



COLLABORATIVE INFORMATION SEEKING:  
A STUDY OF A PATIENT CARE TEAM  
IN THE EMERGENCY DEPARTMENT

by

PATRICIA RUMA SPENCE

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Approved by

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Dr. Madhu Reddy, Advisor

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Dr. Richard Hall

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Dr. Ray Luechtefeld

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## ABSTRACT

In the modern organization, work is increasingly organized around teams. One important aspect of collaborative team work is information seeking. However, there is little empirical understanding of how team members collaborate to find needed information. The purpose of this research is to better understand collaborative information seeking (CIS) through a qualitative field study of patient care team members in the emergency department of a rural, regional hospital.

The study found that most CIS activities occur because of an information breakdown. The study also detailed CIS triggers, mechanisms used to collaborate, and questions that lead to collaboration.

Specifically, team members collaborated when (1) information was not easily accessible, (2) information need was complex, and (3) information seeker lacked the expertise needed for the situation. The results also showed that the main source of information was most often an informal source, and that collaborations took place in two distinct ways: through face-to-face discussion and through the use of technology. Furthermore, the findings pointed to three types of questions that lead to collaboration – patient specific, organizational, and plan of care.

This research helps us better understand the phenomena of CIS. It also identifies ways to better facilitate team members working together effectively and to design information systems that support their work. For example, information should be “pushed” to the seeker at the time it is needed. Additionally, technological support mechanisms can help reduce the negative effects of an interruptive workplace. Lastly, systems must support the function and the day-to-day activities surrounding the function.

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# **1. INTRODUCTION**

## **1.1. MOTIVATION**

Information plays a central role in completing a given task or job-related function, and in the modern workplace a wide variety of information is readily available. Finding needed information and using it to make decisions and coordinate activities is vital to organizational work. Consequently, organizations have implemented processes and technologies to support their workers' information needs and activities. Historically, these support mechanisms have been designed for the individual information seeker; in most organizations, information retrieval is viewed as an individual activity [1, 2].

Yet, modern organizational work is being increasingly organized around multidisciplinary teams [3-5]. Therefore efficient and effective collaboration is essential to successfully accomplishing team work. One important aspect of collaborative team work is information seeking [6]. However, we have little understanding of how people actually collaborate in teams to find information [7, 8]. Furthermore, very few systems exist to support this type of collaborative information retrieval.

Therefore, to facilitate team members working together effectively and to design information systems that support their work, we must understand the collaborative information seeking practices of team members [9].

## **1.2. INFORMATION SEEKING IN COLLABORATIVE ENVIRONMENTS**

Researchers in information systems typically develop tools to support individuals searching for information. However, as discussed in section 1.1, people rarely work independently in modern organizations; people normally collaborate with others or work

in teams to accomplish their tasks [10]. Therefore, the dominant setting for information work in organizations is often interdisciplinary or multifunctional teams [9]. Although many aspects of organizational problem-solving are studied as collaborative (rather than individual) processes [11], the processes of information seeking, use, and management that lie behind them are largely understood as activities carried out by individuals; only a few studies have considered the collaborative nature of information seeking [8, 12, 13]. Understanding how people work together to find and use information is critical to designing effective technologies for supporting and enhancing collaborative work.

Historically, there are two major emphases in this area of study: focus on the individual information seeker and focus on the information seeking activities itself. First, most models of information seeking focus on the single user [14, 15]. They regard information seekers as individuals engaging with one or more information repositories in order to satisfy their information needs. However, in practice, information seeking and retrieval are often carried out not by individuals, but by groups of people. Information seeking duties are distributed throughout a team; an individual recruits others throughout the process of searching, interpreting, contextualizing, and assessing information.

Second, a common feature of conventional approaches to information seeking is to focus on the information seeking itself, rather than the practice of information seeking as it is integrated into the work being conducted. People's main purpose is rarely to seek information; instead, information seeking arises, and is carried out, as part and parcel of a larger activity. Therefore, the progress of any information seeking event is shaped by the work in which it is embedded. An adequate account of information seeking, then, must look at it in the context of everyday working activities.

### **1.3. RESEARCH APPROACH**

This study focuses on the information seeking and retrieval practices of work teams. The research investigates how team members seek and retrieve information in the context of members' daily work practices. Although a number of organizational settings involve teams and team work, few are as rich and information-intensive as hospitals.

Hospitals are complex, information-rich environments in which people need to collaborate to provide appropriate patient care, with patient care teams at the core of the work. The collaborative environment in a hospital setting provides an ideal environment in which to gain a deeper understanding of the collaborative nature of information seeking practices of teams.

Specifically, the research was conducted in the emergency department, where patient care team members constantly worked together efficaciously to provide the highest level of care possible. These patient care teams were comprised of professionals with varied roles and responsibilities (physicians, family nurse practitioners, registered nurses, paramedics, technicians, and administrators). In the course of their daily work, these medical professionals viewed information seeking as an endeavor integrated into the work being conducted, not an independent activity.

**1.3.1. Research Questions.** The goal of this study was to better understand the collaborative information seeking practices of patient care teams. Therefore, the study was conducted in a specific information-rich and collaborative environment, an emergency department. This examination of the collaborative information seeking behavior of patient care teams considered the following questions:

- What are the collaborative information seeking behaviors of patient care team members in the emergency department?
  - When do patient care team members in the emergency department collaborate to find needed information?
  - What triggers the collaborative information seeking process in the emergency department?
  - What mechanisms<sup>1</sup> do patient care teams in the emergency department use to collaborate?

In order to answer these research questions, a qualitative study employing ethnographic methods [16] including observation, formal and informal interviews, and artifact collection was conducted.

#### **1.4. THESIS OVERVIEW**

This thesis is organized as follows:

- Section 2 – Background: This sections details previous studies of collaborative information seeking and retrieval.
- Section 3 – Method: This section describes the processes and methods used in the project, including the site, participants, and data collection and analysis methods used in the study.
- Section 4 – Findings: This section presents the results of the analysis of the study.

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<sup>1</sup> The term ‘mechanism’ is used to describe “an instrument or a process, physical or mental, by which something is done or comes into being.” This definition comes from [www.dictionary.com](http://www.dictionary.com).

- Section 5 – Discussion: This section describes the implications of the results of the study.
- Section 6 – Conclusion: The conclusion briefly summarizes findings as they relate to the goals, as well as thoughts for potential future work.

## **2. BACKGROUND**

### **2.1. INTRODUCTION**

The major emphasis in studies of information seeking has been on the individual information seeker. Most research studies have focused on the information seeking needs and behaviors of the individual information seeker, rather than those of the collaborative, or team, information seekers.

The objective of this section is to highlight research concentrating on both individual information seeking as well as collaborative information seeking. By highlighting this research, performed in various domains, we can begin to gain some insight into opportunities and challenges regarding: (1) the facilitation of patient care team members effectively working together to find information, and (2) the design of systems that support their work

### **2.2. STUDIES OF THE INDIVIDUAL INFORMATION SEEKING IN MEDICAL INFORMATICS**

Medical informatics research has long studied the information needs, seeking, and behaviors of medical professionals. Most of these studies were based on the traditional models of information seeking, focusing on the information seeking needs and behaviors of the individual information seeker [17] – most often physicians. Additionally, these studies primarily examined two main aspects of individual information seeking: information needs and information sources.

**2.2.1. Individual Information Needs.** Generally, researchers have studied information needs from two perspectives, recognized and unrecognized. When discussing the information needs of physicians, Gorman [18] explained four states of information need – unrecognized (not aware of an information need), recognized (aware of an information need), pursued (needed information is sought) and satisfied (needed information is found).

Covell et al. [19], in their classic investigation into the information needs of individual physicians in office practice, explained that physicians often recognized the need for further information in order to provide proper care for their patients. Similarly, Brown et al. [20] conducted a study of physicians in the Neonatal Intensive Care Unit (NICU) and their utilization of written and verbal sources of patient information. Again, physicians recognized a need existed for further information in order to provide proper care for their patients. Coiera and Tombs [21] took a slightly different approach in their study. They looked at the information needs of healthcare workers by studying their communication behaviors. These communication behaviors uncovered needs ranging from the need for patient specific information to questions about plan of care. Obviously, these medical professionals recognized an information need, and then pursued it via communicating with each other.

