EMOTION AWARENESS AND INVISIBILITY IN AN EMERGENCY ROOM:

A SOCIO-TECHNICAL DILEMMA

A Dissertation in
Information Sciences and Technology

by
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Abstract

The expression of emotion is often an overlooked aspect of work and consequently is easily neglected in the design of collaborative information systems. However, in collaborative work, emotion expressions can play an important function in how each individual works as well as how the team works together. As work environments become increasingly computerized, the unintended consequence of the introduction of information systems on emotion awareness emerges. This can be a serious issue for certain highly coordinated, information intensive critical environments such as in the healthcare field.

In this dissertation, I investigate the occurrence of work-related emotion expressions in the real-world work environment of a hospital emergency room (ER). Effective communication and coordination between personnel in an ER can literally mean the difference between life and death. Due to the high rate of information sharing errors, hospitals are beginning to push for the integration of electronic patient records and other information systems in the hopes it will improve communication, and that this in turn will increase safety and efficiency. At the same time, there have been many examples of unintended consequences that have emerged as the result of the implementation of electronic patient records. A central premise of this dissertation is that the expression of emotion is one of these informal aspects of coordination that may be lost or mishandled in the move toward increased technology support.

To examine the occurrence and function of emotion expressions, I conducted a six-month field study of interaction in a large urban hospital in the Northeastern United States. This field study consisted of observations of ER personnel, formal and informal interviews, artifact analysis of formal ER patient records and administrative documents, and a reflexive diary to reflect on my own emotional reactions.

The first contribution of this dissertation is to explain why emotions are expressed in the ER. This includes uncovering the sources of work-related emotion in an ER, the functional roles of the expression of those emotions, and the consequence on the work of the ER. The second contribution of this dissertation is to explain how emotion expressions are modified in the ER. This contribution shows the effect of various stakeholders’ constraining and enabling behaviors on the expression of emotions in the ER. The third contribution is to expand and articulate the role of emotion expression in the development of emotion awareness in work. The final contribution is to discuss how these findings can guide the design of systems for the emotion awareness in the ER as well as discuss the possible unintended consequences of a greater technology driven ER.
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“Emotions are alien to me. I'm a scientist.”
-- Spock, *This Side Of Paradise*, Stardate 3417.3, Episode 25
Chapter 1. Introduction

Effective communication and coordination between personnel in highly collaborative environments such as hospital emergency rooms can literally mean the difference between life and death. Contextual factors in these environments such as time pressure, complex and ambiguous problems, stress, and interruptions (Orasanu & Connolly, 1993; Salas, Driskell, & Hughes, 1996) can raise strong emotions that must be managed in order to perform effectively as a team. The following is a vignette, which captures the intensity of these emotions as well as the repercussions on the team.

“Three young and tired residents in an emergency room were wondering why the pizza they had ordered had not come yet. A nurse shouted, ‘GSW\(^1\) trauma one, no pulse, no blood pressure’. The residents recognized the unconscious teenager. He was the delivery boy from their favorite all night restaurant. He had been mugged bringing their dinner. That made them work even harder. A surgeon cracked the kid’s rib cage to expose his bullet torn heart, but they could not even stabilize him for the O.R.\(^2\) After 40 minutes of resuscitation they called it. Time of death, four a.m. The young doctors shuffled into the empty waiting area. They sat in silence. Then one of them said what all three were thinking. Where is the food? They found their pizza where the delivery boy dropped it a few steps away from the emergency room’s sliding glass doors. They put it on the table. The overnight shift was brutal. The doctors were hungry; the delivery boy was already dead. But they just stared at the food. Then one of the residents spoke. ‘How much do you think we ought to tip him?’ They laughed. Then they ate.” (K. Watson, 2006)

This story highlights the occurrence of emotions in the emergency room; the sadness and fear that the young residents felt after fighting death and losing. It also shows the toll the emotional experience took in that the residents could not even satisfy their base instinct to eat. And, like every profession that confronts suffering or death, the vignette shows that humor around tragedy is vital for effective functioning. The doctors

\(^1\) GSW = Gun Shot Wound
\(^2\) O.R. = Operating Room
needed to laugh before they could move on, before they could eat and be the best they
could be for the next patient, or before they could recoup as a team and know they can
rely on one another to recover for the next patient.

It is important to recognize the impacts of the occurrence and expression of
emotions in critical work. By *emotion*, I am referring to a specific, identifiable affective
state such as angry, afraid, happy, and excited. Such emotions can play an important
function in how each individual works as well as how the team works together. In the
design of information systems that support such environments, we cannot simply assume
that work activities are rational and prescribed. We must be aware of how the
participating workers feel, how collaborators express their feelings to one another, and
how those feelings inform their individual and shared work. Developing these
understandings is an essential step in the design and construction of information systems
that provide effective support for collaboration in critical environments. Broadly, we
must understand the role of emotions in collaboration in order to determine whether we
need to design collaborative information systems to support emotion.

1.1 Problem Motivation

In a healthcare environment, effective information sharing and coordination
between healthcare workers is essential. Fumbled handoffs have been depicted as the
“Bermuda triangle of healthcare” (Landro, 2006). Errors or omissions that lead to patient
harm can occur in the gap when a patient moves from the supervision or responsibility of
one healthcare provider to another either during or at the end of a shift. Gandhi (2005)
provides a compelling case of a missed tuberculosis diagnosis due to the lack of effective
information sharing between caregivers. Despite multiple visits to the emergency room, a three-week stay in the hospital, multiple radiographs and CT scans, and the continued notation of possible tuberculosis from radiologists, the patient’s diagnosis of tuberculosis was delayed for four months, resulting in death. Gandhi argues that this tragic outcome resulted from simply the lack of directed and motivated sharing of the abnormal findings from the radiologist to the physician.

In fact, failures in information sharing are the primary reason for the majority of fumbled handoffs and medical errors – recent data indicates this could be as high as 70% (Joint Commission on Accreditation of Healthcare Organizations, 2004), with 25% of the errors occurring in the emergency room (Sucov, Shapiro, Jay, Suner, & Simon, 2001). By information sharing I mean both the explicit and implicit information exchanges of already acquired information towards the solving of a problem (Talja & Hansen, 2006). It is clear that accurate and efficient information sharing is required throughout the patient’s illness trajectory – both within a single shift and as when one shift hands off to another.

Due to the high rate of information sharing errors, hospitals are beginning to push for the integration of electronic patient records and other information systems in the hopes it will improve communication, and that this in turn will increase safety (i.e., reduce deaths) and efficiency (i.e., reduce costs). At the same time, many problems and issues have emerged with this move to the paperless hospital (Ash, Berg, & Coiera, 2004; Embi et al., 2004) – primarily due to a rash of unintended consequences from a lack of understanding how medical workers realistically coordinate and share information.

There have been many examples of unintended consequences that have emerged as the result of the implementation of electronic patient records. Ash et al. (2004)
produced a summary of errors caused by the implementation of patient care information systems that were pulled from a set of qualitative studies conducted in the United States, the Netherlands, and Australia. As a result of this survey, they concluded that the “intended strengthening of one link in the chain of care actually leads unwittingly to a deletion or weakening of others” (p. 105). For instance, a qualitative study of the implementation of computerized physician documentation argued that the increase in documentation for efficiency and thoroughness might be detrimental to clinical practice and education due to increases in documentation that is not useful (Embi et al., 2004). Because of templates and the pervasive ability to cut-and-paste content, the patient charts overflowed with “clutter” and some of the physicians felt that this might hinder efficient patient care. This was especially a problem with less experienced residents who inappropriately used automated features like template generation of notes that in the end created documents that were useless. Faculty physicians also lamented that they believed the residents lost the opportunity to reflect on the patient’s data while crafting the proper input because they came to depend too much on automation. This caused the faculty physicians to distrust the work of residents because they questioned how much the residents thought through individual problems when they were easily able to cut and paste clinical assessments and treatment plans from another physician’s or nurse’s notes.

Another class of unintended consequences is the loss of information that is fundamentally emotional in nature. It has been shown that the feelings of the nurse or doctor towards the patient or the patient’s course of care is an important aspect of information transfer during handoffs (Evans, Pereira, & Parker, 2008; Kerr, 2002; Lamond, 2000; Philpin, 2006). Unfortunately, after the move from a paper-based system
to a computerized system, psychosocial information such as the patient’s emotional state or personality-related concerns can disappear from written records due to concern regarding the permanence and far-reaching distribution of the electronic documentation (Zhou, Ackerman, & Zheng, 2009).

The move to a more computerized hospital environment as well as the introduction of new information technologies in the healthcare field may improve some aspects of information sharing and coordination. Unfortunately, it will also inevitably overlook aspects of coordination that are less formal (and thus difficult to represent as part of a persistent and far-reaching digital record), but are just as important as the more objective elements of patient care. A central premise of this dissertation project is that the expression of a medical worker’s emotions towards the work is one of these informal aspects of coordination that may be lost or mishandled in the move toward increased technology support. It is important to gain an understanding of the role of work-related emotion expressions in medical work in order to better design information systems or else plan for alternative mechanisms and processes in order to ensure the support of effective coordination and information sharing.

1.2 Research Motivation

The study of emotion expressions in the emergency room clearly has important real world implications on medical information system design and implementation. In addition, my primary research goals relate to the more general question of how the computer supported cooperative work (CSCW) and human computer interaction (HCI)
communities can better design information systems to support the expressions of emotion in a collaborative environment.

1.2.1 Advance the Perception of Emotion in Collaborative System Design

Emotion has rarely been regarded as an important component in the design of information systems to support collaborative activities. Although often analyzed as part of designing enjoyable or fun technology experiences, for the most part, researchers have not considered the collaboration opportunities or challenges raised by emotion expression in work settings. Even when emotion has been investigated in work activities, the emotional content is typically viewed as external to the work activity itself. For instance, Nardi (2005) examined the creation and maintenance of socio-emotional connections within work-based networks. She suggested that people work to keep a social network at hand so that they can activate communication activities when needed to facilitate work goals. In one of her examples, an interviewee told of sending an instant message to a coworker to “just say hi” in order to indicate affinity as part of maintaining a social connection. This affinity could then be called upon for future work-specific communication. Although Nardi’s work is a first step toward the study of emotion in a computer-mediated work setting, it focused on the role of emotions and feelings as external, lubricating factors rather than content integrated within work activities.

The lack of attention to emotion in collaborative system design is consistent with the general orientation of cognitive and organizational behavior researchers, who have tended to view emotion as an unimportant and an inappropriate aspect of work (Ashforth & Humphrey, 1995; Putnam & Mumby, 1993). Traditional theories of cognition and
decision making position emotion as the antithesis of rational thought. Indeed, decision-making that weighs emotion over reason has often been blamed for poor decisions. These theorists believe that emotion does not and should not play a part in real work. Instead emotion is viewed as a disturbance – something that employees must work around or address, but not actively engage in.

Despite this traditional yet still pervasive absence of emotion in formal models of work, a growing number of studies over the last two decades have documented important roles for emotion in work (for a review, see Grandey, 2008). Emerging research in cognitive psychology has shown that emotion is not orthogonal to cognition and, quite to the contrary, can actually enhance cognitive processes (Isen, Daubman, & Nowicki, 1987). Emotion is now being analyzed as an integral supporting element of the cognitive system instead of as a peripheral and detrimental causal factor. For instance, researchers have found that positive group affective tone can improve group processes by increasing cooperativeness and group performance (Barsade, 2002; George, 1990). Thus, this growing collection of empirical studies and theory can be seen as an “affective revolution” (Barsade, Brief, & Spataro, 2003) that has spread from the cognitive sciences to the social sciences in the study of work. This is highlighted by Fineman (2004) in Understanding Emotion at Work, who regarded the typical study of organizational life as bland – that which does not allow the complexities of practice to be revealed. He argued for the use of an emotional lens (i.e. viewing emotions as an important aspect of all work and interactions), for he considers emotion to be the primary medium through which people interact. But, due to the fundamentally social nature of work, the expression of emotions are also regulated by display rules – emotional requirements of the job that may
be explicitly stated in training or implicitly stated through on-the-job socialization (Rafaeli & Sutton, 1987). This is especially important when a job depends on effective interaction with customers.

Overall, there has been a scarcity of studies on the expression of emotion in work with the intention to inform the design of collaborative systems. More often, studies of emotion in CSCW have focused on non-work related text chat and blogs (Gill, French, Gergle, & Oberlander, 2008; Hancock, Gee, Ciaccio, & Lin, 2008). However, those that have been conducted have shown the positive effect of emotions on work outcomes as well as the usefulness on enhanced emotion expressions in computer-mediated communication. For instance, in computer-mediated groups, the mean level of group happiness leads to more cohesiveness, which subsequently leads to greater participation by those in the group (Rhoades & O'Connor, 1995); subjective assessment of computer-mediated communication by group members for a group decision making task was improved when the use of emoticons (emotional icons) were introduced (Rivera, Cooke, & Bauhs, 1996); and group process feedback increases the number of socio-emotional interactive sequences in a computer-supported work environment (Losada, Sánchez, & Noble, 1990).

The nascent movement of emotion studies in work shows a growing recognition that emotion can play an important role in coordinated work. However, although emotion may be expressed in a workplace and may be an important aspect of the work itself, it is rarely included in formal models of work and thus has not played a prominent role in the design of information systems intended to support communication and coordination. This perception must be overcome. On the one hand, emotions may be providing critical
information that will be lost as work environments come to rely more on information technology; on the other, emotion may be part of a rich social context for action that will be unable to operate as work interactions become increasingly technology-supported. Given the pervasive existence and impacts of emotion, it is not wise to simply ignore emotions or assume they will ‘find a suitable way’ to persist with the introduction of new collaborative work systems. As efforts expand, the discussion and investigation of emotion will become even more widespread and the implications for the design of information systems will begin to amass. Thus a high-level goal of the work reported here is to contribute to this awakening of interest in emotion in coordinated work and system design by articulating the emotion expression in support of emotion awareness.

1.2.2 Advance the Design Paradigms for Emotion in Human Computer Interaction

When considering emotion from the perspective of the human-computer interaction field, two prevailing schools of thought encompass the research and writings on the subject. The first began with Rosalind Picard, a MIT Media Lab professor and author of the seminal work, *Affective Computing* (1997). Picard, trained as an electrical engineer, began her career in the area of signal processing which she then applied to the detection of physiological and later, behavioral markers of emotion. Thus, her approach has focused attention on the reliable sensing of emotion. In addition to the hundreds of papers by Picard’s Affective Computing Research Group, this perspective on information system design and development has inspired a variety of research projects focused on sensing various instantiations of emotion during human computer interaction. Other work
from this tradition has then been to translate the sensed emotions into displays and outputs that are reliably understood by another.

Years later, Donald Norman has helped to popularize the role of affect in user interface design through his book titled *Emotional Design* (2004). In the model he presents, human reaction to design exists on three levels: visceral (appearance), behavioral (how the item performs) and reflective (what the product evokes in relation to the self and previous experiences). However, Norman’s design focus is relatively narrow, aimed primarily at display and beauty in visual design. Although Norman’s book has spurred the field of human computer interaction to consider emotions more thoughtfully, it has left many designers and researchers with little more than a ‘pretty is more useable’ mantra. In fact, I would argue that this book was a disservice to those interested in affect in information system design, because it created the impression that affect need only be considered in the look-and-feel elements.

Much like the emotional design perspectives, researchers working in information science have attempted to raise positive emotions through the design of information systems. Recently, Diane Nahl and Dania Bilal (2007) published an edited book of work entitled *Information and Emotion: The Emergent Affective Paradigm in Information Behavior Research and Theory*. Much of the work in this area, including the work by Nahl and Bilal, has focused on the emotions felt during the information seeking process. In general, the field of information science tends to focus on understanding the emotions raised by an *individual* using an information system as opposed to collaborators.

More recently, a social, *interactional* perspective was developed in contrast to the approach of the previous, *informational* efforts. This view surfaced initially with the
Affective Presence Group, a group of international researchers who are “interested in creating affective interactive systems or devices that trigger social and emotional engagement and reflection” (Höök, ND). Out of this group came the seminal treatise, *How Emotion is Made and Measured* (Boehner, DePaula, Dourish, & Sengers, 2007). This paper directly challenged the affective computing and emotional design approaches by claiming that emotions are not individual states that occur in a vacuum but are rather developed in conjunction with their environment and through interactions with others. Thus, they termed the previous efforts as part of the ‘informational approach’ – i.e. they view emotion as an “internal, individual, and delineable phenomenon, which operates in concert with and in the context of traditional cognitive behavior” and thus they have “difficulty in accounting for and adequately incorporating an understanding of everyday action as situated in social and cultural contexts that give them meaning” (p. 275). In contrast, the ‘interactional approach’ asserts that emotion is more than “information units that are internally constructed and subsequently delivered” (p. 275). Thus, researchers in this field have developed systems and methods for measuring emotion that encourage reflection on and creation of emotional experiences. This perspective has inspired a whole new line of emotion research within the field of human-computer interaction.

All of these approaches indicate the growing importance and interest in emotion in information system design. However, all of the design perspectives begin with a focus on explicitly designing for as opposed to beginning with an understanding of social-emotional phenomenon and then determining the best course for designing with emotions in mind. Thus, the work reported here begins with an eye on how emotion is currently initiated, developed, and expressed during collaborative work tasks. This then puts the
emphasis on the social and allows the technical to naturally evolve from real world findings. From this technical evolution a reflection on the two prevailing design perspectives (information processing and interactional) may enlighten how to negotiate between these two perspectives.

1.3 Research Questions

In order to address the aforementioned problem and research motivations, I have chosen to study emotion expressions in the information-intensive, tightly coordinated emergency room (ER) of a large urban academic hospital. The ER is a rich site for the preliminary study of emotion in collaboration because of the type of work that takes place in such a unit: it is a fast-paced environment where patient conditions can change rapidly and personnel must often make split-second decisions that can literally mean life or death. Emotion expressions are frequent and may influence decision-making; this means that the analysis of emotion is both feasible (sufficient frequency and variety of episodes) and of high impact. Therefore, to better understand work-related emotion expressions in an emergency room, I have conducted a study of medical personnel and their expressions of emotion in information sharing and coordination practices.

In service of my problem motivation – to understand the role of emotion expression in medical work in order to design effective collaborative medical information systems – I have sought to answer the following research questions:

\textit{RQ1: How does the expression of emotions support the coordinated work of an ER?}

\textit{RQ2: In what form are emotions expressed in the ER?}
These questions address the more practical aspects of this dissertation. The findings of this study aim to answer these questions in order to provide meaningful guidance to further medical information system design directions. For instance, the first question addresses why emotion expressions should continue to be supported with the introduction of information systems in the medical domain, whereas the second research question aims to specifically identify what emotion expressions could possibly disappear in the move to electronic medical documentation in an ER.

In addition to my problem motivation, I aim to address two research motivations. My first research motivation was to further the CSCW field’s understanding of the occurrence of emotion expressions in work environments as well as the relationship between the occurrence of emotion expressions and emotion awareness in work. To that end, I have specified the following research questions:

*RQ3: How does the expression of emotion play a part in the development of emotion awareness in coordinated work?*

*RQ4: How does the social context shape the expression of emotion in coordinated work?*

Because I will be investigating a real world collaborative context, I expect to go beyond the individual and lab studies documented in the existing research literature and uncover critical contextual factors associated with emotion expressions towards work goals. Knowing why emotion expressions have been integrated into work practices informs our understanding of the differing and evolving ways people share information to coordinate work. In addition, the direct expression of emotion is one such mechanism for expressing emotions in the ER. However, social and contextual factors in the work environment of the ER may modify the mechanisms of emotion expression. For instance,
in contrast to the direct expression of emotion, some emotions may be surreptitiously expressed. I want to discover what factors may be important in how emotions are expressed – and perhaps not expressed – in the ER. This analysis can be used to determine what considerations must be made for the design of systems that enable emotion awareness.

My second research motivation was to further the affective computing field’s understanding of the social nature of emotion expressions in a work environment and, thus, to provide a counterbalance to the two prevailing interventionist-oriented design approaches. To that end, I address the following research question:

*RQ5: How can we design information systems for the socially manifested emotion expressions of a coordinated work environment?*

This might mean actively designing for emotions or it may mean being cognizant of the occurrence and functionality of emotions in order to allow for their continued appropriation. Thus, in addressing this research question, I will utilize what I have learned from answering the previous questions in considering the application of each design perspective to the development of emotion awareness technologies for an emergency room. In addition, I will address the unintended consequences that may arise from the introduction of new information technology into an effective socio-affective work environment.

1.4 Dissertation Overview

The remainder of the dissertation is organized in the following manner:

**Chapter 2: Emotion Theories, the Workplace, and Design.** This chapter provides an overview of the theories and models of emotion as well as an overview of
related studies of emotion in the workplace. Following that is a more comprehensive discussion of the two prevailing perspectives on emotion in human-computer interaction that I previewed earlier.

**Chapter 3: Study Design and Methodology.** This chapter outlines the epistemological basis for the ethnographic approach used as well as provides details on the observation and interview methods.

**Chapter 4: Research Setting and Information Flow.** In this chapter, I present the context in which the data was collected. This includes the personnel who were observed and interviewed as well as the structure and media used to support emergency room activities.

**Chapter 5: Emotion Expression in the Emergency Room.** This chapter describes the occurrence of work-related emotion expressions in the emergency room. It provides a description of the source of emotion as well as the outcome of the emotion expressions. I then discuss how the expression of emotion serves a critical role in the work performed in the emergency room.

**Chapter 6: Moderators of Emotion Expression.** I discuss in the second results chapter how various moderators influence the expression of emotion. Moderators take the form of either constraining emotion expressions or promoting them within the workplace.

**Chapter 7: Expressions in Emotion Awareness.** In this chapter I relate the findings from chapters 5 and 6 to the concept of awareness, articulation work, and common ground to form a framework for understanding emotion awareness and the expression of emotion in work.
Chapter 8: Design For and Around Emotion Expressions. In this chapter I consider the implications for collaborative information system design by situating the findings between the two prevailing perspectives on designing for emotion in HCI.

Chapter 9: Conclusion. This chapter revisits the research questions and presents the major contributions of the study along with plans for future work.
Chapter 2. Emotion Theories, the Workplace, and Design

In 1884, William James asked “what is emotion?” This question has yet to be put to rest, at least partly because the ambiguity of the term has posed a significant problem for researchers studying the nature, impacts and dynamics of emotion. In this literature review, I first introduce and define three related concepts: affect, emotion, and moods. I follow this with a review of theoretical perspectives of emotion from both the cognitive and social sciences. I then will review the studies related to emotion in the workplace and, specifically, medical work. Finally, I discuss the two prevailing perspectives on how to design for emotion in the human computer interaction fields.

2.1 Defining Affect, Emotion, and Moods

The terms ‘affect’, ‘emotion’, and ‘mood’ are sometimes used interchangeably, while at other times they are intended to refer to very different phenomena (Izard, 1977). In this dissertation, I use the terms to emphasize different psychological processes or states, so it is important to specify how I will use these terms in my literature review, as well as in my data collection, analysis and discussion.

*Affect* refers to an overarching construct that can be instantiated in either a positive or negative form. The direction of the affect experienced (i.e., whether it is positive or negative) is often referred to as its valence. Although the phrase ‘negative affect’ implies a stressful situation, it is not necessarily harmful to cognitive performance. For instance, when a person encounters a bear in the woods, a fear-induced fight-or-flight response is clearly a useful negative affective reaction. In fact, positive and negative affect do not always even have distinct effects on cognition (Isen, 1999). Researchers
have found that both highly positive and highly negative valenced events are more memorable than neutral events (Burke, Heuer, & Reisberg, 1992). One distinction that appears in the research literature is between affect as a state and affect as a trait. *State* refers to a person’s momentary affective experience whereas *trait* refers to a relatively stable attribute of personality. Although there is a strong relationship between state and trait, this dissertation focuses solely on affective state.

*Emotion* refers to a specific, identifiable affective state. For example, emotions include angry, fearful, and disgusted which are negative affective states; and happy and excited which are positive affective states. An emotion is a dynamic and multifaceted construct composed of a mental experience (feelings), neurophysiological response, and motor expression (Scherer, 2000). Although these three elements are synthesized as an emotional experience, the components can occur independently as well, and may have different correlates (Russel & Barrett, 1999).

In addition to feelings, neurophysiology, and motor response, emotion theorists have posited a fourth component of emotion, arguing that emotions promote action tendencies (Frijda, 1986) or thought-action tendencies (Fredrickson, 1998) that may affect motivation and behavior. An action tendency might be realized as an intention to run away due to fear, or to fight due to anger; these tendencies are believed to be adaptive response tendencies that have developed through an evolutionary process. Note though that the action tendencies that are part of emotion do not include the actual behaviors of running or fighting, but rather just the inclination towards such actions. Emotions are also thought to have control precedence that allows them to interrupt current cognitive
processes, and to possibly reorient a person’s goals and motivations in a different direction (Frijda, 1993).

Mood is a fundamentally different concept from emotion but does fall within the larger construct of affect. In contrast to an emotion, a mood is a continuing, long-term affective state that may arise from a series of emotional reactions or experiences over time. Moods tend to be weaker in intensity and longer in duration than emotions (Russel & Barrett, 1999). Emotions are directed towards an object or experience. One can be scared of a bear or angry with a friend. A mood, however, is not directed at a particular identifiable cause (Russel & Barrett, 1999).

My research will focus on discrete emotional experiences (i.e., as caused by an event). I am focusing on the construct of emotion because it can have an identifiable state with a clear cause. In addition, in the ER, a patient-directed or work-related affective event is more likely to be an emotion than a mood.

In both the following literature review and in the results I will signal that I am referring to an emotion by specifying the emotion by name (e.g. frustrated, happy). In addition, I will use the term “feelings” in reference to that aspect of emotion. However, when reporting analyses or conclusions of specific studies in the literature review, I will use the term the researchers’ chose to refer to their construct of interest.

2.2 Structures of Affect

There are two prevailing structures for the study and measure of emotion. Both of these two structures have been independently developed through factor analyses of self-reported affect data. In one structure, proposed by Larsen & Diener (1992), emotion is
organized by the two dimensions of hedonism versus arousal. Hedonism is measured from unpleasant to pleasant while arousal refers to the level of activation (i.e. deactivated to activated) (see the solid lines in Figure 2-1). In this factor solution, positively and negatively valenced emotions are conceptualized as diametrically opposed. In addition, the structure proposed by Larsen & Diener (1992) considers an individual’s activation or arousal level to be independent of pleasantness or valence.

![Figure 2-1. Three Models of Affect (adopted from Grandey, 2008, p. 236)](image)

In other work, Watson, Clark, & Tellegen (1988) identify an alternate structure during factor analysis. In their model, arousal and pleasantness are combined into unipolar dimensions that they label positive and negative affectivity (see the dotted lines...
in Figure 2-1). Thus, positively and negatively valenced emotions are not on opposite sides of a continuum; instead they are distinctive dimensions that are orthogonal to one another. Positive affectivity is the extent to which one feels enthusiastic, active and alert. High positive affectivity includes high energy and concentrated states whereas low positive affectivity includes sad and lethargic states. Negative affectivity includes distress and unpleasurable states such as fear and disgust at the high end of the spectrum and calmness and serenity at the low end of the spectrum.

Both of these structures can be overlaid on the circumplex model of affect (Russel, 1980), which arranges major emotions in a circle around a two-dimensional space – active-passive and positive-negative. Figure 2-1 synthesizes the two structures discovered through factor analyses on the circumplex model. The words around the outside of the circle are specific emotions that are a subset of the circumplex model. The pleasantness-arousal two-dimensional structure (Larsen & Diener, 1992) is shown with solid lines, while the positive affect-negative affect two-dimensional structure (Watson et al., 1988) is rotated 45 degrees and is shown with dashed lines. In sum, these two structures present differing viewpoints for measuring and describing emotions. Specifically, whether or not positive and negative affect are independent of one another. If they are, then behavior associated with one valence is also feasible from the other valence. On the other hand, if they are not independent, then a behavior cannot occur in both negative and positive valences.
2.3 Approaches, Models, and Theoretical Perspectives of Affect

Scholars of emotion have developed a range of theoretical perspectives that seek to explain the interplay between affective states and human behavior (see Table 2-1 for cognitive theories and Table 2-2 for social and communication theories). In the following, I summarize major theories from the cognitive and social sciences that have described how and why emotions exist.

2.3.1 Cognitive and Information Processing Theories

Due to the nature of the study of cognition, the cognitive science theories of emotion are focused on the experience of an emotion by an individual and the effect that emotion has on an individual’s thoughts and behaviors. Although this dissertation is interested in the expression of emotions between individuals, it is important to understand the influence of experienced emotions on an individual in order to understand why emotions are expected to occur in the ER.

As previewed by William James’ question in 1884, the James-Lange theory of emotion conceptualized emotion as an interpretive response to a specific bodily change that occurs after or during an event (Scherer, 2000). For instance, a man comes across a bear in the woods (the event), feels his heart beat more rapidly (the bodily change), and interprets that he feels fear (the emotion).
<table>
<thead>
<tr>
<th>Year</th>
<th>Name &amp; Theorist(s)</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1884</td>
<td>James-Lange</td>
<td>Emotion is perception after bodily change. For each emotion there is a corresponding physiological arousal.</td>
</tr>
<tr>
<td>1966</td>
<td>Lazarus</td>
<td>Primary appraisal process – pleasant or unpleasant. Secondary appraisal process – ability to cope.</td>
</tr>
<tr>
<td>1990</td>
<td>Feeling-as-Information</td>
<td>Mood is a source of information. Negative mood = problem with the task, use systematic reasoning. Positive mood = everything is OK, use heuristics.</td>
</tr>
<tr>
<td>1990</td>
<td>Control Theory</td>
<td>Less progress towards a goal -&gt; negative affect -&gt; increased effort. Progress towards a goal -&gt; positive affect -&gt; less effort is needed.</td>
</tr>
<tr>
<td>1993</td>
<td>Mood-as-Input</td>
<td>Mood informs when achieved goal. Positive mood = achieved goal, can stop. Negative mood = goal not achieved, persist.</td>
</tr>
<tr>
<td>1995</td>
<td>Affect Infusion Model (AIM)</td>
<td>Affect influence judgments in ambiguous contexts. Affect has less of an effect when engaged in motivated and effortful information processing.</td>
</tr>
<tr>
<td>1994</td>
<td>Hedonic Contingency</td>
<td>Positive mood -&gt; only engage in tasks that maintain positive mood.</td>
</tr>
<tr>
<td>2001</td>
<td>Broaden and Build</td>
<td>Positive mood -&gt; broadens attention, builds social and cognitive resources.</td>
</tr>
</tbody>
</table>
The Schachter-Singer theory of emotion extended the James-Lange theory by positing a cognitive component (Schachter & Singer, 1962). The primary difference between the two theories can be seen in the conceptualization of arousal. Where the James-Lange theory suggested that for each emotion there is a specific pattern of physiological changes, the Schachter-Singer theory believed this was improbable. These researchers offered a new theory that included a non-specific arousal component that in turn elicited a cognitive appraisal of the situation based on past experiences. For the above example, the fear emotion is attributed only after the man assesses the situation based on his knowledge of bears.

Lazarus (1966) continued to develop the appraisal theory by introducing a two-part process for appraising an emotion-eliciting event. The primary appraisal determines the pleasantness and unpleasantness of an event relative to one’s values or goals. The secondary appraisal determines the ability of the person to cope with the consequences of an event. The combination of these two processes determines the significance of the event to the person and thus the emotion it will elicit. For example, when confronted with a bear, a person’s primary appraisal may be that it is an unpleasant event since the bear might attack him. The secondary appraisal is that he can cope with it since it is only a small cub and the zoo owner has it on a leash. Thus although it may be a negative affective event, it may only lead to a low arousal negative affective state.

