td>
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<tr>
<td></td>
<td>Manager (18) Public Rel’t (9) Unknown (9)</td>
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<tr>
<td></td>
<td>Staff (45) Tech. (27)</td>
<td></td>
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<tr>
<td>implementation</td>
<td>Director (10) Nurse (95) Nursing (5) Women (65) White (90)</td>
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<tr>
<td>n=20</td>
<td>Manager (15) Tech. (5) Nursing: Cardiology (5) Men (30) Latino (5)</td>
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<tr>
<td></td>
<td>Staff (75) Nursing: Medicine (5) Unknown (5) Unknown (5)</td>
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<tr>
<td></td>
<td>Nursing: Neuro (10)</td>
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<td></td>
<td>Nursing: Oncology (10)</td>
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<td>Nursing: Peds (15)</td>
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<td></td>
<td>Nursing: Surgery (10)</td>
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<tr>
<td></td>
<td>Technology (40)</td>
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4.2.3 Data Sources

After obtaining chief nurse executive and Institutional Review Board approval, I attended regularly scheduled team meetings. Using an observation guide, I directly observed team members and, in field notes and jottings, recording the length of meetings, who was present, the form of the discussion (e.g., one-way, two-way, multidirectional, briefing, training), what information participants shared (e.g., past experience, information from others, hypothetical scenarios), described “new ideas,” interpretations, conclusions, decisions, or proposed actions to be taken and by whom, and described how participants interacted with each other (e.g., heated debate, developing storytelling, silence, avoiding eye contact, respectful). Field notes and jottings were entered directly into a lap top during each meeting, and then were formatted and imported into ATLAS.ti. Meetings were generally 60 to 90 minutes in length. I also collected organizational documents, such as agendas, minutes, presentations, and organization publications. These were also formatted and imported into ATLAS.ti. During the 18 month study, these data consisted of over 43 hours of direct observation of team meetings and more than 130 organizational documents.

4.2.4 Analytic Approach

Analysis occurred concurrent to data collection. Together with my dissertation chair, I derived codes and initial definitions (Table 5) using the literature on
sensemaking and interpersonal interaction (Kitzmiller, et al., 2010). I coded data to identify and describe the social processes of sensemaking using procedures recommended by Crabtree and Miller (1999). As my understanding of the data developed, additional areas for exploration emerged. I refined the direct observational guide based on identified gaps, and areas needing clarification, verification, or confirmation in subsequent meetings (Corbin & Strauss, 2008; Fetterman, 1998). I recorded data transition steps and retained original material to avoid the risk of meaning loss associated with coding. In this manner I continually refined the codes and definitions, and recorded decision rules in the codebook to guide categorization of data. These strategies ensured rigor (C. T. Beck, 1993; Miles & Huberman, 1994)

Table 5: Codes and Definitions

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Code Name</th>
<th>Code Definition</th>
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</thead>
<tbody>
<tr>
<td>Social Interaction</td>
<td><em>Iterative dialog</em></td>
<td>• back and forth dialog about ideas, developing impressions, active reflecting, adding cues to build a story or throwing out ideas for problem solving</td>
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<tr>
<td></td>
<td><em>Clarifying</em></td>
<td>• follow on question seeking more details or a restatement to confirm that the hearer has the correct meaning.</td>
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<tr>
<td></td>
<td><em>Declaring</em></td>
<td>• making controversial statements to invite discussion. For example, “You mean we bought this system and now we don’t think it will improve patient care?”</td>
</tr>
<tr>
<td></td>
<td><em>Probing</em></td>
<td>• asking for more information or further explanation. (9/8/09) questions are cues when</td>
</tr>
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</table>
they hint or direct attention to needed functionality or possible problems.

Reflecting
- through dialog, examining the outcomes of action and or experimentation, and suggesting meaning for the individual or for the team.

Validating
- checking in, confirming understanding (restating/summarizing) or that knowledge is represented correctly

<table>
<thead>
<tr>
<th>Behaviors/Relationships</th>
<th>Group process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inviting feedback; seeking clarification; confirming understanding; promoting voice; promoting information sharing; summarizing plans, actions, next steps;</td>
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</table>

<table>
<thead>
<tr>
<th>Respectful interaction</th>
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<tbody>
<tr>
<td>demonstrating regard and valuing input of other team members</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Disrespectful interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>demeaning or denigrating contributions of other team members</td>
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</tbody>
</table>

I analyzed the data using the following steps. First, I read each field note and created a memo denoting initial impressions (Corbin & Strauss, 2008). Using the developed codes, I coded all of the text and my dissertation chair also coded at least 10 percent of the text. In addition, we reviewed 100% of the coding together and discussed the codes and memos; codes and memos were revised when we had disagreements or saw areas for refinement. After a second reading, I wrote a second memo documenting emerging themes and questions for follow up; again, this was read and discuss with my dissertation chair. To facilitate analysis, coded text were then extracted into matrices (Miles & Huberman, 1994). For example, I extracted all the data coded as “group process,” placing them in a matrix. Once I identified general themes, I sorted the data by
participant identity, and reevaluated for emerging themes. The themes were read along with associated text and then discussed with my dissertation chair. Again, revisions and refinements were made to the themes after discussion. At each step, the data were revisited to ensure that new codes or themes were applied to data that had been previously analyzed.

4.3 Results

I examined both team leader and team member interpersonal behavior and found that team leader, not team member, behaviors most affected voice and dialog among the teams. Leaders created a psychologically safe environment and encouraged members to voice experiences and observations. Through questioning, team leaders also stimulated and sustained conversations about project issues. Conversely, subtle cues from the leader, such as anger, shut down team discussion despite leaders’ continuous efforts to encourage voice. These negative behaviors took two forms. First, leader expressions of frustration interrupted dialog between members and, when left unchecked, prevented teams from developing an understanding of controversial project challenges. Second, when team leaders appeared to avoid controversial topics, team members were unlikely to engage in sensemaking processes. I organized and present these findings in four themes: (1) motivating voice; (2) stimulating and sustaining conversation; (3) disrupting dialog and; (4) inaction.
4.3.1 Motivating Voice

Three team leader actions appeared to motivate team members to give voice to issues. These were (1) connecting project goals to nurses’ goals, (2) emphasizing the importance of nurses’ involvement in the project and (3) setting expectations for participation.

4.3.1.1 Connecting goals

During the initial kick-off meeting, a project executive spoke of project goals in terms important to nurses.

We want to design the best way to deliver care..., place the best evidence in this system. ...it relates to how we use information and what we need in order to provide the ... safe and effective patient care. It supports the nursing strategic plan by addressing the work environment.... It will help us build the best environment to manage the intensity of work, practice safely, across the health system. (Project Executive)

I found that the stated goals of safe, effective care; managing intensity of work; and using best practices were reiterated by the team leaders of both the CT and the IT. Further, some team members adopted these HIT system goals as their own, in particular, the goal of interdisciplinary coordination. In the following quotes members discussed the need to name the new system in a way that was inclusive of the full care team:

We need to rename the project because this isn’t just nursing...Aren’t we ushering in the future of patient documentation? (CT Member)
Total care record [as a new name for the HIT system]...it brands what is coming. (CT member)

4.3.1.2 Importance of involvement

Team leaders stressed the need for expert clinical knowledge. The emphasis on nursing participation was present at each team’s inception and throughout the 18 months of observation as noted here. For example, the Project Executive says “You are on a journey to help us design a method of collaboration and communication... to design the best way to deliver care in the organization? Team leaders stressed the value of involving nurses who were not members of the HIT implementation teams. For example, the CT Leaders stated, “It really does need to be something more than just our teams making this system work. We need more input.” The IT Leader noted “Notice through this entire process, it’s the input of nurses... We had about 55 people at the cart fair and brought us the best issues, thoughts, and potential work arounds.”