**2.2.2. Information Sources and Barriers.** Information can come from many sources including formal (textbooks, journals, etc.) and informal sources (other physicians, etc.). Yet in the papers reviewed, many studies of the individual information seeker came to similar conclusions concerning information sources – informal sources were frequently used. Covell et al. [19] found that physicians accessed both formal and

informal sources based on the perceived quality and accessibility of the information. Yet, these physicians had their information needs met only 30% of the time. Barriers that prevented physicians from obtaining needed information included lack of time to search, cost, and poor organization of information. In an attempt to overcome these barriers, physicians turned most often to human sources for information.

Additionally, Brown et al. [20], in their study of physicians in the NICU, found the bedside flowsheet to be an important source of information because of its accessibility. Yet, conversations with both resident physicians and nurses were also important sources of information, as verbal communication was often a convenient and quick way to access patient information.

A further study by Lomax et al. [22] investigated the information seeking behavior of medical oncologists in the support of clinical decision-making. The study found that oncologists used formal sources of information (files, textbooks, journal articles, etc.) about 23% of the time. In addition, MEDLINE was used frequently by oncologists. Similar to the findings reported by Covell et al. [19], when oncologists used informal sources of information, they most often consulted a fellow physician.

Dawes and Sampson [23] reviewed nineteen studies describing the information seeking behavior of physicians. The results showed that individual clinicians satisfied their information needs most frequently by using formal sources such as text. Physicians' second most frequently used source of information was fellow colleagues. What led to these sources being used was first their availability and applicability, then their reliability, high quality and speed of use. In addition, physicians consulted colleagues for two main reasons – “reassurance as well as the need for tacit knowledge” [23]. The hindrances to

information seeking of physicians included limited time to search, volumes of material, forgetfulness, lack of urgency, and the belief that there was no answer available.

Coiera and Tombs' [21] study in a hospital setting showed that some information was obtained from formal sources (patient notes, lab results, etc.), but most often the information was obtained from human sources which led to an interruptive workplace. The tendency toward synchronous communication and the need to deal with tasks and questions as they arose led to those sources setting aside what they were doing in order to assist the information seeker.

Gorman's article on the information needs of physicians [18] attempted to explain the use of human sources for information need fulfillment. The study offered a framework for defining the types of information that physicians used when answering clinical questions in the course of patient care. These clinical questions were often very complex, and steeped in the context of the specific patient's story. This is believed to be the main reason that physicians consistently turn to human sources to meet their information needs, as shown in other studies [19, 24]. This can be explained because colleagues understand that what is needed is an answer to a patient care problem, not an answer to a medical query.

**2.2.3. Summary.** Many researchers have studied the information needs, seeking, and behaviors of medical professionals. Most of these studies focused on the information needs and information sources of the individual information seeker. In many cases, the medical professionals were aware of the information need, or recognized the need for information. In addition, medical professionals sought information from many sources ranging from textbooks to bedside flowsheets to MEDLINE. Yet, nearly all the studies

reviewed point to the fact that medical professionals often turn to informal sources for needed information.

## **2.3. STUDIES OF COLLABORATIVE INFORMATION SEEKING**

Although there is limited research on collaborative information seeking (CIS), researchers have begun to explore this phenomenon in various domains. Researchers have approached collaborative information seeking from two different perspectives: (1) a conceptual perspective and (2) a technical or tool perspective.

**2.3.1. Conceptual Understanding of CIS.** Some researchers are undertaking studies in order to gain a conceptual understanding of collaborative information seeking. These researchers are beginning to understand CIS behavior, yet still do not have a deep understanding of CIS. This gap in understanding includes such things as the details of how CIS manifests itself, the mechanisms used in CIS, an understanding of the contexts within which CIS is applicable, as well as the limitations of CIS. Gaining this conceptual understanding of CIS enables researchers to apply and adapt CIS to new situations that may have not been previously studied.

In a study of information behavior in a hierarchical work environment – a military command and control environment – Sonnenwald and Pierce [13] described information seeking as a dynamic activity in which “individuals must work together to seek, synthesize and disseminate information.” They observed that team members maintained awareness of each other’s information activities and found that this awareness influenced their information sharing with each other.

Fidel and the Collaborative Information Retrieval (CIR) project team studied how work teams seek and retrieve information collaboratively [25]. The studies revealed factors that influence the need for information and for collaboration during information retrieval. For example, in a study of two design teams, Poltrock et al. [26] examined how team members actively worked together to identify information needs. They found that each team had different communication and information seeking practices based on work contexts, yet they also found many similarities in both the kinds of information sought and the methods employed to retrieve the information. For example, both teams sought information regarding design constraints from external sources. In addition, both teams employed the common strategy of proposing ideas and requesting feedback, as opposed to asking directly for recommendations. Poltrock et al. also found that technologies did not exist to support the teams' collaborative techniques.

In their studies of information seeking and needs in an Surgical Intensive Care Unit (SICU), Reddy et al. [27, 28] found that the first resource for needed information was another team member. This is in line with the findings of Cicourel [10], as various team members brought their own expertise and perspective to the question at hand. In addition, team members often turned to a human resource because that resource brought context to the situation. For example, if a team member wanted to know what was done, they could use the bedside flowsheet as a resource, but if they wanted to know why something was done, they asked the individual who was involved in making that decision

Reddy and Dourish [27, 28] also argued that work rhythms play a role in healthcare providers' collaborative information seeking practices. These rhythms provided SICU team members with a source for seeking, providing, and managing

information in the course of their work. Furthermore, these rhythms provided team members with information about each other, which allowed them to plan their search for information accordingly. Therefore, when team members understood the rhythms of the unit, they also knew what information needs to fulfill prior to known future activities. Team members then collaborated for needed information in a “just in time” fashion (not too soon and not too late) based on the rhythms of the unit.

In a study of how people in organizations look for information in order to get their work accomplished, McDonald and Ackerman [29] examined the role of a particular person, an expert or gatekeeper, in the information seeking process and how this expert served as an information resource for other people. The study demonstrated that CIS is not only a response to a breakdown in information, but also about the uninterrupted flow of information in the workplace – the information seeker collaborated with the gatekeeper to find information within the normal flow of work practices.

In another study of collaborative information seeking in the SICU, Reddy et al. [8] discovered collaborative information seeking “triggers” buried in the work. These triggers, or situations, which lead to CIS, included (1) a lack of expertise, (2) a lack of immediately accessible information, and (3) a complexity of information need. These triggers highlighted possible mechanisms which lead to collaborative seeking and the providing of information within the context of work.

Lastly, through a survey of collaborative information seeking practices of academic researchers, Spence et al. [30] found that researchers reported that (1) the lack of expertise was the primary trigger for CIS; (2) traditional methods, including face-to-face, phone, and email were the preferred communication mediums for collaboration; and

(3) collaborative information seeking activities were usually successful and more useful than individually seeking information. These results highlighted the important role that collaborative information seeking plays in daily work.

**2.3.2. Technical Perspective of CIS.** A few researchers are also exploring collaborative information seeking from a technical perspective. These researchers study how technology should support the collaborative nature of information seeking, including such things as specific functionality to be included, interface design details, and so forth.

Twidale and Nichols [31], in their study aimed at designing interfaces to support collaboration in information retrieval, suggested that support tools must provide a visualization of the search process which can be changed and talked about by the users. In addition, they argued, “information retrieval systems should acknowledge the existence of collaboration in the search process.” Furthermore, they believed that collaboration can improve the users learning and understanding of the systems.

Krishnappa [32] designed a collaborative information seeking and retrieval prototype – MUSE (Multi-User Search Engine). During the evaluation of the prototype, Krishnappa found that the collaborative features in MUSE, specifically the chat function, played an important role in enhancing the information seeking and retrieval process for the collaborative work teams. The use of chat led to a better understanding of both the search process and the findings.

