"It's Like a Circus in Here!" Affect and Information Sharing in an Emergency Department

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Abstract
The following research begins to address the relationship between affect and information sharing in order to inform the design of collaborative systems. Through ethnographic observations of affect and face-to-face information sharing in an emergency department we begin to see trends on the occurrence of affect due to context as well as the relationship between affect and information sharing outcomes.

Keywords
Emotion, information sharing, collaboration

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

CHI 2009, April 4–9, 2009, Boston, Massachusetts, USA.
ACM 978-1-60558-247-4/09/04.

Introduction
The importance of affect in the design of interactive systems has gained acceptance in the HCI community based on numerous psychology studies. For instance, affect has been shown to have an important effect on an individual's motivations and goals. For instance, mood (a long-term affective state) influences motivation by informing people when they have achieved their goals [6] (i.e. positive mood indicates the goal has been achieved and one can stop, negative mood indicates the goal has not been achieved and one should persist). However, there are a number of studies which show that affect also influences a group's behavior. Emotional contagion, the process of "catching" others' emotions, occurs in groups [5] and can lead to a group's general affective tone [4]. Positive homogenous group affective tone can improve group processes by increasing cooperativeness which can in turn increase levels of group performance [2]. And yet, there has been much less attention given to affect in the design of collaborative information systems.

Because affect influences both individual and group behavior, the adoption of an emotional lens can be beneficial in designing collaborative information

systems that support processes such as information sharing.

The intention behind information sharing is to influence another's understanding of the world. Toward this end, [8] acknowledged that group members deliberately select what information to mention and how to mention it in order to satisfy personal motivations and goals as well as shared group goals. If one takes a goal-oriented perspective on information sharing, questions surface concerning the information sharer's affect. In a real information sharing environment, a person's emotional state or mood may well influence what, how, and to whom information is shared. Understanding this phenomenon can be particularly useful in designing collaborative information systems.

Studying Affect in Collaborative Information Sharing
In studying affect in group information sharing we are guided by [3]'s interactional approach to conceptualizing and studying affect. In this approach emotions are not "internal, individual, and private phenomenon" but rather are a "witnessable property of social action, a way in which actions are rendered interpretable and meaningful (p.280)". Thus, merely viewing emotions as measurable biological and finite facts precludes us from gathering a rich view of emotional experiences. The interactional approach is more in line with sociological and anthropological studies of emotion rather than the prevailing cognitive science studies which have dominated the affect in HCI literature. Thus, it encourages the use of methods that capture the "complex expression of the experience of emotion (p. 285)" such as observations and interviews. Thus, because we want to understand the deeper structure of affective phenomena within a collaborative contextual setting, we are conducting an ethnography to delve into the relationship between affect and information sharing.

Information Sharing in Emergency Departments
To address the relationship between affect and information sharing, while also ensuring it is addressed in the context of real world collaborative settings, I am investigating a medical emergency department (ED). In this setting, communication failures - particularly information sharing failures - are a primary contributor to many fumbled handoffs and medical errors [7].

Because there is such a high rate of medical errors in EDs, hospitals are beginning to push for an integration of electronic patient records and other information systems in order to increase efficiency and safety. However, many new problems have emerged in the process of moving to a paperless hospital [1] – many of these are due to a lack of understanding of how staff coordinate and communicate in an ED. A more complete understanding of how affect influences information sharing in this critical environment could be used to support the design of effective information technology.

Research Questions
To initiate a research program on information sharing and affect, we asked the following research questions:

1. *When does affect play a part in information sharing in an emergency department?*
2. *How does affect play a part in information sharing outcomes in an emergency department?*

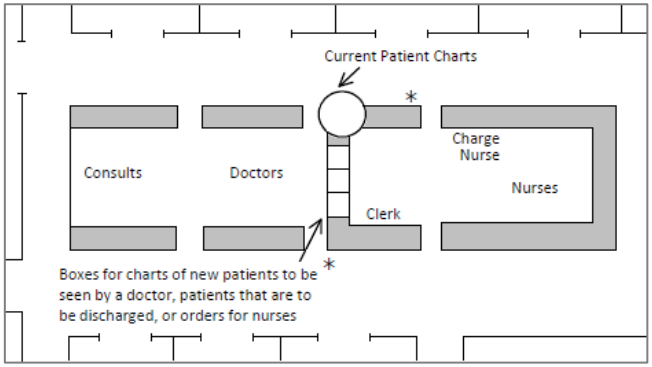

Figure 1. Layout of ED Personnel Stations. Stars indicate location of researcher during observations.

Approach

This study is being conducted at a large level 1 trauma hospital in the center of a major U.S. metropolitan area. It is an academic medical center that is a major receiving site for police and fire rescue patients; it also services a large number of walk-in patients from the general population. This ED has not fully integrated the use of information technology; for instance, it maintains paper patient records for both nurses and doctors to document patient information and orders. In addition, a substantial amount of information needed to redirect patient care is relayed in face-to-face sessions.