4.3.1.3 Expected participation

Team leaders consistently set expectations for members to raise concerns and to serve as a conduit between their clinical units and the teams.

We have a lot of variety in this group that can offer alternate points of view. Speak up. We need to hear from you. This project is for the nurse at the bed side and things need to make sense to you... You have to let us know what you think. Don’t wait until the end of this project to raise your concern. (IT leader)
Expectation messages culminated in the IT leader framing how participants should think about their feedback during an all-day retreat.

I want you to think about your clinical area to be the representative for everybody. How will other users think about the system? What suggestions will you make to the training team? …We need your feedback today in a very constructive way. (IT Leader)

Collectively I found that the connection to nurse relevant goals, the emphasis on nursing involvement, and the continued appeal to nurses to raise important clinical practice issues gave team members permission to voice concerns. Thus, in making the connection between each team’s work and the purposeful selection of each team member, members felt emboldened to point out what was missing from the HIT and reveal problems occurring on their patient care units.

The problem with the new nurses is that they are constantly accepting defaults. They verbalize that the pedal pulses are not good, but when I go to the note they are documenting 2+ because that’s what the nurse before them did. (CT member)

We don’t have preprinted plans of care at all in [unit name]. We were doing content maps forever but those disappeared [from the unit]. (IT member)

Continued encouragement from IT and CT leaders, such as: great question, thank you for raising that point, and all questions are on the table, appeared to promote a sense of safety among team members. I noted that clinical staff team members
confidently shared their experiences and engaged in conversations about clinical practice throughout the course of the project.

4.3.2 Stimulating Conversation

Leaders promoted member participation by inviting members to share their expertise and by asking members for advice. These two behaviors garnered immediate access to specialized knowledge, which then evolved into a conversation.

4.3.2.1 Sharing expertise

As ET members discussed how to deal with medication reconciliation processes, the ET leader asked a hospital HIT manager to share his plans: “Would you like to talk about that [manager’s name]?” This team member shared the initial development of a technology-based solution that was being piloted. Through conversation, each team member contributed what he or she knew about medication reconciliation. ET members learned that integrating the hospital’s various health technology systems was impeding the development process.

It [medication list] gets input from the admit record, the discharge record, provider order entry and ambulatory electronic medical record. The list should also receive data from the ED system, for example. Our challenge is the large number of systems that can contribute to the list. Syncing the languages between the systems is challenging, and will always be a work in progress as to its use in terms of integration. (ET member)
Further, care provider work load negatively affected adoption. Care providers appeared to be too busy to learn the new technology and incorporate a new documentation process.

I’m trying to get more people to use this. I don’t have an institutional bazooka to get the surgeons to adopt it. Cardiology admits 25 patients per night and is pressed for time. I anticipate some rough spots. (ET member)

Thus, the ET learned that both the technology supporting medication reconciliation and the process of completing medication reconciliation was immature. In terms of the HIT project, ET members acknowledged nurses’ expectation of both contributing to and using patient’s medication lists. Based on this understanding, ET members agreed to take two steps. The medication reconciliation project would begin the process of integrating data from the HIT. And HIT system training would include content specific to both the new documentation process as well as how to find and use the medication list.

4.3.2.2 Asking for advice

In the previous example, a specific person was invited to provide feedback as a subject matter expert. I also found team members responded when the leader’s request for advice was made to an entire team. For example, as the IT Leader prepared the team to develop options for documenting patient care plans, she stated, “[Staff member name]
has some questions for you. Maybe you can shed some light, give her some guidelines, or tell her who to go see.”

As team members shared how care plans were used on their individual units, the team learned that nurses on some units created their care plans on the spur of the moment, while others used preprinted paper plans. Some units’ care plans were completely on paper, while other units used a combination of electronic and paper documentation. Most preprinted care plans had been photocopied so many times that they were nearly illegible and none were centrally located so that nurses might easily find them. As the conversation evolved, IT members began to understand that the use and maintenance of care plans varied significantly across units. Together, the team determined that their first step would be to establish the current state of care plans on each unit. As can be seen in these examples, specialized knowledge became available when the team leader specifically invited input. Once available, team members determined the information’s relevance to the HIT implementation and devised what actions to take next.

4.3.3 Sustaining Conversation

Team leaders also sustained discourse among members by making a connection to existing organizational challenges, possible barriers to project implementation, and future HIT system goals. For example, as the ET discussed the possibility of developing
electronic care plans in the new system, the ET leader reminded the team that the current ICU HIT system did not have a query function. In years past, the hospital had been unable to conduct data mining in this system. This limitation significantly hindered the hospital’s efficient use of nurse documentation when developing best care practices. The ET leader asked the team:

Have we done an assessment to see what we collect in [our existing system], and see what we actually need going forward, from a nursing practice perspective? Have [asked] the advanced practice nurses and those looking at [the geriatric care standards, evidence based practice [group]]? Are we able to capture what we think we need to capture with the system for future investigation?

These questions reminded ET members of HIT project objectives and that hospital experts were working on the content for care plans. The team then discussed the capabilities of the new HIT for documenting care plans, noting that text documentation was severely limited. Limits on free text represented a significant change for nurses. In response to this change, another project team was investigating alternate methods of capturing patient care information. In this manner, the executive consistently directed the teams’ attention to larger organizational issues and the need to coordinate actions across multiple hospital groups.

I found that the IT leader similarly encouraged ongoing conversations between IT members by using a series of probes to encourage team members to think about care practices in the larger hospital setting. In the following
example, the team discussed the role of patients’ weight in medication dosing, a care process that crossed departmental and professional boundaries. The question: “When do you weigh?” led to discovering that clinical unit practices varied between hospital units: units weighed patients once (at admission), once a day, or once a week. The question: “Do you change the medication dose based on actual weight, every day?” led to the discovery that not all medications were adjusted when a patient’s weight changed. The question “If I look at your [intravenous] pump and there is a weight, how do I know what weight was used?” revealed that on paper-based units, this data was passed verbally between nurses. The question: “how does a pharmacist know what weight to use?” reminded team members that weight data was used by many healthcare professions. Through questioning, the IT leader facilitated ongoing dialog about patient weight data and the discovery of new information regarding patient weight. Ongoing dialog revealed assumptions regarding how weight was recorded and used in the medication administration process. Thus, a conversation supported by the IT leader’s probes, facilitated IT members to develop a greater understanding of information representation in the HIT system and the possible impact on the hospital’s clinical units, departments and professions. I found leaders expended a considerable amount of effort to ensure
member voice and member participation. However infrequent negative team leader emotion disrupted ongoing conversations between team members.

Further, subtle behavior, such as leader silence and inaction, discouraged team members’ from voicing concerns about emerging project issues. These findings are described in the next two sections.

4.3.4 Disrupting Conversation

While I observed very little conflict in meetings, I found that certain leader behaviors halted conversation between members. As the project progressed the ET leader increasingly voiced dissatisfaction with the vendor’s performance. Unlike other vendor-based projects, the HIT was purchased out right. The project was described as a ‘rapid deployment’ therefore the team did not anticipate or provide time and resources for developing the software. Thus repeated problems with system design, delays and unexpected expenses came as a surprise. In this example, the ET leader responded with anger about the vendor failing to meet a significant number of contractual milestones:

I don’t know how to nicely say it but I’ve about had it, you know? This is just ridiculous. [Only] half of a maintenance fee [refunded to the hospital] for next year to me is not acceptable. You know? I’m sorry. This was clearly planned and there are constantly issues. As far as I’m concerned, it’s [all] a show stopper because [vendor] still hasn’t met these deadlines and they’ve known this for a long time. I understand that things come up in testing but, now I’m just [pause]…this is not acceptable. [tapping pencil on table in agitation]
What began as a discussion about the interdependencies between system testing and the go-live schedule abruptly came to a halt. After a prolonged silence, the team moved on to other topics. When criticisms were expressed in anger, as in this example, team members stopped talking and silence followed. Thus anger by the leader appeared to discourage team members from elaborating on what they know and observe.