To date, no commercial systems exist which fully support collaborative information retrieval. However, a few commercial systems have implemented functionality which supports some aspects of CIR. For example, IBM<sup>2</sup> offers many

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<sup>2</sup> <http://www.lotus.com/lotus/offering2.nsf/wdocs/rttc>

products which allow collaborations among colleagues, customers, business partners and suppliers. These products offer presence awareness, instant messaging, and web conferencing. In addition, the latest Netscape<sup>3</sup> browser allows a team leader to share their web page with multiple users. Lastly, Enlista's Chat in Context<sup>TM</sup> allows users to browse and share information while chatting<sup>4</sup>.

**2.3.3. Summary.** Though limited, researchers have started to explore collaborative information seeking. Many of these studies looked at CIS from a conceptual perspective and focused on such things as the manifestations of CIS, mechanisms used in CIS, the contexts within which CIS is applicable, as well as the limitations of CIS. In addition, some researchers have looked at CIS from a technical perspective. These studies concentrated on how technology can and should support the collaborative nature of information seeking.

## **2.4. SUMMARY**

Most medical informatics studies examine information seeking from the vantage point of the individual information seeker, not from that of the team. In these studies, information seeking is primarily viewed as a set of activities carried out by a single person, fulfilling a recognized information need via a formal or informal information source. A few medical informatics studies and information science studies [8, 13, 25-32] examine information seeking from the collaborative perspective. However, for the most part, collaborative information seeking research is still in its infancy.

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<sup>3</sup> <http://www.netscape.com>

<sup>4</sup> <http://www.enlista.com/products.html>

Like most modern organizational work, collaboration and the need for information are central to medical work [33]. In order to provide appropriate patient care, healthcare providers from many disciplines (e.g., nurse, physicians, and technicians) must coordinate their efforts; therefore, the collaboration of these healthcare providers is vital. While collaboration is essential, information is also crucial for these workers; high quality patient care is the direct result of accurate and timely information [9]. Indeed, healthcare workers must collaborate to find information in order to provide patient care; however, a lack of research still exists in the area of collaborative information seeking. Consequently, we have little understanding about the intricacies of the collaborative information seeking process such as when and how healthcare providers work together when seeking information, and the mechanisms by which people coordinate their work activities when collaborating.

To address these knowledge gaps, a research study was conducted examining the collaborative information seeking practices of medical workers in the emergency department of a small, rural hospital. As a follow-up to a field study conducted previously in the surgical intensive care unit (SICU) at Metropolitan Hospital (a pseudonym) [9], the focus of this project was to extend the findings of the first study in a different hospital setting. The next section lays the groundwork for this study by discussing the research methods and data analysis techniques used.

### 3. METHOD

#### 3.1. INTRODUCTION

A successful research project cannot only be determined by the results it produces, but on the processes and methods used to execute the project. This chapter describes the site, participants, and data collection and analysis methods used in the study

#### 3.2. SITE

The site of this research project is the Emergency Department (ED) at Regional Hospital (a pseudonym). With only 210 beds, Regional Hospital is significantly smaller than Metropolitan Hospital, the site of Reddy's earlier research. In addition, Regional Hospital, providing care for a rural area, serves a different patient population than Metropolitan Hospital which provides patient care to a large urban area. Lastly, many medical students are involved in the work at Metropolitan Hospital, a teaching hospital. Regional Hospital is not a teaching hospital; therefore, very few medical students work at the hospital. These differences allow us to examine the findings from the first study to determine if they are generalizable to other hospital settings.

**3.2.1. Site Details.** The ED at Regional Hospital is a 25-bed unit that treats people suffering from a wide range of illnesses. The ED manages everything from children with fevers to severe motor vehicle accident victims. It is a busy unit seeing approximately 90 patients per day, and often more than 100 patients per day in the winter months. The unit is staffed 24 hours per day by a team of specially trained healthcare professionals. In order to care for a wide-range of patients, the ED is equipped with sophisticated technical equipment including digital physiological monitors, web-based

applications included on the Regional Hospital intranet, similar to applications used in other hospitals [34], and a computerized patient record system known as Meditech, again similar to systems used at other hospitals [35]. Medical staff is also equipped with radio pagers and telephones available throughout the unit. Patients' average length of stay in the unit is three hours and twenty minutes.

The Emergency Department is divided into two main areas, urgent care, and convenient care. Convenient Care offers non-emergency walk-in care, 7 days a week, 12:00 p.m. to 12:00 a.m., for minor illnesses and injuries. Convenient care (CC) is staffed by a family nurse practitioner (FNP) and a registered nurse (RN). The convenient care area includes five rooms (beds), a nursing station, a family nurse practitioner office, and an OmniCell pharmaceutical dispenser which does not dispense narcotics. Please see figure 1.1 below for a graphical layout of the convenient care area.

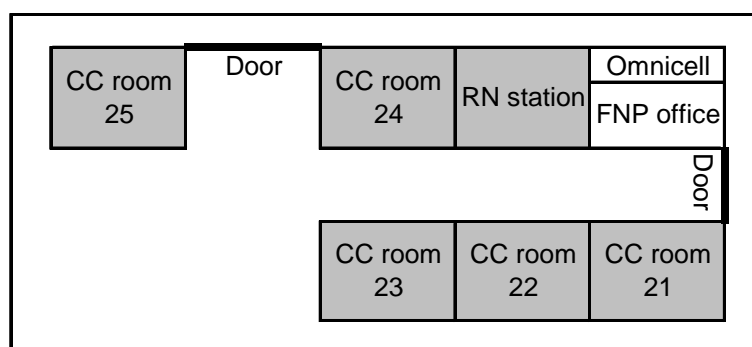


Figure 3.1. Convenient Care Layout

The second main area of the unit is urgent care. (Please see below for a graphical layout of the urgent care area.) Urgent care is open 24-hours /day, 365 days per year.

While the majority of patients admitted to urgent care arrive by ambulance following injuries, accidents, or sudden traumatic illness, walk-in patients are also treated when immediate attention is needed. At any given time, urgent care is staffed by, at minimum, a physician, a charge nurse, a technician, two registered nurses, and a unit secretary. The urgent care area includes 20 rooms (beds), three nursing stations, a charge nurse desk, a physician station, an OmniCell pharmaceutical dispenser and medication dispensing preparation room, an emergency medical services (EMS) desk, and a unit secretary desk.

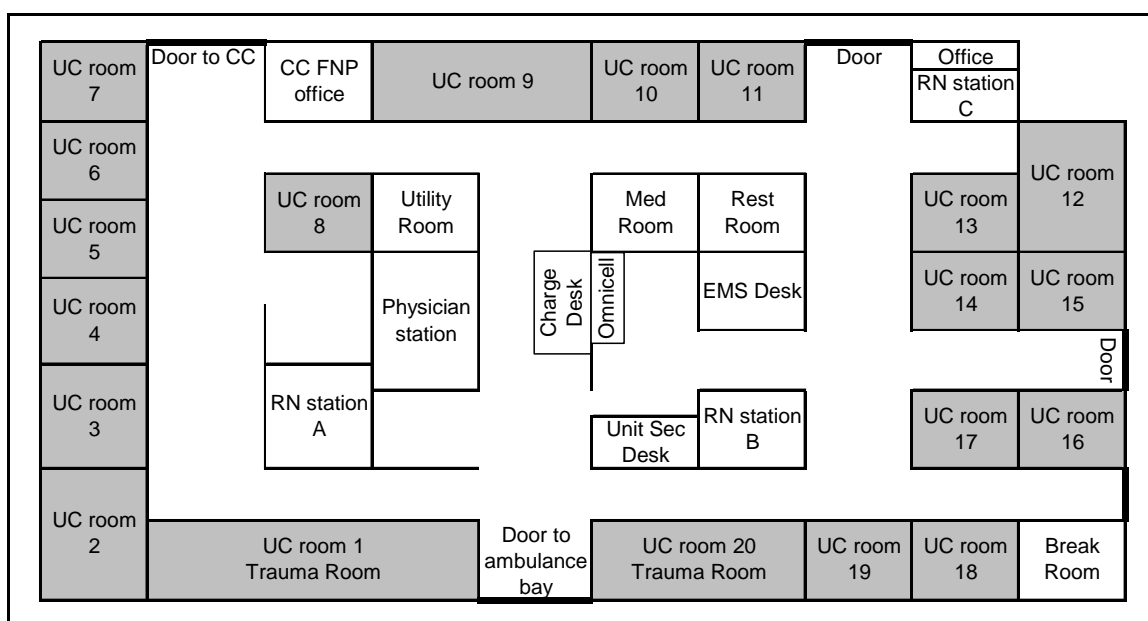


Figure 3.2. Urgent Care Layout

### 3.3. PARTICIPANTS

The Emergency Department staff consists of a team of healthcare professionals who bring their own particular expertise and experience to the unit. The team members

interact constantly throughout their shift, collaborating to provide the highest level of care for patients in the ED. As one paramedic stated, “we have a really good team here and everybody tries to help everybody.” He further went on to say, “We have good teamwork.”