The feelings-as-information model (Schwarz & Clore, 1990) proposes a simpler view, namely that people see their moods as a source of information in judgment and reasoning. First, people use their conscious feelings as a shortcut or heuristic to make judgments (i.e. a “How do I feel about this choice?” heuristic). Second, a person’s
processing style may change based on his/her mood. Negative moods suggest a problem with the task at hand and that a systematic reasoning process is needed. Positive moods indicate everything is okay and thus heuristics can be used.

According to control theory (Carver & Scheier, 1990), making progress towards one’s goals leads to positive affect, and this in turn signals that decreased effort is needed. On the other hand, making less progress than one desires results in negative affect and thus increases the effort one puts towards achieving a goal. This theory is closely related to the mood-as-input approach. That conceptualization states that mood influences motivation by informing people when they have achieved their goals (Martin, Ward, Achee, & Wyer, 1993). Those in a good mood are likely to interpret their positive feelings as a sign that they have reached their goal; while those in a negative mood may similarly interpret their feelings as a sign that the goal has not been reached, and hence persist at the task. This approach is particularly applicable to ambiguous tasks. Likewise, the Affect Infusion Model (AIM) (Forgas, 1995) states that affect has more of an influence on judgments when decisions are complex and ambiguous. However, when engaged in motivated and effortful information processing, affect has less of an effect.

The hedonic contingency model (Wegener & Petty, 1994) states that people in positive moods are motivated to stay in their positive moods and thus are motivated to engage in tasks that they expect to maintain their positive mood. For instance, they may choose to process information only if it is positive, in order to avoid losing a positive mood.

Fredrickson’s (2001) Broaden-and-Build Theory has been a focus of recent work in the emotion research community. She argues that positive emotions broaden people’s
cognitive abilities that in turn build social, cognitive, physical, and psychological resources to be used in the future. For instance, a pick-up game of basketball leads to the positive emotion of enjoyment in the moment; in addition, the game can strengthen the social bonds between the friends that can then be called upon at a later time. Thus, a momentary emotional state can leave the lasting benefit of traits, social bonds, and abilities. The survival advantage of positive emotions is focused on a long-term investment as opposed to the short-term flight-or-flight benefit of negative emotions. The implication of this work is that positive emotions have inherent value to human growth and development and cultivation of these emotions will help people lead fuller lives.

The theories summarized here view emotion as an internal state experienced by an individual. Emotion provides an appraisal of one’s environment – perhaps an object of interest (e.g. bear), or perhaps a task being performed in the environment. The outcome of that appraisal is a behavioral action by the individual. If the appraisal is positive the behavioral outcome will be to either reduce effort or at least maintain the behavior responsible for the positive feelings. One possible motivation for adjusting one’s behavior to maintain positive feelings is that they can lead to positive social benefits in the long run.

Thus, in the ER, we should expect emotions experienced to result in a thought-action or behavior-action. Since it is reasonable to expect a predominance of negative emotions in the ER, the goals of each individual should be to work to address the issue leading towards the negative emotion. This may include the help of a coworker. In such a situation, the expression of one’s emotional state might be a resulting behavior-action that is beneficial towards the work of the ER (e.g. patient care).
In a collaborative environment, emotions do not develop in a vacuum. They are shared and developed in concert with others. Thus, although it is important to understand why an emotion arises and how it influences individual behavior, it is also important to understand how emotions are expressed to others and why expression is a necessary aspect of social relations. In this study, I am interested in the occurrence and expression of emotion in a collaborative environment. In the following section, I explain the theories on how this occurs and the outcome on behavior.

2.3.2 Social and Communication Theories

In contrast to the cognitive theories of emotion, the social science theories of emotion are focused on the importance of emotions in an interpersonal context. Thus, emotions are not simply a signal to oneself, but also a signal to others. There are two types of signals that may be conveyed through the outward expression of emotions to another (Cosmides & Tooby, 2000). The first is the inner emotional state of the person, e.g., someone shows surprise at something that has been said. The second is information regarding the environment around them, e.g., someone shows fear because there is danger nearby. Both types are evolutionarily adaptive. For instance, conveying one’s inner state not only informs others but also might influence their behavior (Levenson, 1994; Van Kleef, 2009) Having an ability to influence others confers evolutionary benefits on the displayer of emotion. For instance, an infant experiencing discomfort shows its inner emotional state outwardly, perhaps by crying; this in turn elicits a comforting response from the child’s caretaker. Or a child’s cry of distress may be indicative of danger nearby and this elicits the caretaker to rush to the assistance of the child. This response to the
outward expression of emotion ensures the care and nurturance of the child, ultimately assisting in its survival.

Table 2-2. Social Theories of Emotion

<table>
<thead>
<tr>
<th>Year</th>
<th>Name &amp; Theorist(s)</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1872 - present</td>
<td>Evolutionary Theory</td>
<td>Facial expressions communicate emotional states.</td>
</tr>
<tr>
<td></td>
<td>Charles Darwin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eibl-Eibesfeldt</td>
<td>Universal facial expressions.</td>
</tr>
<tr>
<td></td>
<td>Ekman</td>
<td>Two types of signals: inner emotional state &amp; environment</td>
</tr>
<tr>
<td></td>
<td>Cosmides &amp; Tooby</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Differential Emotion Theory</td>
<td>Universal view of emotions even across cultures.</td>
</tr>
<tr>
<td></td>
<td>Izard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ekman</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>Social Construction</td>
<td>People learn emotions through social rules not innate behavior.</td>
</tr>
<tr>
<td></td>
<td>Averill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harré</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lutz</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Functionalist Theory</td>
<td>Despite universality of expressions, emotions are still social and contextual.</td>
</tr>
<tr>
<td></td>
<td>Barrett</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Emotions as Social Information (EASI) Model</td>
<td>Emotion expression influences observer’s behavior through the mutually influential processes of inferences and affective reactions. Reliant on the observer’s motivation and ability and social appropriateness of expressions.</td>
</tr>
<tr>
<td></td>
<td>Van Kleef</td>
<td></td>
</tr>
</tbody>
</table>

This evolutionary significance of communicating human emotions began with Charles Darwin’s seminal work, The Expression of the Emotions in Man and Animals (1872/1965). He discussed how facial expressions and other external indicators play a vital role in the communication of a human’s emotional state to others during social and informational exchanges. Taking an evolutionary perspective, Darwin argued that the
successful nonverbal communication of fear and anger conferred a survival advantage on members of a linguistically under-developed society or on those with no common verbal language. As humans evolved, their communication with one another also had to improve in order for the species to endure.

This evolutionary view of emotion is consistent with the observed ability of higher-order primates to convey emotions through facial expressions. For instance, Eibl-Eibesfeldt (1972) contends that eyebrows are an adaptive feature that has evolved to display emotion through muscle movements that raise, furrow, or otherwise position them. In fact, Eibl-Eibesfeldt suggests that eyebrows provide evidence for the natural selection of those with the ability to display affect facially.

Since Darwin’s work, evolutionary theories of emotion have been substantiated by studies that have documented the universality of facial expressions. Ekman (1994) has been a leader in this effort, showing that both recognition and expression of most basic emotions transcend geographical borders and that humans are able to communicate emotion reliably across cultures. For instance, in many cultures, the most prevalent and recognizable facial expressions used to convey emotion are smiling and frowning.

Ekman’s studies, along with work by Izard (1977), lend evidence to the Differential Emotions Theory, which argues for a universal view of emotions because many of the same facial patterns are used to convey emotion in many different cultures around the world (Ekman, 1994). These similarities exist even between cultures that have had little or no contact. Further supporting this notion is the universality of facial displays of emotion in infants, who have not had time to acquire them from others (Ekman, 1994).
However, other theorists who are focused on the purpose of emotions contend that, despite the evidence for some universality, emotions should be understood as social and contextual (Barrett, 1993). For example, in the functionalist perspective on nonverbal communication of emotion, “social communication is a central function of the emotion process” (Barrett, 1993, p.165). One of the functionalist perspective’s most interesting propositions is that “communication of emotion always is embedded in a context: [t]here are no movements that can be considered clearcut, context-free expressions of emotion, at any period of development” (Barrett, 1993, p.159). This idea suggests not only that physiologically similar emotions can be explained differently in different cultures, but also that emotions are fundamentally connected to cognitive processes. Emotions influence the cognitive processing of information as it is communicated from one human to another.

In contrast to the cognitive and evolutionary theorists, social constructivists would argue that the individual learns to recognize and express emotions through social rules, not as a result of innate behavior or physiological arousal (Metts & Bowers, 1994). In such a view, emotions are part of an interaction between beings in the context of social norms that are influenced by the actors’ culture. Emotions are social relationships that are instantiated when an individual makes four interpersonal “choices”: the object or person toward whom an emotion is directed, the positive or negative valence of the emotion, whether the individual is giving or wanting to get something, and what the person wants (Metts & Bowers, 1994).

Although, the functionalists and social constructionists differ from the universality of emotion expressions in their belief that the social purpose of the
expression is more important in the display and comprehension of emotion, all three perspectives essentially contend that emotions have developed to help humans adapt to the environment around them. Thus, emotions aid in the internal regulation of an individual’s psychological state and behavioral regulation for different environments as well as the social regulation in a variety of situations.

One recent account of the social purpose for emotions is provided by the EASI Model – Emotions as Social Information (Van Kleef, 2009) (figure 2-2). The EASI Model is rooted in the social-functional approach to emotion that states that emotion expression influences observers’ behaviors. The model states that the influence is accomplished through two processes: The first process is one of inference – a cognitive process on the part of the observer. Based on the emotions expressed, the observer can infer what behavior they engaged in that resulted in such an expression, and thus can predict what behavior might change the expression of emotion. The second process is affective reactions. For instance, observing an expression of happiness will cause the observer to feel happy, which in turn increases feelings of liking and willingness to help the person expressing the emotion. These two processes may be distinct but they are mutually influential. Their outcomes may converge, they may lead to opposite behaviors, or they may influence one another in more subtle ways. For instance, Van Kleef presents the following situation as an example of competing motivations from the two processes. “When faced with an angry negotiation opponent, one’s own reciprocal anger may inspire competition, but one’s inference that the other is upset because his or her limits have been reached may encourage cooperation, depending on one’s negotiation goals and strategy” (Van Kleef, 2009, p. 186). However, it is not clear from this example if the
emotion itself has changed based on one’s inference or if instead, desired outcomes causes one to modify the emotion they express. Finally, the strength of the effect of an expressed emotion on an observer’s behavior is reliant on the observer’s motivation and ability to process the emotion expression as well as the social appropriateness (e.g. display rules) of the expressions.

![Observer's Affective Reactions](image)

**Figure 2-2. EASI Model of Emotion Expression Relationship to Observer Behavior**

All of the social and communication theories point to a view of emotions as more than internal states that simply provide personal experiences for those who feel them. Instead, interpersonal communication is seen to rely heavily on the external communication of emotions, even to the degree that one primary purpose of emotions may be to communicate feelings and needs to others (Andersen & Guerrero, 1997). Social and communication theories highlight the importance of emotion expression in the maintenance of effective social environments. This includes the workplace. There may not be a bear in the ER, but there are conditions in which the expression of emotions is
necessary and appropriate. As I alluded to at the end of the previous section, expressing one’s negative feelings in the ER (including the cause of those negative feelings) elicits behavior from one’s coworker, whether by inference or a reciprocal affective reaction. Thus, we should see that the experience of emotions in the ER is used to elicit work-related behaviors from a coworker.

Now that we have discussed the prevailing perspectives on emotion in the social and cognitive sciences we can better understand how emotions have been conceptualized by the social and organizational psychology communities in the workplace.

2.4 Affect in the Workplace

Neither the information processing nor the interactional perspectives have developed a comprehensive discussion of how emotion might fit into the design of systems for collaborative work. However, there are a number of studies that have emphasized the important role that emotion plays in collaborative work settings, and many of these studies can be mined for their design implications. In the following section, I review studies of emotion in the workplace, drawing from research conducted in the organizational-behavioral, information science, medical, and CSCW domains.

2.4.1 Display Rules and Presentation of Self

Jobs that require interaction with customers may have display rules. Display rules are emotional requirements of the job that may be explicitly stated in training or implicitly stated through on the job socialization (Rafaeli & Sutton, 1987). A common display rule often associated with the service industry is “service with a smile” (Diefendorff, Richard, & Croyle, 2006). However, “surface acting”, when an employee
fakes a positive emotion expression and suppresses their negative emotions, can cause health problems (Brotheridge & Grandey, 2002; Erickson & Wharton, 1997; Grandey, 2003; Pugliesi, 1999). This is because regulating one’s emotions requires attention and depletes resources such as strength, attention, and energy (Gross, 1998; Muraven & Baumeister, 2000). For example, emotion suppression has been shown to impair cognitive performance on complex tasks (Muraven & Baumeister, 2000).

Display rules can vary depending on who is the observer. For instance, a worker may be able to express more emotions with their coworkers than with their supervisors (Diefendorff & Greguras, 2006; Rafaeli, Grandey, Ravid, Wirtz, & Steiner, 2006). Overall, display rules help maintain social order in a workplace; new workers are taught the rules through their observations of other’s emotion expressions (Scott & Myers, 2005; Van Maanen & Kunda, 1989).

In the ER, multiple types of display rules may be present. For instance, a nurse and doctor may present “service with a smile” to a patient and their family. It is especially important not to show stress or defeat (i.e. negative emotions that imply a lack of ability) to patients. However, in interactions between medical workers, the display rules may be more relaxed. For instance, it may be appropriate to show one’s stress level to a coworker in order to elicit their help and support. On the other hand, emotional displays that are directed towards a coworker may still be governed by display rules. For instance, a nurse may not have the freedom to express her dislike or distrust of a doctor due to hierarchical display rules.

Along the same lines, Erving Goffman, a prominent anthropologist and sociologist, refers to the importance of presenting oneself in a manner conducive to
achieving social goals (Goffman, 1959). He utilizes the theater as a metaphor for social interaction: all of us are actors, where there is a front stage (where we perform for our audience), a backstage (where we can stop acting), and the cast of characters who you must successfully interact with in order to pull off the play. The cast of characters in the workplace can be seen as the team that works together to achieve a common goal. For instance, the doctors and nurses in the ER all present a unified presentation of medical workers to the patients and family members. Thus, in order to maintain that presentation of self, the characters in the cast are reliant on one another to not let the façade fall and must cooperate in order to maintain a given impression. In other words, if the presentation of self includes the ability to handle the stressful, emotional burdens of the ER, then all of the medical workers need to present this ability. Thus there is a “bond of reciprocal dependence linking teammates to one another” that ensures that no one will “give the show away” by acting inappropriately (Goffman, 1959, p.82). In addition, to maintain this façade, those in the team are “in the know” and thus any new member of the team must immediately be integrated as soon as possible (i.e. made to be “in the know”). Thus, the rules associated with the display of emotions are not only due to one’s job requirements but also due to the needs of the workgroup to present an acceptable presentation of self.

In the ER, we might see that there are display rules that the group as a whole imparts on one of its members. In essence, the group knows that they are stressed or unhappy by some work factor, but in order to maintain the “show” they expect everyone to continue acting the part of a competent, unemotional medical worker. This is different
than the display rules imposed by the organization since these rules are defined and upheld by the workers themselves and would be different from ER to ER.

2.4.2 Emotional Contagion and Affective Tone

*Emotional contagion* refers to the process of “catching” others’ emotions. Although there have been several different proposed processes of emotional contagion, the most cited is that of *mimicry*, also known as primitive emotional contagion. In a mimicry process the sender expresses an emotion and the receiver automatically and unconsciously mimics the expression; this is thought to induce a congruent emotional state in the receiver (Hatfield, Hsee, Costello, Weisman, & Denney, 1995). Contagion can also occur through conscious cognitive processes such as empathy and conditioned or unconditioned emotional associations (Hatfield, Cacioppo, & Rapson, 1994).

High arousal emotions seem more likely to be “caught” than low arousal emotions (Bartel & Saavedra, 2000); however there has been no clear indication whether negative or positive affective states lead to greater contagion. In one study negative moods were more likely to be caught than positive moods (Bartel & Saavedra, 2000; Totterdell, Wall, Holman, Diamond, & Epitropaki, 2004); but in another, there was no difference in contagion of positive and negative moods (Barsade, 2002).

The result of emotional contagion may be the adoption of an affective tone by the group. *Affective tone* is operationalized in a simple fashion, by aggregating measures of the affective state of each group member (George, 1990). Findings have shown that an individual team member’s affective state was consistent with the group’s affective tone (George, 1990). In addition, studies on mood linkage in nursing teams found that a
nurse’s mood was more like his or her team’s affective tone than another team’s affective tone on the same day (Totterdell, Kellet, Teuchmann, & Briner, 1998). In addition, a nurse’s mood is more similar to her team’s mood on one day in comparison to her team’s mood on another day. More importantly, this mood linkage was found not to be a product of shared work problems or the amount of time the nurses spent with their teammates. It is thought that when a new member enters a group that has established this affective tone, group norms require the new member to shift their affective state. This shift and normalization is required for group cohesion. This may all be because homogenous group affect has been shown to improve group processes by increasing cooperativeness that results in higher group performance (Barsade, 2002; George, 1990).

Thus, in the ER, the motivation to achieve a group affective norm (and thus the possibility of having a higher group performance) may lead to an increase in the amount of emotion expressions presented. Specifically, we may see an increase in emotion expression on high activity days – days in which the team feels they need to be higher performing.

2.4.3 Emotion Expressed in Medical Work Environments

There have been a few studies that have touched upon the role of emotion expressions in a medication work setting; however a few studies exist in important critical environments such as command control and medical informatics.

Typically, studies of emotion in the medical domain focused on the emotions of the patient (Lamond, 2000), for example relying on physiological monitoring of the patient’s emotions towards enhanced health care; these methods and research questions
are consistent with the information processing paradigm evident in the field of affective computing (Luneski, Bamidis, & Hitoglou-Antoniadou, 2008). In a few cases, researchers have examined how the emotions of medical workers are impacted by the introduction of new technologies (Sittig, Krall, Kaalaas-Sittig, & Ash, 2005). There has also been a nod towards the importance of humor in the emergency room (van Wormer & Boes, 1997); researchers have found that humor is important for teamwork as well as the mental health of the emergency care workers (recall the vignette at the beginning of this dissertation).

Only a few studies have investigated the occurrence and transfer of emotion between workers in the medical domain, and these have focused primarily on communication between nurses, and transfer activities during handoffs between healthcare workers. For example, Kerr (2002) conducted a qualitative study of nurse shift handoffs in two pediatric wards in a British hospital. The study showed that in addition to the more formal informational and educational functions, handoffs served an informal social function that included an opportunity for emotion support and stress relief. During these emotion support moments the nurses would “share stories and experiences about patients and engage in a form of reflection and reasoning” (p.131). The exchanges were also used to share information that the nurses deemed inappropriate to formally record such as problems with patients’ family members. These are aspects that cannot be captured in a written handoff form and are best capitalized in face-to-face handoffs.

Lamond (2000) also studied nurse shift change handoffs, producing a content analysis of nurses’ medical notes and verbal, face-to-face shift reports. This study found that, for all types of information, typically more instances were found in the written notes
than the verbal handoffs. However, summarized judgments regarding the patients’ condition, psychological state, and personality were more prevalent in the verbal shift reports than in the written nursing notes. The reason for this claimed by the researchers was thought to be a mechanism for off-going nurses to reduce the amount of cognitive processing needed by the on-coming nurses in starting their shifts. Summarized judgments of the patient status and personality provided shared heuristics without the need for longer more detailed descriptions and explanations.

Another study of verbal shift handoffs in the UK showed that nurses may insert personal or subjective comments in addition to the transfer of objective medical data (Philpin, 2006). Often this would occur at the end of the objective information transfer as a summary. The following vignette exemplifies this subjective information transfer.

“Having finished with all the objective information – the vital signs, the infusions and the ventilator settings – both nurses discussed the patient’s plight in a compassionate way and expressed sadness that her condition was now hopeless. The night nurse commented that the patient ‘was a very nice lady when she was conscious.’ Their demeanour indicated sympathy and resignation” (Philpin, 2006, p.91).

The researcher proposed that the “subjective, affective domain that was guided by their shared emotions” was reflected back to and used to reinforce the values of the group. However, what is startling is that the researchers failed to discuss the important function of sharing the subjective information for the work. For instance, it is probable that the information changes and verifies how the in-coming nurse will continue to care for the patient because the two nurses are now feeling the same way about the patient and the patient’s future.
Evans, Pereira, and Parker (2008) observed the function of sharing one’s feelings about a patient during nurse shift handoffs for the work. Despite the fact that expressions of likes and dislikes of patients during the handoffs were unacceptable within the handoff process, nurses did use keywords to describe patients. Examples in the study included:

“He’s a very anxious man. I was going to say demanding. Probably shouldn’t.”
“He’s been a very naughty boy. He’s refused to eat and drink today.”
“She’s such a sweetie though.” (Evans et al., 2008, p.43)

The authors referred to these keywords as “stereotypes”. These stereotypes encapsulate subjective feelings about a patient and are used to give implicit guidance to the on-coming nurse about how to handle the patient. Thus, they covertly showed their feelings towards the patients and directed their colleague as to how to approach and consider the patient. Zhou, Ackerman, and Zheng (2009) also found the use of keywords by nurses to encompass a particular patient type. For instance, during shift changes nurses would indicate that a patient was ‘needy’ to insinuate that this patient will require a lot of the nurse’s attention and time. This then was a cue to the oncoming nurse to plan the distribution of her time accordingly. Such terms are used not only as shorthand for more complex and extensive information transfer, but they are also used because the longer explanation is often less flattering and professional.

Studies of emotion and information sharing in the medical domain have also begun to pervade the HCI and CSCW community in terms of information system design implications. This community, which is becoming cognizant of the importance of emotions, ambiguity, and the user experience, has led to a few studies of the importance of expressing emotions in medical environments.
A study of doctors’ and nurses’ effective information transfer during handoffs in an emergency room in Australia found “emotional anecdotes” that are shared during handoffs but not recorded in the formal patient record (Mueller, Kethers, Alem, & Wilkinson, 2006). The researchers learned that the incoming doctor very much wanted to know generally what the outgoing physician “felt” about the patient – what was his or her “intuition” about how the patient was fairing and what does he or she feel may happen in the next few hours. This is a direct request for the personal, non-factual assessment of the patient based on a “gut-feeling”. This can include comments such as:

“This patient is a difficult man.” (Indicating appraisal and dislike of patient)
“I don’t like it if patient X always asks for drug Y.” (Indicating distrust of patient)
“Patient Z does not make me feel good.” (Indicating dislike and possibly distrust of patient) (Mueller et al., 2006, p.65)

Even though these summary statements include ambiguous terms and phrases, the doctors interviewed by Mueller et al. indicated that offering them is an important aspect of information transfer that helps them to be effective at their job. Thus, these researchers concluded that along with supporting the transfer of “hard” medical data about patients, they also needed to support the “soft” data that is ambiguous but conveys how the other team feels about a patient’s state (p.65). At the same time, the researchers found that different medical practitioners have varying levels of comfort with sharing these intuitive summary statements. For instance, a few physicians stated their hesitation with expressing their intuitive feelings about patients; the researchers suggest that this may be due to medical education that emphasizes the importance of factual data. Different individuals also had varying acceptance of their colleague’s intuitions; this may have
been due to varying levels of comfort with intuitive judgment in general, or more specifically their faith in a specific colleague’s intuition.

A recent study by Zhou, Ackerman, and Zheng (2009) examined the replacement of paper-based nursing documents with a new information system. Before the transition, they found that the temporary written documents used to share important information from shift to shift contained not only factual data such as vitals but also information on the patient’s personality (e.g. pleasant, needy), mood (e.g. restless, calm, comfortable), and psychosocial context (e.g. keep particular family member away from the patient). After the new information system was introduced, this “psychosocial” information virtually disappeared from written records, due to concern regarding the permanence and far-reaching distribution of the electronic documentation. The researchers observed a “corrective” trend to include more psychosocial information in the verbal information sharing activities, even though this removed one of the benefits of a persistent record from shift to shift. Of particular interest is that the nurses themselves did not perceive the loss of this information as detrimental to their work. They “cheered the termination” of the temporary documents once they realized all of the objective information could be easily found in the new information system. They did not perceive the loss of the written psychosocial information as important as the objective information. However, this raises the question of the changes to the verbal handoffs: if the psychosocial information was not important, then why did the nurses generate longer verbal reports so as to provide the psychosocial information?

Previous studies of emotion expressions indicate that, in the ER, I will observe many instances of a nurse or doctor expressing their feelings towards the patient with
their coworkers. In addition, this information is important yet sensitive enough to circumvent formal sharing methods such as formal documentation in the patient record. However, it is not clear from these studies why a medical worker may express their feelings. In other words, what is the intent of emotion expression – thus indicating why we should continue to support work-related emotion expressions. In addition, it is not clear what other causes of emotion are expressed in the ER that are important for the primary work of the ER to be conducted. These are all areas of further study addressed by this dissertation.

2.5 Human Computer Interaction Perspectives on Emotion

When considering emotion from the perspective of information system design, there are two predominant schools of thought – the information-processing perspective and the interactional perspective. The first perspective has its basis in the accurate sensing and transmission of affective information whereas the second perspective is open to the ambiguous and situational nature of emotion.

In the following section, I outline informative and representative examples of the type of research in these two perspectives for the design of affective technology. The aim of this section is to present these two perspectives in order to later determine the merit of each perspective in supporting work-related emotion expressions in the ER.

2.5.1 Information Processing Perspectives

Much of the work addressing emotion in computing was pioneered by Rosalind Picard at MIT’s Media Laboratory. Picard (1997) coined the term “affective computing”, meaning “computing that relates to, arises from, or deliberately influences emotions” to
describe this field of endeavor (p.3). Picard’s emphasis is on the reliable sensing of emotion in order for a system to respond appropriately to a user’s interactions. For instance, in one thought paper, Picard expresses her opinion that the research in agent technology should not be as concerned with virtual agents expressing emotion-like behavior to seem more realistic and instead focus on recognizing emotions of the user in order to construct more ‘emotionally intelligent’ agents (Picard, 1998). Picard’s Affective Computing Research Group has both led and inspired many studies aimed at creating technology artifacts that are able to both sense and respond to the user’s emotional states.

Consistent with a signal processing orientation, much of the work by members of the Affective Computing Research Group has been aimed at finding new and more reliable methods for sensing and recognizing affective states. They began their inquiry by developing affective signal processing algorithms that would extract information from physiological signals (i.e. skin conductivity, blood volume pressure, respiration, and electromyogram) (Healey & Picard, 1998). By using pattern recognition algorithms they were able to distinguish between angry and peaceful states, and between high and low arousal states, but they found it difficult to distinguish between positive and negative valence states. This latter difficulty may have been due to the diversity of arousal associated with the various emotions that contribute to the two valence states.

Drawing on this initial work, researchers in the Affective Computing Research Group then trained a recognition system with data previously gathered from frustrating participants with a ‘non-working’ mouse (the mouse would occasionally be slow in responsiveness), with the goal of recognizing one specific emotion: frustration
(Fernandez & Picard, 1997). Their initial study utilized Hidden Markov Models to obtain user-dependent patterns that yielded significant recognition results (better than chance).

Since then, Picard’s group has shown that physiological signals such as pulse and galvanic skin response correlate with various emotions such as joy, frustration, and anger (Vyzas & Picard, 1999) and attached electromyographic sensors to the muscles of the face to reliably detect smiling and frowning activity (Partala, Surakka, & Vanhala, 2005).

Many of the early methods proposed by Picard and her colleagues for sensing emotion data were obtrusive and might influence the user’s affect, but more recently researchers have explored more unobtrusive techniques for sensing affect. For example, one study showed that users squeezed a pointing device (mouse) more when frustration was induced (Qi, Reynolds, & Picard, 2001). Another study developed a method for sensing frustration through touchpad pressure (Mentis & Gay, 2002); when users became frustrated the touchpad was used with significantly more pressure. Not surprisingly, the human face has been an active area of research on emotion sensing. Thermal imaging of a user’s face is undetectable by the user because they assume that the camera is for video-conferencing (Puri, Olson, I., Levine, & Starren, 2005). Likewise, an office chair embedded with electromechanical film seems like a typical office chair, but the film technology can reliably sense heart rate as a user sits in the chair (Anttonen & Surakka, 2005).

With the rise of interest in affective computing, a number of companies have begun to use the automatic sensing of emotions to respond to users’ emotions. For example, Toyota designed a concept car that responds to the emotions of the driver (Arimoto, 2001). Developed in collaboration with Sony, the car monitors drivers’ pulse
and galvanic skin response as well as driving behavior and offers feedback via color-changing lights and other displays. For instance, when a driver slams on the breaks, lights on the outside of the car turn red to express anger to other drivers on the road. Also, when a driver is exhibiting poor driving behavior, the interior display will provide icons of praise or warnings to the driver to modify their emotions and thus their driving behavior (see Figure 2-3 for an example of a ‘happy car’).

Much of the research on emotions in HCI has been aimed at sensing a user’s emotion in order for the system to respond to a human’s emotions. However, a few research groups have studied emotion conveyance between two people in computer-mediated communication (CMC). Most of this research has been informed by media richness theory (Daft & Lengel, 1984) or social presence theory (Short, Williams, & Christie, 1976). Media richness theory suggests that communication channels that support a richer set of social cues, such as vocal inflections, facial manipulations, and bodily gestures, provide more effective support for complex tasks. Social presence theory proposes that a central requirement for any communication medium is that it supports the level of interpersonal involvement needed for the task at hand. Thus, based on these premises, researchers have been attempting to enhance remote communication technologies with emotion transference in order to improve communication and collaboration.
Orange LED lights on the front of the car indicate a ‘happy car’ and thus a happy driver.\(^3\)

One study drawing from these two theories used text chat to support a distributed group decision-making session in which one set of groups were given three different emotion icon buttons – happy, sad, and angry (Figure 2-4) – to use in their communication; a control condition had no such options for enhancing their text communication (Rivera, Cooke, Rowe, & Bauhs, 1994). The researchers found that subjects used the emotion icons more often when a confederate group member instigated

this communication practice. However, the researchers found no evidence that use of emotional icons promoted decision conformity (a common dependent measure believed to reflect group effectiveness in decision making tasks). It is not clear whether the emotion content had no effect, or whether its effect would only be observed over time as the group coheres and affective communication norms emerge. However, the participants were asked to reflect on whether they thought that CMC technology enhanced dispersed group decision-making; those who had emotion icons available rated CMC as an enhancement, while those with no emotional icons available said that it does not replace face-to-face group decision-making. However without converging performance differences, it is difficult to interpret these subjective reactions to a novel communication technique.

![Emotional Icon Buttons](image)

**Figure 2-4. Emotional Icon Buttons (Rivera, Cook, Rowe, & Bauhs, 1994)**

More recently, a chat system was developed which used animated text to show the affective state of the user (Wang, Prendinger, & Igarashi, 2004). The system used galvanic skin response to determine arousal; it also allowed users to specify their affective valence through a button, a short-cut key, or tag embedded in the message. The automatically sensed arousal dictated the speed, size, color, and interaction of the animated text and the user-specified valence dictated the animation type used (e.g. happy
or sad) (see Figure 2-5). Thus, the animated text conveyed the affective state of one communicator to another while chatting. Participants indicated that they felt more engaged with and more interested in the conversation; however, some participants also indicated that they did not always want their partners to see their GSR information.