I found instances when leaders recognized the negative impact of their behavior on team members and were able to facilitate team member voice by inviting alternate points of view. In this example, the ET leader again voiced frustration regarding project delays which, in turn, halted the team’s discussion about remaining project tasks. A long silence among team members followed the ET leader’s negative comments. However, the ET leader was able to overcome the negative effect of anger by inviting team members to counter existing perceptions saying, “…Don’t hold back, tell me anything.”

The ET leader’s invitation encouraged team members to reframe project issues. One member provided this opinion regarding the complexity of project work:

…I have come to learn, [it] is one of the most complicated things we will ever have to do around here. The translation between a doctor’s view of orders, a pharmacist’s view of orders, and a nurse’s view of orders, and having that go both directions [electronically] is fraught with complex analysis. (ET member)

ET members went on to discuss the challenges of software development in the hospitals’ technology environment:
Enormous attention is being paid to those [integration] details. There’s a defect list, if you will. We get code and we check it and when they [vendor] change something, it modifies other things that we thought were set. So, it’s a matter of iteratively checking. We are getting close and [project director] is optimistic, but she is not willing to put it into production unless it meets a very high standard. (ET member)

This finding suggests that when team leaders pay attention to member reactions, it is possible to reengage members in dialog about difficult issues, even if the leaders’ behavior initially disrupted dialogue.

4.3.5 Preventing Dialog

Team members’ silence can have a detrimental effect on the team’s ability to identify emerging issues. If team members suspect that the team leader is not open to hearing their concerns or that speaking up is pointless, members are less likely to raise issues (Milliken, Morrison, & Hewlin, 2003). Repeatedly, CT members expressed concern about the lingering impact of nurses’ experiences with the two prior organization wide projects: hospital rebranding and a provider order entry system implementation.

[Hospital rebranding campaign] has left a bad taste in everyone’s mouth. I have staff [members that] don’t want gifts [with the new hospital brand]. We need to learn from this so that people don’t see this as a nursing only system and don’t want to participate. (CT member)

Over the course of several meetings, members repeatedly expressed worries regarding staff’s feelings of exclusion and disappointment.
[the new name for the system] makes it sound like it’s a physician thing. We already went through this with [the order entry system]. (CT member)

… the biggest thing is that it is a [vendor name] system and people see that [the order entry system] isn’t doing what we were told it would do. These are the things that we must keep in the back of our minds as we move forward…We just need to recognize that this concern is there as we move forward. (CT member)

The staff talked about the button on [the order entry system]. All they hear back is “no we can’t do that”. (CT member)

In each instance, the team leader signaled, through silence and changing the subject, that further discussion was unwanted. When the team leader did not facilitate or encourage dialog among the members, the team then moved on to new topics. Since sensemaking is shaped by the discourse between team members, the degree to which team members participate, or engage in dialogue about unfolding events, directly impacts the sense they make. Since the team did not discuss the effect of past projects on nurses, they missed an opportunity to expand their understanding of hospital staff’s implementation experience and determine how these views would impact the project. Team members look to the team leader for permission to discuss potentially controversial topics. Thus when a single issue was raised repeatedly and is not taken up by the leader, members may interpret that some topics are off limits.

4.4 Discussion

My goal for this study was to identify team member behaviors that facilitated or hindered social interaction; the key to sensemaking processes. As sensemakers, staff’s
observations and interpretations of ongoing events are essential to anticipating implementation barriers and to facilitating adoption of HIT (Ashmos & Nathan, 2002; Edmondson, 2003b; Nembhard & Edmondson, 2006). Sensemaking is dependent upon team members’ giving voice to knowledge, concerns, emotions and hypotheses. Thus, the finding that team leader behavior, as opposed to team member behavior, facilitated and inhibited sensemaking processes has important implications for supporting interactions among team members. Team members must also be willing to acknowledge and explore the points raised by other members through dialog, conversation and debate. In this study, knowledge about the organization and the possible impact of change became available for team analysis and interpretation when the leader facilitated team member dialog. However, team leader anger halted dialog between members and the flow of information among team members was blocked. Thus, team members were unable to discover additional factors or determine what actions to take next. These results are consistent with studies in both healthcare and non-healthcare settings (Edmondson, 2003b; Eisenhardt, et al., 1997; Maitlis, 2005; Nembhard & Edmondson, 2006).

To ensure open communication about project issues, team members must believe that giving voice to their opinions and observations is wanted and valued by leaders, and will not result in professional harm. Team leaders in this study enacted several
strategies designed to promote team member voice and foster team sensemaking. These actions included: communicating a compelling vision of the future; connecting project goals to team member values; and promoting and supporting open dialog among members by consistently seeking team member input (Edmondson, 2003b; Edmondson, et al., 2001; Gioia & Chittipeddi, 1991; Maitlis, 2005; Maitlis & Lawrence, 2007; Nembhard & Edmondson, 2006). When leaders enacted these strategies, team members engaged in knowledge exchange and developed a shared understanding of impending change. Prior research suggests that when team leaders create a climate conducive to team member voice, they ultimately improve sensemaking because they promote social interaction and access to diverse perspectives which, in turn, promote shared understanding and coordinated action (Cohen & Bailey, 1997; Edmondson, 1999, 2003b; C. Ford & Sullivan, 2004; Ganster, Williams, & Poppler, 1991; Leonard & Sensiper, 1998; Sims, Salas, & Burke, 2005). These outcomes are associated with successful organizational change. (Balogun & Johnson, 2005; Edmondson, 2003b; Maitlis, 2005; Maitlis & Lawrence, 2007; Pisano, Bohmer, & Edmondson, 2001; Stensaker & Falkenberg, 2007).

If, as I have previously proposed, the purpose of forming multidisciplinary project teams is to anticipate the consequences of changing the hospital care environment, then team leaders and members must be prepared to discover potentially
conflict-producing topics and issues as the project proceeds. While infrequent in this study, expressions of anger on the part of team leaders had the unintentional effect of disrupting ongoing conversations about project issues. Once dialog stopped between team members, the team was no longer able to discover what was known about an issue, interpret the issue’s meaning, or determine what action should be taken to deal with the issue. However, team members were willing to reengage on sensitive topics when specifically invited by the team leader to do so. When the team leader expressed openness to hearing opposing views, team members shared a variety of interpretations, and developed a richer understanding of the multifaceted meaning of the new HIT system. Thus, my findings suggest that team members are acutely sensitive to team leader reactions. Research findings suggest that ongoing verbal exchange between team members is essential to developing successful problem solving strategies perhaps because dialog increases the amount of information and interpretations available for sensemaking (Edmondson, 2003b; Maitlis, 2005). Future research might investigate ways in which team leaders can assess the effect of their behavior on team members and determine which strategies are most effective for reengaging team members in raising voice and engaging in dialog.

