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The Impact Of Intraorganizational Trust And Learning Oriented Climate On Error Reporting

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THE IMPACT OF INTRAORGANIZATIONAL TRUST AND LEARNING ORIENTED
CLIMATE ON ERROR REPORTING

by

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ABSTRACT

Insight into opportunities for process improvement provides a competitive advantage through increases in organizational effectiveness and innovation As a result, it is important to understand the conditions under which employees are willing to communicate this information. This study examined the relationship between trust and psychological safety on the willingness to report errors in a medical setting. Trust and psychological safety were measured at the team and leader level. In addition, the moderating effect of a learning orientation climate at three levels of the organization (i.e., team members, team leaders, organizational) was examined on the relationship between trust and psychological safety on willingness to report errors. Traditional surveys and social network analysis were employed to test the research hypotheses.

Findings indicate that team trust, when examined using traditional surveys, is not significantly associated with informally reporting errors. However, when the social networks within the team were examined, evidence that team trust is associated with informally discussing errors was found. Results also indicate that trust in leadership is associated with informally discussing errors, especially severe errors. These findings were supported and expanded to include a willingness to report all severity of errors when social network data was explored. Psychological safety, whether within the team or fostered by leadership, was not found to be associated with a willingness to informally report errors. Finally, learning orientation was not found to be a moderating variable between trust and psychological safety on a willingness to report errors. Instead, organizational learning orientation was found to have a main effect on formally reporting errors to risk management and documenting errors in patient charts. Theoretical and practical implications of the study are offered.

This dissertation is dedicated to my grandmother and mother, Betty Stephens and Paula Robertson. Their personal strength taught me to reach for the highest goal, and whose love and faith kept me going.

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INTRODUCTION

In recent years, the buzz word 'social capital' has become popularized in relation to knowledge management and understanding the informal networks by which information travels. One of the most well-known modern-day discussions of the utility of social capital was presented by Malcom Gladwell (2002). In *The Tipping Point,* Gladwell discussed how the spread of popular trends and even disease can be understood through social connections and ties to others. In the organizational setting, Leana and Van Buren (1999) described organizational social capital as a supply of interpersonal connections within an organization that may be used to create value and facilitate collective action. Thus, it may be that it is becoming increasingly important to have the 'right' social connections in order to access needed information and resources. Leana and VanBuren's description of organizational social capital may lend support to the old adage that knowledge is power.

At a macro-level, knowledge provides organizations a competitive advantage through increased organizational effectiveness and innovation (e.g., Argote, 1999; Conner & Prahalad, 1996; Grant, 1996; Grant, Baden-Fuller, Ghoshal, & Moran, 1995; Lewis, 2004; Liebeskind, 1996; Wernerfelt, 1984). Often times, the most valuable knowledge is created over time through the experiences and day-to-day interactions of employees. These intraorganizational experiences and interactions are valuable not only when new information is created but also when employees actively evaluate processes to improve future performance and adapt to an ever-changing environment. Consequentially, researchers are now examining the relational components of knowledge

transfer (Levin & Cross, 2004) and the conditions under which knowledge is transferred (Lesser & Prusak, 2004)

In this paper, the social interactions and networks that exist within a team and department will be examined to better understand how information travels within an organization. Further, an emphasis will be placed on the circumstances under which information, which may be used to improve the quality of services provided, is shared with colleagues, team leaders, and the overarching organization. Although there maybe any number of types of information that could benefit organizational effectiveness, this study will focus on error reporting. This focus on error reporting is due to the benefits organizations receive when employees reflect on their performance, discuss unexpected outcomes, test assumptions, and openly discuss errors among team members (Edmondson, 1999). Justifiably, employees may be cautious in openly discussing their own errors or the errors of their colleagues in fear that they might be perceived as incompetent, have reduced opportunities for promotion, or even be labeled as a whistle-blower or tattle-tale. So the question arises, given that some employees are willing to speak up and openly admit to and discuss errors, under what conditions will employees be willing to engage in behaviors such as reporting errors?

In general, trust has been strongly associated with a willingness to communicate and share information with team members (Larson, 1992; Shapiro, 1990; Zucker, 1986) and with leaders/managers. (e.g. Clutterbuck & Hirst, 2002; Dirks & Ferrin, 2002; Gillepsie & Mann, 2004; Treadway, Hochwarter, Ferris, Kacmar, Douglas, Ammeter, & Buckley, 2004). Given that discussing errors creates vulnerability on the part of the employee and that trust may act as a social lubricant in the face of vulnerability, it is

proposed that trust will be a primary factor in employees' willingness to report errors.

Another factor that may influence the decision to share information is whether an employee perceives that his/her input is valued and desired. That is, does the employee perceive there to be a climate in which learning from errors and questioning the norms is acceptable? An organizational climate is defined as a shared perception of what is valued or expected in the work environment based on the norms, policies, and procedures within the team and/or the organization (Schneider, 1990). Therefore, the climate that is perceived to be fostered by teammates, team leaders, and/or the organization is likely to indicate whether information sharing is valued by the organization. Specifically, a learning oriented climate may bolster an employee's decision to openly discuss errors.