<table>
<thead>
<tr>
<th>Happy</th>
<th>Drop</th>
<th>Move</th>
<th>Jump</th>
<th>List</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Happy" /></td>
<td><img src="image2" alt="Drop" /></td>
<td><img src="image3" alt="Move" /></td>
<td><img src="image4" alt="Jump" /></td>
<td><img src="image5" alt="List" /></td>
</tr>
</tbody>
</table>

Figure 2-5. Text Animation to Indicate Emotions in a Chat Environment

In summary, the primary goal of research in affective computing has been to accurately sense and or convey an emotion from one human to a computer or another human. In other words, the crux of the development or design of the system is to ensure the ‘true’ or ‘correct’ emotion was transferred to the system or communicator. This is typically done by automatically sensing the emotion; however, this has also been achieved by a person explicitly indicating their true emotion. The hope is that techniques can be developed to improve the computer’s ease of use, or to augment human creativity, decision-making ability, or communication.

Following this design perspective, a collaborative systems designer would go into the ER with the intent of determining the best and most unobtrusive indicators of emotion (e.g. physiological sensors or a user-initiated emotion ‘button’). The output of these
sensors would provide a clear indication of an individual’s emotions and would be added alongside other types of information (i.e. objective data such as blood pressure, heart rate, etc.).

2.5.2 Interactional Perspective

The interactional approach articulated by Boehner, DePaula, Dourish, and Sengers (2007) argues that the study of emotions in HCI has been tightly bound to the traditional information-processing model that is rooted in laboratory science methods and value systems. In this model, emotion is another type of information that occurs within an individual and must then be conveyed to a system or another individual. Thus, even though the affective computing paradigm has encouraged designers to broaden their view of human interaction from one that is focused on cognition to include emotional factors, the interactionists posit that the ways that emotions are conceptualized and studied needs further broadening. The laboratory science tradition has provided useful knowledge for HCI designers (e.g., in design of visual displays and interaction dialogs), but it promotes too narrow a definition of emotion – one that is rational, well-defined, and culturally universal.

The interactional perspective instead seeks to address the entire emotional experience by including aspects of human experience that are “not objectively accessible and measurable, that which is personal and idiosyncratic, that which varies over cultures and over time” (Boehner et al., 2007, p. 277). Whereas an information-processing view prioritizes the individual (i.e., emotion data that is being generated or processed by the individual), the interactional approach views emotions as deriving meaning from the
social and contextual environment, and thus inextricably bound to this context. With this view of emotion as a starting point, the experience or sharing of emotion cannot be seen as an individual act but rather part of an ongoing socially-mediated experience. Thus, Boehner et al. (2007) challenge the adequacy of an information-processing model for studying emotion in HCI, and encourage a broader view that includes the application of concepts and methods from cultural studies, sociology, and anthropology.

The interactional perspective believes that emotion is produced within a social and cultural milieu and subsequently experienced and interpreted through our interactions with others. Thus, the interactional approach attempts to change the direction in which we design information systems for emotion by (1) moving away from the emphasis on computers reliably sensing a human’s emotions and (2) moving towards systems that encourage an individual or group to understand their emotions. Towards the second goal, interactionists believe that ambiguity that encourages reflection is the best route towards this end – thus, they also eschew the focus on reliably displaying emotions.

The Boehner et al. paper reviews a number of studies that reflect an interactional approach. A good example of the move away from the “extraction and transmission of emotional information to providing resources for situated emotional meaning-making” (Boehner et al., 2007, p. 282) through ambiguity and reflection is the Affector system (Sengers, Boehner, Mateas, & Gay, 2008). The system collects video footage of two colleagues and distorts the video output based on user-defined rules. For example, office conditions such as movement in the room are reduced to trails of movement (see Figure 2-6). The distorted video is then transmitted to the other office colleague on a video monitor placed between the two offices (i.e. as if it was a window between the two
offices). In contrast to an information processing perspective, Affector does not assume a well-defined model of emotion that is used to translate the video into a particular emotional state, which is then translated into a particular video effect. Instead, the designers of Affector intended for the office workers themselves to interpret and tune the output over time to what it might potentially mean to them as well as to their office mate. Thus, it is deemed a system that is ‘emotionally expressive’ as opposed to ‘emotionally representative’.

![Figure 2-6. Emotional Expressivity between Coworkers (Boehner et al., 2007)](image)

Likewise, eMoto (Sundstrom, Ståhl, & Höök, 2007) is a method for sending open-ended emotion representations along with text messages. Emotions are expressed by selecting a colorful and animated shape that is displayed in the background of the
message. The expressions were initially designed as a shape-colorwheel to revolve around the circumplex model of emotion (valence on the X axis and arousal on the Y axis). For instance, high arousal negative emotions were a sharp red, jagged shape (see Figure 2-7 for the shape-colorwheel). However, studies using the system found that participants rarely used a one-to-one emotion-to-expression mapping. Rather, the colorful shapes were used to express complex or mixed emotional experiences (e.g. empathy or irony). In addition, because participants are able to choose their emotion representations, they were able to introduce and share emotions they might not have been feeling at the time. It is suggested that this is important in order to “make human relations work” (Höök, Ståhl, Sundström, & Laaksolahti, 2008, p. 650).

Figure 2-7. eMoto. Open-ended Emotion Representations in Text Messages (Sundstrom, Ståhl, & Höök, 2007)
Since its publication, additional writings have expanded upon the interactional approach. Noteworthy is Höök, Ståhl, Sundström, & Laaksolahti (2008), which integrates physical, bodily experiences as part of the feeling of an emotion. Through physical and intellectual experiences of emotion one engages in an affective loop. In it, the user expresses emotions that are reacted to by the system or another user through the system. In kind, the system or co-user expresses emotions that then influence the initial user. For example, in order to select a colorful shape in eMoto, a user performs gestures with a motion and pressure sensitive stylus. The various shaking and pressure combinations then reinforce the emotions felt. For instance, if one is sending an angry text message, they will vigorously shake the stylus to move the colorwheel to show a pointy red shape. In essence, that vigorous shaking reinforces the emotion the user is feeling.

The interactional perspective is still in its infancy; however it is not alone in its movement away from the information processing focus of affective computing. Others had made a number of similar arguments before Boehner et al wrote their manifesto, as they acknowledge in their discussion. However, over the next decade further studies will expand how we can consider the larger emotion experience in the design of sociotechnical systems.

In both of the systems described, the ‘interaction’ aspect is that emotion sensing and representations is not predefined. Rather, a user discovers and understands another’s emotions through reflection on the output he or she receives. So, as the two coworkers know more about one another, they can begin to understand and modify the Affector output to be more meaningful to them. However, this might not be the same output that would be meaningful to another coworker in the office next door. Likewise, The friends
who are sending text messages to one another via eMoto are learning as that friendship pair develops what those colors and shapes mean to their friend and how to understand them.

Following this design perspective, a collaborative system designer would go into the ER with the intent of presenting systems that ambiguously represent an affective tone of the group or individual coworker representations. A multitude of sensors could be used including noise, light, and movement in the ER as well as user-specified indications such as color or object selections. As a new member is introduced to the team, they can begin to understand the representations over time as they get to know their coworkers better. The expressions of emotions through this new system would be separated from other data driven information; thus, there would be no indication of this information on formal documentation such as the electronic patient record. Rather, there may be a dedicated display on the wall in the ER for workers to stop and reflect.

Despite the interactionists’ emphasis on the importance on the social, contextual, and situational, the interactional approach begins with the development of a technology and then investigates how people use it as opposed to beginning with an interactional approach of how people actually work together and communicate their emotions to one another. In this sense, they do not understand the social before they design for it.

2.5.3 Summary of Design Perspectives

Here I have presented two different design perspectives. Both can be used for the expression of emotions. One designs systems to reliably sense a user’s emotions for the automatic transference to another and to be easily understood by the receiver. The other
puts the onus of sensing or recognition on the human. Note that neither design perspective has investigated an existing setting and subsequently designed a system to support emotions and experiences.

2.6 Summary

In this chapter, we see that emotion is a vital factor in everyday experiences such as motivation, communication, social interaction, and work performance. The HCI field has begun to take up the call to address emotion in the design of information systems, computer-mediated communication, and social interactive systems. However, it is also evident that more work must be done. The use of emotion expressions to address work-related goals is not clear yet. Why and how do workers use emotion expressions in their work? Consequently, how can we design new technologies to support these expressions in the workplace?

To address these questions, I conducted a research study examining emotion expression towards the work between medical personnel in an emergency room of a major urban hospital. I expand upon the medical domain studies reviewed here by observing all types of information transfer instances towards achieving the work of the ER – not just handoffs. In the next chapter, I lay the groundwork for this study by discussing my research methods and data analysis techniques.
Chapter 3. Study Design and Methodology

Studying emotions “is far from straightforward” (Savage, 2004, p. 26). Researchers from multiple fields who study social behavior echo this sentiment and emphasize that knowledge of context and interaction is critical in informing one’s analysis. In the anthropology of emotions, Leavitt (1996) insisted that humans cannot recognize and gain insight into the emotions of others without a detailed understanding of the social and cultural interactions in which the others’ emotions are expressed. In communication research, Barrett (1993) argued that emotions could never be seen as clearcut and context-free expressions. And in the sociology of emotions, (Burkitt, 1997) proposes that emotions are culturally specific and meant to be expressions between people. “A culture provides for people an emotional habitus with a language and a set of practices which outline ways of speaking about emotions and of acting out and upon bodily feelings within everyday life” (p. 43). In the following section, I describe how I approached the study of work-related emotion expressions in the ER towards the design of collaborative information system design.

3.1 Studying Emotions for Collaborative Systems Design

Building from the views implicit in the statements above, my conceptualization and study of work-related emotion expressions is in line with the interactional approach (Boehner et al., 2007). In these authors’ primary conceptual paper, they begin their argument by demonstrating that even though there has been a move away from a purely cognitive rational model of how humans interact with computer systems, to one that is more emotional, the study of emotions in HCI is still very much grounded in an
information-processing model. Furthermore, the information-processing model draws heavily from the laboratory science tradition that seeks to analyze human behavior devoid of context. This tradition has provided useful knowledge about the elements and operations of emotion expression and communication, but at the same time it has narrowed the definition of emotion to be rational, well-defined, and culturally universal.

The interactional approach views emotions as deriving meaning from the social and contextual environment and thus cannot be seen as an individual act but rather part of social interaction. Thus, the interactional approach encourages the uptake of concepts and methods from cultural studies, sociology, and anthropology. Thus, to move from the information processing tradition we need a new epistemological basis of evaluation and new methods built from this base. They suggest that researchers should use methods that are able to capture the “complex expression of the experience of emotion over its categorization into delineable categories (Boehner et al., 2007, p.285);” observations and interviews with qualitative analysis are offered as example approaches that might support a more experiential analysis. Their suggestions are of course quite consistent with other CSCW researchers who have argued for finding alternatives to the traditional goal-oriented cognitive models (e.g., Suchman, 1987). The influx of qualitative methods in studies of collaborative work and supporting systems is more evidence for researchers’ recognition that more complex and open-ended approaches are required.

Boehner et al. (2007) developed their arguments to guide design and evaluation of affective computing systems (e.g., user interfaces that sense and convey emotional states); however, the same arguments also apply to studies of collaborative behavior conducted in order to inform the design of affective computing systems. Because my goal
is to understand the deeper structure of affective phenomena within a collaborative and context-rich work setting, I used ethnographic field methods that allow me to delve into the relationship between emotion expressions and information sharing. Ethnographic field methods have a basis in traditional ethnography but have been adopted by the HCI community as a means to apprehend the complexities of the real world (Dourish, 2006). My eventual goal is to understand the opportunities and challenges for bringing affect into the design of collaborative information systems; in this sense I hope to discover design concepts that are much more than an attractive look and feel or an explicit transmission of states between collaborators. Although quantitative research has been useful in studies of affect and group work, I hope that my study will help to build an enriched understanding of the processes and dynamics of emotion as part of information sharing, one that can better inform affective computing system design.

Because the experience of emotion is not a fact – even in the eyes of he/she who is feeling it - an interpretive epistemology is most appropriate for researchers adopting an interactional approach (Boehner et al., 2007). Interpretive methods assume that scientific knowledge of reality is a social construction by human actors (Walsham, 1995). In this sense, my responsibility as a researcher is not to evaluate a person’s “true” emotion; I do not and cannot “adjudicate which is the user’s correct or actual emotion” (Boehner et al., 2007, p.287). Instead, I am guided to co-interpret human emotions along with those experiencing the emotion, working together with them and their subjective understandings to construct an account of what happened and why.

When conducting any type of research study one must prioritize the research goals of generalizability, precision, and realism. As McGrath (1984) has argued, it is not
possible to maximize all of these goals simultaneously; however, all are viable and correct choices for a single research study. Ethnographic studies aim to make observations of the natural context with as little intervention as possible. Thus, ethnographic studies maximize realism, but they do so at the cost of greater generalizability and precision. However, the explanatory power offered by the qualitative data that I gather with ethnographic methods provides me with insights into the group processes and other hidden factors that might be ignored or unnoticed using more generalizable and precise quantitative methods. Quantitative methods cannot convey the story behind the figures, whereas qualitative methods are flexible and sensitive to social contexts. For instance, people may have varying definitions of certain terms, such as trust. If the researcher adopts a quantitative approach (e.g. responses in a survey), it may be difficult to obtain a rich understanding of how people trust one another. Thus, I opted for a more flexible process of data collection, one that allowed me to follow affective as well as collaboration leads as they were presented to me.

Finally, by taking an interpretive analysis approach I was able to understand the workers (and the emotions exchanged) in their working context. I am employing an interpretive epistemological lens to articulate the social relationships through the subjective meanings that the participants experience and assign to them (Myers, 1997).

3.2 Observing Emotions

There is precedence for studying emotions using ethnographic methods in other fields of research. Lesson learned from these studies provide a good basis for beginning a study of emotions in HCI.
In the study of emotions, ethnographic methods can facilitate the discovery of hidden interactions. For instance, in Allan’s (2006) ethnographic study of an infertility clinic, both patients and staff had related to the researcher that nurses were the ones who were “emotionally close” to the patients. However, through the course of her observations it was clear that the nurse had very little interaction with the patients and was, in fact, emotionally distant. The discrepancy between what patients expected of nurses and what nurses expected of themselves (gathered through interviews with both sets of stakeholders) colored both groups’ assessment of their relationships with each other. These assessments were not consistent with the detailed observations. Allan thus claims that ethnographic methods are critical in allowing discrepancies of practice to emerge that no other methodology would uncover.

When conducting an ethnographic study of emotions, data can be collected by observing external signs of emotions, by probing people for descriptions of their emotions, or by relying on one’s own experiences of others as a source of data (Parkinson, 1995). However, there are two issues that come up frequently for any of these data collection approaches: a) there is no way to ensure a consistent link between internal experience and the language or terminology used to describe it; and b) it is questionable whether an individual researcher can truly “understand” another’s emotion through either or both expressions or descriptions. Mitchell (1997) argues that the best solution to these issues is to immerse oneself in the practice of the observed. By having a “felt experience” the analyst can attain deeper insights and interpretations. Beatty (2005) echoes this approach, noting that no one can fully grasp how another is reacting unless we have
experienced a similar event. The resulting experience is then not an act of “translation, but of empathy…”’resonance’” (p.21).

Researchers in the field of HCI have recently taken up empathy as a resource for relating to users and thus designing better systems (for a short review see Wright and McCarthy, 2008). With respect to the relationship between the designer – including the user experience researcher – and the user, Wright and McCarthy state that in order to ‘know the user’ we must “understand what it feels like to be that person” (p. 638) – this is where empathy plays a roll in whatever methodology we use. Specific to their conceptualization of empathy is Bakhtin’s dialogical approach. This approach emphasizes the “felt, valuational response from one’s own particular, unique value position” while at the same time maintaining a separation between self and other (i.e. not ‘becoming’ the user). This ‘turning inside’ to understand the human experience was the basis of psychology before behaviorism dominated the field. William James (1890) stated that introspective observation “is what we have to rely on first and foremost and always” (p. 185) and it is just as fallible as any other “observation of whatever kind” (p. 191). Wright and McCarthy (2008) also reflect on the use of empathy to produce complete and useful ethnographies towards design. They cite Dourish’s description of the ethnographic process as being “concerned with the member’s perspective and the member’s experience…” (p. 639). Thus, the use of empathy to better understand the human experience through an ethnography is particularly fitting since an “ethnography involves dialogical engagement with living and breathing others and an empathic rendering of that encounter” (p. 644).
A final thought on the importance of qualitative methods for the study of emotions in real world settings is the explicit recognition of the researcher’s own emotions and how these may interact with her perception and subsequent reflections about what she has observed. It is indisputable that the emotions of the researcher influence the data collection and analysis (Craib, 1995). Kleinman and Copp (1993) address the assumption of the “emotionless” researcher and encourage qualitative researchers to acknowledge their emotions and the effect(s) they have on their observations, recordings, and interpretations. One method for recognizing and understanding these influences is the use of a reflexive diary, a journal by the researcher documenting and reflecting on the feelings and emotions they are experiencing throughout the study. Through the diary, one can use their own emotions as insight in the analysis of the data.

In the same study described above by Allan (2006), the researcher used a reflexive diary that was entirely separate from her analytic notes to record her own feelings and reactions to what she was observing because she knew that she had a previous emotional relationship to this medical context (she was infertile, as were the patients being observed). These reflections offered her another viewpoint during the analysis of her analytic data. By acknowledging her reflexive practice she concedes that the final analysis is not the ‘truth’ – “it is the researcher’s representation … I have shaped and produced it” (p. 404). The reflexive diary allowed her to manage her own emotional reactions to what she was observing as well as to gain insight into what the players were experiencing.
3.3 Researcher Disclosure

In all research efforts, the individual researcher starts with a personal perspective based on background knowledge, values, biases and so on. In the case of emotion research “much depends on his or her working definition of emotion and its relation to cognition, feeling, and bodily processes” (Beatty, 2005, p.18). Thus, one of my responsibilities is to make my suppositions about emotions explicit and describe how they are consistent with my methodological approach. The following is disclosure of my own background and suppositions on emotion.

My background is in the cognitive sciences and my training is rooted in the positivist, quantitative paradigm. Until I began my PhD, my training and experience with research methods revolved around laboratory studies, quantitative data like time and errors, psychometrics, and inferential statistics. However, I believe that these methods did not always satisfy me and thus I was open to learning and engaging in the social sciences and to activities that involved interpretivist, qualitative research. The design of this study was partially motivated by my aim to fully understand and apply qualitative methods as well as become comfortable with the interpretivist epistemology. In line with most qualitative work, I am less interested in finding something that is generalizable, and far more interested in deep understandings.

Before studying cognitive psychology I was interested in biology and was considering a degree in medicine. I received my EMT-B⁴ license and spent some time

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⁴ EMT-B (Emergency Medical Technician-Basic): A trained entry-level pre-hospital emergency medical service provider. EMTs assess a patient's condition (usually at the scene of an accident) and perform cardiopulmonary resuscitation, defibrillation, control severe bleeding, prevent shock, body immobilization, and splinting in order to transfer the patient to an appropriate destination for advanced medical care (e.g. a hospital).
working as an EMT and volunteering in a number of hospitals. Because I do have a limited background in emergency medical care I am able to grasp what is occurring in the ER in terms of care, tests, and equipment.

My method for studying and my conceptualization of emotion has been substantially transformed over the last nine years. As an undergraduate I first proposed a study using EEG tests to measure satisfaction and frustration with a user interface. During my time at Philips Research, I was investigating the use of cognitive models to analyze the emotional experience of using multimodal interfaces. As I started my master’s degree I was utilizing touchpad pressure to measure frustration in order to create adaptive interfaces. In all of these studies, my background in the positivist, cognitive sciences was evident in that (1) I believed emotion could be measured and (2) I believed that it was our job as computer system designers to build adaptive and responsive systems to a user’s emotions.

My transformation began as I began a study on the occurrence of frustration during human-computer interaction. The use of a qualitative data gathering method provided me with a very rich understanding of when emotions occur as well as how diverse emotional reactions can be. I began to think more about the need to understand how emotions occur in ‘the wild’ before we can delve back into the lab to run controlled studies and design adaptive systems. Over the next few years I became more interested in the use of ethnographic methodologies as a way of learning about emotions. In addition, I realized that emotions are more than an individual’s interactions with a computer system.

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5 I was very active in the neurocognitive lab where we utilized EEG for a number of studies.
6 This study later replaced the touchpad study as my master’s thesis.
but are in fact fundamental to the social nature of work in terms of the social situation that work is placed. Thus, I began this dissertation study with the aim of investigating emotions from an interpretivist, qualitative stance with a focus on the social and collaborative nature of work ‘in the wild’. Only later, as I was considering design implications, did I subscribe to the Boehner et al. (2007) perspective of designing interactive systems – design for interpretation and reflection as opposed to sensing and transmitting.

Thus, this study was informed by at least three assumptions on the part of the researcher. The first of these was an explicit supposition that emotion is inseparable from cognition let alone any social act. The second assumption was that I would be able to share in the emotions felt by the personnel in the ER through observation and reflection. Third, I assumed that I would be able to recognize and give voice to these emotions. These initial assumptions about the nature and location of emotion had wide ranging effects, shaping, for example, the choice of methodology and the type of data that was focused upon.

3.4 Access to the Field and Gaining of Trust

Gaining access to the ER was not an easy task. I had chosen this work context because the ER is an excellent example of a critical environment that is also information rich. In addition, due to the time sensitive nature or ER activities, strong emotions are likely to occur, providing a richer fabric of activities for observation. So as to enhance the element of time sensitivity and pressure, I chose to conduct the ethnography in an inner city hospital.
I began my search for a research site by asking close friends and family members throughout the United States who were members of or were close to the medical field whether they had any contacts in an ER. As I had hoped, planting the seeds early led to people remembering my request when an opportunity did present itself. Thus, within, a year I had three contacts at different hospitals. The most promising was a young resident who was finishing her emergency medicine rotation at Center City Hospital\textsuperscript{7} in Philadelphia, Pa, USA. She had previously attended a public health program with a close friend of mine and they happened to run into one another on the streets of Philadelphia in June of 2007. When my friend learned of her old classmate’s current rotation, she immediately remembered my request and proceeded to explain my research interest (as best as she could). There happened to be an attending physician in the Center City Hospital ER, which the resident knew had an interest in information systems. I met with the young resident, presented my study to her and she proceeded to put me in direct contact with the attending physician.

By December of 2007, I had met with the attending physician and exchanged a number of emails on my research interests. At that time we began the process of gaining Institutional Review Board (IRB) approval from Penn State’s Office for Research Protections for the use of human subjects. The PSU ORP had told us that we must first gain Penn State’s IRB approval and then Engineering University’s\textsuperscript{8} IRB approval because Center City Hospital was an Engineering University teaching hospital. By April 2008, we learned that this was not the proper procedure and in fact we should have begun

\textsuperscript{7} Pseudonym has been used for the name of the hospital to protect the identities of the participants and patients.

\textsuperscript{8} Pseudonym has been used for the name of the university to protect the identity of the hospital.
with Engineering University’s IRB because the research is being conducted in their hospital, not a Penn State campus or facility. This, along with other miscommunication and lack of appropriate process knowledge on the part of the PSU ORP as well as lack of timeliness on the part of the two university’s IRBs, prolonged the IRB application process until October of 2008.

Once I gained approval from Penn State’s IRB, Engineering University’s IRB, and the Togetherness Healthcare Corporation⁹ that manages the Center City Hospital, I immediately visited the emergency room; my attending physician contact gave me a tour and briefing on how this particular emergency department worked. We then met with the head of nursing in the emergency department to further explain the intention of the study and begin the paper work needed to obtain a hospital identification badge. This badge allowed me access to both the ER and the personnel lounge where I later conducted the interviews. It also served as an identifier to ER staff that it was okay for me to post myself at the physician and nurse stations. I was told by my attending physician contact that I should not wear a white coat or scrubs because that might cause confusion for the nurses and patients. Instead I was instructed to wear “nice, but not too nice” clothes. Usually I wore flats, dark slacks, a light sweater or top, and a cardigan with pockets for storing tissues, pens, my phone, snacks, etc.

While collecting my observations, I normally carried a travel coffee mug. I found that this acted as a point of informal conversation with the doctors and nurses (e.g., do I drink tea or coffee, where did I get it, did I need more coffee) as well as being a great

⁹ Pseudonym has been used for the name of the healthcare corporation to protect the identity of the hospital.
‘prop’ for seeming like I was simply hanging out and not really listening in on their conversations. Although everyone knew why I was there and that my job was to observe their work and listen to their discussions, I quickly learned that overt staring or leaning in to hear conversations produced questionable looks and ceasing of conversation. I found that a useful tactic was to appear casual and more interested in my coffee than in what was happening around me.

Over the first two months, a nurse or physician who wanted to know who I was and what I was doing occasionally questioned me. My typical response was “I am Helena. I am studying information flow in the emergency room.” Rarely did I get further in my explanation – the response at this point was usually “oh, ok” along with a wave of the hand. Some of the staff were more interested in my research and would take the time to ask what I was observing, what it was all for, and if the Center City Hospital leadership would receive a report. Some staff members had their own conceptualization of what needed to be done and addressed in the ER and were happy to share this with me. I quickly realized that they were rather guarded in what they shared with me and what they said in front of me. My impression is that they were concerned that I was a ‘spy’ from Togetherness Healthcare Corporation or was going to run back and report my observations to the head of ER nursing. In addition, I got the feeling that most staff members assumed I would be visiting for a few weeks and then leave, never to be heard from again. Thus, they invested no effort into building emotional connections to me, and more importantly felt I was not emotionally invested in them and their needs and opinions. I decided that there was little I could do upfront to alleviate their suspicions.
about my purpose for being there, and that my continued presence week after week along with a lighthearted and joking nature was all I could do.

By the third month, I was no longer stopped or questioned as to who I was. Staff members would occasionally stop to ask me how it was going and if I had learned anything yet. A number of times I was greeted with “Here again?” or “Can’t get enough of us, can you?” This was my cue to joke back with “My life is quite boring. This is all I have.” or “You would miss me if I wasn’t here.” The opportunity to engage in banter was another indication of me being slowly accepted and even welcomed into the ER. In addition, during that month, I had a nurse comment on the ER having a “bum problem” the last three times I was there (i.e., she had remembered my presence and was joking with me about bringing in the bums off the street), I had a clerk engage me in the relating of a story to another staff member because I had been there during the incident two weeks prior, and a number of physicians and nurses turned to me because they missed what was stated over the loudspeakers and they knew I was listening. Through these changing reactions to me, I could see that the staff had noticed my working style and dedication; this was important for them to take my study and my presence seriously while at the same time to be less suspicious about my motives.

At around this time, I began my interviews. As I approached and interviewed personnel I realized that this was another way in which they were becoming more comfortable with my presence and observation activities. The questions I asked them during the interviews gave them considerable insight into my research interests and what I was hoping to learn. In addition, I gave them the opportunity to ask me questions at the end of the interview. This usually led to them asking what my intentions were with the
data I was collecting and I would explain both my dissertation goals as well as the report I planned to prepare for the Center City Hospital/Togetherness Healthcare Corporation. The interviews were also helpful in encouraging the staff members to approach me directly in the future whenever they had an interesting experience they felt might be related to my research. Once I changed my recruiting strategy, I felt quite comfortable approaching staff members I had recently interacted with during a work session, to question them on what they were doing, what they just said, and so on, because even a brief history like this seemed to make them much less suspicious as to why I was asking for the interview.

During the fifth month, I was away from the ER for almost two weeks due to illness and travel. When I returned, I was greeted by the clerk, physician, and two nurses who all chided me and commented on my long absence. This was the moment I knew I had been accepted and was no longer seen as an outsider. At this point I knew that they trusted that I was not there to ‘catch’ them doing something wrong and that I was not there just to ‘gather some data’.

After my first six months of observations had concluded I stopped visiting the ER for a month to analyze my data before returning for a second round of interviews and follow-up questions. After I was gone for three weeks I received a text message from one of the nurses asking, “Hey! Did you complete your Center City Hospital project? We miss you watching our every move! Good luck and take care!”. This was sent during this particular nurse’s shift; it implies to me that the nurses may have been talking about me not coming around anymore and perhaps thought I was done with my study. It made me realize that I should have shared my status with the ER personnel (i.e., that I was going to
go away for a bit to spend time analyzing data but I would return soon) because my 
sudden disappearance might be upsetting or at the very least noticed. I also didn’t want to 
lose the trust of the personnel that I had worked so hard to gain. I immediately replied 
that I was analyzing data but would be back soon, and hoped he would share this to the 
other nurses.

3.5 Grounded Theory

My data analysis procedure was based on grounded theory (Glaser & Strauss, 
1967). In using grounded theory, the researcher forgoes a guiding theory or set of 
hypotheses and instead evolves an understanding of the phenomenon through systematic 
coding of the data. In the course of this coding, patterns become visible, giving rise to 
hypotheses that in turn are strengthened or dismissed through further coding of the data. 
The coding is a continual process that occurs not at the end of the data collection but 
during it; categories (e.g. themes or variables) emerge from the data and are strengthened, 
modified, or discarded as more data is collected. It is a research approach that aims to 
analyze the data and investigate processes using constant comparison method where 
codes are compared in an iterative manner, thus leading to the development of a 
substantive theory.

As a result of the conceptual split between the two co-originators of grounded 
theory, there are two methodological schools in how to conduct a grounded theory 
approach. This split is based on the level of engagement one has in both data collection as 
well as data analysis. The Glaser school of thought condones maintaining distance and 
independence between the researcher and the data (Glaser, 1992). Glaser wants neutrality
in both the questions one asks during data collection as well as the way a researcher describes the data – in a sense condoning a positivist tradition of research. In contrast, Strauss along with Corbin (1990) encourage researchers to question the data and even view researchers as ‘interpreters’ of the data – to use their prior experiences and knowledge to interrogate the data and form theory. In addition, in this school of thought, researchers are encouraged to turn to other theories and literature to help explain and categorize the data collected. See Locke (1996b) for further elaboration on these differences.

Due to these differences, it is advisable for me to specify which approach I followed. Due to my use of empathy to understand the participants I study, along with the large cadre of emotion theories to apply to my findings, I choose to follow the Strauss and Corbin (1990) version of Grounded Theory. Thus, I realize that I am the interpreter of the data and that my prior experiences effect my interpretation. In addition, through the course of the cycle of data collection and analysis I turn to previous theories and literature to guide my lens to interesting and insightful questions as well as the categorization and explanation of my data.

3.6 Data Collection

In the following sections I describe how my preliminary study site provided me with insights as to how to best conduct my observations and then I provide a detailed description of my data collection methods
3.6.1 Preliminary Study Site

In order to try out the use of ethnographic methods as well as become more comfortable and knowledgeable of the ER, I spent 17 months volunteering in the Rural Medical Center near the Pennsylvania State University. Once a week, I would volunteer in a four hour shift where I would be responsible for patient transport, supportive care (providing food, drinks, and comfort to the patients), laboratory runs, and assist the nurses and doctors in medical procedures. During this time, I had ample opportunity to observe the relationship and coordination activities between the staff in the central work area. From these preliminary observations I learned that I should position myself near the charge nurse station, that a lot of information is written on temporary documents such as napkins and scraps of paper, and that the majority of interactions and discussions occur in this central work area. However, I was unable to view the medical records since the Rural Medical Center was a computerized ER. Thus, all formal information was recorded in the computer system, to which I did not have access. I did realize that emotions were expressed frequently in face-to-face interactions – both about the work of the ER as well as in non-work related social interactions. I recognized emotion expression primarily through tone of voice and, occasionally, through bodily posturing and facial expressions as well. I realized that for the majority of face-to-face interactions, the expression receiver would only be able to recognize emotions through vocal tone, inflections, or words since oftentimes they were interacting without facing one another. Thus, I realized that in the observation of face-to-face emotion expressions, I must be in a location in which I can hear all vocal expressions.
3.6.2 Data Collection Methods

My ethnographic data collection methods included observations, interviews, artifact analysis, and a reflexive diary. All of these data sources allow for triangulation and thus provide greater validity in the findings uncovered.