**3.3.1. Physicians.** The ED physician staff plays a central role in making medical and plan of care decisions in the unit. Physicians must make decisions rapidly, not only because the patient’s condition may call for urgency, but because the unit is often very busy with patients waiting to see a doctor. When warranted, physicians may want to have a patient admitted to the hospital. In this case, ED physicians must contact an admitting hospital physician for admission approval and patient hand-off. The physician staff consists of eight contracted doctors who work twelve-hour shifts. One to two physicians are on duty at any time.

**3.3.2. Nurses.** The ED nursing staff consists of approximately 23 full-time equivalent registered nurses (RNs), three family nurse practitioners, and three paramedics, all specializing in emergency medicine.

**3.3.2.1 Registered Nurses.** Each RN assumes responsibility and accountability for their patients, and provides both direct care, as well as directing the care given by other members of the patient care team. In addition, the RN coordinates care for patients, working closely with physicians and ancillary departments to assure coordinated care is provided. During their shift, each nurse is assigned to three or four ED beds (rooms). Along with providing care, one of the primary roles of a registered nurse is patient advocate. In addition, RNs are responsible for observing, assessing, and recording symptoms, reactions, and progress in patients; assisting physicians during

treatments, and examinations; and, administering medications. RNs also instruct patients and their families in proper follow-on care. Because of the continued contact and interaction with patients, the nursing staff has the most knowledge about the patient's status and the patient care tasks that have been and need to be performed.

**3.3.2.2 Paramedics.** In addition to registered nurses, the staff includes paramedics. Usually, one paramedic is assigned per shift and works under the supervision of a registered nurse in the same capacity as a registered nurse; however, their assessments and triage notes must be co-signed by an RN. Furthermore, paramedics are allowed to perform intubations in the emergency department, while registered nurses are not. This is the only difference in responsibilities between registered nurses and paramedics. RNs are trained to perform intubations, yet hospital policy does not allow this.

**3.3.2.3 Family Nurse Practitioners.** A family nurse practitioner is a registered nurse with advanced training in the primary care of adult and pediatric populations. As stated previously (Section 1.2.1), the convenient care area of the ED is staffed by a family nurse practitioner with the assistance of a registered nurse. The family nurse practitioner is responsible for providing primary care to convenient care patients under the medical supervision of the ED physicians and as directed by clinical protocols. In addition, the family nurse practitioner oversees the work of the staff assigned to convenient care and assures that convenient care is run according to hospital and department standards.

**3.3.2.4 Charge Nurses.** Lastly, each shift is supervised by a registered nurse that has been assigned the position of charge nurse. When selecting a charge nurse, the unit director looks for persons with strong clinical skills, good inter-personal skills, and

the ability to lead others effectively. The charge nurse leads and coordinates the day-to-day activities of the nurses and support staff, ensuring adherence to regulations and guidelines, hospital policies, and accepted nursing protocols and procedures. The charge nurse also coordinates services with other patient care units, and provides nursing services and patient care as needed.

**3.3.3. Technicians.** The ED also includes technicians who provide direct and indirect patient care under the direction and supervision of a registered nurse. The technicians help set up a variety of patient care procedures as well as perform tests such as electrocardiograms and blood draws. In addition, technicians are responsible for room preparation and cleaning as well as stocking and dispensing of supplies.

**3.3.4. Unit Secretary.** The ED includes a unit secretary. The unit secretary provides clerical support to the ED with responsibilities that include entering physician orders, gathering appropriate documents, organizing ED charts, and participating in the collection of ED statistical data. The unit secretary also acts as receptionist for the unit.

### **3.4. DATA COLLECTION**

This qualitative study employed ethnographic methods and techniques commonly used in Computer-Supported Cooperative Work (CSCW) research [36-38]. Methods included observation, formal and informal interviews, and artifact collection [16]. Table 3.1 includes data collection methods, examples, and quantity.

Table 3.1. Data Collection Methods, Examples, and Quantity

Data Collection Methods	Specific Examples	Quantity
Observation	ED work processes, day/night shift	7 months, ~ 100 hours
Observation	Charge Nurse meetings	3 meetings
Interviews (semi-structured)	Formal	9
Artifact Collection	Regional Hospital Standards of Behavior, ED Flowsheet, Event Report, Order Sheet	

**3.4.1. Observation.** The focus of the study was to provide insight into work practices, information seeking needs, and collaborative behaviors of the ED staff. Given that observing a group in their natural setting is a key aspect of qualitative research, I employed observational techniques to gain a better understanding of the patient care team's work practices and interactions [39]. Over a period of seven months in 2005, I observed the ED staff carrying out their daily work activities. I was present at different times during the day. The observation sessions lasted from one hour to seven hours each; totaling 95 hours of observed activity. All observations were documented in field notes and later transcribed.

**3.4.2. Learning the Basics.** In order to understand the work, I spent the first few months of observations following individual patient care team members, alternating between each team function (RN, technician, unit secretary, physician, FNP, paramedic, as well as emergency medical services ambulance personnel). This afforded an understanding of the terminology, general process flow, and responsibilities of the different team members. It also allowed the ED staff to become more comfortable with me and built trust and rapport, as we were able to interact one-on-one.

**3.4.3. Attention to Detail.** Paying attention to the details of the work meant that I had to be at the location where patient care team members collaborated most – at the main nursing stations (A and B, see figure 1.2 above). Therefore, after a few months, I spent less time with individual team members, and more time at the central nursing stations observing the team. The “view” from the two main nursing stations allowed me to observe all team members interacting and collaborating. For example, in one instance, a registered nurse waited to enter orders for a newly arrived ambulance patient, as she wanted to consult with one of the physicians first. The registered nurse waited near the physician station for the doctor to finish a phone call, then explained the patient’s condition and situation to the physician. The physician decided not to have any orders entered, but instead agreed to see the patient right away.

**3.4.4. Meetings.** I attended both formal and informal meetings of the unit. The director of the emergency department met with the ED charge nurses on a regular basis. At these meetings, information pertaining to hospital and unit policies, procedures and standards was disseminated. In addition, staff concerns and issues were discussed. After these meetings, charge nurses were responsible for having “standing” staff meetings,

where the staff stands in a circle for a quick meeting, or one-on-one meetings with their personnel in order to further disseminate the information.

**3.4.5. Interviews.** I used semi-structured interviews to collect information regarding the role, information needs, and collaborative behaviors of the subjects in the ED. The interviews were guided conversations where broad questions were asked, and new questions were allowed to arise as a result of the discussion [40]. I asked the following questions during each interview.

- How long have you been working in the ED at PCRMC?
- Please provide a very brief overview of your role and responsibilities.
- What do you think is your most important job function and why?
- What information do you need to do your job?
- What sources of information do you use to do your job?
- When do you collaborate with coworkers regarding your information needs?
- When you are collaborating with your coworkers looking for information, what are the biggest problems you have to deal with?
- How have your information needs changed with the introduction of new technologies?

I conducted interviews with members of the staff who represented the core healthcare team in the unit (table 3.2). The interviews were audio taped and transcribed. In addition, I performed informal interviews during the observations to further understand the work being carried out and for clarification purposes.

Table 3.2. Number and Category of Staff Interviewed

<b>Group Interviewed</b>	<b>Quantity</b>
Registered Nurses	4
Paramedics	1
Technicians	2
Physicians	1
Unit Secretaries	1

**3.4.6. Artifact Collection.** Having access to formal documentation including procedures, standards, internal communications, organizational charts, flowcharts, job summaries, and performance appraisals allowed for the understanding of how day-to-day work differed from documented procedures. In qualitative research, the interest is “in the everyday practices rather than the idealized account” [40]. Forms and paperwork used during the day were also collected for the study.