Purpose of the Research

Team theory implies that teamwork and taskwork are solely performed by those whom are 'on the team' (e.g., Hackman, 1990). Yet, many employees engage in practices and/or tasks that do not align with espoused job descriptions and reporting protocols in order to accomplish their tasks (e.g., Brown & Duguid, 1991; Suchman, 1987). In fact, individuals often create and depend on personal networks (i.e., informal organizations; Blau & Scott, 1962) to resolve problems (Boissevain, 1974) and gain power/promotions within an organization (Burt, 2000). The motivation for creating certain ties with individuals vary (e.g., Burt, 1992; Milgram, 1967) and this is reflected in the structure of the resultant informal network. Past research has provided evidence that trust mediates patterns of social interaction and information sharing (e.g., Coleman, 1988; Levin, 1999; Tsai & Ghoshal, 1998).

The purpose of this study is intended to bring to bare the literature on social networks, trust, and learning oriented climates to better understand the phenomena of sharing information that may be personally risky. Specifically, this study will use a combination of traditional surveys and social network analysis (SNA) as a methodology to examine the association between informal communication patterns among employees and the trust held towards representatives of two levels of the organization (i.e., team, team leader). This statistical technique will allow informal relationships to be examined systematically and provide quantitative evidence of the influence of these relationships on important organizational processes.

A second purpose of this study is to examine the moderating effect of a learning oriented climate, fostered by teammates, team leaders, and/or the organization, on the relationship between trust and error reporting. Klein, Tosi, and Cannella (1999) and others identified a dearth of research that examines mid-level constructs (e.g., leadership, climate) or acknowledges high level constructs (e.g., organizational context) on individual-level characteristics (e.g., attitudes, behaviors). As such, measures of climate at three levels of the organization will be used to determine whether the climate further promotes (or suppresses) error reporting in the presence of trust. This examination of trust and climate is a significant contribution to the literature by spanning across multiple levels of the organization and beginning to frame both the macro and micro view of the constructs of interest. In the following pages, the theoretical framework used to guide this study is presented. Figure 1 provides a graphical representation of the constructs included in this study and the related hypotheses. Next, the proposed methodology and analysis is described. The paper concludes with a discussion of the scientific and practical

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implications of this study.

<div align="center">Overview of Social Network Analysis</div>

The early foundations for modern day SNA are harkened back to the 1930's when researchers (e.g., Köhler, Lewin, Moreno, Radcliffe-Brown) sought to understand social structure and interactions, cliques, and group dynamics. Two major innovations relevant to this paper stemmed from this early research. First, the sociogram that allowed researchers to graphically represent the flow of information between individuals. By analyzing the sociogram, it was possible to identify social structure within a group such as emerging leaders and individuals isolated from the group. Moreno's work was the foundation for graph theory, which more realistically represented the strength, positivity, and direction of relationships within a larger network of individuals (Cartwright & Harary, 1956). The second early innovation was group behavioral theories associated with Lewin (1936) that argued 'social forces' acted within a group to create meaning and that these social structures could be mathematically modeled.

Over the past 70 years, the researchers have continued to refine theories, develop increasingly more complex mathematical models, and use SNA in a wide variety of fields. Examples of influential studies examining organizational issues and information sharing include: the power of informal networks within the formal organizational hierarchy (Cross, Borgotti, & Parker, 2002; Krackhardt & Hanson, 1993), the impact of interpersonal relationships (or lack thereof) on information flow (Burt, 1992) and access to unique information (Granovetter, 1973), and the influence of trust on social network development (Levin & Cross, 2004).

Despite the early use of SNA to understand group dynamics, much of modern team research has depended heavily on the use of observation and attribute data. Using observational data, it is necessary for the researcher to observe behavioral manifestations of the constructs of interest – leaving to chance that the behavior occurs, that the researcher observes it, and that the behavior is an accurate representation of the construct of interest. Attribute data, conversely, is typically a series of questions or items intended to measure team members' perceptions, attitudes, and/or motivations of the team and team interactions. Herein, attribute data will be generically referred to as 'traditional surveys'. The challenge in using traditional surveys such as these is that it is unlikely that everyone within the team is perceived similarly. Traditional surveys do not provide adequate opportunity for participants to disclose these differing perceptions. The responsibility is placed on the participant to do the mental calculations to average his/her perceptions of each team member into a single rating for each item on the survey.

Based on the extensive research conducted on teams and teamwork, there is evidence to suggest that while participants will provide a team rating when asked. By employing SNA, the common (and nearly exclusive) use of traditional surveys in the study of teams, is called into question. Traditional surveys may not accurately reflect the interpersonal relationships that actually exist within the team. Instead, it is proposed that a richer, naturalistic approach to understanding team dynamics is to examine teams as a social network. A social network consists of two or more interdependent members (or actors) in which there is an assumption of patterned interactions based on either theoretical rationale or empirical evidence (Wasserman & Faust 1994). From this social network perspective, the attributes of any given person within the team (i.e., his/her

attributes, attitudes) is not of interest. Instead, the interest lies in the collection of individuals and the linkages between them within the social environment (Wasserman & Faust, 1994). SNA aims to accurately model these linkages among a finite set of actors.

In the following pages, several commonly used SNA measures and methodology will be described to provide greater explanation of the utility of this approach to examining team dynamics. This review will focus on measures relevant to study detailed here, but for a more complete review of the social network measures available see Wasserman and Faust (1994).