For the first two months, I focused on building trust with the ER personnel as well gaining a detailed understanding of the roles and responsibilities of all personnel and flow of information in the ER. In addition, I gathered data on the current use of any patient records and information systems. After these first two months of grounding I began to focus my attention on affective aspects of the ER as well as actively searching for instances of information sharing breakdowns/successes. After the first three months I conducted a preliminary analysis of the data I had to date and devised a set of interview questions based on my understanding of how the ER functioned and what affective phenomenon I had observed. I then began formal interviews while also continuing to conduct observations for the following three months.

As part of my grounding and preparation, for the first two months I visited the ER for four-hour blocks that intersected with a variety of shifts and weekdays. This provided me an overview of all personnel and situations that occur in the ER. After this preliminary period, I chose to focus on three different shifts that contrasted in day and time; narrowing my focus in this way also made data collection more convenient and tractable. These shifts corresponded to Friday mornings, Saturday afternoons, and Monday evenings. I visited the ER for five-hour blocks during these shifts during my six months of observation. In Table 3-2, I present a short introduction to the personnel of the ER; a more complete description can be found in Section 4.1.1.
<table>
<thead>
<tr>
<th><strong>Data Collection Method</strong></th>
<th><strong>Time/Quantity</strong></th>
<th><strong>Participants/Objects</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>240 hours (48 sessions)</td>
<td>Attendings/Residents/Interns Charge Nurses/Nurses/Nurse Assistants Clerk</td>
</tr>
<tr>
<td>Informal Interviews</td>
<td>~50 interviews</td>
<td>Attendings/Residents/Interns Charge Nurses/Nurses/Nurse Assistants Clerk</td>
</tr>
<tr>
<td>Formal Interviews</td>
<td>17 interviews</td>
<td>Attendings/Residents Charge Nurses/Nurses Clerk</td>
</tr>
<tr>
<td>Artifact Analysis</td>
<td>45 artifacts</td>
<td>Written Policies &amp; Procedures Patient Records, Posting Boards, Whiteboards</td>
</tr>
<tr>
<td>Reflexive Diary</td>
<td>~13 hours (48 entries)</td>
<td>Personal feelings, concerns, reactions, etc. towards the work, the people, my dissertation, etc.</td>
</tr>
</tbody>
</table>
Table 3-2. ER Personnel Observed and Interviewed

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending Physician</td>
<td>An attending physician has completed his or her residency in emergency medicine, can supervise fellows, residents, and medical students, and are responsible for all aspects of patient care.</td>
</tr>
<tr>
<td>Resident Physician</td>
<td>Residents in the ER are physicians in training for the specialty of Emergency Medicine. They provide a large portion of the medical care in university hospital EDs under the supervision of an attending physician. Thus, they must report to an attending physician their medical decision making during a process called ‘presenting’.</td>
</tr>
<tr>
<td>Charge Nurse</td>
<td>The charge nurse is a registered nurse who for that shift is in charge of the entire ER. The charge nurse is responsible for maintaining the flow of patients in and out of the emergency room and speaking with the physicians regarding patient status and time to discharge.</td>
</tr>
<tr>
<td>Triage Nurse</td>
<td>The triage nurse is usually an RN and performs preliminary evaluations of patients who arrive as a walk-in (i.e. not brought via ambulance) to determine criticality of the chief complaint and take preliminary vitals and history.</td>
</tr>
<tr>
<td>Staff Nurse</td>
<td>The staff nurse performs many of the typical nursing duties such as administration of medication, drawing specimen’s for lab work to be conducted, and assisting a physician with patient care.</td>
</tr>
<tr>
<td>Nurse Assistant</td>
<td>The nurse assistant performs support duties to the staff nurse such as taking specimens to the lab, retrieving medications from the pharmacy, and providing patients with food and blankets.</td>
</tr>
<tr>
<td>Clerk</td>
<td>The clerk is the administrative assistant to both the physicians and the nurses in the ER. He or she is in charge of ordering labs for nurses, answers the phones, and pages hospital personnel for the nurses and physicians.</td>
</tr>
</tbody>
</table>

3.6.2.1 Observations

I began each visit by recording the state of the ER. This included how many of the ER patient rooms were open, how many patients were waiting in the waiting room, and
how many new patients were waiting for a physician to see them. I also noted the attending physician(s) who were on duty, the charge nurse, and the triage nurse. I then took a moment to observe and document the level of general activity and the affective tone of the ER. I ended each visit with a similar summary of my impressions about the activity level in the ER during that visit and any salient group affective tone changes I may have noticed.

I made observations of key ER healthcare workers such as attending physicians, residents, consulting physicians, charge nurse, on duty nurses, and nurse assistants. However, observations were not equally distributed across these four participant categories. The majority of observations involved attending physicians, residents, the charge nurse, and the on duty nurses. This was due to both the dynamics of the information sharing that took place in the ER the locations I chose to use while observing.

During observations, I stood either at the intersection between the physician and nurse work areas or next to the charge nurse’s station. Figure 3-1 depicts the layout of these two work areas in the center of the ER – the stars indicate where I normally stood during observations. These locations were chosen for several reasons. First, the intersection between the physician and nurse work areas was the main point of verbal information exchange between the physicians and nurses, as well as between all ER personnel and the clerk (an administrative assistant serving as the nexus of all information). The clerks were immensely helpful in explaining things I did not understand; they also provided “behind the scenes” information about personnel and their interactions with one another. I also was in earshot of verbal interactions that occurred
between various physicians in the physician work area – specifically when a resident would present to an attending or when a consultant from another department would discuss a patient’s case with an ER physician. The location next to the charge nurse work area allowed me to closely observe nurse information recording behaviors, and gave me a clear view of the charge nurse’s interactions with all ER personnel. The charge nurse work area is the location where most of the nurses interacted formally with one another, as well as spending time on informal joking and conversation.

![Figure 3-1. Location of Observer in Reference to Physician and Nurse Work Areas](image)

(asterisk denote the primary locations I stood to conduct the observations)

I observed the ER personnel discussing patient care during formal shift changes, as well as sharing information and making decisions more informally. These discussions occurred between both personnel with similar roles (e.g., charge nurse and on duty nurse; attending physician and resident) and personnel filling different roles (e.g., charge nurse and attending physician). At no time did I interrupt the interaction between personnel or between personnel and patients.
I recorded all episodes of information sharing between ER workers that appeared to include an instance of an emotion expression. In this case, an emotion expression is defined as a verbal or nonverbal outward indication of emotions. This could be a direct indication such as stating “I’m so frustrated” or an indirect indication such as a scowl on someone’s face. I primarily focused on vocal cues – either words or inflections. However, I was also cognizant of facial cues and body posture. In addition to recording the information-sharing episode itself, I would record my real-time interpretation concerning the outcome(s).

For instance, I might record an exchange in which a nurse shared with a nurse assistant her feelings about a patient for whom they were providing coordinated care. The interpreted outcome was that the nurse assistant became aware of the nurse’s feelings toward this particular patient. At times, informal interviews after information sharing episodes were used to clarify the information that was shared, affect felt, or the intention of the participants (see Section 3.6.2.2 below for more information).

When recording the emotions of the observed participants, I utilized three of the approaches for observing an individual’s emotion that have been prescribed by Lazarus (1991): behaviors and actions, self-report, and environmental contexts. Behaviors and actions refer to the observation of intentional or unintentional actions (e.g., words spoken, facial expression, physical posture, behavioral norms). This was the primary means of emotion data collection during observations. Environmental context refers to the observation of events around an individual that allowed me to infer current emotional states.

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10 The fourth approach Lazarus suggested was physiological measurement that was inappropriate for this study.
states. For example, I inferred that a triage nurse was pleased when his coworkers congratulated him on a good catch\textsuperscript{11} and he laughed in agreement. Finally, \\textit{self-report} refers to simply asking the participant how he or she felt. For example, I might ask how a participant felt after a particularly hectic day in the ER.

In addition, my observations were guided by Beatty (2005), who delineates five aspects of an emotion episode that an ethnographic researcher may choose to focus on: initial situation and its interpretation, feeling state, the mode of expression, the labeling of the emotion, or the consequences (e.g. connected emotions, others' reactions). For this study I focused on the mode of expression (face-to-face or written) as well as the consequences (how one’s emotions influenced their work as well as how it influenced others). I chose to focus on these two aspects primarily due to access. I was not privy to a large number of initial situations since I was kept out of the patient rooms per IRB’s request.

3.6.2.2 \textit{Informal (Contextual) Interviews}

During observations, at times I needed further explanation for a work-related interaction after it transpired. As soon as was feasible, I would take the opportunity to follow up with the participant(s). Specifically I would attempt to clarify what information was shared, what affect was felt by participant(s), or what had been the intention of the interaction. One of the primary reasons to ask participants how they felt was to capture affect descriptions in the \textit{words of the experiencer}. These interviews were very short (no longer than 5 minutes) and usually were initiated by a question regarding the episode that

\textsuperscript{11} “A good catch” is a colloquialism in the ER meaning someone has realized there was a medical problem and addressed it or brought it to the attention of another medical personnel.
just occurred, with a second question probing the normalcy or regularity of this as a work-related interaction in the ER.

3.6.2.3 Formal Interviews

I chose members from three ER healthcare worker groups for interviews: attending physicians, residents, and nurses. This decision was based on my initial observations of interaction in the emergency room. I saw that the majority of information sharing needs and activities surrounding patient care occurred between (1) nurses and the resident and/or attending physician; and (2) between attending physicians and their residents. In addition, there is a substantial amount of information sharing between the charge nurse and other nurses as well as the physicians. In this case, however, charge nurses are a subset of the overall nurse population and were covered by sampling from the greater nurse population.

In order to gather interviews, I first sent out a request via email to the nurse and physician electronic mailing lists informing them of my interest in interviews for the study I was conducting and asking them to contact me with a date and time that would work for them. I followed this up with posted flyers around both the physician and nurse workstations. After a few weeks I found this to be ineffective in evoking participation – I had a few expressions of interest during face-to-face conversations but little follow-up on the part of the participants. Thus, I modified my recruitment strategy by identifying one or two participants after a day of observations who I had interacted with personally on that day, or who I had observed in an interesting interaction; I then approach them directly to request an interview as a follow up to our conversation or the observation.
Because they had been made aware of my interest in interviews through the email and flyers they had a context for understanding this request. In addition, our interaction history provided some grounding as to what I was interested in. Finally, I would schedule a day and time for the interview as part of the interview invitation, based on their next shift. Usually participants preferred to meet before their shift began because they expected to be tired afterwards. I would write the day and time on the back of one of my business cards and told them they could contact me if they had to postpone the interview to another day. No one ever postponed. Two participants forgot but then rescheduled.

Two rounds of formal interviews were conducted. The first round was focused on gathering information regarding the following three constructs of interest: information sharing practices, paper documentation/information system use, and affective events and outcomes. (See Appendix A for a complete set of interview questions.) In this round, I interviewed eleven participants: four attending physicians, two residents, and five nurses (one of these was a charge nurse). Each interview was conducted in the ER’s personnel lounge, lasted approximately a half an hour and was recorded by hand by me.

The second round of formal interviews was focused on affective episode reflection and co-construction. As suggested by Boehner et al (2007), emotions should be co-interpreted with the participants, together constructing an account of what happened and why. However, I refrained from asking participants for an immediate interpretation of the events I observed for two reasons. First, there was usually not enough time. The ER is usually a fast paced critical environment that leaves little room for interruptions and questions of the personnel. In these situations, questions tended to produce quick off-handed explanations with no opportunities to delve into underlying feelings and thoughts.
Second, I wanted to first interpret the data as the researcher: I wanted to reflect on the episodes I observed and compare these episodes to other observations before coming to my own conclusions about what was occurring and why. Thus, the second round of interviews was an opportunity for me to share my composite of emotion-bearing information sharing experiences in the ER to the participating personnel, so as to gain their own reflections. These more relaxed interview sessions allowed me to present an exemplary vignette from my observations and evoke a personal interpretation of the event from the participant. This method is similar to the member-checking that is often used in qualitative data analysis as a validity check (Lincoln & Guba, 1985). However, unlike member-checking, I did not present a theme that had emerged from my data analysis; rather, I presented an actual vignette that I felt to be exemplary of a theme and asked the participant to describe what they thought was occurring. I followed this exercise up with the opportunity for the participant to share a story that was similar from his or her own experiences. In this round, I interviewed six participants: two attending physicians, two residents, and two nurses (one was a charge nurse). Again, each interview was conducted in the ER’s personnel lounge, lasted approximately a half an hour and was recorded by hand by me.

3.6.2.4 Artifact Analysis

The analysis of artifacts embedded in work practice provides a different perspective on the design consequences and role of these artifacts. This can both inform the design of further electronic artifacts as well as understand how certain work practices persist in the current context.
Investigation of documents included internal communications such as written policies and procedures on work expectations, emotional display rules, and information systems usage. In addition documentation artifacts such as patient records, posting boards, and patient whiteboards were also examined. I had unfettered access to patient records in the ER as long as I reviewed them in the doctor work area. In addition, due to IRB rules, I was not able to make copies or photos of any of the patient records I viewed. However, I did have some trouble obtaining formal policies and procedures. The head of nursing persistently forgot to pass these over to me. In the end, I had to look through documents that were in the doctor and nurse work areas as well as ask new nurses if I could look over their materials.

3.6.2.5 Reflexive Diary

I maintained a reflexive diary in which I recorded my own affective states and reactions to what I had observed after every session in the ER. In it I also recorded my personal feelings towards those I was observing or interviewing. Because I was empathizing with the personnel of the ER – doctors and nurses – as opposed to the patients, this caused some emotional dissonance in me. I used the reflexive diary to maintain a rich perspective on my own emotions in this high stress environment. Finally, I used the reflexive diary to muse on the use of qualitative methods for studying emotions in the field.

3.6.3 Checking for Validity of Observed Emotions

To strengthen the internal validity of the research findings, I needed to ensure that my findings would be credible. I performed both triangulation and a type of member-
checking of the data (Lincoln & Guba, 1985). The triangulation was performed by collecting data from multiple sources such as physicians and nurses and also by collecting data using multiple data collection methods such as observations, interviews, and artifact collection. To ensure external validity, the findings of the research should be generalized to other settings. I collected enough data to provide a thick description of the nuances of the hospital context and the assumptions of the research study (Denzin, 1989). Thorough details of the data collected and analysis will allow an individual to check for its appropriateness in other settings.

The reliability of the research findings can be achieved when the data is consistent and findings are dependable and trustworthy (Lincoln & Guba, 1985). Consistency of the data was maintained by closely analyzing the data and also by corroborating the evidence from various data sources. The trustworthiness of the research was achieved by revealing the entire research process as I have done in the previous sections as well as explicitly stating my own biases and theoretical understandings, as I did in my researcher disclosure.

As described above, I often conducted follow-up informal interviews to check my reading of the situation and gain further insights as to emotions expressed and intentions of the expresser. In addition, I performed formal interviews where I employed affective episode reflection and co-construction.

Overall, my interpretations of the emotions expressed in the ER were accurate. The difference in emotions such as anger, joy, and sadness were evident in facial expressions, body posture, and vocal inflections. However, some emotions were too similar in their manifestation for me to differentiate. For instance, frustration and
irritation were too similar to differentiate and, thus, usually I would categorize it as frustration and the medical worker’s would verify that frustration was a good word for it. Thus, interpreting emotion expression was not a difficult task once I identified an emotion was being expressed. Identifying an instance of an expression of an emotion was the more difficult task. This is the skill that developed over the course of my observations as I began to know each individual in the ER and began to understand the rules of emotion expressions in the ER. For instance, one charge nurse always had a permanent scowl on her face and always spoke in a forceful tone of voice. When I began my observations in the ER, I thought that she was always angry or annoyed. Then one day I saw her make a joke and laugh with the other nurses yet continue to display the same face and use the same tone of voice. I realized that this was not an expression of emotion as much as her affective trait. Later on I observed her become very angry with an attending and his resident. In that instance I understood how to differentiate her expression of anger and annoyance. In addition, after further observations, I understood what issues and conditions made this particular charge nurse happy, annoyed, angry, etc. Thus, I could better understand further interactions she had with her coworkers and almost foresee what situations were going to cause her to express and emotion. Thus, it made it even easier for me to position myself to catch interactions that contained emotion expressions. After these experiences and discoveries about the personnel I was observing, I would review my notes and amend my interpretation of emotions based on new understandings of how each individual expresses their emotions.
3.7 Data Analysis

Arguably the most important aspect of ethnography is the analysis – extracting meaning and coaxing out results from a rich array of data (Randall, Harper, Rouncefield, 2007). The data collection method of an ethnography is much like that of other observer based qualitative methodologies; however, during analysis, the researcher must have a reason or aim for that analysis to be applied. Thus, the major difference between ethnography and other qualitative methods is not in the manner in which the data is collected, but in how the data is interpreted.

3.7.1 Coding

Following the Strauss and Corbin (1990) method of coding in grounded theory, coding has three steps: open, axial, and selective coding. The first step in the coding process involves open-coding where a line-by-line analysis of the data is performed to derive open codes from the data. In the beginning, everything is coded with the goal of producing many high level, abstract concepts. These concepts are then compared as more data is coded, and merged into new concepts, and eventually renamed and modified to produce core codes or categories. The second step is axial-coding where the researcher is attempting to identify the relationship between the various categories of codes. Finally, the third step is selective-coding, which takes place when the data is recoded within these core categories to validate and refine the concepts and relationships to yield an emerging phenomenon. In addition, during axial and selective coding, the researcher is selectively searching out situations and examples to build these relationships and refine the categories.
After the first round of data collection (at approximately 2.5 months), I began the open coding phase. In the beginning, this revealed concepts such as affect terms used by participants and/or the emotion interpretation of the researcher (e.g. joking with one another, ‘frustrated’), my interpretation of an information sharing success or failure, and my interpretation of the purpose of the emotion expression (e.g. built awareness, created a shared mental model of care). In addition, I coded each day as a modular case, with an activity attribute that indicated whether I interpreted the day as a normal day in that emergency department, an especially slow day (i.e. low activity), or an especially frenetic day (i.e. high activity). These attributes were assigned based on the amount of activity observed as well as staff comments (e.g. “don’t say the ‘s’ word or you will jinx it” (slow), “this is nuts”). I also recognized that there were very few examples of emotions in the formal documentation. Thus I began to code for where the emotion was being expressed (i.e. face-to-face, written documentation, public whiteboards), and whose emotion was being expressed (i.e. that of the patient or the medical worker).

After the open-coding phase, I moved on to collect further data while at the same time continuing into the axial coding phase. During this phase, I began to discover the relationship between the activity level of the department and the frequency of emotion expressions in face-to-face situations and the relationship between who or what was the recipient of an emotion expression (i.e. hierarchical difference, medium difference) versus the frequency of emotion expressions. I continued to collect data that validated these relationships and I sought out situations that I deduced would exemplify these relationships.
During the last two months of observations I began to refine and the codes manifested in the open-coding phase. In order to refine these codes I turned to other literature and research to inform my conceptualizations and terminology. In the Strauss and Corbin (1990) version of Grounded Theory this is an acceptable method for coding data since it is understandable that many phenomena one uncovers already has been discussed and it supports the relating of one’s theory to prior and future theory.

First, I verified each of my observed emotion expressions were indeed an emotion according to the circumplex model. Specifically, I renamed a few terms of emotions to terms used in the circumplex model.

Second, my analysis was initially patterned after Basch and Fisher (2000) who categorized job-related, affect-producing events according to the affective valence of the resulting emotion. However, because the majority of events observed turned out to be of a negative valence, I found it to be less useful to categorize the events by valence of the emotion. Instead, I adopted a social constructivist view of emotion interaction (see section 2.3.2 for further information). In the social constructivist view, emotions are social relationships that are instantiated when an individual makes four interpersonal “choices”: the object or person toward whom an emotion is directed, the positive or negative valence of the emotion, whether the individual is giving or wanting to get something, and what the person wants (Metts & Bowers, 1994). I followed these four categories and modified my previous categories to specifically code for the object or person toward whom the emotion is directed (the source), the negative or positive valence of the emotion (valence), whether the individual was giving or wanting something
(intention), and then what was my interpretation of what the emotion was intended to achieve (purpose).

In addition, it was during this selective-coding phase when I began to realize some interactions were a result of emotion expression rules on the part of various stakeholders. I thus coded for interactions where it seemed evident it was a result of a modifying force (e.g. organization policy).

Finally, as I began to coalesce and describe my findings, I summarized the codes using percentages. These percentages were calculated by dividing the number of instances coded for a given selective code (e.g. patient as a source of emotions) by the total number of emotion expression instances (i.e. 174 emotion expression events). These percentages provide the reader a convenient indication of how often a particular behavior was observed; however, the primary evidence used in support of this dissertation is found in the thematic findings and representative vignettes. It is also important to note that during the axial and selective coding phases I was focusing my attention on discovering further examples of categories and relationships I had already discovered. Thus, these percentages would be different in an observation session that would be unselective.
Chapter 4. Research Setting and Information Flow

4.1 Research Site

This study was conducted at Center City Hospital\textsuperscript{12} in Philadelphia, Pa, USA. Center City Hospital is a 618-bed academic medical center located in the center of the Philadelphia metropolitan area. Center City Hospital is an affiliate of Engineering University’s College of Medicine and is managed by Togetherness Healthcare Corporation, which has 49 acute care hospitals in 11 states.

Center City Hospital’s Emergency Department (ED) is a 30-bed, Level I Trauma Center that provides emergency services for the greater Philadelphia region. It is one of the major receiving sites for police and fire rescue patients, and services a large number of walk-in patients from the general population. Center City Hospital is also served by the MidAtlantic MedEvac, a regional air medical transport service. In 2005, the emergency department was renovated to expand its capacity and improve the layout of the department.

The emergency department consists of Fast Track, the Emergency Room, and the Trauma Center. In Fast Track, patients are evaluated by a specially trained nurse practitioner and receive rapid care for non-life threatening illnesses and injuries between the hours of 11am and 11pm. The Emergency Room is equipped to treat stable, urgent, and emergent illnesses and injuries 24 hours a day. The Trauma Center includes specialized emergency resuscitation and diagnostic, surgical, and critical care services

\textsuperscript{12} The names of the hospital, its affiliates, and information systems have been replaced with a pseudonym through the dissertation.
organized for immediate response to provide care and treatment for seriously injured patients 24 hours a day. This study focused on the activities in the Emergency Room.

The Emergency Room (ER) consists of the following physical areas: waiting room, triage, registration, patient rooms/beds/chairs, healthcare personnel stations, and an X-ray department. Of the 27 patient rooms in the ER, three are obstetrics rooms, two are isolation rooms, one is a pediatrics room, and one is an orthopedics room; the remaining 20 rooms are for general medical care. There are also five chairs in the hall reserved for patient care as well as additional beds in the hall if the need arises to take in additional patients.

ER activity is a mix of patient care and bed management. The former activity can take from one to 12+ hours per patient while the latter is an ongoing process. Patient care is the understood primary activity of the health care workers in an emergency room. It includes the tasks of diagnosis and resolution of the health complaint – where resolution can be either patient discharge or admittance to the hospital. Both direct care and complaint resolution depend very much on the second locus of activity, which is less recognized: bed management. Bed management includes both internal bed management within the ER and making arrangements for moving people out of the ER. Coordination within these two activities occurs between the health care workers within the Emergency Department as well as between the ER and other departments within the hospital.

In the following sections, I outline the ER staff (their roles and schedules), the physical layout of the ER, the typical patient flow from entering the ER to admittance or discharge, and media used for information sharing.
4.1.1 ER Staff

*Attending physician:* An attending physician has completed his or her residency in emergency medicine and can supervise fellows, residents/registrars, and medical students. Attending physicians (attendings) in the Center City Hospital ER are all board certified and are responsible for all aspects of patient care. Attendings work three shifts a week in one of five overlapping shifts during weekdays or three overlapping shifts during weekend days. On Mondays, there is an extra shift from 12pm to 8pm due to the perceived increase in patients on Mondays. During the week at least two attendings are on duty from 10am to 2am, and at least one is there from 2am to 10am. On the weekends at least two attendings are on duty from 11am to 11pm and at least one from 11pm to 11am. The Center City Hospital ER has a total of 12 attending physicians.

*Resident physician:* Resident physicians (residents) in the ER are physicians who are in training for the specialty of Emergency Medicine. They provide a large portion of the medical care in university hospital EDs under the supervision of an attending physician. Thus, they must report to an attending physician their medical decision making during a process called ‘presenting’. A residency in the Center City Hospital ER lasts for 3 years; the first year resident is referred to as an *intern* and the second and third year resident is referred to as a *senior* or simply *resident*. Residents work three days a week in one of three overlapping shifts. On any given day, there are at least 4 residents (2 seniors and 2 interns) on duty from 2pm to 5pm and from 9pm to 12pm and at least 2 residents (1 senior and 1 intern) on duty from 12am to 2pm and from 5pm to 9pm. The Center City Hospital ER has a total of 9 interns and 8 seniors.
Nurse: There are three types of nursing jobs in the Center City Hospital ER (outlined below). There are a few registered nurses (RN), but the majority of nurses are licensed practical nurses (LPN). An RN is the more advanced designation, as it takes two to four years of study to earn; whereas an LPN usually only takes a year of study. Nurses work three days a week in one of four overlapping shifts. On any given day, there are at least 10 nurses on duty between 11am and 11pm (1 charge nurse, 1 triage nurse, and 8 staff nurses) and at least 6 nurses on duty between 11pm and 11am (1 charge nurse, 1 triage nurse, and 4 staff nurses).

Charge Nurse: The charge nurse is an RN who is in charge of the entire ER’s logistics for a given shift. The charge nurse is responsible for maintaining the flow of patients in and out of the ER by assigning patients to nurses, monitoring the work of staff nurses within the ER, requesting beds in the hospital for admitted patients, and, on occasion, speaking with the physicians on duty regarding patient status and discharge plans or schedule.

Triage Nurse: The triage nurse is usually an RN who performs preliminary evaluations of patients who arrive as a walk-in (i.e. not brought via ambulance); the triage nurse determines criticality of the chief complaint and takes preliminary vitals\(^{13}\) and history.

Staff Nurse: The staff nurse performs a variety of nursing duties such as administration of medication, drawing specimens (blood, other fluids, tissue samples) for lab work to be conducted, and assisting a physician with patient care. Staff nurses work

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\(^{13}\) Measures of various physiological factors of major (vital) body functions. Typically body temperature, pulse rate (or heart rate), blood pressure, and respiratory rate. (http://en.wikipedia.org/wiki/Vital_signs)
as patient advocates for the care and recovery of the patient and ensure that each patient receives appropriate and professional care.

Nurse Assistant: The nurse assistant, who has received their nursing assistant certificate from a state-approved training program, performs support duties to the staff nurse such as taking specimens to the lab, retrieving medications from the pharmacy, and providing patients with food and blankets.

Clerk: A single clerk acts as the administrative assistant to both the physicians and the nurses in the ER. He or she is in charge of ordering labs for nurses as well as ensuring the patient record is complete before it is sent to billing and archived. He or she also answers the phones and pages hospital personnel for the nurses and physicians. There are six clerks who work one of three shifts on any given day of the week, but only one clerk working at a time.

4.1.2 Physical ER Layout

Figure 4-1 shows the layout of the entire ED. The ER personnel work areas are in the center of the emergency room with the patient rooms extending down the two wings. The center work area is surrounded by a 3.5-foot high, 1.5-foot deep ledge and lined on the inside by a long desk area. On these desks there are computer workstations for interacting with the patient record and ordering systems as well as ample room for writing on paper patient records. In addition, there are three computer workstations that are on the ledge facing out for personnel to easily stand and enter or view information without moving to the internal work area.
Figure 4-1. Physical Layout of the ED
Darker section in the middle indicates the ER physician and nurse work areas that are the foci of this study and shown in Figure 4-2.

Figure 4-2. Physical Layout of ER Physician and Nurse Work Areas
4.1.3 Information Sharing Media in the ER

ER staff use a number of media and related artifacts, both physical and electronic, to store and share information.

*ED Record:* This is a multi-page, multi-copy paper document. The ED Record has a section for the triage nurse to enter initial information regarding the patient such as chief complaint, vitals, current medications, and previous medical history (Figure B-1 in Appendix B); a section for the physician’s report including chief complaint, physical exam data fields, and test results (Figure B-2 in Appendix B); and a section for the attending physician (if supervising a resident) to document his or her understanding of the patient’s case, final diagnosis, and signature (Figure B-3 in Appendix B).

This ED Record is stored and shared in several possible physical locations. The Record is usually stored in one of the bins for action or in an ER patient room bin (see below for descriptions of bins). In addition, many physicians stack piles of ED Records on the desks found in the ER physician work area.

The ED Record is a mechanism for the transfer of information from the triage nurse to the charge nurse, the staff nurse, and the physician(s). In addition, it is used for the transfer of information between the resident and attending physician during presenting as well as the transfer of information during shift changes. The ED Record is sent with the patient when the patient is admitted to the hospital. If the patient is discharged the ED Record is sent to the records department to be archived (i.e. PDFed and stored).

*Nurse Assessment Document:* This is a multi-page, multi-copy paper document. The Nurse Assessment document has fields for documenting a patient’s felt pain level
along with a range of status information (e.g. neurological, musculoskeletal). It also contains sections for documenting medications received and progress notes as the patient moves through ER processes (Figure B-4 in Appendix B).

The Nurse Assessment document is always kept at the workstation of the patient’s assigned staff nurse until a patient is either discharged or admitted to the hospital. It is used primarily for the staff nurse to maintain a record for his/her own knowledge and hospital documentation purposes. In addition, these notes are passed onto the next staff nurse during a shift change. Finally, the Nurse Assessment is sent with the patient when the patient is admitted to the hospital. If the patient is discharged the Nurse Assessment document is sent to the records department to be archived (i.e. PDFed and stored).