As can be seen in this case study, team leaders’ strategies to inspire team members’ voice were successful for the most part. However, when team members
repeatedly raised concerns about nurses’ negative experiences during previous organizational change projects, team leader silence signaled that further discussion was unwelcome. We believe silence on the part of the leader communicated a message that the team leader was unwilling to discuss the issue. Thus team members stopped talking about issues. Organizational silence, or the widespread belief among an organizations’ members that speaking up about negative issues is ineffective, unwanted, or will result in negative consequences (Milliken, et al., 2003), occurred perhaps because team members believed that their opinions and observations regarding nurses’ perceptions of the HIT system were unwanted. As the project work progressed members shared very few interpretations of events and developed little to no understanding nurses’ feelings about previous HIT projects. Thus team members missed an opportunity to develop strategies to address its potential impact on the current HIT implementation. These finding suggest that maintaining open communication in project teams requires enacting a set of ongoing interventions, to be used throughout the team’s engagement. Thus a next step for research is to examine team interactions that foster ongoing dialog, especially when topics are difficult or unwelcome.

4.4.1 Practitioner Implications

A key issue in healthcare is that care processes cross departmental boundaries. Members of multidisciplinary teams are charged with representing the issues, concerns
and observations of the effect of change on their departments to other team members. Thus, teams must be prepared to deal with conflict. Eisenhardt and colleagues (1997) found that when management teams embraced conflict as a strategy for discovering facts and vetting alternative solutions, they developed a better understanding of organizational challenges and made better decisions. In this study I found teams were conflict-averse. Team members were highly sensitive to team leader behaviors. Even when an issue was important, if the team leader signaled that he or she was unwilling to discuss an issue, team members became silent. HIT implementation is difficult, thus it is not surprising to find that leaders voice frustration or anger when projects encounter delays. However, voicing issues that may cause anger in the leaders, such as surprises, disappointing outcomes, or even opposing opinions or goals is necessary to identifying and overcoming implementation barriers. Therefore, I suggest that the responsibility for sustaining open dialog about negative issues resides not only with leaders, as prior research suggests but also with team members. I suggest training teams in how to use conflict to achieve greater innovation. Among top management teams, those that frequently engaged in formalized roles (e.g. a do-er, a planner, a visionary, a devil’s advocate, etc.) were more successful in engaging in vigorous debate and discovery while minimizing interpersonal friction (Eisenhardt, et al., 1997). Thus empowered, multidisciplinary team members may be better able to gather facts, reflect on the
relevance of information to the project and organization; and encourage alternate positions (Hirst & Mann, 2004). Together, the ability to recognize controversial issues, direct the team’s attention, and enact ongoing dialog will ultimately increase the flow of information into the team and aid team sensemaking.

4.4.2 Strengths and Limitations

The case study design has both strengths and weaknesses. I chose to examine team sensemaking during change in one healthcare setting, following participants of a single project. Thus the findings are limited in their generalizability. However, I engaged the phenomenon of interest for an extended period of time, capturing changes in social interactions between members which may only have been evident because of this prolonged period. Further, my choice to directly observe participants allowed me to prospectively capture the sensemaking of both individual participants as well as the collective team. However, as Blatt and colleagues (2006) found, participants are able to articulate the barriers and facilitators of voice. Thus, including in-depth interviews may have allowed me to better determine which of my proposed intervention strategies might be most effective in supporting team sensemaking.

4.4.3 Conclusion

Overall this study suggests that team leader behavior directly influences team member voice and dialog; social interaction which is essential to sensemaking. I
identified a set of strategies used by team leaders that motivated team members to actively participate in team work. Further, team leaders effectively sustained team interaction during an extended period of implementation work by repeatedly seeking staff advice and reiterating the importance of participation. However, team members held back when they interpreted team leader actions as unsafe or when team leaders signaled that conflict-laden issues were not open for debate. Thus the team’s primary purpose of knowing the organization better, was undermined when team leaders failed to enact behaviors that promoted sensemaking. These team sensemaking processes include speaking up, updating and revising interpretations, and developing shared understanding among team members. The existence of complex work processes in healthcare settings is well established, therefore, HIT project teams must be prepared to deal with conflicting, contentious issues which will arise during implementation. Yet, the findings indicated that hospital HIT implementation teams may lack these basic skills. Thus I suggest that team training regarding raising issues and debate may be a fundamental step in forming HIT project teams. These skills may promote two essential components of team sensemaking: information flow and ongoing team member interaction necessary for identifying and mitigating negative outcomes commonly associate with HIT implementation.
5. Dissertation Conclusion

Despite the growing emphasis on HIT as one strategy for improving the quality and efficiency of healthcare, less than 8% of US acute care hospitals have rudimentary HIT systems and only 1.5% have comprehensive systems (Jha, et al., 2009). Thus adoption of HIT in hospitals appears to be slow and uneven. Further, HIT effectiveness studies reveal both positive and negative outcomes of HIT implementation suggesting that using HIT in hospitals may not yet be a reliable method for effectively improving care delivery in hospital environments (Bates, et al., 1999; DesRoches, et al., 2010; Franklin, et al., 2007; Kaushal, et al., 2003; Keene et al., 2007; Koppel, et al., 2005; N. Menachemi & Brooks, 2006; Nightingale, et al., 2000).

Implementing HIT has resulted in unexpected or nonlinear consequences for care providers as well as hospital departments (Ash, et al., 2004; Balogun & Johnson, 2005; Campbell, et al., 2006). Research shows that when intentionally implementing a new technology, such as computerized provider order entry, hospitals experienced unintended consequences in the form of reallocated work (Ash, et al., 2004); interrupted work processes (Denis, Hebert, Langley, Lozeau, & Trottier, 2002; Koppel, et al., 2005; Tucker & Edmondson, 2003); altered information exchange, communication patterns, and interpersonal relationships (Ash, et al., 2004; Campbell, et al., 2006; Edmondson, et
al., 2001; Koppel, et al., 2005); and, in some cases, patient harm (Kaushal, et al., 2003; Koppel, et al., 2005). These findings suggest that HIT implementation processes must account for complexity in hospital care environments yet, effective HIT implementation methods remain largely understudied and poorly understood (Kukafka, Johnson, Linfante, & Allegrante, 2003; Wears & Berg, 2005).

Since the effects of HIT implementation often occur in unpredicted ways, hospital leaders, project managers, and team members struggle to make optimal choices when implementing HIT. More often, they are forced to make “good enough” choices and adjust these decisions as organizational circumstances change (Hersey & Blanchard, 1988). Often, analyses of organizational change assume that the problem, such as HIT implementation, is straightforward, all possible alternatives are considered, and a rational decision is made, planned and then executed (Gersick, 1991; Happ, 2000; Hunt, Sproat, & Kitzmiller, 2004; Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Pancoast, 2006; Schwalbe, 2002; Tan, 1995; Van de Ven & Poole, 1995). In reality, these assumptions are often not met, in part, because of hospital work environment complexity, non-linear interdependencies between departments and care provider work practices, and multiple, competing goals among HIT users (Koppel, et al., 2005; Koppel, et al., 2008; Lapointe & Rivard, 2006). Further, few empirical studies linked decisions and actions (Hendry, 2000; S. J. Miller & Wilson, 2006). Research has linked sensemaking with
action (Anderson, Ammarell, et al., 2005; Maitlis, 2005; Maitlis & Lawrence, 2007; Stensaker & Falkenberg, 2007); providing an alternative lens for understanding how HIT implementation unfolds in hospital settings.

5.1 Sensemaking: An Alternate Lens on HIT Implementation

Sensemaking, defined as the search for answers and meaning that drive action, is a cognitive, social process. Sensemaking occurs as organizational members engage in dialog about events and experiences (Currie & Brown, 2003). Through sensemaking hospital staff define what is happening, jointly revise their understanding, learn, and problem solve (Apker, 2004; Currie & Brown, 2003). According to Weick (2001b), “Sensemaking is about sizing up a situation, about trying to discover what you have while you simultaneously act and [thus] effect what you discover” (p. 460).