<center>Common Social Network Analysis Measures</center>

The measures used to examine social networks are as diverse as the networks that they have been developed to investigate. To that end, social network analysts often depend heavily on qualitative analysis and interpretative conclusions. As with all research methodologies, statisticians continue to develop and refine analytic approaches to bolster qualitative findings, quantify increasingly complex research questions, and test specific hypotheses. In general, there are two broad research interests within SNA. One interest is in understanding the social positions and roles that individuals hold within the network. This perspective examines the social structure of subgroups within a given network based on patterns of relationships and enacted behaviors. Thus, a social position is defined by regularities in ties between subsets of actors with an assumption that actors with similar types of connections within a network will have common attributes. For instance, it may be determined that a certain subset of individuals have linkages with both frontline sales people and executives. This position could be termed 'boundary spanner' because the

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position within the network tends to span two levels of the organization. Homans (1960) defined a role by the expected behaviors of individuals in a given social position. Returning the example of the 'boundary spanner', these individuals may have the role of ensuring the flow of communication from lower levels of the organization to executives and interpreting organizational policy to lower levels of the organization.

The other research interest of many social network analysts is in examining the structural nature of an entire network. Wassernan and Faust (1994) define social structure as "…patterns or regularities in relationships among interacting units" (p. 3). For the purposes of this study, the structural nature of the network was of interest and guided the selection of social network measures that would assist in testing proposed hypotheses. When examining the social structure of a network, measures of centralization and centrality are most commonly used. Although the terms centralization and centrality are often used interchangeably, Scott (2000) aptly points out that the constructs of centralization and centrality are distinct and provide unique information about the social network of interest. Specifically, Scott (2000) defines centrality in terms of prominent subsets of actors of actors within a network, whereas centralization refers to the overall cohesion of the network. In this study, centralization is measured via Network Density (ND). Centrality is measured via measures of Degree, Flow Betweenness (FB), and Reciprocity. In the following pages, these measures are described.

Network Density

Network Density (ND) is a measure of cohesion between actors within a social network and an indicator of network centralization. This definition of cohesion, which is mathematically defined as the proportion of the total linkages between individuals in the

informal network to the total possible connections (Scott, 2000), differs from how cohesion is commonly defined in the team literature. In team literature, cohesion within a team is defined as "members' positive valuation of the group and their motivation to continue to belong to it" (Janis, 1972, p. 4). This distinction is important to note because ND, or cohesion in terms of SNA, can be more broadly applied to any type of relationship or interaction within the network. The greater the ND, which ranges from 0 to 1, the greater connectedness that exists between all individuals within a network. Using a communication network within a team as an example, ND is a measure of the proportion of people within the team that speak to each other relative to the total number of team members that *could be* spoken to (i.e., total number of possible connections between individuals) within the specified group. The total possible number of connections is calculated as n (n-1).

A few drawbacks of this measure should be mentioned. First, NDs across teams (or networks) of different sizes cannot be meaningfully compared (Friedkin, 1981; Niemeijer, 1973; Snijders, 1981). The reason that NDs cannot be meaningfully compared across different sized teams is because it hinges on the total number of people within the team. Given research which suggests that there is a finite number of relationships that any one person can maintain (Mayhew & Levinger, 1976), it is commonly observed that as network size increases ND decreases (Scott, 2000). A second drawback identified by Scott (2000) is that the type of network measured can influence the ND. For this reason care should be taken when comparing the ND of one type of network (e.g., communication at the workplace) to another (communication outside of work), even when using the same set of individuals, regarding the conclusions drawn from these

differences in NDs. As an example, the researcher would need to be careful of interpretations of a large observed ND of communication at the workplace and a smaller ND of communication outside of the workplace. Depending on factors unique to the team being investigated and the design of the research study, it is possible that these differences in ND are due to 1) the quality of relationships within the team, 2) the geographic distance between team members influencing communication outside of the workplace, or 3) some other variable.

Despite the drawbacks, ND one of the most commonly used social network measures and is typically used in combination with measures of network centrality. As can be recalled, centrality assesses the existence of prominent subsets of individuals within a network. The most frequently used centrality measure is Degree. We turn now to a discussion of Degree and a related centrality measure, Betweenness.

Degree and Betweeness

Similar to ND, which examines the connectedness of all individuals within a network to each other, Degree examines the connectedness of a given individual to all other individuals within the network. Thus, each person in a team or network would receive a Degree score of their own. Simply put, Degree is a measure of popularity or prominence within a single network. As an individual's Degree score increases (ranging from 0 to 1), he or she is considered a more prominent member of the network. Using the example of a communication network, an individual with a higher Degree score is thought to have greater access to information within the team and is able to more widely distribute information. Using Degree scores, it is possible to determine whether communication can flow easily among all team members (relatively equal Degree scores

for all team members) or if certain team members enjoy greater access to information from disparate members of the team (unequal Degree scores among team members). Keep in mind, however, that members of the team can have equivalent Degree scores, but have dissimilar connections to team members. Taking the measurement of Degree further, it is also possible to determine the extent to which an individual within the team is a 'mediator' or a 'gatekeeper.' This assessment is the measure of Betweenness.