InLab: Orders for tests and medications are input into InLab, an electronic physician ordering system, which is tightly integrated into hospital billing. There are six computer workstations in the physician work area (four at the desks and two on the ledge facing out, at a height where one can stand during use) through which a physician can access InLab and enter an order. Each workstation consists of a keyboard, mouse, and display. Once entered, InLab prints out a copy of the order and this paper copy is placed by the Clerk in the Nurses Orders bin (further described below). These printed orders either accompany specimen samples to the laboratory or are filed with the Nurse Assessment document. Orders are primarily used for physicians to share information with nurses. Note that though the orders are entered into an information system, their primary digital use is in the subsequent billing process; their role in patient care is based on the printed versions.
*PatientTrack:* The tracking of patients, bed management, and medical personnel assignment is supported by PatientTrack (Figure 4-3). PatientTrack is accessed through the same computer workstations that are used to access InLab. When patients are assigned to a bed, the charge or staff nurse indicates the specific bed assignment in PatientTrack. When a physician is assigned to a patient he or she indicates this in PatientTrack as well. There are two views of the data, a tabular view and a physical layout view. The tabular view provides table of the patient names along with assigned physician, nurse, and room. The physical layout associates a patient’s last name to a bed or chair (e.g., Jones; CH 5); it also identifies the attending physicians currently on duty and the number of patients who have been triaged and are now waiting to be taken back into the ER. In addition to being available on the workstation displays, the physical layout view is projected on a 46” LCD positioned on the wall between the nurse and physician work areas. All information entered into PatientTrack is intended to be shared with all other ER medical personnel as well as outside personnel such as consulting physicians, transport, and social workers. The charge nurse primarily uses the physical layout view to maintain awareness of how full the ER is and compare that against the patients that are waiting to be brought back to the ER from the waiting room. The tabular view is the quickest way to find a patient (i.e. scroll through the list of last names and follow the row across for the assigned physician, nurse, or room).
Phones and Intercom System: There are a number of portable phones (typically 10) available for nurses, nurse assistants, and physicians to carry around in case someone needs to contact them. Because these phones are not permanently assigned to any particular staff member, there is a whiteboard to indicate who has which phone. A staff member only has to write his or her name next to the appropriate phone number. However, not all ER personnel take advantage of the portable phones, so often the intercom system is used by the clerk or charge nurse to page for someone to indicate where they are, come back to the center work station, or carry out a particular task.

Bins: There are a number of physical bins that are used to store information that is designed to be shared (e.g., the ED Record). As shown in Figure 4-4 and 4-5, there are bins placed strategically in several locations.
I recognized during my observation that the bins are also serving as an information sharing medium in and of themselves. For instance, once a patient has been triaged, the triage nurse places the ED Record in one of three bins on the wall in front of the charge nurse station. These wall bins are in three columns associated with severe, medium, or low priority (Figure 4-4). As a result the charge nurse can simply glance at the wall from her workstation to assess the severity level of patients who are waiting to be brought back to the ER without having to move over to read the individual charts.

![Figure 4-4. Triage Bins in Front of Charge Nurse Station](image)

There are also three bins lined up on a desk positioned between the nurse and physician work areas (Figure 4-5, right bottom). The first is the To Be Seen bin. Once a
staff nurse brings a patient back to the ER the ED Record is placed in the To Be Seen bin. This bin is in easy view of the physician workstation and allows the physicians to glance over and get a sense of how many patients are waiting in rooms. In addition, the charge nurse can look in the bin to see how much of a backup there is in terms of patients waiting to be seen by physicians. The second bin is the Nurses Orders bin; this is where the printed InLab orders are placed for nurses to pick up and carry out. During busy times in the ER, this pile can become sizeable but rarely does the presence of orders in the bin prompt a staff nurse to check to see if any of them are for her. Thus, during a busy workday, the orders in the bin can pile up and the charge nurse has to prompt the staff nurses to retrieve their orders. The third is the Discharge bin; the physicians used this bin for the ED Record and other paperwork for discharged patients. This bin is constantly monitored by the charge nurse as part of the bed management process.

Finally, there is a set of bins on a circular rack (Figure 4-5, left center) positioned between the nurse and physician work areas. Each of these bins is numbered, to correspond with a patient room in the ER; the room-specific bin is the normal location of an ED Record when it is not in use. In addition, other patient information is placed in these bins, such as EKG printouts and lab reports. The existence of a piece of paper in the bin indicates to a physician that there is information to follow-up on.
Figure 4-5. Bins Between Nurse and Physician Work Areas

*Face-to-Face:* Much of the information flow in the ER takes place in face-to-face (FTF) interactions. The information in these verbal exchanges may often be redundant with information stored using other media like the ED Record. FTF information sharing between ER personnel can occur anywhere in the ER. Many times it occurs in the room with the patient and their family members present. During the physician morning and
evening shift change, the attendings and residents move from room to room and have FTF interactions while standing in front of the room. However, the majority of FTF communication occurs around and in the physician and nurse work areas; in fact the space between the two areas is the most active information sharing and coordination space. This is where the bins are located, as well as the ER clerk. Typically the nurses will come over to the physician area for such exchanges, rather than the doctor entering the nurse work area.

4.1.4 ER Information Flow

The following section describes the flow of patients through the ER, with special attention to the flow of information associated with each patient.

When a patient arrives at the ER he or she first checks in with the guard at the entrance. The guard enters the patient’s name into the PatientTrack system and directs the patient to write his or her name, date/time, and reason for visit on a slip of paper; this paper is placed in the triage box. The triage nurse retrieves these slips of paper and in general calls patients into the triage room in the order they arrive. In some cases, the triage nurse will call a patient in early if she/he feels the complaint written on the paper is severe. When examining the new patient, the triage nurse collects and documents in the ED Record a range of basic information (e.g. date of birth, primary physician name, medications taken, allergies, brief medical history), chief complaint and acuity, as well as initial vitals (e.g. blood pressure, temperature, pulse, respiration). Some patients may have x-rays ordered while they are still in the waiting room to accelerate their care. At times, outside physicians refer patients to the ER. In those cases, the triage nurse still has
to determine the urgency of the patient’s condition in order to facilitate the management of the ER beds.

After triage, the patient is sent back out to the waiting room. Registration then calls the patient to the registration window and obtains billing information. At this time, the patient is provided with an InLab identification number which allows all further lab orders, procedure, medications, etc. to be charged to the patient. If a patient was sent immediately back to the ER or if the patient arrived via ambulance, a registration staff member arrives at the patient’s bedside with a computer on wheels and attains the appropriate information there.

Meanwhile, the triage nurse has placed the ED Record into the triage bins on the wall in front of the charge nurse station. The three slots correspond to the severity of the chief complaint. When a staff nurse has an available bed or the charge nurse is assigning patients, she/he looks through the triaged charts and chooses one. She/he then ‘moves’ the patient from triage to a room using the PatientTrack system, directs the patient to the proper bed, and may initiate a few basic procedures based upon the patient’s condition (e.g., drawing blood, placing an intravenous catheter, or checking the heart rate, blood pressure or oxygen level). Any such actions are recorded by the nurse in the Nurse Assessment document. The staff nurse then places the ED Record into the To Be Seen bin for the physicians. However, it is important to note that the Nurse Assessment remains with the nurse.

An attending or resident physician will then look through the To Be Seen charts and choose one. He/she will read the triage notes and then examine the patient and determine if additional tests or treatments need to be ordered. If a resident was the first
point of contact with the patient he/she will first present to an attending before ordering any tests or medications.

When a laboratory test or medication is needed, the resident or attending must first input the order into InLab; this is needed to support hospital billing procedures. After entry into the system, a paper order is printed in the printer near the clerk who then places it into the Nurse Orders box. It is the responsibility of the staff nurse to check this box to see if any orders have been made for his or her patient. If lab tests are ordered, the nurse must collect any specimens needed (e.g., a blood sample), place the appropriate specimen in the appropriate test tube, place a sticker on the test tube identifying the patient name and InLab identification number, and give it to the clerk along with the printed order sheet and another patient sticker. The clerk maintains a paper log of all orders: she/he places the patient sticker in the log as well as writes the names of the tests ordered. She/he then places the test tube(s) and order sheet into a bag and places that into a bin for transport to pick up during their rounds (transport is to perform pick-ups every 30 minutes). If there is an order that is critical and time sensitive, a nurse assistant is called to run the package up to the relevant laboratory. When completed, lab results are disseminated back to the ER through InLab.

If a medication order is submitted, the nurse must initial the InLab printout and maintain it with the Nurse Assessment document as well as note the order and when she carried it out in the Nurse Assessment document.

If the patient is to be discharged, then the physician prints out any patient discharge instructions and prescriptions and indicates in PatientTrack that the patient is to be discharged. The ED Record along with any other patient information and forms is then
placed in the discharge bin. The staff or charge nurse sees that the patient is marked for discharge and picks up the paper work to give it to the patient and have him or her (or the relevant family member) sign any pertinent forms. The ED Record and Nurse Assessment document are provided to the clerk to be dismantled for billing and archived (i.e. PDFed and archived on a server; originals are destroyed).

When a patient is admitted to the hospital, he or she is marked as admitted in PatientTrack by the physician. It is then the duty of the charge nurse to find a bed for the patient in the appropriate department within the hospital. This can take anywhere from a few hours to days if the rest of the hospital is completely full. In the latter case, the patient is considered a MICU\textsuperscript{14} or other department’s charge and thus is moved to the care of a non-ER attending physician. However, in these cases the ER nurses are still responsible for the daily care of that patient, including running tests and administering medications since the patient is still residing in the ER. When there is a bed open in the hospital, the staff nurse concatenates the ED Report and Nurse Assessment document and sends it along with the patient for the new department’s nurse and physician’s information.

Throughout this process, some patients tire of waiting and leave the ER. If they leave after they have been triaged then it is deemed that they left against medical advice (AMA). If the patient first informs the nurse, the patient may receive a quick consultation by a physician and then sign a form agreeing that they are leaving AMA. If the patient leaves without informing the nurse or doctor, a note is made in the ED Record.

\textsuperscript{14} MICU = medical intensive care unit.
Chapter 5. Emotion Expression in the Emergency Room

5.1 Introduction

The first research questions posed for this dissertation were (1) how does the expression of emotion support the coordinated work of an ER and (2) in what form are emotions expressed in the ER. This question was motivated by two goals. The first was to show that emotion is expressed in the ER and the second was to show that the expression of emotion is an important aspect of the work conducted in the ER. Both of these goals were in order to lay a basis for the further investigation of how the expression emotions are modified in an emergency room towards the design of information systems.

In the following chapter, I show how the ER is an emotionally expressive environment. I also show that emotion expressions are a useful and, in fact, integral aspect of ER work. ER workers must not only share “hard” data regarding the patients’ physiological status or treatment, but also find ways to express their feelings regarding the patients or other aspects of their work.

To begin this chapter, I first explain the discovery I made that there are few written expressions of emotions in the formal patient records. Then, in order to relate the face to face (FTF) emotion expressions to the work conducted in the ER, I discuss the source of emotions expressed during work in the emergency room: the patient, the coworker, and the environment. Finally, I describe the functional utility and purpose of the expression of emotions for the work in the ER.
5.2 Lack of Written Expression of Emotions

During my initial months in the ER, I observed many instances of emotion expressions that showed me that the ER is an emotionally expressive environment. For example, I observed many instances of hugging during times of stress and comments of “I missed you!”. However, as has been reported in previous studies of ER activities (Kerr, 2002; Zhou et al., 2009), most emotion expressions that are work-related (i.e. are expressed in relation to work activities) are communicated through verbal communication. Initially, I intended to investigate how emotion is expressed in different types of information sharing mediums, including formal paper patient records and patient care documentation. However, after studying over 40 ED Record and Nurse Assessment documents over the course of two months, it was evident that emotion expressions were not prevalent in written documentation. The only indications of emotions regularly found in the formal documentation were quotes of the patient who was relating his or her emotional state in response to medical personnel questions. The following are examples of these quotes found in notes made during the triage step of patient processing:

“so sad” [A,1]  
“can’t take the pain” [A,3]  
“very anxious” [A,4]  
“want to kill my father” [A,5]  

In each case, the content was recorded as a direct quote from something the patient said. When I asked about this behavior, I was told that patients’ words are quoted for two reasons: (1) a patient’s words serve as a source of direct evidence about his or her state, in contrast to conjecture by the medical personnel; and (2) the words a patient

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15 Following all raw quotes and data will be an indication of the source of the data. The first character denotes the type of data (A=artifact, I= interview, O=observation), and the second character denotes the source number (i.e. artifact number 5, interview number 2, or observation day number 20).
chooses to express contain more meaning than abstract medical terminology (e.g., categorical terms).

Attending during an interview: “We all choose different words. There are a million ways to describe pain and the word that a patient uses means something. You want to write their words. You don’t want to be constrained to a predefined list.” [I, 5]

Beyond these examples of patient emotion expression, there are no examples of medical personnel explicitly communicating or recording their emotion appraisals in the formal documentation. However, I did observe two instances of emotions that seemed to promote the recording of certain information regarding the patient. For example:

A charge nurse suspected a patient of lying regarding stomach pains after she observes the patient return from the cafeteria with food and is angry at the patient. She records on the patient’s chart, “Patient seen with a large tray of food from cafeteria at 1:12pm.” [O, 25]

A nurse is annoyed with the behavior of a patient who she believes is a drug seeker. She records on the patient’s chart, “No indication at all of any obstruction.” [O, 32]

However, these types of emotion-motivated recording of information were observed infrequently. Typically, if a nurse or doctor wanted to express his or her annoyance or concern with a patient, he or she would express it in person. As a result, because there were few instances of medical personnel recording their own emotions in formal documentation such as the ED Record, a primary focus for my analysis was the emotions I observed during FTF work-related interactions between two or more medical staff members. Recall that these instances of FTF emotion expression were inferred during my observations and recorded either in real time or afterwards while making sense of what I had observed. As described in Chapter 3, I used three sources of evidence for these inferences: behaviors and actions, self-report, and environmental contexts (Lazarus,
In the following sections I describe what I learned by analyzing these FTF emotion expression events.

5.3 Occurrence of Face to Face Expression of Emotions

This section provides an overview of the types of FTF emotion expression events observed in the emergency room. This is meant to provide the reader a thorough understanding of the emotion expressions observed in order to then understand the subsequent findings more fully.

Observations of work-related emotion expressions between coworkers resulted in a total of 174 instances of emotion expression, across 48 observation sessions of 4-5 hours each. This means that over the course of 240 hours of observation, an emotion expression event occurred on average every 1.4 hours\textsuperscript{16}.

However, these instances were not evenly distributed across the observation periods. Some days can be described as high activity days – days which felt like there were a higher than average number of patients visiting the ER. On these days, the average number of emotion expression events was 7.14 during one observation session. Conversely, on low activity days – those days which could be described as feeling like there were a lower than average number of patients visiting the ER – the average number of emotion expression events was 1.78 during one observation session. Thus, an important environmental moderator of the expression of emotions in an ER is the activity level of that ER. Emotions were expressed and most likely felt more often on high

\textsuperscript{16} Although this may seem like a low number to some, it is important to note that these are observations by one person, focusing on two specific locations of worker interactions. Many emotion expressions inevitably missed. However, this is an acceptable risk for the tradeoff of deep observational findings.
activity days due to the number of patients each healthcare worker must attend to as well as the increased stress due to the high number of patients.

In each of these instances, an emotion was conveyed from one coworker to another coworker, multiple coworkers, or undirected towards the general environment. The emotions expressed were predominantly negative in nature (e.g., frustration, annoyance, sadness) (87%). This is most likely because the events recorded were part of medical care tasks that, by their very nature, involve events associated with negative affect (e.g., illness, death, depression). I did at times observe joking behavior as a facet of some information sharing events, but in most cases I attributed this to the apparent desire to alleviate or provide a counter to concurrent negative emotions. This is particularly evident in that joking behavior was highest on high activity (i.e. stressful) days (80% of joking incidents occurred on high activity days and 20% occurred on low activity days).

In the following sections I analyze the emotion expressions I observed in more detail by first using the social constructivist view of emotion interaction (see Section 3.6.4.1) where each incident is coded for the source of the emotion and then the functional utility of the purpose of the emotion expression. The goal of the following sections is to understand why the emotion is occurring and how it supports work in order to determine when and how it could be expressed through an electronic medium.

5.4 Source of Emotions

In order to determine the impetus for emotion expressions in the ER, I investigated the source of the emotion for each instance that was subsequently expressed to a colleague. Across this analysis, I observed that work-related emotions arose in
response to one of three work entities: the environment, a coworker, or a patient. The following three sections elaborate on how each of these entities acted as a source for emotion and provides illustrative examples. Following that, I discuss my interpretation of how the different sources and resulting emotions had consequence for the work of the ER.

5.4.1 Emotions in Response to the Environment

Environmental variables were the most common sources of emotion expressions, accounting for 39% of the instances. I often inferred an environmental variable at a rather high level of abstraction, for example the general activity level of the ER. However, at times it also referred to the equipment or objects present in the ER. The resulting emotion expressions are often globally expressed to those in the unit (e.g. frustration from a backup on admitting patients frustrates everyone in the ER). However, occasionally they can be held by one individual if his or her experience is different from others in the unit (e.g. one nurse has more patients than the other nurses) or his or her mechanism for coping is markedly different from his or her coworkers (e.g. a charge nurse who gets easily anxious when the activity picks up in the emergency room). The following are examples of emotions expressed in reaction to the shared environment:

On a particularly high activity day, two nurses share a roll of the eyes and a sigh of exasperation as they hurry past one another. [O, 2]

Triage nurse who is overwhelmed by the number of patients in the waiting room implores the charge nurse to help her calm down the patients: “...I'm getting killed out there!”
Charge nurse: “And you want me to go out there? I don't think so. Nuh uh. They can wait.” [O, 37]
Nurse in a pleased tone of voice: “Yeah, it is not bad for a Monday. Maybe because it's President’s Day.”

Resident in a joking manner: “Yeah. We are trying not to say that out loud.” [O, 40]

On a high activity day, an attending to a nurse in an exasperated tone of voice: “It's like a circus in here!” [O, 5]

Thus, in the ER, the environment is a substantial factor in the emotions that arise as well as the emotions that are expressed to one another. These emotions probably do not need to be expressed to one another since the environment is shared and thus, oftentimes, coworkers are experiencing and feeling the same emotions. However, the need to express one’s emotions towards the environment is prevalent. This may be due to individual differences as well as slight differences in experiences in the ER, perhaps the need to receive validation for one’s feelings, or to foster a sense of camaraderie.

5.4.2 Emotions in Response to a Coworker

Coworker behavior was the second most prevalent source of emotion (33%). These emotions can typically be understood as one individual’s response to another coworker’s performance. Often the emotion is expressed directly to the coworker who elicited the emotion, but on occasion, the emotion is expressed to a second coworker(s). The following are examples of emotions expressed regarding a coworker’s performance.

Visibly exasperated nurse scolds nurse assistant: “I said rip it apart! All originals to the floor!” <sighs loudly> “Go get them!” [O, 22]

Charge nurse looks through the Orders bin. Holds up a stack of clipboards and yells towards the nurse area: “There's thousands of orders here guys!” <Angrily throws clipboards back into Orders bin.> [O, 22]

Attending: “That's why I'm trying to call - the faster I call the faster she is out of here!” [O, 12]

Charge nurse angrily spits out: “Well duh! You should have thought of this hours ago! On a Saturday!!” <Whips around and storms off> [O, 05]
Nurse expressing her annoyance to another nurse about having to cover for the charge nurse because she thinks she should not have left the ER for a meeting: “Yeah, well, I have five patients and I’m covering charge so she can go to a meeting!”[O, 40]

Nurse to other nurses regarding a nurse assistant: “I love her, I just love her. Whenever I work with her it just makes my day.”[O,41]

Charge nurse cheerily calls out to the attendings as she passes the physician work area: “Good work doctors.”
Attending laughs and calls after her: “Good work nurse.”[O, 2]

Charge nurse approaches triage nurse and pats him on the back: “That was a good catch, Bob.”
<Triage nurse laughs and nods his head.>[O, 3]

Careful examination of these instances suggests that many emotions elicited by coworkers’ behaviors are at least partly the result of the pervasive reliance on coworkers in this highly coordinated setting. In most of the observed instances, the emotion expressed was negative; however, as can be seen by the last two vignettes, there were also instances of positive appraisals of work performance expressed directly to a coworker. In both positive and negative emotion expressions, the ER worker was expressing his or her like or dislike for the behavior of their coworker. This is usually an individual emotion experience and expression. In other words one ER worker feels an emotion in relation to another ER worker. However, this is not always the case. A coworker’s personality can have an effect on the emotions felt and expressed in the emergency room at a more global level.

Attending during an interview: “One person deflates all of us in terms of working together on trauma patients. Mainly because of a lack of cooperation.”[I, 3]

Clerk speaking with me about a nurse who had left the ER to go back to school to become a doctor: “...And when he was charge nurse everything

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17 In this chapter, all names of ER personnel have been changed to protect their identities.
ran smoothly and calmly. He just had that even keel personality.” <Hand
gesture - smoothing out.> “‘OK, we are going to do this then this…’ And
you need that in an ER cause everything is an emergency. And he had the
same amount of patience the first time you asked a question as he did the
20th time. And he joked and made everything fun. It was great around
here when he worked. He is going to be a great doctor.” [O,33]

Nurse during an interview speaking about other nurses’ personalities: “As
charge nurses, Betty and Diane do a good job in keeping things flowing,
but their approaches create an environment that could be ... less
stressful.” (Nurse chose his words very carefully on the last sentence and
left the last word dangling to indicate he was being kind.) [O,1]

What is unique about the previous quotes is that the effect extended beyond one
individual and instead influenced the emotions felt and subsequently expressed to the
entire unit or workgroup. In addition, in all of these examples, the interviewee was
cognizant of the effect one coworker’s behavior can have over the rest of the ER. Thus,
as is likely in most work environments, an ER worker can elicit emotions that are in turn
expressed back to the coworker or expressed to other coworkers.

5.4.3 Emotions in Response to a Patient

Emotions elicited from interactions with patients were responsible for 28% of the
work-related emotion expression events. Although the emotion expressions observed
were usually elicited through individual interactions with a patient (i.e. no other
healthcare worker is present), these emotions were subsequently expressed with other
medical personnel who were interacting with the patient. Emotions expressed were
typically frustration at a patient’s behavior or concern over a patient’s medical state. The
following are examples of emotions expressed between coworkers regarding a patient.

Nurse to nurse: “Oh yeah, he is miserable. And full of shit.” <Smiles>[O,
23]
Nurse takes patient chart out of the To Be Seen bin and brings it to a resident. Explains in a very concerned tone of voice that the patient is 25 years old, female, and pregnant, about 5-6 weeks along. The nurse just learned that the patient was vomiting for 24 hours. Nurse states that she is “very concerned” and thinks she should be seen soon.[O, 34]

Two nurses speaking very low with very concerned faces to attending and resident: “Internal medicine is trying to give her the meds but we need an ultrasound to get it right. She is in so much pain.” [O, 34]

These are predominantly individually experienced emotions. The nurse or doctor has had an interaction with a patient on his or her own and subsequently has developed an emotion towards that patient and their course of care. Although it is possible for a doctor and nurse to have separate experiences with the same patient and walk away feeling the same emotion, more often these emotions were expressed due to a difference in emotions felt (or even the lack of an emotion towards the patient due to no interaction with the patient occurring yet such as in the second example).

5.5 Purposes of Emotion Expression on the Work in the ER

The analysis in sections 5.3-5.4.3 presents a picture of the occurrence of work-related emotions and their expressions in the ER; however, it does not fully answer the question (1) how does the expression of emotion support the coordinated work of an ER. Although it is plausible to deduce that emotions are expressed in the ER as a form of emotional release, this does not provide a motivation for considering emotion expressions in the design of work-related information systems. Thus, we must further consider how the emotion expressions influence the work in the ER.

Subsequently, the next set of analyses examined the functional utility of emotion expression events for the ER goals of patient care and bed management. This was of particular interest to me because so many of the emotions expressed had a negative
valence and one may typically think that negative emotions provide no service to the work of an ER or perhaps cause deficiencies in cognitive functioning or social relationships. In addition, previous work by Parrott (2001) proposed that negative emotions are also important for work processes and can be potentially adaptive and useful to the goals of the person expressing the emotion.

5.5.1 Venting of Emotion Expressions

I observed many instances in which the emotion expression was not directed at anyone in particular; nor was it aimed at a shared work goal. However such emotions may nonetheless be perceived by one or more coworkers. If so, a more refined awareness of the person experiencing the emotions might be expected to develop.

I labeled episodes like this venting of emotion; it was not generated and shared in an intentional fashion but one or more receivers could have detected or inferred that an emotional state was present. Emotion venting of this sort made up 38% of the incidents. Some of these instances involved brief emotional expressions like sighs or shouts of excitement; others involved what appeared to be more extended monologues to oneself. In most of these monologues, there was no behavioral indication that anyone overheard or reacted to emotion expression and/or the subsequent impact on awareness. For example, consider these cases where emotions were shared out loud to no one in particular. Only in the last two examples did a coworker overhear and respond to this emotional expression.

*Nurse muttering to herself while she is trying to find a patient’s paper chart: “I'm so frustrated!” [O, 8]*

*Nurse after a patient died: <sigh> “I'll be crying later.” [O, 4]*
Nurse when InLab was down: “An hour and a half and only verbal orders - sometimes I want to kill myself around here.” [O, 10]

Clerk: “I'm going to have a stroke in this department.” [O, 10]

Nurse looking for a working pulse ox cable18: “I'm just so sick of this shit!” [O, 29]

Charge nurse in an exasperated tone of voice when looking at the number of patients in the waiting room: “How did it get to be 23 out there? Jesus!” [O, 30]

Nurse sighing with relief after seeing how many patients were in the waiting room: “That's better, only 11 waiting now.” [O, 32]

Charge nurse muttering angrily about the nurses: “I can't babysit - they are adults and professionals.” [O, 33]

Charge nurse staring at PatientTrack speaking to no one in particular: “Fourteen in here, 16 out there! Where are we to put them?! I'm telling you admin sucks with a big S!” <Throws down mobile phone.> “I need a smoke!” <Walks out.> [O, 22]

Nurse became frustrated with the printer not working and starts muttering to herself as she walks away from the printer: “I love my job, I love my job, I love my job.” [O, 24]

Nurse muttering to herself: “Oh what am I doing, stuck the wrong papers up there.” <laughs> “Getting a little too crazy in here.” [O, 28]

Nurse using EasyID to print the patient stickers: “Not a valid EasyID logon. Give me a break! Why is this not printing? UGH! Not a valid patient ID. Are you kidding me?” [O, 28]

Nurse 1 after seeing a lab hemolyzed19: “Frick! I didn't draw this, but Frick!”
Nurse 2 overhearing: “Me too - all of mine too.” [O, 33]

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18 A pulse ox (pulse oximeter) measures the oxygen saturation of a patient's blood. The cable attaches to the patient’s finger from the medical device.

19 “Hemolysis can be an important unwanted effect in medical tests and can cause inaccurate results, because the contents of hemolysed red blood cells are included with the plasma” (from: http://en.wikipedia.org/wiki/Hemolysis)
Nurse angrily slams the phone down after paging a patient over the intercom to go back to his room.
Nurse assistant joking: “Tell me how you really feel! Slam that phone.” [O, 34]

It is not clear as to whether or not the staff member expressing emotion in any one of these events expected anyone to recognize the emotional expression and respond; however, even when there is no specific communication goal intended through emotion venting, it may increase awareness of a worker’s emotional state to those around them. This awareness could lead to a helpful work-related response such as helping to find the patient in the last vignette above.

5.5.2 Developing a Shared Mental Model

A shared mental model enables collaborators to agree on the direction of care and work independently toward these shared goals (Cannon-Bowers, Salas, & Converse, 1993). In the ER observations, I found that 18% of emotional expression events could have directly informed the coworkers’ shared mental model. Normally these events centered on a particular patient’s care, so the shared model that is being updated can be understood as the patient’s illness trajectory (see Section 9.1.1 on further discussion of illness trajectories).

Consider the following exchanges in which attending physicians make their coworkers aware of their attitudes towards the patients and thus the direction of care they expect to see.

*Attending with sarcasm: “He is working up a storm in there.”* <Pause; makes ‘boohoo’ nonverbal motion.>
*Nurse: “Yeah.”* <Slowly nods.>
*Attending in back-to-business tone: “I may keep him off oxygen to document the O2 not dropping or I may just discharge him...”* [O, 24]
During a physician shift change.
Attending 1: “Was that the screaming person?”
Attending 2: <Dejected> “Yeah.”
Attending 1: <Sarcastic> “Swell.” [O, 12]

In the first exchange, the physician expresses her annoyance with the patient as well as her belief that he is faking it in order to not go to jail (part of the background to this episode is that the patient had been brought in by the police). The physician is expressing this information so the nurse will understand why the physician is not going to follow a typical protocol of care and instead plans to move the patient more quickly out of the ER, thereby freeing up the bed for a more serious case. Thus, the standard of care that she proposes at the end of the exchange does not come from medical reasoning but rather ideas about how to manage this patient in this situation.

The second exchange occurred during a shift change. The goal of presenting the patients during a shift change is to transfer clinical data as well as the trajectory of care for the patient to the oncoming doctor or nurse. During this particular exchange, the physicians are in the process of sharing information on a particular patient. The leading question of the first attending elicits an emotional expression from the second. The emotional expression confirms that this indeed is the patient who was “screaming,” as well as communicating that this patient had been a problem. The first attending signals his understanding of that feeling by expressing his own unhappiness with the thought of dealing with the patient. This shows that transfer of emotions towards a patient can be part of what happens during shift changes, along with the more central transfer of knowledge about the patient’s medical condition and trajectory of care. Thus the mental
model for a patient may at times contain emotions conveyed directly from one medical staff member to another.

In the next vignette, a nurse and doctor are having trouble getting to the same mental model for a patient’s plan of care. The nurse does not understand why the doctor is following this course of treatment and is prodding him to explain himself.

*Nurse in a very concerned voice:* “His hemo\(^{20}\) dropped!”

*Attending flippantly as he turns away:* “But that is only because we drew the first when he was still bleeding. I don't want to transfuse him until we do another in a few hours.”

*Nurse now visibly upset (voice starts rising and shaking):* “Well what is happening to him - I need to know so I know when to draw blood again.”

[O, 19]

After this exchange the doctor recognized that the nurse was becoming agitated because she was concerned about the patient and did not understand the reasoning behind his course of care. He changed his posture (turned towards her) and began to slowly and calmly explain to the nurse what he was thinking and doing. The nurse began to visibly relax; after a few questions she seemed satisfied with the doctor’s reasoning. With a shared mental model in place, they were able to make a plan to get the patient admitted to the MICU. Of course, corrections to mental models can be achieved without the use of emotion; in other episodes a nurse might more calmly express her misunderstanding of a doctor’s reasoning and obtain a similar explanation. But where a quiet question might easily be ignored by a busy doctor, the nurse’s agitation is a strong signal that more information is needed.

\(^{20}\) hemo=hemoglobin. “Hemoglobin is the protein molecule in red blood cells that carries oxygen from the lungs to the body's tissues and returns carbon dioxide from the tissues to the lungs.” (from: http://www.medicinenet.com/hemoglobin/article.htm)
In addition to developing a shared mental model around a patient’s care, I observed emotion expression being used to develop a shared mental model related to the management of the environment. In the following example, a charge nurse talks to a second charge nurse who is in training, commenting about bed management at the start of their shift.

_While both nurses look at the patient list the charge nurse says in a very annoyed voice: “It has not been a good morning. I heard it wasn't good last night as well. So let's try to get these beds out of here.”_ [O, 22]

She begins her discussion of what is ahead of them by stating her overall feeling and only then follows with what they should do about it. By expressing her exasperation with the current situation she orients the nurse in training, focusing her on the high-level goal of discharging or moving patients out of the ER.

These vignettes depict medical personnel who are expressing their emotions towards a shared work mental model – whether of a patient they are treating or of beds they are managing. The emotion is being explicitly expressed with the purpose to convey their views of the situation to the other parties in order for them to understand their feelings and intentions and aid them to effective completion of their own tasks.

### 5.5.3 Call to Action

A very common purpose for sharing emotion was to convey a call to action (43% of events). Episodes of the call-to-action type involved the conscious and deliberate expression of one’s emotional appraisal of a situation in order to elicit action from one or more coworkers.
For a few of these calls to action, the original emotion expressed came from a patient or some other medical staff member, but was relayed for a clear purpose. In the previous charge nurse vignette in section 5.5.2 above, the nurse began with information about what she had learned about the previous shift. “I heard it wasn't good last night as well.” [O, 22] This statement conveys her belief about how those nurses and doctors who had worked through the previous shift might be feeling at present, as well as how patients who have been waiting in the ER (for a long time) might be feeling. This helps to guide the charge nurse who is in training, so that she can be conscientious to quickly address bed issues. In this case, an increased awareness of likely emotional states of others in the ER is intended to prompt a coworker to support more effective interactions and attune one’s work to increased efficiency.