Sensemaking is, therefore, a critical organizational function in that it facilitates both coping with and implementing change.

Team work is one strategy hospitals increasingly use to bring about organizational change, perhaps because it promotes sensemaking (Devine, et al., 1999). Specifically, team work provides a formal mechanism through which hospital staff members engage in social interaction, share varying perspectives on team tasks, construct the meaning of events as the change unfolds, and take action in response to that meaning. Thus the sense team members make of information and events sets the
course for change (W. L. Miller, et al., 2001; Vaughn et al., 2002). Traditional linear, perspectives on change, such as decision making and diffusion of innovation are largely insufficient to explain the highly complex, non-linear evolution of change in hospital settings (Rogers, 2003; Van de Ven & Poole, 1995). Other ways of understanding change, such as punctuated equilibrium (Pettigrew, 1990), require goal agreement among change participants in order to achieve success. However, studies of change in hospitals clearly indicated that participants often have conflicting needs and goals which altered change processes in unintended ways (Kaushal, et al., 2003; Sittig, Ash, Guappone, Campbell, & Dykstra, 2008). When compared to these perspectives, sensemaking may better explain team actions in complex hospital environments because it is a conceptual perspective which accounts for new information as events unfold and for social interaction and construction of meaning (Anderson, Ammarell, et al., 2005; Balogun & Johnson, 2005; Coopey, Keegan, & Emler, 1997; Gioia & Thomas, 1996; Maitlis & Lawrence, 2007; Thomas, Clark, & Gioia, 1993). Thus the purpose of this dissertation study was to explore how hospital-based HIT implementation teams, comprised of diverse members, made sense of and took action during a hospital-based HIT implementation project. In the following sections, I explore the research results in terms of the four proposed research questions:
(1) describe and compare sensemaking across multidisciplinary project teams whose members differ in terms of hierarchical role and discipline;

(2) describe how the sensemaking of multidisciplinary project teams changes over time;

(3) describe how multidisciplinary project teams' sensemaking influences the actions taken by the teams; and

(4) identify which team member behaviors facilitate and or inhibit the sensemaking of a multidisciplinary project team.

5.2. Sensemaking and the Role of Member Diversity

5.2.1 Diversity = Unique Knowledge

I found that including team members with diverse organization identities provided the entire team with specific knowledge about day to day care practices. This knowledge might otherwise have remained unknown until the HIT was used on care units. This finding underscores a significant challenge to HIT implementation: knowing the hospital care environment well enough to adequately meet the needs of a diverse group of care providers (Koppel, et al., 2005; Stevenson, et al., 2005). Therefore strategies that improve the flow of knowledge into teams tasked with HIT implementation may be essential to knowing the organization better. Previous studies have associated the inclusion of diverse team members with team innovativeness and beneficial
organizational outcomes in non-healthcare industries (Choo & Johnston, 2004; Cummings, 2004; Hirst & Mann, 2004). Similarly, studies in the health care industry have shown benefit to hospitals from including diverse members in organization teamwork. Positive organizational outcomes have been associated with clinician participation in process improvement efforts (Shortell, et al., 2004; Tucker, et al., 2007) and strategic decision making processes (Ashmos, et al., 1998). Shortell and colleagues (Shortell, et al., 2004) found that process improvement teams with at least one physician had greater odds of success than teams without a physician; the greater the number of physician team members, the greater the number and depth of changes made by the team; and the presence of a team champion, defined as a nurse or physician acting as a facilitator, increased overall perceptions of effectiveness and participation and goal agreement (Shortell, et al., 2004). These findings suggest the information clinicians possess may be essential to team success.

Further, I found that clinician team members not only suggested ways to improve HIT, but that through their ongoing dialog within the team, they revealed characteristics of their care practices which appeared to be largely unknown to other team members. Edmondson and colleagues (2001) found that when all members of surgical teams contributed observations during HIT implementation, the teams’ ability to adapt care processes improved, which, in turn, positively affected patient outcomes.
Thus, this study is consistent with past research in the finding that including a variety clinicians in implementation activities, such as teamwork, appears to be an essential component of effective HIT implementation.

Although participants in this study were fairly homogenous in terms of their professional identity, (i.e., nurses) my findings indicate that perspectives on HIT implementation varied across clinical work units. I found that safety checks, a common nursing care practice, occurred differently across clinical units. Further, how and where (e.g., unit check sheet, patient record) nurses documented safety checks also varied depending on the clinical work unit. If HIT designers had relied on a single version or account of safety checks, many units may have experienced a significant disruption in care once the system was in use. Similarly, prior research indicates that clinician needs during HIT implementation vary greatly (Aarts, et al., 2004; Ash, Stavri, Dykstra, & Fournier, 2003; Bar-Lev & Harrison, 2006; Barber, et al., 2007; Kuperman, et al., 2007; Littlejohns, et al., 2003). These needs vary by organizational identity, including professional identity (e.g., nurse, physician) (Ash, et al., 2005; Edmondson, et al., 2001; Jensen & Aanestad, 2007) as well as by hierarchical level (e.g., staff, manager, executive) (Aarts, et al., 2004; Littlejohns, et al., 2003). For example, in a qualitative study of patient care information system implementation in two hospitals, Jensen and Aanestad (2007) found nurses anticipated a positive benefit of improved communication between care
team members while physicians anticipated that the system would be a barrier to efficiency and autonomy. Other studies of HIT implementation indicated that outcomes or consequences of HIT also vary across units (Stevenson, et al., 2005). Thus, in addition to type of care providers and management level, clinical unit representation may be an additional dimension of diversity which must be addressed when constructing HIT implementation teams. My findings suggest that including representatives from different work units may be essential to understanding how common care practices vary and to determining the impact of care practice variance on HIT design.

5.2.2 Accessing Team Member Knowledge through HIT Interaction

Team members in this study often voiced concerns about HIT design and raised issues that conflicted with current team understanding. This finding is contrary to other research which suggested that teamwork does not necessarily guarantee that diverse ideas are accessible. While not specifically studied in hospital organizations, findings from studies in other settings indicated that diverse perspectives created conflict, a team process generally linked to negative experience and poor team performance (De Dreu & Weingart, 2003; Liang, et al., 2007; Wilkens & London, 2006). Rather than share unique knowledge, team members tended to focus on information that was held in-common across team members, perhaps to avoid anticipated conflict (Gigone & Hastie, 1993; Grisoni & Beeby, 2007; Winquist & Larson, 1998). Further, if team members believed that
their knowledge was not valued or wanted by fellow team members, they refrained from verbalizing opinions and observations (Edmondson, et al., 2001; Nembhard & Edmondson, 2006).

I found that team member interaction with HIT also had the effect of animating discourse among clinician team members. Clinicians were more likely to participate in team activities; they were more likely to discuss care-specific topics and; most importantly, clinicians were more likely to notice and bracket variation in how common care practices were executed in different patient care units. Over all, clinicians verbalized more information about their care environment, thus increasing the availability of hospital specific information to the entire team. These findings suggest that frequent interaction with the HIT may improve teams’ ability to know the hospital care environment because that interaction increases the knowledge available to other team members. Thus frequent interaction with HIT should become an essential activity for team members involved in HIT implementation.