### 3.5. DATA ANALYSIS

Faced with volumes of data collected using the ethnographic methods, including transcribed field notes, transcribed interviews, and artifacts, the data was analyzed using Grounded Theory [16].

**3.5.1. Grounded Theory.** Grounded Theory (GT) is well suited to analyzing the collection of data from multiple sources and multiple perspectives. As an inductive theory, GT makes no distinction between theory and design. In fact the theory is a guide to design. It also is an approach for evoking a theory about context from data, as opposed to imposing a hypothesis upon evidence. The theory evolves from coding the data, which leads to the identification of categories and themes, and allows for a close relation between data, analysis, and theory. These categories give rise to hypotheses that are then strengthened, modified, or rejected after further coding of the data and the continuing investigation of relationships between the categories [16].

**3.5.2. The Process.** Once the field notes and interviews were transcribed, the the data was analyzed. Not only was each interview, field note and artifact reviewed and analyzed, but these items were compared (interview-to-interview, interview-to-field notes, interview-to-artifacts, field notes-to-field notes, etc.) looking for similarities and commonalities. The data was analyzed paragraph by paragraph, and at times, line by line and even word by word, to identify categories, and their properties, from the data, (e.g., coding the data). At this point, initial hypotheses about categories, and particularly about relationships between categories, were documented. Further analyses were done to strengthen or dismiss these initial hypotheses. In addition, a deeper review of literature was performed once hypotheses were formed and strengthened [16].

**3.5.3. Qualitative Software.** Qualitative data analysis software was used to assist in the analysis. All data was imported into the software as documents. Even artifacts were created as “external” documents with a rich description of their use and contents. Then as data was reviewed and compared and categories emerged, nodes were created in the

software and the text was “coded” on the respective node(s). This allowed for easy comparisons of text coded on the same node and across nodes. As analysis progressed, memos of emerging hypotheses were documented within the software at both the document and node level. As hypotheses were tested and strengthened, nodes were modified (ordered, combined, collapsed, etc). The software allowed this functionality without any loss of coding. The software program used was N6 developed by Qualitative Solutions and Research (QSR)<sup>5</sup>.

**3.5.4. Triangulation.** As previously stated, data was collected using different methods and compared both within and across data collection techniques. For example, when looking at collaboration in the ED, I focused the observations on these types of activities as they arose. Later in the study, I held formal interviews with questions that focused specifically on collaboration. In addition, the same set of questions was asked during all the interviews. This approach allowed for the gathering and analysis of robust and accurate data. Employing this type of triangulation allowed me to overcome the weakness, intrinsic biases, and problems that come from single method, single-observer, and single-theory studies.

### **3.6. SUMMARY**

The emergency department at Regional Hospital was selected as the site of this research study, allowing for the observation of multi-disciplined patient care teams. The qualitative study employed ethnographic methods such as observation, formal and

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<sup>5</sup> Qualitative Solutions and Research (QSR International), Doncaster, Australia, copyright © 2002, [www.qsrinternational.com](http://www.qsrinternational.com)

informal interviews, and artifact collection [16] to better understand the information seeking behaviors and needs of these teams. Lastly, Grounded Theory [16] was used to analyze the volumes of data collected. Now that the groundwork has been laid for how the study was conducted, the next section will present the results of the analysis.

## 4. FINDINGS

### 4.1. INTRODUCTION

Patient care team members often collaborated because of information breakdowns. These breakdowns occurred when team members did not have the necessary information needed to carry out a task. When analyzing the data from the perspective of how team members attempted to deal with information breakdown, three main themes emerged. These themes focused on (1) questions that lead to collaboration, (2) when people collaborate, and (3) how people collaborate (Figure 4.1).

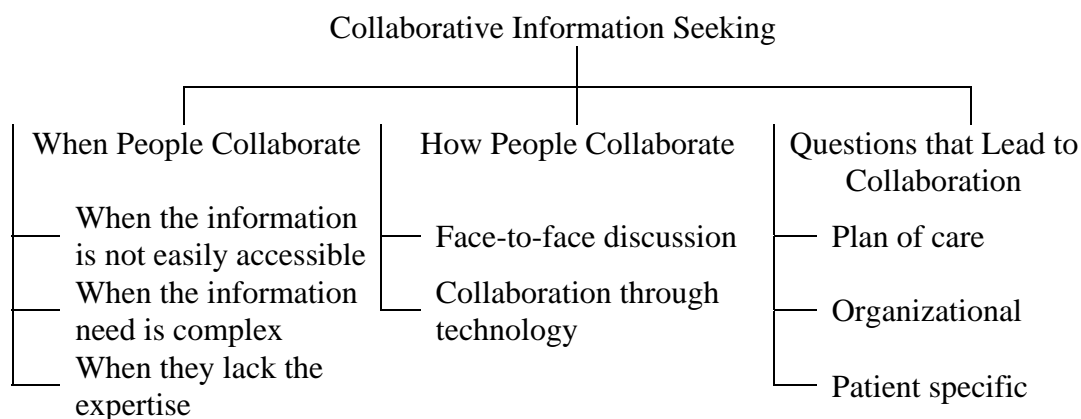


Figure 4.1. Collaborative Information Seeking Themes from the Data

### 4.2. WHAT TYPES OF QUESTIONS LEAD TO COLLABORATION?

Upon examination, information breakdowns manifested themselves in the form of questions. The kinds of questions asked by the information seekers were then analyzed to better understand what questions might lead to collaborative information seeking. During

observations, team members asked 628 separate questions. Questions were analyzed and categorized by question type. Three major categories of questions were identified (see Table 4.1 for a summary): patient specific, organizational, and plan of care.

Table 4.1. Categories of Questions Asked by ED Team Members

Question Categories	Questions (n = 628) 100%
Patient Specific	334 (53%)
Organizational	224 (36%)
Plan of Care	70 (11%)

Past studies highlighted the importance of clinical [41] and organizational [28] questions, and this study included both types of questions as well. However, this study also revealed a large number of patient specific questions (53%). These questions were predominantly asked of patients during their triage and initial assessment because very little is known about the patient's current condition and medical history leading to his or her emergency department visit.

**4.2.1. Patient Specific Questions.** Many patient specific questions were asked in the ED. These questions pertained to information dealing with the patient. Examples of patient specific questions follow.

- *What is his [the patient's] temperature?*

- *Do you have a history of allergies?*
- *Is the patient's blood pressure up?*

Looking closer at the last question, the physician was trying to get the patient's blood pressure under control. The physician initiated a protocol and implemented a plan of care. In this instance, the physician was interested in specific information regarding the patient's blood pressure in order to determine if the plan of care was working. The attending RN had not checked on the patient recently, hence she took the patient's blood pressure. The RN returned and told the physician the patient's blood pressure.

**4.2.2. Organizational Questions.** Many questions pertaining largely to hospital policies, hospital procedures, coordination, and bed management issues were also asked in the ED. Without this organizational information, the ED team would have difficulty functioning effectively and providing appropriate patient care. Examples of organizational questions include:

- *Where can we put the incoming ambulance patient?*
- *Did you bring back a new patient to one of my rooms?*
- *Which tube should I use for an ammonia level blood test?*

Looking closer at the last question, hospital procedures define which tubes should be used for certain lab work. Team members must collect the blood correctly; otherwise the lab cannot process the results. In this case, the information seeker needed to know which tube to use for an ammonia level blood test, and therefore, asked a Medic who told her to use the long green tube with the black top. Drawing blood is a main responsibility of Medics; therefore, they have committed the information regarding lab work tubes to memory. This made them a convenient source of information in this situation.

Two interesting subsets of organizational questions arose from the data focusing on coordination of work and bed management. Coordination questions accounted for 27% of all questions asked, while bed management questions accounted for 3%. Further details regarding these subsets of questions are in the discussion section of this paper.