Another example of relaying another’s emotion expressions is that of the following vignettes where a nurse brings a patient’s emotions to the awareness of a coworker as a call to action. The nurses are sharing their experiences with the patients while at the same time warning their coworker to be sensitive in addressing a medical condition or to be careful when interacting with a patient.

_During a nurse shift change._

_Nurse 1:_ “what caused the amputation?”
_Nurse 2:_ “I think his diabetes, but when I asked him about it he got real shitty with me so…” [O, 40]

_Nurse:_ “Did he get aggressive with you?”
_Attending:_ “No”
_Nurse:_ “Cause he was with Stan.” [O, 40]

More often, though, nurses and doctors were expressing their own feelings as a call to action from their coworkers. An example of a direct and explicit call to action
through the expression of emotion can entail the use of an emotion expression on top of an already explicit request for action. A charge nurse who is having a problem with an attending physician at another facility tells the ER attending physician that “He got mad and said ‘I have residents for this.’”. The charge nurse goes on to say she needs to take care of this before she leaves and it is “stressing her out”. The attending physician takes this as her cue to get annoyed by her outside colleague’s behavior and says, “Try the residents again and then call <name of the other facility’s attending> and I will talk to him. He is holding up my nurses! This is bullshit!” [O, 3]

In this vignette the nurse made her feelings clear to the attending, which encourage the attending to take swift action. Prior to this exchange, the nurse was not getting the support needed from the attending.

Sometimes the calls to action are fairly explicit such as in the previous vignettes. However, other times the emotion expression stands on its own and the call to action must be inferred. In this example, a staff nurse has just stopped a young resident before he goes to speak to a new patient.

*Nurse in a very concerned and sympathetic voice: “The patient is a female, 45 years old. She just lost her 18 year old daughter two weeks ago due to an unknown ectopic pregnancy bursting. She is lifeless and depressed, not suicidal, but very down.”*

<Resident flips through the chart as nurse is speaking; seems confused>
*Nurse: “It’s not in there, it just says chest pain, but I thought you should know. She came in for chest pain but while I was in there I learned about this other situation.”* [O, 1]

The nurse could have added this information to the patient’s chart. However, she chose not to for a number of reasons. Most obviously, she did not want a permanent stigma of depression to be charted unless it was an explicit diagnosis. Nonetheless, the
nurse felt the need to make the physician aware of these other aspects of the patient’s state. She did this by conveying her concern for the patient through vocal inflections. By doing so she conveyed a call for action, so that the resident can consider whether these may be contributing causes of the symptoms but even if not, so that the patient can be treated with these characteristics in mind.

In addition, awareness of collaborator’s emotion state can provide cues as to when specific information should be shared and when it can wait. For instance, I observed cases where an overstressed staff nurse or charge nurse calmly but pointedly made her current state known to someone who wants something from her. As you can see from the following examples, expressing one’s emotions can elicit some very speedy results.

*The charge nurse snaps at an internal medicine consultant who just rushed over to ask her for information: “Don’t talk to me right now. I have 2 things in my head.”* [O, 2]

*The staff nurse in a slow and annoyed voice to resident who just forcefully asked if the patient got a line in yet: “I have not had the chance yet. I have like 3 patients and am doing the best I can. I will try to get a line in as soon as I can.”* 
Resident backs off, retreats with his hands up: “I was just asking.” [O, 23]

*Nurse in concern and urgent voice to attending: “Somebody needs to see the dude. He has been here since 8 o’clock and nobody has seen him.”* [O, 32] <Soon afterwards the attending actively searches for the patient’s record to go see him.>

*Charge nurse stops attending 1 to express her annoyance at the lack of discharges.*

*Attending 1 goes over to attending 2: “We need to discharge patients.”* [O, 7]

*Charge nurse toward physician work area: “We need C9 out of here and that would make me happy.”* [O, 14] <Attending starts asking who is working on C9 and works with the doctors to discharge the patient.>
It is the tone of voice that elicits the behavior the nurses are seeking from the doctors. The charge nurse snaps at the consultant and the staff nurse speaks in an oddly even keeled, but visibly annoyed voice; this indicates in both cases that it was not the right time for their requests. Perhaps if the doctors picked up on the nonverbal signs of these nurses in advance (e.g., the charge nurse had her hand on her head at that moment; the staff nurse had been rushing around frantically), there would have been no need for these particular displays of emotion. But in these examples, this affective information is quickly recognized and the receiver’s behavior adapts in adherence to the call to action (or inaction at times). In fact, sharing one’s emotional state was deemed very important by the majority of nurses and physicians interviewed. The following two vignettes illustrate this.

In this section, these vignettes show that awareness of emotions can be used to elicit a particular work-related behavior from a coworker in order to successfully manage the ER. Thus, when a worker is expressing an emotion, his or her purpose was to develop a shared mental model with his or her coworker or elicit a particular behavior from his or her coworker.

5.6 Contrasting the Source and Purposes of Emotion Expressions

Once I had classified emotion expression vignettes according to their source (patient, coworkers, environment) and their purpose, I was able to examine the relationship between these two characteristics. The cross-tabulation appears in Table 5-1; the pattern suggests that emotions whose source was a patient were equally likely to be used for building a shared mental model or expressing a call to action; in contrast,
emotions whose source was a coworker were more likely to be expressed as a call to action. Episodes that were emotional venting were most likely to have their source in the environment. Perhaps the reason for venting towards the environment is likely due to the loss of control over the environment. Venting is a release of emotions and thus all one has as a course of action.

Table 5-1. Source of Emotions vs. Purpose of Emotion Expression (n=174)

<table>
<thead>
<tr>
<th></th>
<th>Shared Mental Model</th>
<th>Call to Action</th>
<th>Venting</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>9.2%</td>
<td>11.8%</td>
<td>6.6%</td>
<td>0.4%</td>
<td>28.0%</td>
</tr>
<tr>
<td>Coworker</td>
<td>3.5%</td>
<td>20.5%</td>
<td>7.9%</td>
<td>1.1%</td>
<td>33.0%</td>
</tr>
<tr>
<td>Environment</td>
<td>4.4%</td>
<td>9.6%</td>
<td>23.7%</td>
<td>1.3%</td>
<td>39.0%</td>
</tr>
<tr>
<td>Total</td>
<td>17.1%</td>
<td>41.9%</td>
<td>38.2%</td>
<td>2.8%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Thus, with this table we can begin to produce an indication of where we could most support emotion expressions. For instance, if we wanted to focus on the experience of emotion with regards to the patient, we can focus on the development of a shared mental model. In addition we understand that venting need not be addressed in the direct support of work. Thus, perhaps in the automatic sensing of emotions we should not sample all expressions of emotion.

5.7 Summary

An emergency room is a highly complex, emotionally charged work environment where decisions can mean the difference between life and death. It is clearly stressful and frustrating, but the traditional perspective is that emotion is not vital for this work. However, studies in the cognitive and organizational sciences have provided evidence
that emotion is an element of cognitive functioning and part of interactions between all workers and their environment (Grandey, 2008). As I have documented for the ER studied here, emotion expression may be used (whether consciously or unconsciously) to coordinate and work in a more effective fashion.

Figure 5-1 shows the predominant mapping of the source of emotion through to the purpose. Emotions arising from the patient or coworker were typically deliberately expressed to another member of the ED personnel. In addition, both emotions towards the patient and coworker predominantly led to a call to action, but emotions towards the patient also frequently led to a shared mental model. Emotions in reference to the environment were not as often deliberately expressed. More often they were vented which perhaps resulted in a coworker gaining an awareness of one’s emotions.
The number of sources and consequences on the work indicate multiple mediums for the electronic expression of emotions (i.e. different mediums for different work needs would then show emotions brought about from different sources). In the next chapter we will see that emotions are not always expressed and that the modification of the expression of emotions is an important design consideration.
Chapter 6. Moderators of Emotion Expression

In Chapter 5, I discussed the ways in which emotion expressions are a useful and integral aspect of work in the ER. We learned that emotions could arise in response to a patient, a coworker, or the environment of the ER including the information systems they use. We also learned that the majority of the emotions have some type of functional utility for the primary work goals of the ER. However, I also learned early on that despite the utility of emotion expression on the work, emotions are not expressed in formal written documents and that emotions are not always expressed in every medium. Thus, towards my second set of research questions, I will address how the social context shapes the expression of emotion in coordinated work. In answering this question, I am concerned with the rules and behaviors that modify the expression of emotions in different contexts and ultimately change how emotions are expressed in the ER.

In the following sections, I show how individual, group, and organizational attitudes all had a place in shaping the emotion expressions in the ER. Through these oftentimes unspoken rules, the expression of one’s emotions toward the work was either constrained or enabled.

6.1 Individual Rules on Emotion Expression

Each individual within a work environment may hold a different attitude toward the level of acceptable emotion expressions; not surprisingly, I found considerable variation in my observations and interviews with ER personnel. For instance, during interviews, most participants stated that it was important to share one’s feelings about a patient or situation. However, a few participants thought it was not necessary to “be
emotional” at work. Interestingly, these attitudes were shared with me without any prompting or questioning regarding emotions or emotion expression. Individuals who have a low level of acceptance towards emotion expression can introduce constraints on emotion expression in FTF interaction; whereas individuals who have a high acceptance of emotion expression can often enable the expression of emotion in others.

As discussed in section 5.4.2, an individual in the ER can influence the emotions of multiple individuals in the ER. If one or more coworkers have a lack of openness and acceptance of overt emotion display in the ER, others are able to detect these attitudes, and consequently engage in less explicit display of emotions. For instance, some attending physicians in the ER I observed had demeanors that made clear their disapproval of hearing anyone’s “feelings”. These individuals gave rise to what I have termed the ED Record shuffle.

When a nurse brings a patient back to the ER the ED Record is placed in the To Be Seen bin next to the physician work area. The most recent record is to be placed in the back of the bin so that the patients are seen by the physicians in order of arrival. 

One day Dr. R is the only attending on the shift. Six charts are waiting in the To Be Seen bin. 

One staff nurse comes over to the To Be Seen bin and looks through the records. She sees that her patient is fourth in line and then moves it to the front of the bin. When asked why, she states: “He has been there for so long and is in so much pain”

A little while later, another nurse comes over to the To Be Seen bin and looks through the records. He sees his patient now fourth in line. He moves it to the front of the bin. When asked why, he states: “She is such a sweet old woman. She isn’t complaining but she has to be seen for that dizziness”. [O, 22]

A nurse’s choice of whether to use the ED Record shuffle, or simply approach the attending to make a case directly, appears to have more to do with how comfortable she is with the attending than any other factors (e.g. level of activity in the ER). Some
attending physicians are relatively open to hearing a nurse’s concern for a patient. They patiently listen to the story and follow this with feedback about when he or she thinks the patient may be seen. Other attendings are quite uninterested in the nurse’s assessment if it is not data-driven. During shifts when one of the emotionally constraining attendings is in charge, there is a noticeable increase in the ED Record shuffle. In this case, there is invisible emotion information (concern for a patient) being conveyed in an invisible emotion-related work process (constant shuffling of the records) all because of one individual’s attitude towards visibility of emotion in the ER (the attending physician’s).

However, there is not enough of an indication that this is a factor of a power position. All individuals have a different way they like to interact. I saw this occur on multiple levels, so I’m not inclined to say that only one in power has a say over how others interact with them. I am able to say that those in a power position do have more far reaching effects since their behaviors and beliefs dictate how the work shall be conducted towards their goals.

In contrast to the constraining behavior exhibited by a small number of the attendings in the ER, a number of the attending physicians have an extremely open attitude towards all forms of communication including the feelings, emotions, or intuitions of their coworkers. On one high activity day I observed many instances of nurses coming over to the physician work area to ask how one of their patients is doing, or presenting a case to the attending physician hoping to move the patient up in the queue. I noticed that on this day Dr. Collins was on duty and that the nurses would bypass the other attending to approach Dr. Collins instead. I asked him later why he thought

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21 In this chapter, all names of ER personnel have been changed to protect their identities.
the nurses did this and he explained, “Once there is trust, it is easy [for the nurses] to communicate with the doctors. I appreciate [the nurses] telling me what they think and feel.” [I, 7] It is clear that his open attitude towards expression of thoughts and feelings has been explicitly or implicitly related to his coworkers and that they in turn feel encouraged to have emotion-containing interactions with him.

Another attending, Dr. Hanson, also holds a very open attitude towards emotions along with a very good relationship with the nurses. I often observed him walking over to the nurse work area instead of waiting for them to come over to him. Nurses would also actively seek his attention by touching his arm. This level of comfort and trust was not seen between other nurses and doctors. His explanation for this phenomenon was that “nurses feel more comfortable coming to me. If they are young they are not sure if they can ask me these things. But I make sure to let them know it is all right. It is all valid.” [I, 8] His attitude that all concerns and thoughts that they wish to share and discuss with him are valid has created a more open environment for further interactions and a safe environment for emotion expression.

6.2 Group Rules Related to Emotion Expressions

In addition to a single individual enabling or constraining emotion expressions, the group as a whole imparted rules as to the appropriate expression of emotions. These were not formally defined but where instead taught and reinforced through verbal and behavioral indicators.

In the ER that I studied, the nurses are given an immense amount of leeway in how they interact with each other as well as with the physicians. In comparison to my
experiences in other emergency rooms, the nurses in the observed ER seem to display frustration and anger with coworkers relatively intensely and frequently. This can be seen when individuals reflect at times on their ER’s work culture, including personal interactions and social behavior.

One of the newer nurses approached me during observations and asked, “Have you been feeling lonely over there? Sometimes the people here can be rude.” [O, 37]

Attending during an interview: “The nursing staff here has a lack of professionalism. … The older nurses are more disrespectful to each other and to other residents, clerks, patients.” (‘Older’ nurse refers to experience level, not age.) [O, 7]

However, the ER staff also seemed to place limits on how expressive their members may be. This limit was enforced usually by an individual member of the group. For example, individuals within the group would reinforce group emotion expression norms throughout the day whenever someone becomes too ‘worked up’ and thus moved past the accepted limit.

On a very hectic day, charge nurse calls for a nurse over the intercom: “Jenny to the trauma room.”
Jenny comes out of a patient’s room in a gown and gloves and screams down the hall: “Jenny is in a room with a patient!!!”
Charge nurse starts down the hall and scolds in a hushed voice: “You need to stop screaming and come down here.” [O, 22]

After a long, confusing discussion regarding placing patients in rooms, a medic screams at the charge nurse in frustration: “There is no stretcher in there!! That is what we were just doing!!”
Charge nurse: “bah bah bah bah” <hand motion to bring it down while pitch goes from high to low and louder to softer> [O, 15]

In a few instances, a group of ER workers may enforce an emotion expression standard. For instance, on one high activity day, a relatively inexperienced staff nurse
who had been in the ER for only six months started to cry, shout, and pull at her hair in front of six nurses in the nurse work area.

Nurse: “I can't keep up! All of my orders take too long. I have an order here for 750 but we don't carry it. We only have 500 or 1000 - why can't they order what we have?!”

After a moment of staring at the nurse, the charge nurse goes over to the staff nurse and says in a gruff voice: “What do you have? What can I do?”

The staff nurse continues to cry out loud and wave her charts in the air: “I haven't even had time to chart! I can’t do this anymore!”

The charge nurse says again gruffly, “I can only help if you tell me what I can do.”

The other nurses in the nurse work area turn away from the scene and continue with their work. [O, 40]

It was clear during this episode that emotion expressions that showed any type of inability to handle the job were uncomfortable for the group. Both the charge nurse’s gruff attitude as well as the other staff nurses turning their backs and ignoring the outburst indicated to everyone that this was inappropriate. Despite the fact that outbursts of anger, annoyance, and frustration were observed a number of times both towards the patients and towards one another, frustration that explodes to the point of losing control was apparently inappropriate for the group.

Note that the group rules I observed are likely to differ from environment to environment. So, the emotion display rules that are acceptable in one ER may not be acceptable in another ER, another unit within the same hospital, or even different shifts. One attending physician shared with me: “I work better with the people at night. The night hates the day and vice versa. People choose their groups.” [I, 8] When asked why he preferred the night shift, he explained that the atmosphere on this shift is just nicer and more open. During my observations it seemed that the ER personnel on the night shift
were generally less hostile to one another while at the same time were less emotionally expressive about the patients and the environment. However, this might also have something to do with the reduction in the number of patients and thus the night shift would be considered a low activity observation session. The relationship between the rules for emotion expressivity in the group and the level of emotions in the group is not clear and is a candidate for further study.

On the other hand, it seemed that, at the group level, joking in the face of adversity could be construed as an indication of control and a healthy outlet for feelings of frustration. Thus, the group as a whole is supportive of joking in the ER. For instance, continuing the episode above but a bit later (after the crying nurse had regained her composure), another piece of bad news came in regarding the status of her lab requests. In marked contrast to her previous reaction, in the face of this news the nurse just laughed and said, “Oh no, just tell me. Pile it on.” [O,40] The other nurses in the nurse work area immediately responded in kind, laughing along with her. In fact, after the joke was shared, other staff nurses came up to her and asked if they could help with her load. Thus once she was able to gather and display her own composure, the memory of her earlier distress served to elicit a helpful tone from her coworkers. In the ER, it is understood that everyone “has those days” and has emotions; however, there is still an acceptable range within which such emotions are displayed.

Although, from the outside, joking may seem to be a positive emotion, it is normally evoked in reaction to a negative emotion. Each of the following examples occurred on high activity days and thus everyone was feeling the increase in negative emotions.
Nurse to attending: “You discharged X?”
Attending: “Yeah.”
Nurse: “Where is her chart?”
Attending: “Around here somewhere.”
Nurse while looking at the mess of papers strewn all around the physician work area: “Sommmmewheeerrr…” <Nurse starts laughing and attending follows> [O, 40]

Attending to nurse: “I didn't think a woman could grow this much hair. I don't even have that much hair.” <Nurse cracks up> [O, 35]

Attending 1 passing over patient to attending 2 during shift change. Patient was a diabetic who had been given insulin, then went outside for a cigarette and seized because his sugars were too low.
Attending 1: “I asked him ‘why didn't you eat?’ ‘Ah well I wasn't hungry.’ Oh my god! So I put food in front of him and told him to eat. Nice guy just…”
Attending 2: “Not the sharpest tack.”
Attending 1: “Sugars now 126 so...”
Attending 2: “So watch him for another few hours and then discharge.”
Attending 1 shaking her head: “The only one that doesn't eat the tray!”
Attending 2: <laughs> “You know nicotine is more important than food.”
Attending 1: <laughs> “And I even gave him less [insulin] than he needed!”
Attending 2: “That'll teach you to be the doctor that saves the world!” [O, 42]

Frustrated attending to attending after she finished entering a lab request into InLab, dripping with sarcasm: “I love InLab...I want to get it for my home computer.” [O, 15]

Nurse joking to another nurse about a patient’s requests: “I get it, constipation, it's an emergency.” [O, 20]

Each of these jokes was met with laughter and support. There seemed to be nothing off limits. Thus joking is supported in the ER as a healthy expression of emotion. This is supported by a number of other studies that show that people manage the negative emotions of themselves and others through humor (Francis, Monahan, & Berger, 1999) and that physicians even use humor to elicit cooperation from patients (Locke, 1996a). However, it is important to note that this behavior, although task-related, is not functional.
for the work to be done in the ER. It provides a sense of camaraderie but it does not directly support the ER goals of patient care trajectories or bed management.

6.3 Organization Rules Related to Emotion Expressions

Although I observed that emotions were often expressed in FTF settings in the ER, I found little if any indication of emotion in the formal patient care documents associated with the goals of the ER, for example the ED Record or Nurse Assessment. Most of the emotion words in these formal records were those of patients. Often the triage notes or initial physician assessment in the ED Record would contain quotes by a patient about his or her complaints or condition. But with respect to assessments of the patient’s condition by the medical practitioners, only objective, data-driven notes were formally written down.

For instance, one attending illuminated during an interview: “If someone thinks ‘I hate that guy, he swore at me.’ It’s not going to be written down. Overwhelmed. Frustrated. Few things are written. Maybe ‘violent and swore at me’.” [I, 9] Another attending physician lamented, “I may be worried about a patient ‘cause I haven’t sorted it out yet. But I don’t write that down.” [I, 10] Clearly, the facts of the case that may be the source of emotions are documented; however, one’s feelings towards the incident or the status of the patient care plan are not documented.

The reason for the disconnect between the occurrence of emotion in the ER and the recording of emotion in the formal documents is that formally written emotional content is explicitly viewed as unprofessional and inappropriate to the accepted standard of care in the ER. This has been codified in official documents as highlighted in Figure 6-
1. This administrative document specifies that the medical record is to be “objective” and “factual” and to “refrain from including your emotions and frustrations” because including such information would be unprofessional [A, 43]. Ironically, this document also conveys that the purpose for this medical documentation is to “document interdisciplinary planning and facilitate communication” and to create a “vivid picture” of the patient [A, 43]. There is clearly a disconnect between what is an acceptable documentation practice and what is required and practiced as part of comprehensive patient care.

The Medical Record is an objective, factual, chronological accounting of patient care. Its purpose is to document interdisciplinary planning and facilitate communication between members of the health care team. When documenting in the medical record, it is important to follow the guidelines listed below.

- Document objectively. Create a vivid picture of the current status of the patient with clear objective data.
- Refrain from including your emotions and frustrations in your documentation. Finger-pointing and emotionally-laden documentation are very unprofessional.

Figure 6-1. Administrative Document Instructing Formal Documentation Rules

6.3.1 The Role of Formal Documentation

The primary reason for constraining emotion expressions in the formal documentation is the organizational role of these information media. Formal documentation like the ED Record in the ER is created for traceability of treatment decisions and justification of diagnosis. The patient’s formal record is designed to communicate the course of care and medical diagnosis to external agents, including (1)
insurance companies, (2) lawyers, and (3) admitting physician in other units or hospitals. Note that this record is not designed to communicate care to other ER personnel, nor is it a medium for jotting down ‘possibilities’ or ‘concerns’. This does not mean that it isn’t ever used for that purpose; it only means that was just not the intention behind its organizational use. Thus, it is not the appropriate medium to debate or discuss the patient’s diagnosis and care, nor is it the proper venue to share one’s feelings about the patient.

An attending physician explained it thusly: “You chart down information in order to make a case for admission, for medical insurance, etc. You need objective data.” [I, 8] This means that unless there is data-driven evidence for a diagnosis or course of care it is not recorded in the official ED Record. The attending went on to explain, “They don’t know who I am. They don’t know my skill set. They won’t understand my hunch or instinct.” [I, 8] Thus, the consideration of emotions that may be acceptable – even useful – for initial diagnosis and care by the group or individual are not acceptable for the formal documentation. This is because there is no relationship to give emotions context and more weight.

The design of the paper ED Record reflects this use. For instance, it is a carbon-copy document. Thus, this indicates its use as a persistent record. In addition, the majority of the document is dedicated to predefined data fields indicating its use for objective data collection and recording. Finally, the largest free-text field in the ED Record is for recording the physician’s history and physical exam (H&P). At first, naïve glance this may seem to be the best location for emotional information, but after my interviews I soon understood why it was not used as such. The reasons the H&Ps are
important is that they “put a story together” [I, 7] for other outside personnel to come to the same decision the ER physician did – or at the very least understand why a physician came to that decision. A number of times I overheard an attending scolding an intern or resident for not properly using the H&P section of the ED Record.

Attending to intern: “H&P is the story. When I get to the end of the story I should know what the diagnosis is. The story is how we document in the ER. You have a lot of extraneous information here that muddles the diagnosis. You should be showing how your diagnosis is the right one.” [O, 4]

Attending to resident: “You have to tell the story. I should read the chart and know it is not a heart attack instead of all this nebulous stuff.” [O, 37]

This was a common complaint about residents’ reporting practices. Residents are not particularly adept at filtering out the superfluous and documenting a clear case in the ER (these documentation practices are particular to the ER and may not apply to other units). A resident’s inclination is to document everything, a natural response to their general feelings of uncertainty as they learn how to practice medicine. A number of them expressed to me that they are (wrongly) using the H&P section of the ED Record to work through the information they gather. As one attending lamented, “Residents write everything because they don't know what is relevant or not. They fill up space with information and let someone else filter it. Experience creates a filter.” [I, 9] Another attending also pointed out that “medical students just mimic the patient, no interpolation.” [I, 8] In essence, the more inexperienced a medical practitioner is, the more they need to externalize the information they have gathered before they can piece it together as a story suitable for formal documentation (i.e., for reading and evaluation by
outside agents). The more experienced physicians can ingest data, internally interpolate it, and then provide a story.

Experience may create a filter that keeps information out of the ED Record, but it also enables a richer set of intuitions that are not allowed to be expressed in the ED Record. Over the years an attending physician creates a store of knowledge of how illnesses present themselves in reality. “You’ll have a resident that says ‘the book says...’. Sure but never saw one of those. Illness never read the book.” [I, 8] Instead, attendings as well as experienced nurses learn to rely on their observation skills and experience filters to understand a patient’s situation. Unfortunately, as one becomes more experienced they can lose the language of how they got there. It becomes an “internalized operation” that is hard to describe.

*Attending during an interview:* “The more experienced, the safer you are. Subtle details are picked up on.” [I, 7]

*Experienced nurse:* “New nurses – they are thinking linearly. Experienced nurses know subtleties.” [I, 1]

*Experienced nurse during an interview:* “The doctor asked me ‘how is she doing’. I said ‘she’ll die before 2am’. The doctor looked at me like I was crazy and said ‘nah, her vitals are a little off...’ But I was right! And I don’t know how. I just felt it. I can’t write something like that down. I can tell him, but can’t write it.” [I, 1]

Thus, within the formal documentation there was no place for recording that which did not have evidence to back it up including emotions, data interpolation, or intuition. Because of this structure and purpose of the formal documentation, there were a number of attending physicians who mentioned the need for a medium to ruminate on decisions and share their emotions.
Attending during an interview: “I’d really like to see some decision support structured into the chart. ‘Sounds like X but would be Y. Perform Z to determine. I don’t want to do this because...’.” [I, 7]

Attending during an interview: “Look at the chart. There is no place to describe ‘likelihood of this has good evidence...blah blah. This and this and this and why.’” [I, 8]

Attending during an interview: “It [standardization] takes out things like emotion.” [I, 7]

Attending during an interview: “We should be able to examine our thinking. Our fears and feelings as well as our medical thinking.” [I, 10]

Attending during an interview: “There is no systems based thinking including how the patient feels and how the doctor feels.” [I, 8]

A tool or piece of informal documentation used to mull over care trajectories would support such decision and communication needs. Such a medium would also be a more suitable place to share or consider one’s feelings about the patient and the current course of care, and thus might be experienced as a safe place to discuss the patient’s feelings and state of mind.

6.4 Workarounds for the Expression of Emotions

The restrictions on sharing emotion in formal documentation cause the majority of emotion to be shared in FTF settings. There are two major reasons for this. First, emotion is simply easier to convey in person. Second and just as importantly, the rules surrounding the development and use of formal ER documentation hinder the display of emotion in a more explicit fashion.

Thus, at times, emotions were expressed surreptitiously in formal ER documentation. For instance, on one high activity day, a 20-year old female was brought in by the ambulance with stomach pain complaints. Later, after the patient was in an ER
bed, the charge nurse saw her come down from the cafeteria with a large tray of food. The nurse saw this as an indication that the patient had been lying about her discomfort, in order to receive a trip to and from the hospital, and to claim some free food in the process (she explained later that this happens often). The charge nurse was annoyed by what she inferred to be this patient’s abuse of hospital resources, including demands on her own time. She stormed over to the patient record and noted “patient seen with large tray of food from cafeteria at 1:12pm”. Later she remarked to another nurse that she is “on to her” and that she “marked it in the record so the doctor knows” [O, 13].

The charge nurse was annoyed, and was motivated by these feelings of annoyance to share this specific piece of information about the patient’s cafeteria behavior. Note however that she used emotionally neutral wording in the record, such that an external party would not realize that her intention was to expose the patient’s deception. More importantly, this note conveyed useful information to the physician: Because it is an unusual patient behavior to note, it prompts the physician to consider why the nurse might have shared the information. He might infer that the nurse thinks the patient is up to something, and treat the patient accordingly, or perhaps follow up informally with the nurse to get the whole story. This is a good example of an emotion expression workaround, in that the nurse has found an organizationally acceptable way to convey emotions that are important to the case.

A mechanism for sharing hidden emotion is the triage bins. Recall that once a patient has been triaged, the triage nurse conveys his or her assessment of the severity of the patient’s complaint by placing the ED Record in one of three columns of bins on the wall in front of the charge nurse station for easy assessment of the type of patients
waiting to be seen. The three columns correspond to cases judged to be of severe, medium, or low priority. Later, if the charge nurse reads triage notes in an ED Record that do not, in her assessment, match the severity level of the bin holding it, the charge nurse may be prompted to reflect on the triage nurse’s assessment, perhaps following up via a brief FTF discussion. If so the triage nurse will have the opportunity to explain her feeling that a patient “is definitely holding back” [O, 15] or “I’ve seen him here over and over for the same sorry excuse” [O, 40] without leaving a permanent record.

From this perspective, the triage bins serve as a form of interpretive or reflective emotion display, somewhat like the emotion-driven but neutrally worded note by the nurse on the patient’s record. That is, it is the discordance between what is displayed and what one expects (i.e., what is typical) that provides a clue to emotion that is otherwise hidden. As workers learn more about each other and their environment they can read hidden messages such as these while maintaining an air of professionalism to outsiders.

Workarounds like the ones described here prevent the writing of emotion information as part of the ED Record; this is important because the record is a formal document with a life beyond the ER. The staff members producing this document have no control over where this information may end up, or how it will be used. The fact that ER documents have a long-term and unpredictable “life” leads medical practitioners to use transient mediums like FTF conversation for sharing emotion information.
In general, the more transient and flexible the medium, the more likely collaborators are to share emotions. Another example can be seen in the phone board that is used to connect the phone numbers of portable phones to particular ER staff holding it. This display is clearly very transitory, in that it is simply a whiteboard that people write on, erase, and write on again. Perhaps because it is a transient display, it seems to invite emotion sharing. I observed instances when people added a smiley face after their names, drew hearts around their names, or jazzed up their names with colored markers (Figure 6-2). In follow-up informal interviews, a typical response as to why they did that was to
“spread happiness” [O, 2] or “makes me feel good - like I can smile at anything” [O, 8]. A board like this seems to have no emotion display rules associated with it, so people feel free to use it for sharing their feelings. Note though that I saw no cases of negative emotions shared in this fashion, which may mean that even a transient display like this is not appropriate for venting or spreading negative feelings – especially if it is in plain view of patients and family members.

6.4.1 Justification of Emotions

Another frequent approach to getting around the individual, group, or organizational constraints on emotions sharing was to justify one’s emotion expression. Justifications usually arose after an emotion was expressed – as if it was an afterthought when the person expressing emotion realized that he or she had conveyed too much or reacted too strongly. For instance, the nurse described earlier (Section 6.2.1), who became hysterical in the middle of the ER, offered the following explanation to the nurses after she had calmed down: “I called the pharmacy and they said I had to send a sheet and I just lost it.” [O, 40] Implicitly she was asking them to understand that she was feeling stressed and a request for one more form was too much to take. She is also eliciting the frustration they have felt in the past with the same experience in order to not only sympathize but also empathize with her situation.