Further, I found that the way in which the team members’ interaction with HIT was structured in team meetings influenced the social exchange among HIT team members, which, in turn, affected the teams’ sensemaking processes. When HIT team members simultaneously focused on the same HIT content, such as patient safety documentation, multiple interpretations of that same content became available for team
sensemaking. Team members then noticed discrepancies across members and engaged in extended dialog about specific care practices and why differences occurred. On the other hand, when members independently explored the HIT, the process of noticing discrepancies and engaging in dialog about differences did not occur. That is, when members each had their own computer and explored the software independent of other members, they raised concerns about HIT design, but they failed to notice differences between their practices and the practices of other team members. Since HIT studies clearly indicate that the effects of HIT on clinical care processes are most often discovered after HIT is used in the care of patients, strategies that reveal potential pitfalls of HIT are important (Barber, et al., 2007; Koppel, et al., 2005). Thus, I suggest that team member interaction with HIT should be guided, where in all team members focus on the same topic at the same time.

5.3 Sensemaking Over Time

I examined team sensemaking over the course of the project and found that team members updated their beliefs about the HIT as they encountered new information from fellow team members and gained experience with the HIT. For example, the IT engaged in an extended examination of a specific HIT function, called ‘copy.’ During this extended period, three disparate views emerged from ongoing team member dialog: (1) ‘copy’ promoted faulty documentation; (2) ‘copy’ saved time spent on documentation
tasks; and (3) ‘copy’ promoted nurses’ critical thinking. However, as the team experimented with the HIT and learned how ‘copy’ actually worked, they also recognized that ‘copy’ introduced new ways of making documentation errors. Thus, as the team encountered new information from fellow team members and gained new experience with the HIT, they updated their beliefs and perceptions of ‘copy’. This finding suggests that time, experience and social exchange are essential to both team learning as well as updating team members understanding about the impact of impending change. This finding is similar to other studies of change in hospitals (Currie & Brown, 2003) as well as other organizational settings (Balogun & Johnson, 2005; Gioia & Chittipeddi, 1991). Therefore, HIT implementation teams should experiment with and learn about complex HIT functions over extended periods of time.

5.4 Sensemaking and Action

I identified that a specific team member action, summarizing, facilitated team updating and promoted action taking. Summarizing enabled team members to see the team’s current interpretation and understanding in regard to specific HIT topics. For example, through ongoing dialog about patient safety checks, member contributions indicated that this common nurse practice was carried out differently in across clinical care units. The IT leader summarized this emerging perception and proposed the next steps that the team should take. Team members would assess all forms of patient
documentation within their respective care units and bring that information back to the
team. Ultimately, these actions resulted in more information for team sensemaking and
better understanding of current documentation practices. In other situations,
summarizing promoted problem solving strategies among team members. Once IT
members understood that nurses wanted to use the ‘copy’ function, they began to
explore ways in which HIT design choices might mitigate potential negative effects. As
indicated in other hospital-based studies of change, perceptions of impending change
vary (Apker, 2004; Currie & Brown, 2003; Jensen & Aanestad, 2007). During HIT
implementation it is important to anticipate that different types of staff will have
different perceptions, needs, and expectations, and based on these, may take different,
perhaps conflicting, actions during organizational change (Jensen & Aanestad, 2007).
Similar to findings by Currie & Brown (Currie & Brown, 2003), this study indicates that
initial perceptions do change as staff members encounter new information, new
experiences and engage in conversations about change. Summarizing may be one
strategy which assists team members’ in updating their understanding and
subsequently determining which actions to take next during HIT implementation.

5.5 Team Member Behaviors and Sensemaking

I examined the interpersonal behaviors among HIT team members and found
that team leader behavior, as opposed to team member behavior had the greatest impact
on dialog among members. Six team leader actions promoted team member participation in team activities. These included (1) articulating meaningful goals; (2) emphasizing the importance of team members; (3) setting the expectation of participation; (4) inviting expertise; (5) asking for advice; and (6) connecting HIT design issues with larger organizational problems and goals. Studies of sensemaking in hospitals demonstrated that communication among staff improved knowledge and influenced the sensemaking of patient care as well as administrative issues (Torkelson, et al., 1996). Among operating room teams implementing new surgical technology, leader actions created a non-threatening environment in which team members felt empowered to share observations and make recommendations for ways to improve team work (Edmondson, 2003b). Albolino, Cook, & Clark (2007) found that through conversation during formal patient rounding, medical residents and their supervising physicians constructed the meaning of patient symptoms, improving both medical residents’ understanding of each patient’s care as well as the coordination of the teams’ care actions. Others (1991) found that CEOs who consistently interpreted external events as opportunities, or non-threats, worked in hospitals characterized by greater participation in strategic decision making and better hospital performance, than those hospitals of CEOs who interpreted events as threatening. These authors explained that participation promoted access to more people and their knowledge, thereby increasing
information processing which likely facilitated more positive interpretations and actions and positively impacted hospital performance (Thomas, et al., 1991). These findings suggest that communication between organizational staff members may influence both the sense people make as well as the action they take. Since sensemaking is shaped by the discourse between organizational members, it is important to enact strategies, such as those identified in my study, which improve the degree to which team members participate, or engage in dialogue about unfolding HIT implementation events.

I also found that negative leader actions, such as anger, frustration and avoidance discouraged team members from raising important issues or stopped dialogue on certain topics. Because sharing diverse, potentially conflict-producing information is risky, teams must have a psychologically safe work environment in order to share information (Edmondson, 1999; van Ginkel & van Knippenberg, 2008). Among temporary hospital teams, those that managed conflict and provided a psychologically safe, trusting environment for discussing potentially volatile perspectives experienced greater goal attainment than teams where members felt threatened (Irvine Doran, et al., 2002; Lemieux-Charles, et al., 2002; Pinto, et al., 1993). Psychologically unsafe climates prevented team members from reporting errors (Blatt, et al., 2006; Edmondson, 1996), resulted in poor team performance (Edmondson, 1999), and slowed organizational change (Balogun & Johnson, 2005). Mannix and Neale (2005) noted that the knowledge,
skills and experience found among diverse members only benefited teams and organizations when interpersonal relationships were carefully managed. Thus an environment free of ridicule, promotes sharing diverse perspectives which is linked to positive team performance outcomes. Dialog between team members is essential to overall understanding of team tasks, how each team member’s perspective impacts tasks, and developing potential solutions thus managing negative team leader behaviors is essential for maintaining access to team member knowledge and is especially important when discussing difficult issues commonly associated with HIT implementation. Thus, HIT implementation team leaders recognize the negative effects of anger and frustration, and enact strategies which support dialog about difficult HIT implementation issues.

5.6 Limitations

While a large number of studies on care practice change exist, understanding change implementation in hospitals is hampered by limitations in research design. For example, in an extensive meta-analysis of the dissemination and implementation of care guidelines, a mere 7% (n=17) of nearly 240 studies were conducted in hospital settings (Grimshaw et al., 2004). Overwhelmingly, implementation research has taken place in outpatient settings (Fitzgerald, Ferlie, Wood, & Hawkins 2002; Glasgow & Strycker, 2000; Goodson, Gottlieb, & Smith, 1999; McGlynn, et al., 2003), single work units, (e.g., a
lone primary care practice) (Fitzgerald, et al., 2002; Grimshaw, et al., 2004), and has focused on physicians (Fitzgerald, et al., 2002; Grimshaw, et al., 2004; McGlynn, et al., 2003). My study was conducted in a single hospital, following a single HIT implementation project thus findings may not be generalizable to other care settings, other HIT system projects, or other organization change projects. However, the studies cited previously failed to take into account the interdependent nature of care delivery and the complexity of multidisciplinary, multi-unit, hospital care environment, factors essential to understanding change in hospitals. My setting and sample choices were made to address these limitations and, indeed, study results clearly capture complexity found in hospital care environments.