**4.2.3. Plan of Care Questions.** During observations in the ED, many questions regarding plan of care were asked. These questions, when answered, allowed the team members to develop and/or modify a treatment plan for the patient. Example plan of care questions include:

- *Can we do anything else for her right now to ease her symptoms?*
- *Do you want the patient to be sent to x-ray before blood work is drawn?*
- *Should I send the patient to another hospital?*

Focusing on the last question listed, the ED physician was faced with a decision regarding the longer-term treatment plan of the patient. Given that the ED physicians are not responsible for patients once they leave the emergency department, he had to discuss the situation with the patient's family physician. The ED physician asked the family physician, "Should I send the patient to another hospital?" After some discussion, they decided to send the patient home with extra medication and to have her see her family physician tomorrow. Together, they determined a plan that gave the patient the care she needed, within the constraints of the situation.

**4.2.4. Summary.** It was useful to have an understanding of the questions asked within the context of the work. These questions highlighted examples of information breakdowns, which in turn can lead to collaborative information seeking. Within this

study, three major categories of questions were identified: patient specific, organizational, and plan of care.

#### **4.3. WHEN DO PEOPLE COLLABORATE?**

One theme that emerged from the data regarding information breakdowns highlighted when people collaborated. In the ED, patient care team members collaborated when the information was not easily accessible, when the information need was complex, and when the information seeker lacked the expertise needed for the situation.

**4.3.1. When the Information is Not Easily Accessible.** In this study, medical professionals collaborated most often because the information needed was not easily accessible to them. Often, the design of the work process or information system made it difficult to know when information is available. At other times, team members collaborated because they do not know what information to pull from various sources.

In the following example, an ED physician found it difficult to access needed information.

*The ED Doctor is caring for a patient in room 5 and is waiting for lab results. Normally, upon completion of the lab work, the results print directly to the Unit Secretary's printer, and then the Unit Secretary either puts the lab results on the patient chart or in the appropriate slot in the rack on the Unit Secretary's desk. The needed results are not in either location. The Doctor asks the Unit Secretary about the labs, but she has not seen the results either. Therefore, the Unit Secretary checks the status of the results in the Meditech system, while the Doctor calls the lab directly to check on the lab work for room 5. The Meditech system showed the lab results as status 'pending,' while the lab told the Doctor that it will be about 15 minutes longer before the results will be available. The Unit Secretary and Doctor then regrouped and shared with each other what information had been found.*

In this example, the information needed by the ED physician (the lab results) was not easily accessible when needed. The physician did not find the lab results on the chart or in the slot for room 5 in the rack at the unit secretary's desk. At this point, the physician enlisted the help of the unit secretary, who serves as an information resource for other people. Because they each knew how to possibly access the information, they divided-up the information seeking, with the unit secretary using the Meditech system and the physician calling the lab directly. They both determined that the labs were not yet available, but the physician also discovered that the labs would take another 15 minutes to complete. The information found by each team member was shared with the other team member. This iterative process, of searching-sharing-searching until the information is found was observed quite often in the emergency department.

**4.3.2. When the Information Need is Complex.** In this study, ED team members often collaborated because the information need was fragmented and could only be gathered by using multiple sources. In healthcare, the information needed to give high-quality patient care is often intricate and multi-faceted, and finding this information can be a difficult task.

In the following example, an emergency department physician needed many pieces of information about a patient before administering a pain medication.

*The Triage RN brings a patient back to room 16. The patient's pain is severe enough that the Triage RN starts a protocol, entering the protocol into the Meditech system. But, the Triage RN questions the suggested pain medication believing it may not be strong enough for the patient. Therefore, the Triage RN discusses the pain medication options with the Doctor. The Triage RN suggests a particular pain reliever. Before deciding on a pain medication, the Doctor wants to know the patient's weight, current pain level rating, symptoms and pain location. While the Triage RN has some of this information documented, the current pain level rating is not up-to-date. Therefore, the attending RN volunteers to talk*

*with the patient about their pain rating, while the Triage RN reviews the Emergency Department Flowsheet. Once the needed information is found by the Triage RN and attending RN, they share it with each other and the Doctor. This information is then used by the team to determine that Demurral should be administered for the pain.*

In this example, emergency department team members were interested in finding information for a specific task. The ED physician, triage RN and attending RN collaborated before determining which pain medication to administer to the patient. The physician initiated this collaboration because the information need had many components (weight, pain rating, symptoms and pain location), and could not be easily found by looking at one source of information. The physician needed many pieces of specific information about the patient. While they each had access to the information, it was easier for the triage RN and attending RN to find the pieces of information because they were more familiar with the resources.

**4.3.3. When They Lack the Expertise.** Emergency department team members also collaborated because they lacked the skill or knowledge in a particular area. The emergency department is a team environment consisting of medical professionals from many disciplines including physicians, registered nurses, technicians, paramedics, family nurse practitioners, and administrative personnel. Additionally, each team member has a role to play in the ED, bringing their own experience and expertise to the unit. Therefore, team members often relied on each other for information outside of their own expertise.

In the following example, an ED physician consulted with a radiologist about a patient with shoulder pain and mobility issues.

*The ED Doctor sees x-rays in the rack at the Unit Secretary's desk. The Doctor looks to see if they are the x-rays he is waiting on for room 19. They are, so the Doctor takes the x-rays and reviews them. The Doctor*

*sees some irregularities; therefore, he goes to see a radiologist for a consult. The Doctor shows the Radiologist the x-rays and says that he is not sure if the fracture he sees in the shoulder is old or new. The Radiologist asks the Doctor the age of the patient and the presenting condition. The Doctor tells the Radiologist this information. While the Radiologist reviews the x-ray close, the Doctor returns to the emergency department to ask the patient about possible past shoulder injuries. Upon a thorough review of the x-ray, the Radiologist tells the ED Doctor that the fracture looks old because the edges of the bone are rounded, not sharp. The Doctor is able to support the diagnosis with the information gathered from the patient – he had hurt his shoulder about 11 months earlier. They discuss further, and decide to have the patient see an orthopedic doctor in one week, just in case. Until then, the patient should do no heavy lifting and take their pain medication as prescribed.*

In this example, the ED physician lacked the knowledge in radiology to make a diagnosis in which he could feel confident. Therefore, he consulted with a radiologist, the expert in this area about his patient. This collaboration led to a diagnosis and treatment plan that was acceptable to both doctors.

**4.3.4. Summary.** The first theme that emerged from the data demonstrated how information breakdowns manifested themselves as questions within the context of the work. The second theme highlighted the triggers that lead patient care team members to collaborate, specifically when the information was not easily accessible, when the information was complex, and when the information seeker lacked the expertise needed for the situation. The last theme explained how patient care team members collaborate in the ED.

#### **4.4. HOW DOES COLLABORATION WORK?**

The two ways that team members collaborated in the information seeking process were face-to-face discussions and through the aid of technology.

**4.4.1. Face-to-Face Discussion.** In the emergency department, the team was physically co-located. In addition, the pace in the emergency department was very fast; therefore, the most convenient and expeditious way to collaborate when breakdowns occurred was in person. Face-to-face interaction allowed team members to acquire information they would not otherwise have been able to obtain including the background and circumstances surrounding the activity for which the information was needed. When an ED team member found themselves needing information, they sought out the person or persons they thought would most likely have, or know where to find, the needed information. Often times these discussions took place at the point of contact of the collaborators, whether that be as they passed each other in the hallway, as they sat at the nurses' station, as they assessed the patient in their room, etc.

In the following example, the attending RN needed as much information as possible about the new ambulance patient in order to administer care.

*An ambulance arrives with a woman complaining of confusion. As the patient was wheeled into a room and moved from the gurney to the bed, the attending RN began filling out the Emergency Department Flowsheet. The RN and Paramedic removed themselves from the room and spoke in the corridor. They discussed pertinent information regarding the patient's condition. For example, the RN needed to know how the patient acted upon arrival at the scene, what prescriptions the patient was taking, general symptoms and presenting condition of the patient, as well as the patient's history. Since the patient was unable to communicate, the RN worked with the paramedic to gather the needed information. The RN asked the Paramedic for information regarding the current condition of the patient, and then the RN asked the patient's wife about the patient's medical history and list of medications. Both the Paramedic and the patient's wife provided the needed information, and offered additional information about the patient that they felt was important.*

In this example, the RN needed information in order to treat her new patient. Yet, at the time of transfer, the information needed was in the minds of the paramedics and the

patient's wife. This information was not documented by the paramedics until after the patient was handed over to the hospital. This was obviously too late for the needs of the attending RN, but was suitable for official documentation and hand-off procedures. The easiest way for the RN to access this information was to talk, face-to-face, with the paramedics and the patient, or in this case, the patient's wife. The advantage of the face-to-face discussion was that it offered a convenient and fast way to gather the needed information, allowing the flow of work to continue.