I also observed that the use of quantification or numerical data often seemed to make the display of emotion to be acceptable, perhaps because numbers make the emotion seem to be quantifiable and detached, or perhaps because they provide some form of recognizable justification (i.e., indicating an “amount” of stress).
Charge nurse snaps at an attending: “Don't talk to me right now. I have two things in my head.” [O, 2]

Nurse to resident in an extremely annoyed voice: “I have not had the chance yet. I have like three patients and am doing the best I can. I will try to get a line in as soon as I can.” [O, 40]

Nurse to nurse obviously angry: “Yeah, well, I have five patients and I'm covering charge so she can go to a meeting.” [O, 43]

A visibly annoyed nurse at the start of his shift: “‘Have a good night.’ Yeah like that's going to happen. I have two who are to go to ICU, one to CCU, all which could crash at any moment, one who is crashing and I don't feel guilty for not taking any more patients. I'm already two over what I'm supposed to be.” [O, 45]

In other situations, exaggerations of the current situation were used as a way to justify an emotion expression. For the following two examples the actual time and number of patients is given in parentheses.

Frustrated nurse to charge nurse: “She just put it in like a minute ago.” (5 minutes ago) [O, 45]

Nurse snaps at attending: “We have had like five transports in five minutes so we are hustling here.” (3 transports in over 20 minutes) [O, 2]

Nurse calls over the intercom for patient to return to her room. Slams receiver down.  
Nurse assistant: “Tell me how you really feel! Slam that phone.”  
Nurse: “Well she has been here every day this week.” (Only the last 2 days) [O, 42]

Thus, a predominant method for expressing emotion in a safe and acceptable manner is to justify them. These examples of justification also exemplify that the ER workers are aware that emotion expressions have to have a functional reason. Thus, if it is not clear that it is an acceptable feeling to express, the worker appends their emotion expression with a reason – even if it is not quite accurate.
6.5 Summary

Emotion is an integral part of the work performed, but for a variety of reasons, emotion content is scrubbed from formal documentation and is repressed in FTF interactions.

Figure 6-3 shows the predominant mapping of the source of emotion through to the purpose and the various stakeholders’ rules that moderate the mechanism of expression. In this synthesis model, it is clear that organizational rules primarily affect the documented expression of emotion, which in turn primarily affects the development of a shared mental model. In addition, the group and individual are modifying the expression of emotion in face-to-face mechanisms and equally affect the development of shared mental models as well as a call to action.

Figure 6-3. Relationship between Modifiers, Mechanism of Expression and Purpose
The reason for this is due to explicit or implicit rules set in place by the organization, the group, or by individuals themselves. The organization’s focus is on legal liability. Any indication of “wild” emotions – particularly towards a patient – is unacceptable. In contrast the group is focused on coping with their often stressful environment. They know emotions are a part of what they do and how they cope but emotions that may be disruptive (i.e dysfunctional) are not acceptable. An individual’s openness to the visibility of emotions is related to their comfort with emotion as an element of the medical work context. If an individual does not accept emotions as a part of emergency medical work, this attitude can stifle the visibility of not only their own emotions, but also the visibility of the emotions around them. Thus, the organization is interested in maintaining emotion as invisible to outsiders whereas the group and individual are interested in maintaining invisibility to themselves. All of these rules, norms, and attitudes lead to a mixed environment for emotion displays.

In the following chapters, I take the lessons learned from answer the research questions and relate them first to the concept of emotion awareness and then to the design solutions touted by the two prevailing design perspectives in HCI. By relating the findings from a real-world context, we can see how certain beliefs and values of each of these two design perspectives support or contradict how emotions are shared in the ER.
Chapter 7. Expressions in Emotion Awareness

The findings presented thus far demonstrate the intertwined relationship between the expression of emotion, the coordination of work, and the social structure surrounding emotion expressions. The significance of this relationship can be shown by the application to the concept of awareness within the field of computer-supported cooperative work (CSCW). By considering the expression of emotion in the following theoretical framework, we can appreciate the application of emotion to CSCW issues as well as CSCW system design.

As a domain of research, CSCW is primarily concerned with the study of the social organization of work and the design of information systems to support that work. The expression of emotion has been only superficially addressed in this field with much of the research being aimed at computer-mediated communication (CMC). A prevailing assumption behind this research is that CMC is deficient since it does not support the conveyance of non-verbal indicators of emotion. This assumption is informed by media richness theory (Daft & Lengel, 1984) and social presence theory (Short, Williams, & Christie, 1976), which suggest that communication channels that support a richer set of social cues, such as vocal inflections, facial manipulations, and bodily gestures, provide more effective support for complex tasks. In fact, the measure of social presence is on a continuum of the degree of awareness of the other people with which one is communicating. Thus, based on these premises, researchers have been attempting to enhance remote communication technologies with emotion transference in order to
improve communication and collaboration through the enhancement of social awareness in distributed communication channels.

Early conceptualizations of awareness (Bly, Harrison, & Irwin, 1993; Dourish & Bly, 1992) identified it as the passive gathering of information regarding the social context of shared work in order to “…tacitly and unobtrusively align and integrate” cooperative activities (Schmidt, 2002, p.287). Awareness of social context included ‘Who is around?’ and ‘Who is talking with whom’; it is “of information such as interest and attention, or emotional state of a conversation partner. It is often perceived in a non-verbal way through back-channel feedback and non-verbal cues like eye contact, facial expression, and body language” (Gross, 1997). In other words, social awareness requires a rich set of social cues like media richness theory implies.

However, some researchers felt this concept of awareness was too narrow in that social awareness was of information that was seen primarily to occur outside of the formal cooperative work. Schmidt (2002) derides this conceptualization of awareness stating that “there are, of course, domains in which awareness of the general social context is an important aspect of articulation work…but in the wide and multifarious world of cooperative work such settings and situations are exceptional” (p. 289). He goes on to state that awareness of social context is perhaps only useful to domains such as politics, management, or teaching, “but in the coordination and integration of interdependent activities other and more urgent concerns are pivotal” (p.289). He provides examples of such more important concerns such as ‘Will he be able to do it?’, ‘Is she on time?’, and ‘Hasn’t he noticed the problem?’. It seems that Schmidt considers these aspects of work as being distinctly not informed by the social context. Instead he
likely considers the answer to each of the previous questions is based on the skill of the coworker that is set and predetermine as opposed to a state influenced by the social context. But, much like Dourish and Bly originally propose, the tacit knowledge gleaned from the social context is an integral part of the coordination of work – and emotions are one such aspect of this social context. Thus, an awareness of what emotions are arising and being expressed around the work just as much informs an awareness of the work as direct knowledge of work activities and statuses.

To this end, the prevailing design paradigm to support emotion awareness has been to ‘add’ emotion information into already existing modes of communication (e.g. text chat). Some of these ideas have been outlined in section 2.5. However, previous efforts on developing systems to allow for full and complete awareness showed that it is not as straightforward as simply opening up the floodgates of audio and visual information (c.f., e.g., Gaver, 1992; Heath and Luff, 1993). A more finite understanding of what aspects of emotion awareness is useful and appropriate is required. Simply adding unfiltered emotion may not be the best method of supporting emotion expressions in work as described in the following two points. First, it has been shown that people are able to detect one’s feelings simply through a text chat communication medium (Hancock et al, 2008) and, in the findings of this dissertation, we see that people can successfully adapt themselves to the channels of communication provided to them through workarounds. Second, people oftentimes feel trepidation at sharing their emotions (Wang, Prendinger, & Igarashi, 2004) and have even stated that they appreciate the ability to ‘hide’ their feelings from their friends (Höök, Ståhl, Sundström, & Laaksolahti, 2008). This is further supported by the results presented in this dissertation in that various
social structures can moderate the expression of emotions in different ways. Thus, freely and automatically expressing emotions between coworkers in all situations is not ideal. It is these issues that begin to paint a conceptualization of the place for emotion expressions and emotion awareness in communication and cooperative work.

In order for awareness to be developed, two practices must occur: (1) actors monitor the activities of their colleagues and (2) actors make their own activities appropriately publicly visible (Schmidt, 2002). Thus, awareness is a joint activity between collaborators who “adjust the degree of obtrusiveness to the requirements of the situation, and they similarly display their own work in a form and at a level of granularity which is attuned to the situation facing their colleagues” (Schmidt, 2002, p.291). This monitoring and adjusting of displays can be seen in the increase in observable emotion displayed on high activity days in the ER. When there are many patients and a pervasive high level of stress throughout the department, emotions in reference to the work would need to be displayed at a higher rate or with more intensity to be picked up on by coworkers. However, this could lead to an overwhelming level of displayed emotions in the ER leading one to wonder what is important to pay attention to and what is par for the course. It has been suggested that an established member of a group may be able to manage the inundation of emotion expressions since people develop schemas of what is typical and thus are able to determine when someone’s behavior deviates from the norm (Klein, 1998). This is where display rules play a part in supporting the monitoring of displayed emotions towards emotion awareness in a cooperative work environment. Display rules not only provide guidelines for the actor to appropriately and in a timely fashion display emotions, they also provide a filtering mechanism for the actor who is
monitoring the emotional displays of their coworkers in order to assemble some form of emotion awareness. Rules as to what emotion displays are normal and acceptable in any given social context allows for abnormal or noteworthy emotional displays to pop-out and thus be addressed immediately. For instance, when the nurse began to pull at her hair and cry out loud in the ER, it signaled to the other nurses that she was completely overwhelmed by the activity in the ER. She was at a level that was far above what any other nurse was feeling at the time. Her breaking of the display rule norm was the only way she could elicit the attention and help she needed. Until that moment, no other nurse or doctor was providing her with the support she needed. Although I observed her expressing sign of distress and annoyance to her coworkers, the display rules of the ER allowed for the overlooking of this mild expression of emotion. It wasn’t until she broke the barrier of acceptable expression that anyone realized she was indeed overwhelmed and required assistance – both in terms of her tasks as well as emotional support.

However, there is more to a sense of ‘normalcy’ than a fixed set of display rules. Normalcy is also contingent on what is the current level of emotion expressed in the ER. If everyone in the ER had been crying and slamming papers, then I doubt a crying nurse would have been deemed as needing further assistance. This sense of ‘what is the current emotion level’ is best informed by the venting of others in the ER. Remember that venting is to no one in particular and is not to elicit any immediate reaction from a coworker. However, venting can be picked up on either consciously or unconsciously by one’s coworkers. This information is then combined with other staff’s venting behavior and begins to paint a picture of what the current climate of emotion is in the ER. This
background picture then helps one make sense of specifically expressed emotion during information sharing events.

![Diagram](image)

**Figure 7-1. Relationship between Expressions of Emotion and Emotion Awareness**

As shown in Figure 7.1, the direct expression of emotion by an individual to a colleague leads to the colleague developing an emotion awareness of that individual. In addition, venting by an individual leads to a colleague developing an emotion awareness of the group. This group emotion awareness is also contributed to by the emotion awareness of the individual. Finally, the emotion awareness of the group along with the display rules of the group provides context for developing an emotional awareness of the individual during direct expression, or as an outcome of venting (e.g. venting that seems in excess of that of the group or far outside the display rules of the group brings a colleague to be aware of the emotion of that venting individual). All of this information is used to guide further behavior by the observer. It is important to understand that emotion awareness is not only about sensing another’s emotions, but it is also about understanding
what those emotions mean and how they impact the work. Thus, the emotion awareness of the group as well as the display rules of the group both provide context for understanding and effectively reacting to the emotions of the individual.

7.1 Observer’s Development of Emotion Awareness

The EASI model, which addresses the relationship between emotion expressions and observer’s behavior, can also inform the model presented in Figure 7-1 (Van Kleef, 2009).

In this model, two processes influence an observer’s behavior: affective reactions and inferential processing. The first process if primarily reliant on emotional contagion and that may only provide a subconscious addition to one’s emotional awareness. For instance, a nurse expressing her intense concern to a doctor may elicit his own feelings of concern. In addition, affective reactions also include determination of impressions and interpersonal liking. In other words, a nurse who is being yelled at by a doctor might begin to feel anger towards the doctor because of her growing dislike of him. The second process the EASI model indicates as an influencer on observer’s behavior is inferential processing. In this process, in order to inform his or her own behavior, an observer can infer an expresser’s emotion. In other words, a doctor smiling happily at a nurse informs her that she is doing a good job and should continue doing what she is doing. Both of these processes, affective reactions and inferential processing, can result from either direct expressions or from venting. In my field data, it appeared that both sorts of mechanisms were contributing to behavior changes after emotion expressions. For instance, the charge nurse yelling at the attending to start discharging patients motivated
him to encourage the other attending to also discharge patients. This was most likely a
cognitive appraisal on his side – “what do I have to do to make her happier”. In addition,
I noted affective changes that occurred in people who were receivers of emotion
expressions, and these affective changes led to behavior changes. For instance, a nurse
expressing her concern for a ‘poor, nice, old lady’ encourages similar feelings about the
patient in the physician, thus causing him to perhaps visit with the patient sooner. Thus,
my findings are consistent with the EASI model of purpose in emotion expressions.

The EASI model’s contribution to emotion awareness is through the moderators
that affect both processes: information processing motivation and social-relational
factors. The first moderator, information processing motivation, includes factors such as a
lower need for cognitive closure, low time pressure, or low power. When the observer’s
information processing motivation is high, behavior is influenced more from the
mechanism of inference; however, the shallower the information processing motivation,
the greater the affective reaction will lead to the observer’s behavior.

For instance, in the ER, oftentimes there is a hierarchical difference between staff
nurses and attending physicians or residents and the charge nurse. In these situations, the
role with less power (staff nurse and resident in the previous examples) is more likely
inclined to process the emotional information and thus use inference to deduce their next
behavior to continue to please. Thus continuing to perform tasks that support the work
(e.g. fulfill a call to action).

However, in situations where the expresser is in the lower power position, the best
method for eliciting certain behaviors from their higher power observer is to elicit an
affective reaction whether through emotional contagion or affective response. The one
strategy a nurse might use is to express her emotions in a clear and strong manner to the attending physician in order for him to catch her emotions and thus fulfill her call to action.

The second moderator, social appropriateness, includes issues such as norms/display rules and towards whom/what the emotion is directed (i.e. directed and the person or at the situation). Thus, one’s behavior, such as lending a hand to a distraught nurse, may be reliant on the appropriate level of emotion displayed by the needy nurse (i.e. not too much). In addition, if the expresser is directing their emotions towards the person (i.e. the source of the emotion was the coworker that is also the observer) then affective reactions will have a stronger influence on the observer’s behavior. However, if the expresser is directing their emotions towards the situation (i.e. the source of the emotion is the patient, the environment, or another coworker who is not also the) then inferential processing is more likely to moderate the behavioral outcome.

In Figure 7-2, we see how this model informs the model first presented in Figure 7-1 (new additions are in lined in blue). The direct expression of emotion can inform the emotion awareness of the individual through either the observer’s inferences or affective reactions. However, the observer’s motivation towards information processing as well as social-relational factors, which also includes the display rules of the group, can also moderate the strength of either process.
In order to better understand how emotion awareness plays a part in cooperation, it helps to take a closer look at two closely related aspects of awareness: articulation work and the development of common ground. In general, awareness supports the use of articulation work whereas awareness needs common ground in order to function properly. In the following two sections, I show how emotion awareness supports certain aspects of articulation work and how common ground provides a basis for emotion awareness.

### 7.2.1 Emotion Awareness in Articulation Work

*Articulation work* was first defined as “a kind of supra-type of work” (Strauss, 1985, p.8) and consists of the meshing of tasks, efforts, and actors to, in effect, “manage the distributed nature of cooperative work” (Schmidt & Bannon, 1992; Nardi, 2005). Since the introduction there have been transformations of the concept for different
aspects of work; however, a common view of articulation work is as the “work that enables other work,” (Sawyer & Tapia, 2006), that is, it is the extra work that collaborators (both singly and in collectives) do to coordinate and enmesh their activities for more effective outcomes.

This coordination relies heavily on collaborators’ awareness of one another in relation to their own work activities. Awareness of ‘What is he working on now?’ and ‘How long until he finishes that task?’ provides a context for when articulation work can occur (e.g. when is it suitable to instantiate a conversation regarding further work to be done) as well as what articulation work must be conducted (e.g. knowing if a coworker needs to know the next step of the work that needs to be done). In addition, the activities of monitoring and displaying without interrupting the flow of work, in essence, can be seen as a type of articulation work. Without continually maintaining and contributing to awareness, the work of importance and focus must be stopped in order to consciously and explicitly align cooperative work activities.

Since awareness is a vital aspect of articulation work, then it is important to remember that awareness also includes an awareness of social context such as ‘Who is talking to whom?’ and ‘How does he feel about the outcome?’ Although it has been suggested that social awareness “only has a weak relationship with articulation work” (Gross, 1997) I argue that an aspect of social awareness, emotion awareness, may indeed have an important relationship with articulation work.

Hampson & Junor (2005) believed that articulation work can encompass that of emotional labor (Hochschild, 1983) as well as the emotion-regulation necessary to fulfill display rules (Rafaeli & Sutton, 1987). Because I was not investigating emotions in the
ED personnel’s interactions with patients it is hard to speak to the existence of the former. However, the rules governing the display of emotions by the organization, group, and individuals obviously leads to the latter. Thus, according to Hampson & Junor’s conceptualization, the regulation of emotion can be viewed as a type of articulation work in the ED.

Furthermore, the expression of emotion that leads to emotion awareness can also be a part of or a catalyst for further articulation work. Eschenfelder’s (2003) second characteristic of articulation work is the coordination of tasks, beliefs, and goals. This coordination of work can occur during or after an emotion awareness has been developed. For instance, a doctor expressed her feelings about a patient lying and the nurse agreed with the assessment. Not only is this a development of emotion awareness, but also it led to the further coordination of tasks and goals for the patient’s course of care. One could consider the direct expression of one’s feelings about a patient’s behavior to be articulation work in and of itself and that this led to further articulation work on the tasks to be accomplished for the patient’s care.

Finally, the expression of emotion through venting that leads to an overall emotion awareness in the workplace can lead to the need for articulation work if the expression is deemed not normal. When the charge nurse expressed her anger at the doctor for not calling the transport earlier on a Saturday, her behavior was deemed not normal in comparison to the affective tone of the ER at that time. The attending then sent his resident to go over and speak with the charge nurse to try to work out a plan that made everyone happy – to align their goals and beliefs on the best way to handle the patient’s transport to another facility.
Therefore, the expression of emotion that leads to emotion awareness can be both an aspect of articulation work or a catalyst for articulation work to commence. As shown in Figure 7.3 (new additions from Figure 7.1 are lined in blue), the direct expression of emotion can be viewed as articulation work, which then leads to an emotion awareness of the individual. This emotion awareness can then lead to back to further articulation work – either emotion in nature or task-oriented.

![Diagram](image)

**Figure 7-3. Relationship between Articulation Work and Emotion Awareness**

### 7.2.2 Common Ground as a factor in Emotion Awareness

In their discussion of articulation work, Schmidt and Bannon (1992) expressed that “[i]n order to be able to articulate the distributed activities of a cooperative work arrangement, the participants need access to appropriate means of communication” (p. 13). Communication is the fundamental building block of both awareness and articulation work. Without proper communication, neither activity can persist.

The work by Clark on human language (Clark, 1996) has provided a theory of human communication that accounts for social and cognitive factors and has proven useful to the study of work. In his theory of language use, Clark introduced a few well-
motivated principles about the communication process. First, *communication is a collective process*: a joint action in which individual participatory actions are coordinated. The joint action is not a neutral exchange of a message between a sender and a receiver, but requires active involvement and constant verifications by all of the participants. Second, the *grounding process*, the process of establishing mutual understanding, *is always adaptive to the current context of communication* (i.e. purpose, medium, etc.). Third, communication is a multi-modal process. It involves more than just words, or verbal communication. Less conventional forms of language such as gestures, facial expressions, eye gaze, and postures also help people to communicate and coordinate the dialogue.

The process of grounding is perhaps the most central concept from Clark’s theory for human-computer interaction. Common ground is shared knowledge and beliefs, mutually identified and agreed upon by members through a rich variety of linguistic signaling (Clark, 1996). Common ground allows members to communicate and cooperate easily. This construct is similar to the knowledge in common emphasized in the notion of shared mental models plus beliefs in common, as discussed by Mohammed and Dumville (2001), but common ground is not simply a static assumption about shared knowledge and beliefs; it is an ongoing communication protocol through which collaborators test and signal shared knowledge and beliefs. Common ground is incrementally built on the history of joint actions between communicators. This leads to greater efficiency or a minimum effort for communication – which is the purpose of common ground.

Previous work has indicated that there are two types of common ground that vary in their development as well as their composition – content and process common ground
(Convertino, Mentis, Rosson, Carroll, & Slavkovic, 2008). Content common ground consists of information specific to the task at hand whereas process common ground consists of information regarding method for solving a problem and beliefs on what is an acceptable outcome. Both lead to more efficient and effective group work; however, the former has to be regenerated for each new task whereas the later persists over tasks between group members.

Clark had also touched upon this distinction (Clark & Brennan, 1991). He stated that coordination of content depends on a shared understanding of the subject and focus of work (know that). In contrast, coordination of process depends on a shared understanding of the rules, procedures, timing, and manner in which the interaction will be conducted (know how).

As shown in the results presented here, the emotions expressed between coworkers lives alongside more recognizable information like the patient’s complaints, blood pressure, current medications, or medical history. Emotion may add information like a patient’s state of mind or a family’s attitude towards medical care. Emotions may also modify the information contained in the “objective” data like a nurse’s note about a patient’s actions, prompting a doctor’s instinct that a patient is lying or a charge nurse’s worry that a patient is suicidal. This emotion expression and the subsequent change in work as a result leads to the development of process common ground – in other worlds, an agreement on what certain feelings towards the work impacts rules, procedures, timing, etc. The emotional common ground can then be called upon to lend explanation and meaning to future emotional awareness answering questions as to whether this
emotional expression is normal and thus I know how to proceed or do we need to discuss the situation further and perhaps re-coordinate our work (articulation work).

As shown in Figure 7.4, articulation work regarding emotion-related concerns can lead to the development of process common ground (new additions are lined in blue). This high level common ground then provide further information towards the understanding of emotion awareness of the individual. As stated before, emotion awareness is more than just sending the emotions of an individual, it is also understanding what those emotions mean. This figure provides an indication of some of the resources one can pull from in order to better understand and thus address emotions that are expressed in course of cooperative work.
7.3 Expression of Emotion and Awareness in Cooperation

In essence, the expression of emotion leads to an emotional awareness that can be used in the coordination of work through articulation work. Through the use of emotion expressions in articulation work group members develop process common ground regarding the implications of emotions on the work and thus can use that information to further one’s development of emotion awareness and understanding.

Through this relationship, emotional awareness can be seen to be an integral aspect of coordinated work as opposed to residing outside of the work to be done. However, on initial inspection, one might think that the media richness theory is correct in that communication channels needs to support a richer set of social cues, such as vocal inflections, facial manipulations, and bodily gestures in order to support complex tasks. In the next section, I discuss the design implications building on this description of the use of emotion awareness and its relationship to the prevailing affective computing design directions.
Chapter 8. Design For and Around Emotion Expressions

8.1 Introduction

Based on the findings presented in the previous chapters as well as the framework for understanding the expression of emotion in the development of emotion awareness, there are two perspectives we can take in considering the implications for design. The first perspective builds on the history of affective computing. This perspective puts the emphasis on designing for the expression of emotions. In other words, emotions are put front and center. System design explicitly considers how workers wish to express their emotions in both face-to-face as well as distributed environments and in response, designers imagine systems that could support those expressions or even take them beyond what is possible in unmediated environments.

The second perspective in considering the implications for design is concerned instead with designing around the expression of emotion. In this perspective, instead of designing with the expression of emotion as an explicit design goal, we consider the impact any mediation may have on the expression of emotion between workers. In this perspective, we are not explicitly designing for emotion but rather remembering that the expression of emotion in a critical environment, such as the emergency room, is a sensitive topic that is embedded within rules and norms and, thus, may be adversely affected with the future introduction of technology in such an environment.

In the following sections, I first address how one can take the findings presented and introduce them into novel systems for the expression of emotions. In so doing, I hope to open up the potential design space for explicitly considering emotion in the design of critical information and communication systems. Following that, I address the process of
designing around emotion by mitigating unintended consequences in the future introduction of technology in the emergency room.

8.2 Designing for the Expression of Emotion

The challenge of designing for emotion in work is complex. There is the conundrum that emotions are an important part of the work and should be shared while at the same time the workers might not always want to express their emotions with one another. The norms for controlling emotion expressions develop for a reason; information system designers need to keep this in mind as they consider the future use of information systems.

For instance, the organizational policies of a hospital may inhibit medical personnel (and the information system designers who seek to support them) from making emotion ‘visible’ or persistent to outside entities (e.g. health insurance agencies or patients and their families). Because of group norms, designers must also allow for the ‘hiding’ of emotions in ways that are consistent with the group’s display rules. Unless and until emotion becomes a socially and organizationally recognized element pervasive in serious work, designers must continue to respect the invisibility of such content in collaboration. Perhaps in the future, emotion will come to play a more explicit role in work, broadening even more the emotion revolution in the workplace.

In the meantime, we can learn much from the emotion expression patterns we have discussed thus far in the ER. In particular, we can look for design inspiration in the workarounds and use of transient mediums; as these are naturally occurring “solutions” emerging from the workplace, they may suggest ways to design systems that are more
supportive of emotion being expressed. Of course individual workers and work groups may choose not to use emotion-supportive information systems, but at least those who are persuaded of the value of emotion expressions will have more options.

Since the emergency room will continue to be a primarily face-to-face environment, the active design for emotion will be aimed at enhancing current communication mediums and thus we make the assumption that there is something beyond the *face-to-face gold standard*. As Hollan and Stornetta (1992) explain in *Beyond Being There*, the benefit of new technologies is that it can provide more than simply replicate what is possible when face-to-face. Information technologies can provide possibilities for “higher information richness than face-to-face” (p. 123). Thus the following design discussion is focused on an enhancement to the current emotionally expressive environment.

Finally, if we are to actively design for emotion then we are inevitably faced with the need to choose a design paradigm. Thus we return to the two prevailing HCI design paradigms for emotion in sociotechnical systems – the information processing paradigm that is associated with most design work in affective computing, and the interactional approach that focuses primarily on context and the situational nature of work. Each design paradigm offers concepts for bringing emotion into the ER environment. Likewise, the ER setting raises obstacles that each design paradigm must overcome. To consider these opportunities and challenges in more detail, I discuss ER features that seem to support or hinder the applicability of each paradigm. For each approach, I also sketch out design examples for mediated expressions of emotion, where the overall aim is to enhance ER function.
8.2.1 Information Processing Paradigm

The information processing paradigm assumes an overarching design goal of accurate detection, representation, and transmission of emotion information. This requires a mechanism for sensing emotion that reliably maps a physiological or behavioral signal to an inferred emotional state. In addition, this paradigm requires a clear output of emotion directed toward a receiver – this can either be a computer or a human. The transmission of emotion is successful if the receiver recognizes and understands the emotion output. Thus the interesting questions concern the novel devices that can be used to detect and encode emotion-related signals (e.g., heart rate, skin conductance, facial tension), the validity of the emotion thus recognized or encoded, the potential impacts of this emotion on other agents in the system, and techniques for building verbal, visual, auditory or other sensory displays that convey the emotion to other agents.

Like any critical environment, the ER requires clear and concise information transfer. It is a high stress, fast-paced environment where staff members rarely have time to decipher ambiguous information and signals – including an ambiguous emotion expression. Many of the instances of emotion I observed were clear-cut, ‘this is how I feel’ expressions of emotion. For example, a nurse outright expressing, “I'm so frustrated!”, or a nurse a expressing in a very concerned and sympathetic voice the story of the mother who had recently lost her 18 year old daughter. In these examples, it is hard to deduce that the emotion expressed is anything but frustration for the former and concern in the latter. Given this general preference for concise and unambiguous emotion content, one might expect the ER to benefit from the clear expressions of emotion that are the hallmark of the information processing paradigm. Designing mechanisms that detect
or produce clear signals of staff emotions towards a patient or their course of care could be beneficial.

However, there are also many instances where a direct and clear emotion display is inappropriate in the ER; I have described numerous examples of emotion content that is expressed in a hidden or surreptitious fashion. For instance, organizational norms require the medical personnel to not write ‘emotional’ information in the ED Record. However, I observed the use of workarounds and transient displays to circumvent emotion display rules and norms. I described how wording that is emotionally neutral but unusual in its placement or other content can be used to signal that all is not right; this is used to circumvent organizational rules against emotion content in formal documents. The ED Shuffle (reorganizing patient records according to which staff are present) is used to circumvent individual preferences regarding emotion display.

In addition, the large number of non-functional emotion expressions (especially those due to venting) are not appropriate expressions of emotion to ‘support the work’ and thus should not be sampled for the system to inference the emotion of an individual or group. Currently, the systems developed under the information processing paradigm have an all or nothing perspective – they either sense all of the signals from a particular source or none of them. Thus, there needs to be further consideration for what emotions expressions are important enough or appropriate for the work to be mediated and which should be conveniently ignored.

Synthesizing across these two lines of argument, I suggest that information system support for detecting or representing emotions in the formal documentation of the ER should be as clear and precise as possible; at the same time, the design should also
include options for ‘hidden’ or surreptitious expression of emotions to meet individual, group, or organizational constraints.

8.2.1.1 Design Ideas

One design direction that is implied by the affective computing paradigm is that emotion displays in formal ER documentation should support a simple process of ‘wiping away’ or ‘removing’ the emotion when it is no longer needed or are not appropriate. In addition, we need to ensure that any emotion that is displayed in digital form includes features that emphasize its transitory nature. This might be an explicit statement, a display feature (e.g., content that gradually fades away unless reactivated), or even the digital medium itself. Without an assurance that the emotion will not be stored permanently, workers may resist conveying emotions in digital form.

For example, Figure 8-1 provides an example of a formal digital patient chart augmented with more informal information that could be emotional in nature. The handwritten notes have an informal character, clearly distinguished from the form and data entry. The terminology chosen can be as precise as the person expressing the emotion wishes to be (e.g., it might say “depressed” but it might also say “a bit down”). Because the notes are viewed as “handwritten” annotations, the emotion label appears to be information that may be erased or edited at any time (e.g., after it has been read by the coworker or the patient has been discharged and the patient record will be archived). A layering technique or the use of specialized objects like post-it notes might increase this display affordance even more.
Another application of the affective computing paradigm is to provide aggregated displays of emotion in the ER. Because feelings towards the environment are often shared within a work group, it might be possible to detect, represent, and convey a generalized indication of how ER personnel are currently feeling about their work setting. Recall the episode in which the charge nurse wanted the nurse in training to understand how the current staff might be feeling (i.e., after a tough night). Providing a more broadly accessible indication of the overall feeling of the group towards the environment could
provide even more awareness of how the team is handling and coping with trauma. This awareness can be used by both those who are at work in the environment and those outside of the ER who must interact with ER personnel (e.g. attending and resident physicians from other hospital departments).

Figure 8-2. Group Emotions towards the Environment on a Shared Display

A display of this nature could conveniently be coupled with other general-purpose ER displays such as the “big board” that is currently being implemented in hospitals across the country. An example of this is shown in Figure 8-2. The large screen display on the wall provides information about the ER such as which bed a patient is in and how
many patients are in the waiting room. The purple aura created by ambient lights around the display presents an indication of the emotions of the ER. This is an unobtrusive display in addition to being meaningful to only those that work in or with the ER.