Research studies of HIT implementation strategies are largely absent from the literature. HIT implementation literature is comprised of anecdotal cases reports and HIT effectiveness, and impact research. Unfortunately, case reports represent the majority of HIT implementation. These stories of hospital-based HIT implementation lacked rigor in design, data collection and analysis. While the points raised in this body of work are interesting, they were purely anecdotal (see Goldstein, Coleman, Samson, et al. 2004; Jones, 2003; Fretschner, Bleicher, Heininger, & Unertl 2001). Second, studies of the efficacy of HIT systems often included a summary of lessons learned; however these lessons were rarely a part of the study design and usually appear in the discussion
section as an explanation of findings. Finally, studies on the impact of HIT implementation examined the effect of technology on clinical staff and work processes. Most often these studies were either cross-sectional or retrospective, methods which rely on data from a single moment in time and on participant recall. To address methodological limitations associated with anecdotal reports, retrospective recall and cross-sectional data collection, I chose a prospective, longitudinal case study design; include staff participants, and use longitudinal case study methods to capture ongoing, evolutionary, social process of sensemaking. Since sensemaking is dependent on the verbal communication between team members, my choice to not interview team members was intentional. My study uses less traditional methods of studying hospital care processes in order to illuminate how clinicians learn about the larger context of care. This knowledge cannot be accrued using traditional survey or quantitative methods

5.7 Implications for Research

Findings from this study suggest a number of areas for future research focused on HIT implementation teams including; (1) team composition; (2) team activities; (3) team processes; and (4) team leader actions. I found that diverse team members provided greater access to care process information and lead to new team member understanding about how care was delivered in the hospital setting. My findings
suggest some particular characteristics that might make some members more useful than others in facilitating dialogue for sensemaking. For example, team members with dual identities, such as physician/informatics administrator or staff nurse/educator were particularly flexible in examining issues from various perspectives. Therefore, a next focus for research might be to determine which care roles, management levels and hospital department representatives possess the most useful knowledge and attributes to facilitate team sensemaking and would be productive members of HIT teams. I found the frequent, iterative, focused or guided interaction with HIT not only increased the degree to which team members participated in HIT evaluation, it also promoted dialog about variations in care practices. This finding suggests the need to determine the ideal duration, or dose effect, of HIT interaction. I found that when team members summarized current knowledge in regard to a specific HIT design issues, team members updated their understanding and were able to determine next steps in the implementation process. A next step in research would be to conduct control trails to determine the effectiveness of this strategy on team sensemaking and action. Finally, leaders in this study enacted strategies which both encouraged and discouraged team member participation. While not specifically mentioned in the literature, it appears that hospitals will rely on a core set of individuals to observed the care environment, synthesize the varying needs of care providers, and design the HIT in ways that will
have positive effects, however, literature indicates that even under the most deliberative processes, problems arise (Barber, et al., 2007; Koppel, et al., 2005). Thus, identifying strategies which foster ongoing dialog in the face of difficult topics is vitally important to the overall goal of improving clinician involvement in HIT implementation.

5.8 Implications for Practice

The findings from this study suggest some practical strategies for improving HIT implementation team work. These are organized into four broad categories: team composition; team processes; team activities; and team member preparation.

5.8.1 Team Composition

Literature suggests that there are three dimensions to hospital staff diversity which should be represented on HIT implementation teams. These are:

- Different patient care roles (e.g., nurse, physician, pharmacist)
- Different hierarchical levels (e.g., staff, manager, executive)
- Different departments (e.g. pediatric adult, step-down, intensive care patient care units; pharmacy, medicine, and technology)

My study findings extend knowledge about staff identity to suggest that members who maintain multiple roles, such as care providers who work in technology, articulate multiple perspectives on implementation issues, thus increasing the information available for team sensemaking.
5.8.2 Team Activities

Understanding the care environment is essential to HIT design plans, HIT implementation actions as well as to anticipating and mitigating negative consequences of HIT use. Thus, the following strategies may improve access to critical care-environment information and knowledge:

- Provide HIT team members with frequent opportunities to interact with HIT, as this activity provides an opportunity for members to compare HIT design with their current care practices.
- Guide HIT interaction so that all HIT team members are attending to the same HIT content at the same time. This activity provides access to multiple different interpretations of the same event and allows HIT team members to understand how care needs and practices vary across the hospital and alerts HIT team to possible unexpected consequences of HIT implementation.

5.8.3 Team Processes

- Facilitate ongoing social interaction among member by asking for expert feedback and team member advice. These techniques encourage members to share more information about their day to day practices.
• Enact conflict management techniques as a routine method of improving social interaction among members when the team is dealing with contentious implementation issues.

• Summarize the current state of team understanding. This action allows team members to see how common understanding of HIT implementation issues is evolving and promotes updating perceptions and attitudes among team members.

5.8.4 Team Member Preparation

Findings from this study and others demonstrate that the issues of HIT implementation are often far more complicated than simply fixing HIT design. Thus members must be prepared to offer their unbiased observations about HIT design and implementation plans. However, conflict, anger and frustration often arise when teams must tackle difficult topics. Therefore, we recommend several strategies which may improve HIT teams members ability to engage in dialog, an activity associated with improved problem solving. Strategies include:

• Communicating HIT project goals in terms that a meaning and congruent with team members professional and department goals

• Articulating the importance of team member knowledge to the success of the HIT project
Describing expectations of participation in HIT team activities
## Appendix A: Direct Observation Guide-Team Meetings

<table>
<thead>
<tr>
<th>Activity</th>
<th>Meeting</th>
<th>System Testing</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-team</td>
<td>Executive</td>
<td>Communication</td>
<td>Implementation</td>
</tr>
<tr>
<td>Length of activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who was present?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Form of the discussion (e.g., one-way, two-way, multidirectional, briefing, training)**

**What information do participants share? (e.g., past experience, information from others, hypothetical scenarios)**

**Describe categorization, “new ideas,” interpretations, conclusions, decisions, or proposed actions to be taken and by whom**

**Describe how participants interact with each other (e.g., heated debate, developing storytelling, silence, avoiding eye contact, respectful)**
## Appendix B: A-priori Sensemaking Codes