Betweenness is calculated based on the geodesic path between pairs of actors and calculating the proportion of times that an actor is 'between' any two pairs of actors. A high Betweenness score is an indicator of someone with influence within the network. It is also a sign of weakness within a team because it suggests that there may be two or more clusters of individuals connected through a few individuals. The loss of that high Betweenness individual (i.e., attrition) or the unwillingness of that person to transfer social resources (i.e., information) could lead to a breakdown within the team. The measure of Betweenness hinges on the assumption that exchanges will flow between the shortest geodesic path (Newman, 2005). It may not be true that the shortest 'path' is always taken as Betweenness assumes – possibly because the shortest path is blocked by a 'mediator' who is unwilling to participate in the exchange – but rather another path that is 'less efficient.' In order to better model how social networks interact, another measure combines the strengths of Degree and Betweenness. This measure, Flow Betweenness (FB), takes into account that there may be many different paths to the same outcome.. FB supplements the measure of Betweeness (i.e., mediator status) by calculating all possible paths between two actors rather than just the shortest geodesic path.

Inclusiveness and Reciprocity

To this point, there has been a focus on who is most central within a team. However, another approach to understanding team functioning is to examine those who are on the periphery of team. Conclusions can be drawn from factors such as how many and who is not tightly linked to the rest of the team. In social network literature, this is termed Inclusiveness. Inclusiveness is defined as the number of connected (i.e., communicating, interacting) individuals within a community minus those individuals isolated from the social network (Scott, 2000). Those who do not interact with anyone within the network are Isolates. Isolated individuals are unable to share or receive social resources from those within the network. A network is more inclusive as the number of isolates decrease. Given that in most organizations, it is unlikely that many team members are completely isolated from the team, it makes sense to use a more broad interpretation of Inclusiveness. For the purposes of this study, this broader interpretation of Inclusiveness was considered by assessing the reciprocity of the interactions between team members.

Reciprocity is formally defined as a bidirectional response ties between actors. In more general terms, it is a measure of mutual relationships. In the measures discussed previously, there is a general assumption of a connection if person A identifies a connection to person B and ignores whether person B identifies person A. It is not uncommon for information to flow in only one direction (e.g., managers provide feedback, but do not receive feedback). Likewise, it is common for a disparity to exist between people's perception of their relationship with others (e.g., A trusts B, B does not trust A). Unreciprocated relationships are called non-symmetric ties. Non-symmetric ties

can be outgoing (i.e., A endorsed B, B does not endorse A) or incoming (A did not endorse B, B endorsed A). These directional ties are outdegrees and indegrees, respectively. Reciprocity ranges from 0 (no mutual ties) to 1 (all ties are reciprocated). In the case of team inclusiveness, it would be expected that increased reciprocity would equate to greater amounts of inclusiveness. Conversely, those who have a large percentage of non-symmetric outdegrees (i.e., those whose endorsements are not reciprocated by others) would equate to lower inclusiveness. By examining non-symmetry in outdegrees, it would be possible to examine whether there is a pattern of those who are not well accepted by others in the team as a measure of team inclusiveness.

<u>Review of Social Network Analysis Methodology.</u>

At this point, there should be some awareness that SNA is not like much of the research conducted in social sciences. For this reason, it is important to briefly review how data is can be collected and the software used to analyze the data.

Data Collection

The primary difference between social network measures and traditional surveys is that social networks ask respondents to provide information about specific individuals within their network. Whether the respondent is given a list of people who the researcher believes to be in the network (i.e., a team roster) or whether the respondent generates the list of those in his/her network (i.e., free recall), social network measures are not anonymous. However, this lack of anonymity and the ability to link specific relationships is what provides the richness of understanding of team dynamics that traditional survey measures currently lack.

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Several approaches are commonly used to collect Social Network data. These data collection tools include: questionnaires, interviews, observations, archival records, and experiments. Questionnaires can provide a roster of individuals thought to belong to a given network or allow the respondents denote those who belong to the network. Although employing a roster for data collection limits participants to only those identified by the researcher as members of the proposed network, it ensures that a consistent set of members are rated. Conversely, respondents may be allowed to identify individuals within their network via free recall. Risks in using these approaches include such factors as participant fatigue and participant lack of recall. A hybrid approach, used in this study, provides a roster of network members and allows participants to write-in additional members who the participant believes should also be included in the network. A full discussion of the pros and cons of these approaches are beyond the scope of this paper. For a discussion of these methodologies, see Wasserman and Faust (1994) and Scott (2000).

Social Network Software

Due to the relational data gathered to conduct SNA, the data analytic software such as SPSS (Statistical Package for the Social Sciences) and Microsoft Excel are not adequate. Instead a number of data packages have been developed to handle the relational data, include standard social network measures (e.g., Density, Betweenness), and offer graphical capabilities needed to display the relationships between members of the network For this study, UCINET 6.0 (Borgatti, Everett, & Freeman, 2002) was used. In using this software, it was possible to conduct the analysis described in future sections of

this paper, including overlaying attribute data collected and analyzed in SPSS. For a review of other software available for SNA please see Scott (2000).