Data Collection

This initial report is based on a collection of ED observations and informal interviews. A single researcher observed the ED personnel discussing patient care during formal shift changes, as well as ongoing informal information sharing and decision making episodes (see figure 1 for reference of environment). These discussions occurred between both personnel with similar roles (e.g., nurse and nurse assistant; attending physician and resident) and personnel filling different roles (e.g., charge nurse and attending physician).

The researcher noted all episodes of information sharing that appeared to include an instance of affect. For instance, a nurse might share with the nurse assistant her feelings about a patient they are discussing. In addition, the researcher recorded her interpretation concerning the outcome of the affective information-sharing episode. In the above example, the interpreted outcome is that the nurse assistant is now aware of the nurse's feelings toward the patient for whom they are coordinating care. 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.

Observations were conducted in 10 different visits on different days of the week (7 during the week and 3 on the weekend); and at different times of day (2 in the morning, 4 in the afternoon, and 4 in the evening) for a total of approximately 70 hours. The observations took place during 12 shift changes and about 35 face to face information-sharing episodes.

Data Analysis

The researcher's notes were open-coded to collect affect terms used by participants and/or the affect interpretation of the researcher (e.g. joking with one another, 'frustrated') and information sharing outcome (e.g. built awareness, created a shared mental model of care). In addition, each day was coded as a modular case, with an activity attribute that indicated whether the day was 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").

Results

Affect in Information Sharing and Activity Context

To address our first research question we investigated the relationship of affective episodes to the overall level of activity in the ED. Figure 2 demonstrates that we observed an increased number of affective information sharing events on high activity days, including an increased number of negative affect states such as frustration, annoyance, and anger. Note, however, that there is also a high frequency of joking occurring on these high activity days, despite (or maybe because of) the stressful context.

Our observations document that affective information does play a role in highly critical environments and increasingly so on high activity days. Importantly, it influences both success and failure in information sharing. For instance, the following exchange began with a miscommunication between the physicians and the charge nurse on a high activity day. The intern had not informed the charge nurse that she is trying (unsuccessfully) to find a transport for a discharged patient. In this interchange the charge nurse had come over to complain to the attending physician about the patient not being discharged yet. She learns that the delay is caused by problems in trying to get a transport.

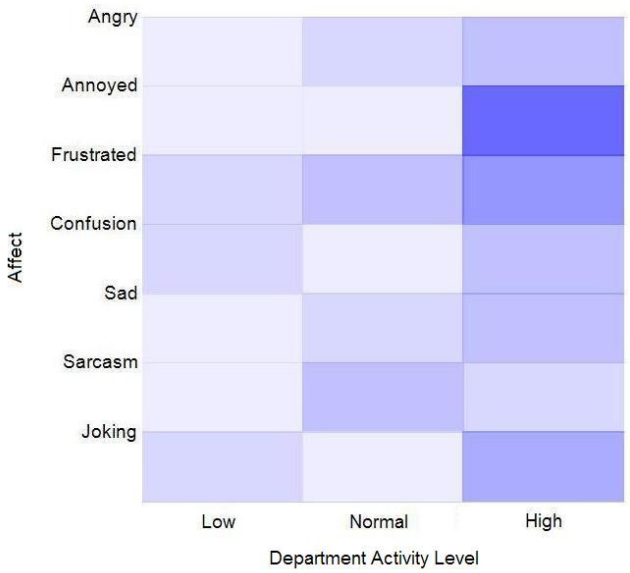

Figure 2. Affect Occurrence and Emergency Department Activity level. Increased shading indicates increased number of occurrences.

CN: *"It is almost 5PM!! You need to call them right now!"* <emphasis added>

Attending:*"That's why I'm trying to call - the faster I call the faster she is out of here!"*
CN:*"Well duh. You should have thought of this hours ago. On a Saturday!!"*
<The two storm off in different directions.>

The lack of initial information sharing caused an already overstressed charge nurse to snap at an attending physician. This in turn led to tension between the two parties and contributed to breakdown in coordinating a transport.

In another example, a cardiology consultant became extremely agitated and frustrated because he had previously spoken to an ED intern and had *"gotten the pic"* that he was to be consulting on an echocardiogram which had already been completed. He begins to yell at the attending physician, *"from now on I will talk to you (points to attending) to get the pic."* The attending begins to reproach, *"but that is part of the learning process!"* and an argument ensues. At this point a much calmer ED attending intervenes, allowing the attending to walk away and calm down and the consultant to later say to the attending *"I, like you, want to see the patient get better so I will put politics aside".* Again, the lack of proper information sharing led to frustration which prevented further appropriate information sharing to ensue until one relented.