Note that a shared emotion display assumes some form of emotion detection that can be “summed” or “averaged” for the group, which itself implies a clear notion of who is currently a member of the group (and thus contributing to the shared emotion state). It is unlikely that ER staff would agree to wear individual obtrusive sensors to pick up muscle tension or other physiological indicators for emotion. However, it seems quite possible that surrogates like triage output or case wait time could be used to predict group emotion; it may also be that more ambient and unobtrusive measures like complexity and amplitude of voices in the ER could be correlated with general emotion state. In addition, previous studies on mouse pressure (Qi et al., 2001) or physiological sensor in the chairs (Anttonen & Surakka, 2005) could be a direct indicator of ER personnel emotion since typically the only people using the information system and the chairs in the ER are the ER personnel (occasionally the consultants will look something up on the computers or sit in a chair to jot down some notes, but this is rather infrequent since they have their own area of the ER to conduct their work).

8.2.2 Interactional Paradigm

The interactional paradigm is less concerned with accurate sensing or transmission of emotion signals and rather is focused on discovery of emotions through interaction. Emotions derive their meaning from the social and contextual environment and thus cannot be seen as an individual act but rather part of social interaction. As a
result, designers pursuing this approach do not attempt to precisely sense or display user emotions, but rather explore the consequences of deliberately ambiguous displays that evoke interpretation and reflection (e.g. Boehner, Sengers, & Warner, 2008; Höök et al., 2008).

In the ER, when a nurse makes an unexpected statement on a patient record (e.g., what the patient had for lunch), it becomes an “ambiguous display” to the doctor who reviews it; he may guess that the nurse has an emotional agenda item, which he can either infer using other knowledge or follow up in a FTF interaction. As I have argued earlier, the ambiguous annotation serves as an implicit call for action. Accepting the ambiguity and subsequent constructive interpretation of emotions allows this information to be invisible to those outside the ER yet meaningful and important for those inside the ER.

Just as activity awareness guides cooperative activities, so does emotion awareness. However, in an environment like the ER where everyone may be at a high stress level, sensing and conveying individual levels of stress through physiological sensors seems likely to lead to information overload, and it is not clear that anyone would look “different” when all are feeling stressed in general. Rather it should be up to the individuals who are feeling emotion to determine if they are especially overloaded or not and whether they want their collaborators to know this. This suggests a design emphasis on systems that orient participants toward the experience of emotion, encouraging them to engage in reflection and interpretation rather than simple sensing and transmission of emotion states. At the same time, we must remember that there is very little time in the ER for reflection on one’s own emotions as well as on the emotions of their coworkers.
An ambiguous display may be inappropriate when an individual is experiencing and sharing time-critical emotions.

### 8.2.2.1 Design Ideas

As an alternative to supporting emotion as an element of the formal documentation, an informal information sharing and decision making space could be a more suitable environment for emotion expressions. For example, the use of whiteboards in clinical care settings has shown the effectiveness of non-permanent displays in facilitating the sharing of ‘unofficial’ information as well as for saving face between personnel (Riley, Forsyth, Manias, & Iedema, 2007). Whiteboards are considered an unofficial communication channel, one that is not governed by hospital policies or regulation and thus is under the management by those in the department itself. In addition, whiteboards were shown to be an informal channel that allows for the use of covert strategies of information sharing and decision-making manipulation by hierarchically ‘lower’ nurses. Although the transience of the nurses’ notes reifies their invisible roles, the benefit of an impermanent display facilitates informal information sharing.

Medical personnel need decision spaces for working out and sharing thoughts on more complex cases. If these spaces were temporary and not a part of the formal patient care documentation, this would facilitate a safe environment for the expression of emotions towards the patient and their course of care.

As described by the physicians and nurses in this study, formal documentation is for recording data (i.e. hard evidence) as well as the “final story” (i.e. the diagnosis and
evidence that supports that diagnosis). There is no room for superfluous information that veers the story off course from leading to a conclusive diagnosis and course of treatment. Unfortunately, not all cases are always clear in the beginning. Medical personnel need more time to work out the answer and new residents could benefit from seeing as well as hearing the decision-making process. Medical mystery solving is also the time when emotions that are felt towards the patient affect the diagnosis. Thus, the emotions that arise and are expressed as a part of the work, should be felt, examined, and discussed by those feeling them and possibly everyone who is working on the case. Thus, an interactional approach would tout this conceptualization of emotion in the work as an important reason for reflective displays as opposed to one to one emotion information transmission. A decision making space which provides a safe place to both try out possible diagnoses as well as share and consider emotions in those diagnoses and course of care could be beneficial.

Just as nurses write on paper towels to “keep an eye on what I'm doing” there needs to be an informal medium for physicians as well as the entire ER patient team to track and reflect on what they are doing, why they are doing it, and how they expect it to progress. Writing it down makes it real. Something that is real needs to be addressed before you can dismiss it as unimportant. A more informal area to mull over care trajectories would support such decision and communication needs. Such a medium would also be a more suitable place to share or consider each other’s feelings about the patient and current course of care as well as safely discussing the patient’s feelings and state of mind. The lack of formality gives rise to more ambiguous expressions, which in turn encourage a more constructive interpretive process.
Another design issue provoked by the interactional perspective is support that enables workers to hide, modify, or magnify emotion displays, depending on the dynamic context in which they find themselves. Such flexibility is an important feature for managing rich social interaction while also complying with organizational rules. For instance, an overt display of frustration or annoyance by a nurse can counteract the urgency of a doctor’s requests. Staff members who successfully control their frustration and stress levels reassure the group that they have their tasks under control. Thus, the choice of when and how much to comply with the group’s or organization’s emotion display norms should be up to the individual. A corollary to this guideline is that individuals should also be able to share their emotions within a group while at the same time control its visibility to those outside of the group.

One way to realize this idea is to integrate a personalized emotion display into existing ER communication practices. For instance, mobile phones for personal use in the ER are a common mechanism for communication; they could be integrated with the new mobile communication method called Vocera (Figure 8-3). Vocera hangs around the neck of the nurse or doctor. An embedded display on the front of this personal communication device could then be used to indicate the emotions of the coworker on the other end. Because these phones are with the user at all times they may be able to detect emotion indicators like heartbeat, noise levels, words used, movement, etc. These sensors could provide a ‘baseline’ emotion level for sharing. However, a simple dial would allow the user to modify the display output, including turning it on or off – thus giving the staff members control over whether and what kind of emotion they wish to convey. In addition, since these are first and foremost communication devices (they are easy to use
mobile phones specifically for hospital contexts) they could also transfer user prescribed emotion signals during a call. Thus, one can see, even before they answer a call what is the emotional intent of the call. Indeed, one might imagine that a “helpful” individual might choose to show her “happy face” emotion in cases where she knows others are feeling stressed, just as I observed some doing informally using personal decorations on the phone check-out board.

Figure 8-3. Display of Emotion Controlled by Individual to Comply with Display Rules

8.2.3 Reflections on Affective Computing Design Paradigms

Most HCI research streams have a unifying vision of what the future can hold and how to design for that future. The problems with such a vision is that they continue to mold the way design is discussed and the goals they entail long after the vision is first created and most likely long after the vision is relevant. Bell and Dourish (2006) exemplified this in relation to the vision for ubiquitous computing, which, among others, provided a vision of the future that promoted homogenization. What the present shows us is that ubiquitous computing is here and the way it has been appropriated is not to promote homogenization at all but instead resides in our messy lives; yet the vision for the future of ubiquitous computing remains intact with no consideration for how things have naturally evolved.

The vision behind affective computing has fallen to a similar fate. The initial vision was a future where computers can sense and respond to a human user’s emotions and thus provide an adaptive, more effective user experience. Even the interactionist model, although not as concerned with accuracy in the sensing of and responding to emotions, is driven by the view of the future that places positive emotions above negative emotions, that assumes man requires support in articulating his emotions, and views the needs of a face-to-face environment equal to that of a distributed environment. However, not all contexts follow these assumptions. Thus neither affective computing perspective may not be the best way to approach designing for emotion.

As is evident in the emergency room discussed here, negative emotions are an important part of the work and lead to effective, even necessary, outcomes. However, the
medical workers use them judiciously and it is evident that overly salient negative emotions are deemed unacceptable. In this case, it seems likely that the medical workers would reject technologies that overly promote the negative emotion expression that are so prevalent in the ER. In addition, the expression of emotion is already effectively expressed within the rules and norms that have been organically created over time through negotiations between actors. The introduction of new technologies to enhance emotion expressions or make them more salient may interfere with that delicate balance. Finally, in this face-to-face environment, the expression of emotion may not even need to be supported. Instead, what needs to be accounted for in a face-to-face environment is the assurance that new technologies do not interrupt the effective expression of emotions.

In the next section, I discuss a different way to think about designing for emotion – designing around emotion. In this perspective, design is not concerned with sensing, responding, or augmenting the expression of emotion but rather design is concerned with considering emotion in the tradeoffs in the design of information and communication technologies for the emergency room.

### 8.3 Designing around Emotion Expressions

The current paradigms spend much energy explicitly designing for emotion and thus they begin to miss that emotion is part of a larger context of interaction; rarely does it live alone. As Palen and Bødker (2008) point out, emotion is an integral part of all interaction and should not be put on a mantle as one important component of interaction and experience. Thus, perhaps it is more fruitful to discuss implications on emotion as a greater component of ICT usage as opposed to making it a single stand-alone experience.
In the design of sociotechnical systems, we must consider both supporting the formal work on the one hand while being cognizant of the unofficial work on the other (Star & Strauss, 1999). Suchman (1987) discussed the difficulty this presents to system designers in that it is not always appropriate to lend visibility or official legitimacy to the invisible. But at the very least, we must ensure that the support that information systems provide for visible work does not interfere with invisible work that may also be crucial.

Thus, we need to be aware of how current directions may provoke some unintended consequences in terms of the expression of emotion between medical coordinators. As reviewed in the introduction to this dissertation, from the introduction of all forms of technology to a medical setting, some form of unintended consequence arises. It is important to learn from the mistakes of the past and more importantly consider the consequences of future technology introduction. In illustration of this point, I point to three trends towards the introduction of new information and communication technologies in medical environments.

The first trend is the replacement of paper medical records and face-to-face information transfer with electronic medical records and physician ordering systems. The electronic medical record is touted as providing an effective method for multiple source data aggregation, communication between collocated and distributed medical workers, and quicker billing and reimbursement. The effect it has on the medical work team can be beneficial, but it has also been known to produce multiple unintended consequences, specifically on the communication practices of medical workers (Ash, Berg, & Coiera, 2004; Embi et al., 2004).
The second trend is the introduction of telemedicine, which is defined as “the use of electronic information and communication technologies to provide health care when the caregiver and patient are geographically distanced” (Yoo & Dudley, 2009, p. 2705). As shown in Figure 8.4, the goals of telemedicine is to bring literally bring in consultants via video and audio channels to discuss a patient’s course of care and thus pull from the expertise of doctors from great distances. Although this may seem far-fetched in a western hospital setting, the use of telemedicine is most hopeful for developing countries that have few specialists to call upon (Latifi, 2008; Wootton, Patil, Scott, Ho, 2009).

Figure 8-4. InTouch Health’s ® RP-7 ® for Telemedicine

Image from: http://drbobbs.files.wordpress.com/2009/04/rp71.jpg
A natural outcome or direction of this line of research is to record these transactions. Any attempt to record verbatim interactions between medical workers presents legal and ethical dilemmas. However, with the advancements in cheap and abundant server space, this may not be such a distant possibility.

The third trend in medical informatics is the introduction of decision-making agents towards evidence-based medicine or case-based reasoning systems. The problem with these agents is that they are based on a typical model of care not including situational and contextual issues such as a patient lying or the issues of triage in a busy ER. Thus, if an attending physician disagrees with the agent’s diagnosis or instructed course of care, organizational protocols may be put into place which require the physician to explain why he disagrees.

In the following two sections I illustrate two possible unintended consequences on the expression of emotions from the introduction of these two technology directions.

8.3.1 Making Emotions Visible

Although the intention is to always know what is going on or what is happening and remove the burden on the doctor or nurse to record data and ideas, there are some unintended consequences that may arise from the over reliance on recording telemedicine interactions.

The most important issue to discuss is that recording interactions prevents the team from being able to hide their emotions from outside entities such as insurance companies and legal entities. As we saw in the ER, nurses and doctors record their emotions in an ambiguous manner in order to share their feelings within the workgroup
while at the same time ensuring that their emotions are invisible to those outside of the workgroup. Recording telemedicine interaction makes this impossible in the real-time collaborative environment of doctors and nurses discussing course of care treatments and possible diagnoses. Thus the use of emotion expression in order to develop a shared mental model or to impart a call to action has to be muted and thus the benefit of this use of emotion may be reduced.

Likewise, the need to justify one’s diagnosis or course of care deviation from a decision-making system may also present a situation where a doctor has to choose between making his feelings and intuitions visible in order to justify his decision-making process. If he chooses to not make his emotions visible, then he might actually choose instead to continue to follow the advice of the un-situated decision making model.

8.3.2 Losing Emotion Expressions

As can be seen in the above examples, another unintended consequence could be the reduction or loss of emotion expression in the ER due to the recording of telemedicine interactions or the justification of disagreements with decision-making models.

Another example of the possible loss of emotion expressions is due to the increased prevalence of electronic medical records. Inevitably the touted benefit of electronic records is the decreased need for face-to-face communication. The use of these records is justified by the increased efficiency in communication and thus the reduction in the need for face-to-face handoffs. Unfortunately, organization decision makers who believe these claims may begin to request or impose work processes that remove the need
for face-to-face interaction. But although this may be fine for ‘data’ it is not appropriate to assume that digital media is always appropriate for ‘softer’ forms of data such as conjecture, intuition, and feelings.

Unfortunately, the time required to interact with the digital records has the unintended consequence of taking away time to interact face-to-face, which is the best place for feelings, intuitions, and emotions to be expressed and discussed towards a shared mental model or a call to action. Even more egregious is if after medical personnel fill in all of that information they still chose to take the time to interact face to face. Thus, an outcome of this would be that the introduction of electronic medical records would not actually make the medical care process more efficient and faster – in actuality it might slow down the entire process.

8.4 Summary

In a real-world environment such as the hospital ER, both information processing and interactional paradigms provide perspectives that are useful in designing affective cooperative information systems. The difference lies in where, when, and how the emotions are being used to support the work of the unit. When emotions are integrated into the formal medical documentation it is best to allow for clear displays of emotion, yet my field work emphasizes that such displays should be transient so as not to create unwanted archival data. But when emotions are being used to support informal decision-making, then it will be preferable to allow for more ambiguous and open-ended emotion displays.
Note that I am not asserting that emotions should be brought to the forefront of work through the design of new information systems. Invisible emotions allow for the maintenance of important aspects of work such as congeniality and conveying a sense of control and professionalism. Invisibility is central to the “work” of emotions in this environment. Instead a more useful direction will be to support emotion through transient displays and by supporting personal control over emotional displays in general.

In addition it is important to be cognizant of the unintended consequences of other forms of technology introduced into the medical environment. The communication and work processes of the ER have organically evolved over time as a negotiation between medical workers and organizational needs. Sudden technology introductions that affect the communication of medical workers may have unintended consequences on the expression of emotion that could be detrimental to the work. In most situations, humans are capable of adapting to various communication mediums; however, with the rules and norms in place currently in the ER, the possibility is that the expression of emotion will not be able to persevere such as was shown in Zhou et al. (2009).

Finally, there will always be differences between ER settings or even between different shifts in the same ER. This makes it difficult for system designers to create one system that supports or allows for all levels or types of emotion displays. It is easier to design for an environment where emotions are allowed or not allowed as opposed to all of the subtle shades of gray in between. Thus, depending on the environment, one design paradigm may be more appropriate than the other. This is very much in line with the overall perspective of the interactional perspective – emotions are social and contextual – and thus the design for those emotions may be social and contextual. Collaborative
information systems should allow for varying levels of emotion displays and expressions to be decided upon and designers together.
Chapter 9. Conclusion

An emergency department is a highly complex, emotionally charged work environment where decisions can mean the difference between life and death. It is clearly stressful and frustrating at times, exciting and joyful at others. However, the traditional perspective has been that emotion is not vital for the medical work that takes place. More recently, studies in the cognitive and organizational sciences have provided evidence that emotion is an important element of cognitive functioning and part of interactions between all workers and their environment (Grandey, 2008). As I have documented for the ER studied here, emotions may be used (whether consciously or unconsciously) to coordinate and work in a more effective fashion, but various stakeholders modify those expressions. These modifications have consequences on the work as well as on the design of information systems to support that work.

9.1 Research Questions Revisited

This dissertation began with three sets of seven research questions that the results should have been able to address. In the following sections, I restate these questions and review the results that address each research question.

9.1.1 Problem Motivation

The first set of research questions were in service of my problem motivation. Both questions assumed from prior literature that emotions would be expressed in the ER. The first research question was aimed at investigating the reason behind these expressions, whereas the second research question was concerned with determining how and where these expressions are conveyed.
**RQ1: How does the expression of emotions support the coordinated work of an ER?**

Towards the first question, we learn from the results presented in chapter five that emotions are expressed in response to a patient or the patient’s course of care, in response to a coworker’s work effort, or in reference to the environment in which he is working (i.e. the activity level of the ER or the equipment they are working with). Many emotions that are expressed have a functional role in achieving medical outcomes (e.g., enhancing patient care), whereas others have no specific function (though they may have indirect effects through changes in awareness). The fact that the majority of emotions I observed were playing a functional role suggests that emotion expressions take place as part of information sharing to help the work progress in an effective fashion. My analysis further suggested that these functional expressions of emotion could directly help the unit by facilitating the development of shared mental models or a call to action.

Given that observed instances of emotion expression had different work-related sources of emotion, it may be that the associated emotions have different consequences on ER work processes or outcomes. To better understand the consequences of these three sources of emotions on medical work I considered the outcome of the emotion expressions on the trajectory of an individual patient’s illness and on bed management.

*Illness trajectory* is a term coined by Strauss, Fagerhaugh, Suczek, and Wiener (1985); it encompasses not only the fairly predictable course of the illness but also the “organization of the work done over that course, plus the impact on those involved with that work and its organization” (p.8). Thus it is a highly situated construct, viewing the illness as a focus point in a set of interrelated processes and effects; as such it is
particularly useful in my analysis of emotion in the complex context of the ER. An illness trajectory begins at diagnosis. After that point the caregivers develop and maintain an illness trajectory “prediction” that guides the course of their care. When contingencies arise, the caregivers refer to this trajectory as part of making decisions about options that will allow them to proceed on the planned course of care.

Considering the role of emotion through an illness trajectory lens, I can see that emotions provoked by patient interactions play a part in both the point of diagnosis as well as at option decisions. For instance, the nurse’s felt concern or worry about the nice old lady in the ER may prompt the doctor to make a safer (i.e. more cautious) diagnosis that ultimately results in admittance to the internal medicine unit. A triage nurse’s suspicion that a patient is a drug seeker (perhaps conveyed as a side remark in a disapproving tone) may prompt a doctor to discharge the patient immediately after the first diagnostic test rather than running more tests to address other hypotheses. These emotion expressions play an important role in planning and managing the patient’s care; however, they are not documented as part of the formal documentation created during patient treatment. Such emotion expressions emerge only in face-to-face setting between caregivers.

In contrast, emotions toward the environment are not patient specific; even so, they can modify the illness trajectory for individual patients. During high activity days, when everyone is feeling the pressure to move patients out of the ER, the agreed-upon standard of care may be adjusted in a global fashion. For instance, consider the following interaction observed on a high activity day.

*Resident to nurse: “We are going to send him home”*
“So that’ll be a world record!”
“Haha, he’d like labs? No!” [O, 18]

In this exchange, the resident is making a joke that implies that normally he would conduct further lab work for the patient; but because they are at full capacity with a packed waiting room he will not entertain any further lab work and just discharge the patient.

Emotions expressed in response to the environment can also impact the bed management process. For instance, the previous example of the charge nurse expressing her feelings about the state of the ER “It has not been a good morning” [O, 22] imparts her motivation to get patients admitted or discharged more quickly. In addition annoyance with an attendings’ slow progress in discharging patients can cause the attendings to move faster and thus help with bed management.

RQ2: In what form are emotions expressed in the ER?

Towards the second question, I also showed in chapter five that emotions are primarily expressed in a face-to-face manner and rarely through formal communication channels like forms or other documentation. There were many occurrences of the direct expression of one’s emotion from one worker to one or more staff members through either specific words (e.g. “…I’m getting killed out there!”) or through vocal inflections (e.g. the softly spoken ‘concerned’ tone of voice). In addition, there were also a number of instances of venting where a worker expressed their emotions out loud or through visible bodily actions to no one in particular (e.g. Clerk out loud: “I’m going to have a stroke in this department.”). In addition, in chapter six, I showed that some emotion expressions are found in work processes and transient environments (e.g. ED Record
Shuffle). Most importantly, in chapter six, I show that the form of the medium can affect the form of the expression (e.g. paper documentation, transient whiteboards).

Given that emotion may play varying roles in an illness trajectory and bed management, one might expect that the expression of the corresponding emotions may require different forms or media of communication. Although it may be best to express emotions related to a patient’s course of care in a patient-related document or medium, it is not the appropriate place to vent one’s feeling towards a coworker or the environment. Thus, because emotion can arise in response to various sources, the expression of emotions in work are in order to elicit behaviors towards different work responsibilities. In general, an emotion about a patient is to elicit from a coworker a behavior towards the patients. An emotion about a coworker may be to elicit from a coworker a behavior towards bed management.

The studies summarized in the literature review provided a starting point for investigating work-related emotion expression in the medical domain. For example, I reported face-to-face interactions that involve a variety of informal information - affective information such as stories and experiences with patients (Kerr, 2002), summary judgments regarding the patient’s psychological state and personality (Lamond, 2000), feelings towards the patient and their care (Philpin, 2006), stereotypes that encompassed feelings towards the patients (Evans et al., 2008), intuitions regarding care (Mueller et al., 2006), and the patient’s psychosocial information (Zhou et al., 2009). All of these types of information are of a subjective type, not grounded in factual data; however, the information is important enough to be regularly shared, discussed, and acted upon for effective patient care. My findings add to the growing number of studies that
show the importance of “soft” data alongside the “hard” data. They go beyond what has been reported thus far by expanding the analysis of emotion expression in coworker interactions.

9.1.2 First Research Motivation

The second set of research questions was in service of my first research motivation. Both questions are concerned with coordinated work more generally and require the generalization of the results beyond the ER. I will begin by reviewing the answers towards RQ4 and then return to RQ3.

RQ4: How does the social context shape the expression of emotion in coordinated work?

In chapter six, I show for RQ4 that social context can include the rules associated with the display of emotion in the workplace. Rules governing how emotions should be expressed in a work setting can arise from three entities: an individual, the group, or the organization. These results echo that of Bolton (2000), Hackman (1990), and McGrath (1991) who all highlighted the influence of these three entities on the workgroup. These rules can either be constraining or promoting of emotion expressions. Thus, how emotions are expressed depends on context: to whom one is expressing, about what the expression is in reference, and where the expression will reside (i.e. formal documentation, informal documentation, face-to-face).

Despite the usefulness and even necessity for emotion in the workplace, there is a corresponding need for control of emotional displays – whether written or behavioral. Thus I observed that emotions are conveyed through multiple forms of interaction,
depending on what is acceptable between collaborators, and are at times are expressed through invisible or surreptitious communication mechanisms. Many of these variations can be understood as accommodations to the emotion display rules that are associated with either medical work in general or the work of the ER in particular.

The concept of display rules has been a well-researched concept in the organizational behavior literature. For examples, researchers have proposed that workers are taught such rules through their observations of other’s emotion expressions (Scott & Myers, 2005; Van Maanen & Kunda, 1989). However, my data has highlighted cases when emotions were also reinforced because a worker ‘breaks’ a display rule – an example is the nurse who breaks down in the ER when she was overwhelmed. This suggests that another mechanism for learning emotion display rules may be through extinction from coworkers. When work simply gets too tough and an emotional display erupts, careful reactions from coworkers (e.g., distancing of the upset worker) may help to convey to the emotion-expressing individual that venting episodes such as these are undesirable.

Earlier work on emotion display rules has focused primarily on rules associated with the organizational level. Employees learn what the organization expects of them in their work behavior (e.g. how a Starbucks employee greets and relates to customers). However, my study of the ER has pointed to other sources of display rules, creating a much more complicated environment for the display of emotions – especially between coworkers. Multiple entities may contribute to either minimizing or promoting the visibility of emotion; I discussed examples coming from the organization, the group, and
the individual. Each of these entities has different influences on the mediums used for emotion display.

In the ED, the organization’s rules regulated the formal documentation practices that, in turn, reified the inappropriateness of emotions in this work environment. Transient displays were the only ‘suitable’ location for many expressions of emotion. A similar finding was reported by Zhou et al. (2009). They describe how a temporary written document that contained psychosocial information had a note on it explicitly stating that the form is not a permanent part of the medical record. This enabled use of the document for sharing sensitive psychosocial information. However, prior to the move to the new information system, nurses were specifically instructed to not use psychosocial language in the new system to “avoid trouble” (Zhou et al., 2009, p.2065). Subtle design choices and statements by administration such as these force emotions to become invisible in the work practices. Yet even when not formally recognized or encouraged, emotions exist and influence work, despite rules and structures about their display.

The rules for the display of emotion in a face-to-face environment are more open than those of a written environment; however, both ED work groups and individual staff members have their own rules and standards regarding acceptable display of emotions. These display rules are not formally defined, but rather are taught and reinforced using verbal and behavioral indicators.
RQ3: How does the expression of emotion play a part in the development of emotion awareness in coordinated work?

Later in chapter seven, I return to RQ3 and describe the relationship between the two primary face-to-face forms of emotion expressions and the development of emotion awareness at both the individual and group level. I also show how the EASI model and two prominent theories of coordination of work (articulation work and common ground) inform the model of the expression of emotions and emotion awareness.

9.1.3 Second Research Motivation

My final research question is in service of my second research motivation. This question was meant to extend the findings to provide guidance for the Affective Computing domain as well as address considerations for the healthcare technologies domain.

RQ5: How can we design information systems for the socially manifested emotion expressions of a coordinated work environment?

In Chapter 8, I review the two predominant perspectives for designing for emotion and present ways in which these perspectives pertain to the ER I observed. I then conjecture what may occur with the introduction of new information systems that are designed for the medical domain. This analytical technique showed that there might be some unintended consequences that must be addressed to ensure emotion awareness is not affected by increasing emotion expression invisibility.
9.2 Future Research Directions

Clearly it is important to continue investigating emotions in the medical environment. Further research should address how emotion can be expressed while also being sensitive to the expression rules imposed by various entities. In chapter 8, I provided a few examples as to how this may occur. Specifically, I think the best approach is to provide ‘alternate’ mediums, separated from the formal documentation, that encourage emotions as an integral part of the medical work process. Even the concept of annotating a formal document with a transient comment emphasizes the need to separate clearly what is formal and thus persistent, and what is informal and thus transitory. These ideas could be vetted through further qualitative studies of emotion expression during decision making as well as the use of participatory design with medical workers.

Another important step will be to replicate this study in a different ER setting, or perhaps even another critical environment such as emergency response; this would help to understand what parts of my findings are general, and what parts are tied to the ER context or even this specific ER. But the highest-level point in my conclusion is unlikely to vary if other ER settings are studied: emotions are an integral part of medical work. We have yet to learn whether and how emotions expressions play an integral role in the coordination of work in other critical work environments such as firefighting, emergency management, or law enforcement.

9.3 Conclusion

Through this qualitative investigation of emotion in an emergency room, I have shown that emotions exist in parallel with more formal and recognizable work
information and interactions. Expressing emotions is an integral part of the work performed; however for a variety of reasons, emotion content is absent in formal documentation. As we continue to pursue research questions and system design we cannot ignore emotions, perhaps using their relative invisibility as a rationale. We must continue to articulate their role in work practices and uncover their characteristics, so that we can support these aspects of work. The problem arises when we do not acknowledge these implicit work phenomena. In making emotion more visible to researchers and designers, I hope to move the field toward greater acknowledgement and understanding, and hopefully eventually better support.
References


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Appendix A. Open-ended Formal Interview Questions

A. Roles
1. Role of interviewee.
2. Take me through a typical day.

B. Paper recording Habits
1. What information do you write in the patient records?
2. To whose benefit are you writing that information (i.e. do you expect someone else to read it or is it just for you)?
3. What type of information don’t you write down in the patient charts? Why?
4. How do you see information recording differ between new [role type] and experienced [role type]; nurses vs. NAs; attending vs. residents?

C. Information Sharing Focused Stories
1. Tell me of a time you were handing off a patient to another [doctor/nurse] during a shift change: what information was shared and why?
2. Tell me of a time you spoke with a [doctor/nurse] regarding a patient: what information was shared and why?
3. Have you ever needed information and knew it wouldn’t be in the patient charts? What did you do/where did you go?
4. Tell me about a time when there was a misunderstanding between you another staff member regarding a patient (what was the cause, what was the outcome).

D. Affect Focused Stories
1. Remember the last hectic day you worked in the ER. What were your information sharing practices like? How were they related to your goals?
2. Remember the last slow day you worked in the ER. What were your information sharing practices like? How were they related to your goals?
3. Tell me a time when you were frustrated by the information flow between you and another ER staff member.
4. Tell me a time when you were pleased by the information flow between you and another ER staff member.

E. Information Systems
1. What do you like/not like about PatientTrack?
2. What do you like/not like about InLab?
3. What hopes/concerns do you have for when the ER transitions to using PatientTrack for orders and notes?
Appendix B. Images of Paper Information Sharing mediums

Figure B-0-1. Triage Section of ED Record Document

Figure B-0-2. Physicians Reporting Areas of ED Report Document
Figure B-0-3. Attending Physician Area of the ED Report Document
<table>
<thead>
<tr>
<th>TIME</th>
<th>MEDICATION</th>
<th>DOSE</th>
<th>ROUTE</th>
<th>SITE</th>
<th>URINE</th>
<th>OUTPUT</th>
</tr>
</thead>
</table>

Figure B-0-4. Medication and Progress Notes Sections in Nurse Assessment Document
Helena M. Mentis: Abridged Curriculum Vitae

Education

Doctor of Philosophy in Information Sciences and Technology, May 2010
The Pennsylvania State University, University Park, PA, USA

Master of Science in Communication, minor in Cognitive Studies, May 2004
Cornell University, Ithaca, NY, USA

Bachelor of Science in Psychology, Cognitive Psychology focus, May 2000
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Experience

Mobile Life Center at SICS
ERCIM Postdoctoral Fellow, Kristina Höök 2009-2010

Penn State University CSCL Lab
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Lockheed Martin
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Cornell Human Computer Interaction Lab
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Philips Research
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Virginia Tech Human Computer Interaction Lab
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Publications & Presentations

Archived Conference Publications (11)
Book Chapters (3)
Workshops (6)
Non-archived Publications and Invited Talks (10)

Academic Awards & Recognition

Summer Institute for the Consortium for the Science of Socio-technical Systems, 2009
Information Systems for Crisis Response and Management (ISCRAM) PhD Colloquium, 2009
Computer Supported Cooperative Work (CSCW) Doctoral Colloquium, 2008
National Science Foundation Graduate Research Fellowship, Honorable Mention, 2006
Cornell Cognitive Studies Summer Fellowship, 2003