**4.4.2. Collaboration Through Technology.** Although the team was physically co-located, the department was large and segmented. Therefore, technology also played a part in collaboration. These technologies, including two-way radios and the ED board, supplemented face-to-face discussions, allowing other efficient and effective ways to collaborate.

In the following example, the use of two-way radios allowed for quick access of a human information source.

*An ambulance arrives to the emergency department. The Unit Secretary sees this and calls the Charge Nurse over the two-way radio to ask her advice as to where to put the new ambulance patient. They discuss the current bed situation (which rooms are occupied, which are not, and which may be soon), and then the Charge RN makes the decision to put the patient in room 13.*

The previous example illustrates how two-way radios were used in place of face-to-face discussions. The unit secretary was able to quickly engage the charge nurse. Then, they were able to discuss bed availability and quickly secure a room for the incoming patient.

The following vignette highlights the use of the ED board as a collaborative technology.

*An ambulance arrives and the patient is brought directly to triage per the instructions of the Charge Nurse. A little later, the Triage RN comes back to the ED to talk to the Charge Nurse. The Triage RN explains that the patient brought in by ambulance has a large eye contusion and should be sent to an ED room immediately. The Triage RN asks, "Can I put the patient in room 11?" Both nurses go to the board and review the status of beds. While reviewing the board, another RN says that she is discharging a patient in room 19 soon. Considering all the information, they decide to move the triage patient to room 11.*

Knowing where patients are and which rooms are available was very important in the emergency department, as there were nearly always patients in the waiting area. The vignette illustrates that using the ED board and keeping it updated was crucial to a smoothly run emergency department. The board was most used by the triage RN (to know where to put new walk-up patients) and the charge nurse (to know where to put ambulance patients).

#### **4.5. SUMMARY**

Three main themes emerged from the data which aid in better understanding collaborative information seeking in a medical team environment. These themes included (1) questions that lead to collaboration, (2) when people collaborate, and (3) how people collaborate. The team collaborated when the information need was not easily accessible, when the information need was complex, and when they lacked the expertise. In addition, the team collaborated in two distinct ways: through face-to-face discussion and using technology. Lastly, the types of questions that led to collaboration included patient specific questions, organizational questions, and plan of care questions.

## **5. DISCUSSION**

### **5.1. OVERVIEW**

This study of medical professionals working as a team in the emergency department helps us better understand the collaborative information seeking practices of patient care teams. The results of the study indicate that collaboration plays a large part in their information seeking activities. The discussion that follows is based on the research objectives posed earlier in the thesis.

- What are the collaborative information seeking behaviors of patient care team members in the emergency department?
  - When do patient care team members in the emergency department collaborate to find needed information?
  - What triggers the collaborative information seeking process in the emergency department?
  - What mechanisms do patient care teams in the emergency department use to collaborate?

### **5.2. THE IMPORTANCE OF INFORMAL SOURCES**

Medical work in the emergency department, because of its team structure, is naturally highly collaborative. In order to provide appropriate and high-quality medical care, emergency department team members must constantly interact with each other. In nearly all the instances of collaborative information seeking in the emergency department, the first source of information was most often an informal source – specifically another team member. This is not surprising because the emergency

department is a team environment consisting of medical professionals from many disciplines and each team member brings their own experience, knowledge, and expertise to the unit. In addition, the fast pace of the ED leads team members to use informal sources instead of other sources such as textbooks and manuals because informal sources, such as human sources, are often easier and faster to ‘reference.’

**5.2.1. The Gatekeeper.** Collaborative information seeking often occurs due to information breakdowns. In the emergency department, these breakdowns are often overcome by the information seeker collaborating with the most important informal source in the unit – the unit secretary. Similar to the findings of McDonald and Ackerman [29], the unit secretary fulfills the role of gatekeeper in the information seeking process and serves as an information resource for other people. The unit secretary is the conduit between the emergency department and other hospital units, physicians outside of the hospital, other hospitals, and medical partners such as home healthcare providers. Often when a team member needs to speak with someone outside of the unit, they ask the unit secretary to make first contact. In addition, when a team member needs information regarding orders or results; again they go to the unit secretary. When a patient care team member is in doubt of where to look for information or who to call, they first refer the unit secretary for guidance.

**5.2.2. The Interruptive Environment.** The use of informal sources such as the unit secretary can lead to an interruptive workplace. An interruptive workplace is an environment where there are breaks in the uniformity or continuity of the work. There are many possible reasons for the use of informal sources, and therefore an interruptive work environment.

- The ED team is made up of medical professionals from many disciplines offering an abundance of knowledge and experience into which to tap.
- The physical co-location of the team leads to the use of synchronous communications as opposed to asynchronous communications such as voicemail and email.
- The over-arching organizational goal for the ED is to move patients through quickly in order to care for as many patients as possible. This type of environment leads to the need to deal with questions and issues as they arise in order to keep the process from slowing down. Again, synchronous communication with human sources better supports this need.
- Clinical issues are often complex and poorly defined; therefore, the exchange of information and ideas with a colleague during conversation is often the best and easiest way to work through the complexity and to find a solution to the issue.

There are both benefits and costs to an interruptive workplace. One of the main benefits of an interruptive workplace is that patient care team members can talk to other team members as needed. This allows for access to a deep set of knowledge on demand, prompt access to information, and the ability to gain knowledge about the context surrounding the decisions made regarding the activity at hand and the needed information.

Yet, these interruptions have costs associated to them as well. An interruptive work environment can lead to loss of attention, forgetfulness, and errors [42, 43], which in turn can lead to poor quality patient care. In addition, team members often do not think

through the consequences of their collaborative information seeking actions, including their use of alternative sources or approaches which may lead to higher quality or more appropriate information.

### **5.3. ORGANIZATIONAL ISSUES**

One of the key reasons that people collaborate is because they are not clear about organizational issues. At Regional Hospital, policies and procedures change often and without much explanation. These changes are then disseminated by the charge nurses to the staff verbally during standing meetings, as well as via a departmental “communications” book and memos hung throughout the unit. Because of the casual way in which these policies and procedures are conveyed, many are overlooked.

A large percentage of the questions asked during observations (36%) pertained to hospital policies, hospital procedures, coordination, and bed management issues. The answers to these organizational questions allowed the ED team to function more effectively and to provide appropriate patient care. This organizational information allowed ED team members to accomplish their work and keep the unit running smoothly. Two interesting subsets of questions, coordination and bed management, were asked more often than expected.

**5.3.1. Coordination.** In addition to providing quality healthcare, speed is of the essence in the emergency department. Therefore, getting answers to questions regarding coordination is of the utmost importance because these answers allow the emergency department team to work effectively and efficiently. It is imperative for each team member to not only organize their own work, but to coordinate the work of other team

members and healthcare professionals both within the hospital and without. This efficiency and effectiveness leads to high-quality patient care.

For example, in the ED, patients often need x-rays to aid in the diagnosis of the medical problem. Some patients can be brought to the x-ray department, but other patients should not be moved. In the case of the latter, x-ray technicians visit the ED with a portable x-ray machine and perform the x-rays directly in the patient's room. What sometimes occurs is that the x-ray department receives the orders and calls the ED unit secretary regarding the mobility of the patient. The unit secretary then collaborates with the attending RN and/or technician to determine the best course of action for executing the x-rays, and conveys this information to the x-ray department who acts accordingly. This type of coordination leads to an efficiently executed process and higher quality patient care.

**5.3.2. Bed Management.** Space in the emergency department is a critical organizational resource. When all the beds in the ED are filled, only emergency cases which arrive via ambulance are admitted and walk-in cases must wait, sometimes hours, to be seen by a physician. Long wait times have serious repercussions for patients in terms of their medical needs and for the hospital in terms of the customer satisfaction of their patients. Therefore, the ED staff must ensure that sufficient beds are available to allow patients to be admitted as quickly as possible. The flow of patients in and out of the unit is a constant concern for the ED staff.