In contrast, affect can also contribute to effective information sharing by creating a positive and safe environment. For instance, during a particularly hectic day a resident informs the nurse that he is going to send a patient home now. The nurse responds with a laugh, *"So that'll be a world record"*. This elicits further joking from the resident. *"Haha he'd like labs? No!"*

This joviality continued to show up in the rest of their exchanges. The stress of the day was no longer a problem for these two collaborators.

Affect can also be used to elicit helpful action by a collaborator. A charge nurse who is having a problem with an attending physician at another facility tells the ED 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 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!"*

Affect and Information Sharing Outcomes
For our second research question, we investigated when and how affect plays a part in information outcomes. Affect contributed to both awareness outcomes and shared mental model development.

Awareness may initially arise as 'awareness of a patient's state'. For instance, before a resident attends to a new patient, the nurse explains to him that the female patient just lost her 18 year old daughter two weeks ago due to an unknown ectopic pregnancy bursting. She describes the patient as lifeless and depressed, not suicidal, but very down. The nurse says this in a very concerned voice that conveys sympathy and a sense of understanding, as the resident flips through the chart. After hearing what the nurse has to say, the resident seems confused. The nurse tells him *"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."* In this interchange, the nurse relates information to the resident to enhance his awareness of the patient's situation. She does this partly so that the resident can think whether this may be a cause of the symptoms, but also to guide the resident's behavior, i.e. treat the patient with empathy.

Another example of awareness is 'awareness of collaborator's state'. In the following vignette, the charge nurse has just attended to a number of vital issues brought to her by other ED personnel. She has just had the opportunity to sit down in her chair when a consultant approaches to ask her a question. Before he can open his mouth the charge nurse raises her hand in the air and says in an annoyed tone of voice,

CN visibly overstressed: *"Don't talk to me right now. I have 2 things in my head."*
<two minutes go by as the nurse writes some things down on a piece of paper and takes a few drinks of her coffee – the Dr. waits patiently.>
CN: *"OK. Now you can talk, doctor."*

Awareness of collaborator's state can provide cues as to when certain information is important to be shared and when it can wait. In this scenario, the nurse was not in a state to take on any more information. Without even knowing what the doctor was about to request she cut him off and indicated that she was probably stressed out and annoyed. Instead of responding poorly, this doctor understood that he should just wait for her to relax for a few minutes.

Another example of how affect influenced information sharing outcomes is the creation of a shared mental

model. Shared mental models enable collaborators to agree on the direction of care and work independently toward these shared goals. Affect helps to inform these mental models.

<An attending turns to a nurse going to see a patient>
Dr. with sarcasm: *"He is working up a storm in there."*
<pauses as Dr. makes 'boohoo' nonverbal motion.>
Nurse: *"yeah"* with a slow nod.
Dr. in back-to-business tone: *"I may keep him off oxygen to document the O2 not dropping or I may just discharge him..."*.

In this exchange, the physician expresses to the nurse her annoyance with the patient as well as her belief that he is faking it. 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 try to move the patient out of the ED, 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 'deal with the patient'.

A final example of a shared mental model being facilitated by affect comes from a charge nurse talking to another nurse who has just started her shift. While looking 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."* She begins her discussion by stating her overall feeling and then follows that with what they should do about it. By expressing her exasperation with the current situation she orients the incoming nurse, focusing her on the goal of discharging or moving patients out of the ED.

Conclusion

These findings provide initial insight into the relationship between affect and information sharing. Further data collection and analysis is underway to explore these trends as well as discover new relationships. The goal is to provide guidance for the design of collaborative information systems.

Citations

[1] Ash, J. S., Berg, M., & Coiera, E. (2004). Some unintendended consequences of information technology in health care: the nature of patient care information system-related errors. *JAMIA, 11*(1), 104-112.

[2] Barsade, S. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *ASQ, 47*(4), 644-675.

[3] Boehner, K., DePaula, R., Dourish, P., & Sengers, P. (2007). How emotion is made and measured. *IJHCS, 65*(4), 275-291.

[4] George, J. M. (1990). Personality, affect, and behavior in groups. *J. of App. Psych., 75*(2), 107-116.

[5] Hatfield, E., Hsee, C. K., Costello, J., Weisman, M. S., & Denney, C. (1995). The impact of vocal feedback on emotional experience and expression. *Journal of Social Behavior and Personality, 10*(2), 293-312.

[6] Martin, L. L., Ward, D. W., Achee, J. W., & Wyer, R. S. (1993). Mood as input: People have to interpret the motivational implications of their moods. *Journal of Personality and Social Psychology, 64*, 317-326.

[7] Sucov, A., Shapiro, M. J., Jay, G., Suner, s., & Simon, R. (2001). Anonymous error reporting as an adjunct to traditional incident reporting improves error detection. *Academic Emergency Medicine*.

[8] Wittenbaum, G. M., Hollingshead, A. B., & Botero, I. C. (2004). From cooperative to motivated information sharing in groups: Moving beyond the hidden profile. *Comm. Monographs, 71*(3), 286-310.