THEORETICAL FRAMEWORK

A Climate of Trust

Organizational researchers have begun to realize the importance of trust in many facets of organizational functioning. This may be because trust acts as a social lubricant that increases communication, cooperation, information sharing (e.g., Blau, 1964; Ferrin, Dirks, & Shah, 2003; Rempel, Holmes, & Zanna, 1985; Sims, et al. 2005), and organizational learning (e.g., Cross, Parker, Prusak, & Borgotti, 2003; Levin & Cross, 2004; Edmondson, 1999). Trust has also been associated with communicating information upward to management (e.g., Dirks & Ferrin, 2002). When information is not shared with the organization, management and the organization are not able to make needed adjustments or learn from its employees' experiences. Drawing from the trust literature, the ability to foster this sense of trust is dependent on certain characteristics of the organization (e.g., climate, information sharing) and through the interactions that naturally occur among employees. In the following pages, trust will be defined, including how trust is fostered within the team and by the team leader. A number of research hypotheses will be proposed.

Although many definitions of trust have been advanced, one of the most frequently cited definitions of trust is "a psychological state comprising of the intention to accept vulnerability based upon positive expectations of the intentions or behaviors of another" (Rousseau, Sitkin, Burt, & Camerer, 1998; p. 395). The key components of most definitions of trust are: a) a willingness to be vulnerable (Butler, 1991; Mayer & Davis, 1999), b) positive expectations that interests will be protected and promoted when monitoring is not possible (Dirks, 2000; Mayer, Davis, & Schoorman, 1995; Read, 1962),

and c) positive assessment of others' intentions, sincerity, motivations, character, reliability, and integrity (Butler, 1991; Mayer & Davis, 1999; Rousseau et al.1998). The willingness to accept vulnerability evolves over the course of a relationship due to repeated interactions and a history of reciprocity (Baier, 1985; Govier, 1994; Jones & George, 1998, Lewicki, McAllister, & Bies, 1998; Stack, 1988). Therefore, trust is likely to develop differently in relation to team members, managers, and toward the organization as a whole. Not only do team members interact more frequently, these interactions are likely to be fundamentally different than the relationship that exists with managers. Further, employees are likely to develop attitudes of trust (or distrust) towards the organization through their interpretations of the organizational policies and procedures as well as their interactions with coworkers and managers. Because trust within the team and towards the team leader is of interest in this study, these issues will be discussed in turn.

<center>Trust Within Teams</center>

Trust is most frequently discussed in relation to dyads. Jones and George (1998) described an evolution of trust from conditional trust when the relationship first forms to unconditional trust that develops with repeated interactions with another. Through repeated interactions, individuals are able to assess the sharedness of their values (which is important in maintaining a trusting relationship) (Butler, 1991). From an applied perspective, understanding trust between dyads is of limited value to an organization. For this reason, theorists have begun to expand these discussions to teams.

Team trust is important because as organizations continue to move towards team-based structures, employees are being asked to cooperate with others to achieve

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organizational goals and manage today's complex workplace. Therefore, the development of trusting relationships between team members is needed to ensure cooperation (Axelrod, 1981). In the initial stages of a team being established, few interactions have occurred and team members have little upon which to base an assessment of trust (McKnight et al. 1998). This initial trust is delicate, and is strengthened or destroyed through additional exchanges that refine the trusting conditions within the team (Baier, 1985; Govier, 1994; Lewicki, et al. 1998). Thus, the starting levels of trust may be based upon limited knowledge of each other's reputation (Stinchcombe & Heimer, 1985), personality (Rotter, 1971), apparent similarities/differences (e.g., education, credentials, status, values/ethics) among the team members (Zucker, 1986) and the boundaries developed by the organization (e.g., code of ethics) (McAllister, 1995; Sitkin & Roth, 1993; Turner, 1987; Zucker, 1986). In addition, each team members' prior experiences (Larson, 1992) and contextual factors (Shapiro, 1990; Zucker, 1986) may influence these initial levels of trust. Over time, team members will gain information about each other as the team performs, interacts, and shares information. Based on this premise, the following hypothesis is presented:

Hypothesis 1: *The frequency of communication within a team is positively related to trust within the team.*

Trust in Leadership

When information is shared within a team for the sake of learning, the team is able to use it to improve its own performance. However, the improved performance of a single team has limited benefit within an organization. This situation has been termed 'knowledge silos' because information is held and protected within the 'silo' of an

individual team, but is not shared across the organization (Weymes, 2003). The organization can reap the benefit of its teams only if the lessons learned within the team are shared with those who can disseminate the learnings throughout the organization. One tool that can be used to breakdown 'knowledge silos' is a boundary spanner.

Boundary spanners are team leaders that create social networks within the organization. These social networks provide a path for the knowledge and lessons learned within a single team to flow to others to improve performance more broadly (Weymes, 2003). In this way, the lessons learned in one team can benefit the entire organization. Despite this, various streams of literature discuss the tendency for employees to withhold and/or distort information when interacting with management (e.g., Edmondson, 1996; Fulk & Mani, 1986; Linde, 1988). Thus, the question arises, how does a team leader ensure that the team will engage in upward communication and freely communicate the problems that exist within the team as opposed to covering up the errors that occur within the team?

As discussed at the team-level, one way to ensure the team communicates and shares information with the team leader is by building trust between the team and its leader. Clutterbuck and Hirst (2002) suggested that the "management of trust is the emotional glue that binds followers and leaders together" (p. 352). A number of organizational benefits result from trust in the team leader. For instance, increased trust in one's leader has been found to be associated with greater satisfaction with the leader, higher perceptions of leader effectiveness (Gillepsie & Mann, 2004; Hall et al. 2004), reduced turnover (Dirks & Ferrin, 2002), greater perceived organizational support (i.e., employee's belief that the organization cares about them and that their contribution is

valued; Connell, Ferres, & Travaglione, 2003; Rhoades & Eisenberger, 2002), higher trust in upper management, and greater organizational commitment (Treadway, et al. 2004).