Ensuring that accurate bed information is available and quickly answering questions regarding bed management is of the utmost importance because these answers allow the emergency department team to better control the flow of patients in and out of

the unit. It is imperative that each team member keep the ED board up-to-date so that the triage RN is always aware of available beds. Accurate bed information also helps the charge nurse make informed decisions when placing arriving ambulance patients in the ED. These actions lead to shorter wait times and increased customer satisfaction.

#### **5.4. LIMITATIONS**

These findings should be understood within the limitations of the methodology adopted. First, the study was conducted by a single observer in the emergency department; therefore, many collaborative information seeking activities occurred when I was not present; therefore, these activities were consequently not documented. Secondly, it is possible that subjects may have changed their behavior because of the presence of an observer and therefore the actions observed may not be representative of actual CIS practices.

Although the study clearly had some limitations, the study design attempted to compensate by the methodology used. I was in the unit for approximately 100 hours over a period of seven months, observing during both day and night shifts. I collected data regarding the collaborative information seeking practices of many different groups of medical professionals, as team members' schedules are always changing, and at different work periods. This allowed for the sampling of many different types of CIS practices. In addition, since I was in the ED for numerous hours over many months, eventually I was no longer seen as an obtrusive observer and therefore the patient care team members acted in such a way that would be representative of their normal CIS activities.

## 6. CONCLUSIONS

Information plays a central role in completing a task or job-related function, and in the modern workplace a wide variety of information is readily available to workers. Historically, information seeking processes and technologies have been designed for the individual information seeker and information retrieval has been viewed as an individual activity [1, 2]. However, modern organizational work is being increasingly organized around multidisciplinary teams [3-5], and one important aspect of collaborative team work is information seeking [6]. Yet, we have little understanding of how people actually collaborate in teams to find information [7, 8], and very few systems exist to support this type of collaborative information retrieval. Therefore, this research focuses on studying the information seeking and retrieval practices of patient care team members in the emergency department (ED) of a rural, regional hospital to better understand the collaborative information seeking process.

A qualitative study employing ethnographic methods [16] including observation, formal and informal interviews, and artifact collection was conducted. The results of the study concluded that patient care team members in the emergency department collaborated because of information breakdowns that occurred when team members did not have the information needed to carry out a task.

The findings described three collaborative information seeking triggers which were woven into the daily work of the patient care team. Patient care team members collaborated when the information was not easily accessible, when the information was complex, and when the information seeker lacked the expertise needed for the situation.

Looking more closely at accessibility as a CIS trigger, a key organizational and technical challenge is getting information to the right person at the time the person needs it to accomplish his or her work. Overcoming this challenge will improve and support the team members' information seeking abilities. For example, Regional Hospital currently uses the Meditech system for patient records and orders. When orders are entered, the system prints them directly to the main printer at the unit secretary's desk. Once printed, the unit secretary collects the orders and distributes them to the appropriate nursing station. The responsible patient care team member then sees these orders and executes them accordingly. In this example, the orders information is pushed to the unit secretary, and subsequently to the patient care team, in such a way that makes the information obviously available at the time it is needed. Yet, this is not the case for much of the electronic information used in the ED. Often, the seeker must pull the information, making it much harder to identify both what information is needed and where the information can be found. Therefore, team members find themselves collaborating because they do not know what information to pull from various sources. This leads to inefficiency in the department and frustration in the team members.

The results also showed that in nearly all the instances of CIS in the emergency department, the first source of information was most often an informal source – specifically another team member. These collaborations with other team members took place in two distinct ways: through face-to-face discussion and through the use of technology. These mechanisms provided a convenient and expeditious way for the patient care team members to collaborate.

The use of informal, human sources can lead to an interruptive workplace. Yet, in the emergency department, an interruptive workplace is inevitable and this is why. Firstly, team members work closely together in the same physical location. Secondly, staff in the ED do not sit idly at their desks nine hours per day, instead they constantly move between patient rooms, the nurses' station, the physicians' station, the lab, etc., interacting with patients and co-workers. This work environment is not conducive to asynchronous communications such as email. Instead, synchronous communications that support a mobile workplace, including face-to-face discussions and the use of two-way radios, are an integral part of the work processes. However, technological support mechanisms can be implemented to minimize the negative effects of an interruptive workplace. For example, currently the patient chart is a paper form, the Emergency Department Flowsheet (EDF), that is passed amongst the team as needed. At any given time, only one team member has the EDF and can access it for information or documentation purposes. Therefore, team members must collaborate in order to retrieve needed information included on the EDF. A real-time electronic medical record system could be implemented in place of the paper Emergency Department Flowsheet. This would allow each team member unlimited access to the electronic chart at any time.

Moreover, the findings pointed to three types of questions that lead to collaboration. These included patient specific questions, organizational questions, and plan of care questions. Surprisingly, 36% of the questions asked pertained to organizational issues.

Two interesting subsets of organizational questions, coordination and bed management, directly affect both patient care and patient satisfaction. Because speed is of

the essence in the emergency department, getting answers to questions regarding coordination is of the utmost importance because these answers allow the emergency department team to work effectively and efficiently. In addition, space in the emergency department is a critical organizational resource. Ensuring that accurate bed information is available and quickly answering questions regarding bed management is of the utmost importance. These answers allow the emergency department team to better control the flow of patients in and out of the unit. These actions lead to high-quality patient care, shorter wait times, and increased customer satisfaction.

We need to consider these organizational facets of the work when designing support systems. Medical systems currently support patient records and order entry, but must also support the day-to-day work necessary to keep the unit functioning. This includes supporting the activities surrounding coordination and bed management. For example, when an emergency department team member enters x-ray orders into the Meditech system, the orders print directly to the printer in the x-ray department. These orders are then reviewed by the x-ray technician making her aware that an ED patient is coming to the x-ray department. However, often times the patient is immobile or should not be moved. In this case, the x-ray technician must bring a portable x-ray machine to the emergency department. Yet, the fact that the patient is immobile is not included in the x-ray order. Therefore, the x-ray technician must call the ED unit secretary, or vice versa, to determine where the x-rays will take place. In addition, the room number of the patient is not included in the x-ray order. Consequently, if the x-ray technician must perform the x-ray in the emergency department, she must first ask the unit secretary for the patient's

room number. If information regarding patient mobility and patient room number were included in Meditech, the system would better support these coordination activities.

In closing, this study provides us with a broad understanding of the information seeking and retrieval practices of patient care teams in the emergency department of a rural, regional hospital. However, more research is needed to confirm and expand upon these initial findings. Further research is planned in a larger, teaching hospital, allowing for comparison of results between studies. Collaborative information seeking is an integral part of patient care team activities. By better understanding their collaborative information seeking work and processes, we can assist these teams in providing better care for their patients.

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## VITA

Patricia Ruma Spence was born in St. Louis, Missouri, on November 4, 1970. In December 1994, she received her B.S. in Engineering Management from the University of Missouri – Rolla (UMR).

Patricia was employed by Andersen Consulting, LLP from January 1995 to June 1998 as a consultant fulfilling roles including Technical Analyst, Project Model Administrator, Encyclopedia Administrator, Business/Functional Consultant, Technical Consultant, and Business Process Consultant. She then went on to work at The Extraprise Group, Inc. until July 2004 as a senior consultant functioning as Project Manager, Lead Business Strategist, Lead Business Analyst, Lead Siebel Configurator, Lead Trainer, and Business Readiness Consultant/Change Management Consultant.

Upon returning to UMR for a master's degree, Patricia was awarded a Chancellor's Fellowship. While at UMR, Patricia worked as a graduate teaching assistant from August 2004 to May 2005 in the Department of Business Administration, and as a graduate research assistant from June 2005 to December 2005 in the Department of Information Science and Technology's (IST) Laboratory for Information Technology Evaluation (LITE).

Patricia has also published a paper in the referred conference proceeding of the ACM Conference on Group Work (ACM Group '05).

In December 2005, she received her M.S. in Information Science & Technology with honors as well as a Graduate Certificate in Human Computer Interaction (HCI) from the University of Missouri – Rolla.