<table>
<thead>
<tr>
<th>Team Discourse</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categorizing</strong></td>
<td>Providing a classification, grouping with others based on similar properties. For example, “this seems like a hardware issue.” (Weick, 1995, 2001b)</td>
</tr>
<tr>
<td><strong>Cue</strong></td>
<td>Information (signals or encounters) that is discrepant or inconsistent with what is expected (Anderson, Ammarell, et al., 2005); information that is singled out and embellished (Weick, et al., 2005)</td>
</tr>
<tr>
<td><strong>Declaring</strong></td>
<td>Making controversial statements to invite discussion. For example, “You mean we bought this system and now we don’t think it will improve patient care?”</td>
</tr>
<tr>
<td><strong>Events</strong></td>
<td>Providing an example case. May come from a team member’s experience, the team’s experience, the larger organizations’ experience; or be an imagined situation or case (Vogelsmeier, et al., 2008)</td>
</tr>
<tr>
<td><strong>Framing</strong></td>
<td>A bounded map of meanings; providing a particular view of organized action (Torkelson, et al., 1996);</td>
</tr>
<tr>
<td><strong>Interpreting</strong></td>
<td>Providing meaning about an event or about what is said (Weick, 1995)</td>
</tr>
<tr>
<td><strong>Iterative dialog</strong></td>
<td>Back and forth dialog between multiple team members about ideas, developing impressions, active reflecting, adding cues to build a story or throwing out ideas for problem solving (Albolino, et al., 2007)</td>
</tr>
<tr>
<td><strong>Labeling</strong></td>
<td>Providing meaning of an experience or situation through the use of a distinct cognitive representation. For example, “This project has gone south”, implying a bad outcome or turn for the worse. (Anderson, Ammarell, et al., 2005)</td>
</tr>
<tr>
<td><strong>Pausing the flow</strong></td>
<td>Making statements that stop the dialog and potentially cause members to reflect on the conversation and ongoing events and information (Weick, 1995, 2001b)</td>
</tr>
<tr>
<td><strong>Probing</strong></td>
<td>Asking for more information or further explanation. These become cues when they hint or direct attention to needed functionality or possible problems.</td>
</tr>
<tr>
<td><strong>Questioning</strong></td>
<td>Challenging the validity of information or conclusion as it was presented. For example, “I have not had the same experience.”</td>
</tr>
<tr>
<td><strong>Reflecting</strong></td>
<td>Examining the outcomes of action and or experimentation; what this</td>
</tr>
</tbody>
</table>
Reframing | Offering an alternative explanation in terms of known events or circumstances. For example, “this isn’t just about the nurses, what about the patients’ needs?” (Anderson, Ammarell, et al., 2005)
---|---
Validating | Checking in, confirming understanding (restating/summarizing) or that knowledge is represented correctly
**Qualities of Interpersonal Interaction**
Respectful | Demonstrating regard and valuing input of other team members (Nembhard & Edmondson, 2006)
Disrespectful | Demeaning or denigrating contributions of other team members (Nembhard & Edmondson, 2006)
**Group Process** | Actions designed to engage team members: inviting feedback; seeking clarification; confirming understanding; promoting voice; promoting information sharing; summarizing plans, actions, next steps (Nembhard & Edmondson, 2006)
**Team Activities**
Action | Any tasks the team is currently doing (Anderson, Ammarell, et al., 2005)
Action-Experimenting | New tasks the team specifically undertakes to learn and innovate (Anderson, Ammarell, et al., 2005)
Action-suggesting | Tasks one or more members of the group proposes to undertake (Anderson, Ammarell, et al., 2005)
Boundary spanning | Sharing information, experiences, and details from sources external to the team (Shortell, et al., 2004)
### Appendix C: Document Summary Form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document #</td>
<td></td>
</tr>
<tr>
<td>Date obtained:</td>
<td></td>
</tr>
<tr>
<td>Name or description of document:</td>
<td></td>
</tr>
<tr>
<td>Event or Contact, if any, with which</td>
<td></td>
</tr>
<tr>
<td>document is associated:</td>
<td></td>
</tr>
<tr>
<td>Date of event or contact:</td>
<td></td>
</tr>
<tr>
<td>Significance or importance of the document:</td>
<td></td>
</tr>
<tr>
<td>Brief summary of contents:</td>
<td></td>
</tr>
</tbody>
</table>

*Adapted from Miles and Huberman (1994)*
Appendix D: Staff Demographic Form

The following questions are about you and your work on the nursing and patient care documentation system implementation team. Please complete the questions as accurately as possible.

This research study uses a coding system to protect your identity as a study participant and ensure confidentiality of the information you provide.

Please return this document to Rebecca Kitzmiller or send it by campus mail in the envelope provided: DUMC 3322.

Your name: _____________________________

1. What profession best describes you?

(1) Dietician (5) Respiratory Therapist
(2) Pharmacist (6) Social worker
(3) Physician (7) Other, please indicate: _____________________________
(4) RN, Nurse

2. How long have you worked in the profession listed above? ___________________________

3. What best describes your highest level of education in the profession listed above? Please check one.

(1) High school (4) Bachelor’s degree
(2) Diploma (5) Master’s degree
(3) Associate degree (6) Other, please indicate: _____________________________

4. What best describes your overall level of education? Please check one.

(1) High school (4) Bachelor’s degree
(2) Diploma (5) Master’s degree
(3) Associate degree (6) Other, please indicate: _____________________________
5. Which unit / service line / department do you most often work?

(1) General Surgery (19) Orthopedics (36) Accreditation

(2) 2100 (20) 6100

(3) 2200 (21) 6300

(4) 2300 (22) Heart (39) Finance

(5) 3100 (23) 7100 (40) Nursing Informatics

(6) 3200 (24) 7200 (41) Nutrition Services

(7) 3300 (25) 7300 (42) Pastoral Care

(8) Neuro-sciences (26) General Medicine (43) Performance Services

(9) 4100 (27) 8200 (44) Pharmacy

(10) 4200 (28) 8300 (45) Procurement

(11) 4300 (29) Step-down (46) Psychiatry

(12) Pediatrics (30) 7800 (47) Public Relations

(13) 5100 (31) 8100 (48) Risk Management

(14) 5200 (32) Oncology (49) Social Work Services

(15) 5300 (33) 9100 (50) Technology Education

(16) Pediatrics/ Neonate (34) 9200 (51) Women’s Services

(17) 5400 (35) 9300 (52) Other; please indicate:

(18) 5500

6. How long have you worked in this unit / service line / department?

7. What best describes your current job title?

(1) Staff (8) Associate Chief Nursing Officer

(2) Nurse Educator (9) Associate Chief Information Officer

(3) Nurse Manager (10) Chief Finance Officer

(4) Manager (11) Chief Operating Officer

(5) Clinical Operations Director (12) Chief Nursing Officer
Director  (6)  (13)  Chief Information Officer  
Associate Operating Officer  (7)  (14)  Other, please 
indicate: 

8. How long have you worked in the job title listed above? 

9. How many years have you worked for Duke University Hospital? 

10. What best describes your level of technology experience?
(1) Excellent: I teach others  
(2) Pretty good: I can figure it out  
(3) Adequate: I know the basics  
(4) None: I don’t use computers  
(5) Other; please indicate 

11. Are you:
(1) Female?  
(2) Male?  

12. What is your age?
(1) Less than 20  (5) 35-44  
(2) 20-24  (6) 45-54  
(3) 25-34  (7) 55 and over  

13. What best describes your race and/or ethnicity? Please check as many as apply.
(1) American Indian or Alaskan Native  
(2) African-American  
(3) Asian or Pacific Islander  
(4) Hispanic  
(5) White, not of Hispanic origin  
(6) I do not wish to provide this information  

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References


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Jones, M. R. (2003). "Computers can land people on Mars, why can't they get them to work in a hospital?" - Implementation of an Electronic Patient Record System in a


Biography

Rebecca Rutherford Kitzmiller was born in Frederick, Maryland January 5, 1966 to Richard and Roxanne Zimmerman. Married to John S. Kitzmiller, III, Rebecca has two daughters, Katherine, 11 and Elia, 9. They live in Apex, North Carolina. Rebecca received a Bachelor of Science in Nursing from the University of Pennsylvania in 1988, a Master of Human Relations from the University of Oklahoma in 1993, and a Master of Science in Nursing from Duke University in 1997. Rebecca is currently a doctoral candidate and a Health Informatics Pre-Doctoral Fellow at the Duke University School of Nursing. As an active duty Army Nurse Corps Officer, Rebecca served as Chief, Informatics Branch; Chief, Automated Systems Planning; and Nurse Manager, Medical Surgical Unit at Womack Army Medical Center. Most recently, Rebecca was the Director of Nursing Informatics for Duke University Health System and was responsible for diverse clinical systems and user groups. Her leadership experiences in nursing informatics have lead to her research interests in the dynamics of organizational change, specifically health information technology implementation, and its impact on interpersonal interaction and work processes. Rebecca is first author of two publications: “Adopting best practices: ‘Agility’ moves from software development to healthcare project management” published in CIN: Computers, Informatics, Nursing in 2006, and “Making sense of health information technology implementation: A qualitative study
addition, Rebecca’s doctoral training was fully supported by the Duke University School of Nursing. She was inducted into Sigma Theta Tau, International Honor Society of Nursing in 1997.