More importantly, trust in the team leader may foster organizational learning by increasing employee communication (Weymes, 2003), encouraging risk-taking activities that benefit the organization (Baer & Frese, 2000; Edmondson, 1999), and other learning activities (Edmondson, 1999; Tynan, 2005). Thus, not only will subordinates communicate more when they trust their leader, they may also be more willing to communicate information that is personally risky (e.g., admit to mistakes) for the betterment of the team and the organization. This upward communication is important to ensure organizational learning and an important factor in the organization's ability to innovate (Cohen & Levinthal, 1990; Glynn, 1996).

One factor that is strongly related to trust in leadership is leader-team communication (amount, type, quality, accuracy). Team leaders who communicate frequently, openly, in detail, and accurately with their subordinates are more likely to be trusted (e.g., Clutterbuck & Hirst, 2002; Doney & Cannon, 1997; McAllister, 1995; Roberts & O'Reilly, 1974; Sekhar, Chandra, & Anjaiah, 1995; Treadway et al. 2004; Whitner, 1997). Based on this, the following hypothesis is proposed:

> **Hypothesis 2:** *Trust in the team leader is positively associated with the frequency of communication with the team leader.*

Network Characteristics

Throughout the proceeding discussion of trust, the interactions and communication that occurs between individuals – whether within the team or with the

team leader – have been described as dominating factors in the development and maintenance of trust. As such, it is important that the social networks that exist within the team and with the team leader are examined to further understand the manifestations of trust. As a network of individuals, there are two important network characteristics that should be considered in regards to both communication and trust within teams: inclusiveness and density. Inclusiveness is defined as the number of connected (i.e., communicating, interacting) individuals within a community minus those individuals isolated from the social network (Scott, 2000). Isolated individuals are unable to share or receive information from those within the network.

The second critical characteristic is network density. Density, a measure of group cohesion, is a proportion of the total linkages between individuals in the informal network to the total possible connections (Scott, 2000). Kadushin (2002) suggested that trust is an attribute of an entire network, not just a few individuals. Taken further, prior research indicates that trust is developed based on repeated interactions and an assumption of reciprocity (Baier, 1985; Govier, 1994; Lewicki, et al. 1998; Stack, 1988). Thus, it is expected that teams that communicate more frequently and are more inclusive of all members will report higher trust among members. Kadushin (2002) also argued that the density of a network not only promotes a sense of community and cohesive motives, but also a general sense of trust within the network. This suggests that communication networks with high density will result in trust networks that also have high density. The following hypotheses are proposed:

Hypothesis 3a: *The inclusiveness of the communication network within the team is positively associated with the inclusiveness of the trust network within the team.*

Hypothesis 3b: *The density of the communication network within the team is not significantly different from the density of the trust network within the team.*

Hypothesis 4a: *The inclusiveness of communication network between the team and the team leader is positively associated with the inclusiveness of trust network between the team and the team leader.*

Hypothesis 4b: *The density of the communication network between the team and the team leader is not significantly different from the density of the trust network between the team and the team leader.*

Psychological Safety

A construct similar to trust is psychological safety. This construct suggests that when team members experience psychological safety they will feel less vulnerable amongst their teammates and therefore more willing to discuss errors and admit he/she does not have the requisite knowledge and/or a need for additional information (Argyris, 1982; Edmondson, 1999). Psychological safety is expected to operate similarly to trust, thereby providing additional support to the relationships that are expected to be observed with trust. The primary difference between the two constructs is that psychological safety is expected to more strongly link to admission of errors and seeking support from others. This construct has been added to this study in an effort to provide convergent validity to the findings proposed with trust.

Psychological Safety within the Team

Teams are effective due to their ability to bring together individuals with differing experiences, expertise, and perspectives. However, team members often only share jointly held information thereby squandering the unique information held by the team members (Janis, 1982; Stasser & Titus, 1987). A number of reasons have been posited as explanation for why team members may withhold information. For instance, the group-think literature suggests that cohesive teams prefer not to question others in order to maintain the status quo and a peaceful work environment (Janis, 1982). Another reason may be that withholding information allows individuals to avoid appearing incompetent; something, which, in turn may hurt the chance for future promotions or projects (Lee, 1997; Michael, 1976). Under these circumstances, people are likely to seek ways to hide mistakes, become defensive, or blame the mistakes on others (Tjosvold, et al. 2004). Despite the opportunities for the individual and the team to improve their overall performance, people avoid learning situations in which they are likely to be embarrassed (Argyris, 1982).

Psychological safety has been shown to be positively associated with team learning behaviors within a team as well as with team performance (Edmondson, 1999) and organizational innovation and profitability (Baer & Frese, 2003). Like trust, greater psychological safety not only increases communication, it also impacts the type of information that is likely to be shared. Psychological safety is thought to reduce team members' fears of being seen in a negative light by colleagues, increases confidence in admitting to and addressing errors and encourages team members to suggest new ideas (Baer & Frese, 2003; Edmondson, 1999) by focusing on mutual responsibility and

influence, openness to feedback, and communication (Arygris & Schon, 1978; 1996). By creating a sense of psychological safety, unplanned events or errors are not thought of as something to be covered up, but rather as an opportunity to constructively address what went wrong, receive feedback, identify and reflect on potential causes and experiment with alternative approaches when the same situation arises again (Carter & West, 1998; Tjosvold, Yu, & Hui, 2004;). Ultimately, the benefit of teams engaging in learning behaviors is that it will potentially prevent these same or similar errors from occurring again (Cannon & Edmondson, 2001).

The willingness for teams to engage in learning behaviors is fostered by trust and psychological safety that exists within the team. Teams that do not have trust or psychological safety are less likely to discuss problems within the team or share information (Edmondson, 1999). A lack of trust may also reduce the team's willingness to learn from mistakes (Tjosvold, et al. 2004). Given this, the following hypothesis is proposed:

> ***Hypothesis 5a/b:*** *Trust (a) and psychological safety (b) in the team are positively associated with a willingness to informally discuss errors with other team members.*

<div align="center">Psychological Safety Promoted by the Team Leader</div>

Although trust and psychological safety within the team are expected to be large contributors to error reporting, psychological safety within the team does not ensure that team members will be willing to share information with the team leader. Unlike teammates, the team leader is in the position to discipline employees. This inherently creates a greater sense of vulnerability when deciding whether or not to admit to a

personal error or an error within the team. Team leaders can promote psychological

safety within the team and increase team members' willingness to engage in team

learning behaviors (Edmondson, 1999; Tynan, 2005) by manifesting a shared

understanding (i.e., climate) among team members that align with the assumed values of

the organization (Denison, 1996). Based on this, the following hypothesis is proposed:

> ***Hypothesis 6a/b:*** *Trust in the team leader (a) and perceptions of leader's support*
>
> *for psychological safety (b) are positively associated with willingness to*
>
> *informally discuss errors with the team leader.*

Network Characteristics

In many cases, trust is based on the reciprocation of trustworthy behaviors. That

is, there is an inherent assumption of reciprocity such that as long as the relationship

continues to succeed, the person will continue to trust (Lindskold, 1978; Stack, 1988).

Thus, it is expected that networks of trust may vary within teams and towards the team

leader based on how trustworthy others within the network are perceived. Given the

previously hypothesized linkages between trust and the willingness to report errors, it is

expected that the network characteristics of trust within the team and with the team leader

will be highly associated with the network characteristics of the willingness to report

errors. For this reason, the following hypotheses are proposed:

> ***Hypothesis 7a:*** *The density of the trust network within a team is not significantly*
>
> *different from the density of the density of an informal error reporting*
>
> *network.*

Hypothesis 7b: *The inclusiveness of the trust network within a team is positively associated with a willingness to informally discuss errors with other team members.*

Hypothesis 8a: *The density of the trust network between the team and team leader is not significantly different from the density of the informal error reporting network between the team and team leader.*

Hypothesis 8b: *The inclusiveness of the trust network between the team and team leader is positively associated with a willingness to informally discuss errors with the team leader.*

<u>Learning Oriented Climate</u>

Team Learning Orientation

A number of researchers have provided evidence that teams prefer familiar routines and avoid change, even when current team processes are not effective (e.g., Gersick & Hackman, 1990; McGrath, Kelly, & Machatka, 1984; Weick, 1979). Although the trust and psychological safety that exist within the team increases team members' willingness to engage in learning behaviors (Edmondson, 1999); the climate fostered within the team may reinforce or discourage error reporting.

Climate within a team emerges from a shared perception, cognitive appraisal, and attribution of meaning to events that occur within the team (e.g., interactions with coworkers/supervisors, informal policies/procedures) (Schneider, 1990). Teams develop team-specific informal norms based on what is reinforced, rewarded, and expected within the team. The climate that exists within one team may differ from other teams within the

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same organization. The climate discrepancies across teams may be due to the fact that frequent interactions between teammates may lead to more similar perceptions within the team than with those outside the team (Patterson, Payne, & West, 1996). This is particularly relevant for error reporting behaviors. The team climate may bolster or diminish the willingness to report errors above and beyond the trust or psychological safety that exists with the team. A particular climate that supports learning behaviors such as error reporting is a team learning orientation.

A learning orientation climate encourages people to challenge assumptions that exist within the team or organization in order to continually improve (e.g., Baker & Sinkula, 1999; Lipshitz, Popper, & Friedman, 2002). Left to chance, teams tend to make excuses, become defensive, and punish, blame, and embarrass responsible parties when errors are pointed out (e.g., Arygris & Schon, 1996; Bazerman, 1997; Staw, 1981). Teams with a learning orientation, however, have a shared mental model in which mistakes are perceived as important to team performance (Cannon & Edmonson, 2001). Therefore, it is important to identify barriers to success and develop solutions to overcome the barriers (Tjosvold et al., 2004). Based on this literature, the following hypothesis is proposed:

> **Hypothesis 9a:** *A team learning orientation climate moderates the relationship of trust within the team with the willingness to informally discuss errors with other team members.*

> **Hypothesis 9b:** *A team learning orientation climate moderates the relationship of psychological safety within the team with the willingness to informally discuss errors with other team members.*

Team Learning Orientation Promoted by Team Leader

Schneider (1990) argued climates are partially developed thorough interactions with leaders and formal and informal policies/procedures within the organization. This suggests that a climate supportive of a team learning orientation emerges within a team due to team leaders reinforcing certain behaviors. The behaviors within the team that are reinforced and, to some degree, the formal and informal policies that are adhered to, are up to the discretion of the team leader. In fact, team leaders are argued to be critical to the success of a team (Zaccaro, Rittman, & Marks, 2001) by setting the tone for expected behaviors and creating a climate that is supportive of team processes (e.g., communication, team self-correction) (Baer & Frese, 2000; Salas, Burke, & Stagl, 2004; Smith-Jentsch, Salas, & Brannick, 1994). Thus, organizational climate may be inferred from the team leaders' actions (or lack of actions) (Tyler & Lind, 1992). Evidence suggests that leaders are capable of developing climates of safety and awareness that can lead to a reduction in errors (Barling, Loughlin, & Kelloway, 2002).

Another factor to consider is that employees are unlikely to discuss problems within the team or organization if they do not believe that any positive change or outcome will result (Ashford, et al. 1998; Morrison & Milliken, 2000). For this reason, perceptions that the team leader supports a team learning orientation (i.e., supports admission of errors for the betterment of the team, accepts constructive feedback) may bolster the degree to which team members are willing to engage in error reporting behaviors beyond trust and psychological safety that is fostered by the team leader.

Hypothesis 10a: *Perceptions of the team leader's support for a team learning climate moderates the relationship between trust in the team leader and willingness to informally discuss errors with the team leader.*

Hypothesis 10b: *Perceptions of the team leader's support for a team learning climate moderates the relationship between perceptions of the team leader's support for psychological safety and willingness to informally discuss errors with the team leader.*

<div align="center">Organizationally Promoted Team Learning Orientation</div>

Organizational culture is made up of the enduring perceptions of what is valued by the organization (Ashforth, 1985; Schneider & Reichers, 1983) and is a powerful determinant of employee behavior (Schneider & Reichers, 1983). Similarly, organizations learn from and adapt through their employees' interactions and experiences garnered while on the job. Thus, learning organizations, which are "skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Garvin, 1993, p. 80), are likely to have a culture of learning. An organizationally-promoted team learning orientation encourages and values questioning the organization's assumptions in order to learn, adapt, and improve (e.g., Baker & Sinkula, 1999; Lipshitz, Popper, & Friedman, 2002). Organizations that are perceived to reward organizational learning are likely to increase the association between trust and a team's willingness to engaging in a formal error reporting system.

Hypothesis 11: *Organizational support for learning orientation moderates the association between team trust and willingness to formally report errors.*

Similar to the rationale provided regarding a team leader's support for team learning, an organizational culture that promotes learning and innovation sends a clear message that employees will not be punished for discussing problems, inefficiencies, or redundancies within the organization. The message is also sent that the organization is likely to use the information provided by employees to improve organizational functioning (Ashford, et al. 1998; Miceli & Near, 1992; Morrison & Milliken, 2000; Whitney & Cooper, 1989). Ultimately, it is expected that this organizational culture will encourage employees to use more formal routes to reporting errors. Based on this, the following hypothesis is proposed:

Hypothesis 12: Organizational support for learning orientation moderates the association between team leader trust and willingness to formally report errors.

STUDY INTRODUCTION

One industry that has increased its emphasis on organizational learning is the medical field. Intraorganizational communication, which has been discussed as important for innovation and organizational learning, is identified as a widespread problem resulting in patient safety problems (e.g., Balas, 2003; Crane, 1997; Derfel, 2003; Fleming, 2003). In fact, approximately 16% of medical errors in the U.S. are due to miscommunication (Andrews, Stocking, Krizek, Gottlieb, Krizek, Vargish, Siegler, 1997). One method that healthcare workers can use to prevent reoccurring errors is by engaging in a formalized error reporting system to facilitate root-cause analysis.

All too often healthcare workers believe error reporting is a means to place blame and will result in punishment of those involved in an error (Helmreich & Merritt, 1998; Helmreich & Shaeffer, 1994; Rogers, Isreal, Smith, et al. 1988). As a result of this 'Culture of Blame' (e.g., Larson, 2000; Singer, Wu, Fazel, & McMillian, 2001), it is estimated that as many as 50% of all medical errors are unreported (Lawton & Parker, 2002). Trust, which is missing in a 'Culture of Blame,' is a contributing factor in ensuring management receives accurate information about errors (Ayres, Brand, & Faules, 1973; Blalack, 1986; Levine, 1967). It is by analyzing when, where, and why (i.e., root-cause) certain errors occur that changes may be made to prevent the reoccurrence of errors. Does this suggest that all medical professionals are unwilling to share information to improve the care provided to patients? The answer is, emphatically, no.

Informally, medical professionals develop informal networks of individuals with similar interests and expertise for the expressed purpose of sharing knowledge and

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helping others perform their own tasks better (Prusak & Cohen, 2004). While beneficial to the performance of individuals within the network, overall team and/or organizational performance may not improve if the knowledge gained within the informal network is not widely shared. In the same vein, informal networks may form within a team that regularly discuss and learn from mistakes. If these learnings are not widely shared with the work team or organization, overall team performance may be degraded and the organization will miss opportunities to improve processes and the safety of medical care. By examining the conditions within existing informal networks that promote continuous organizational learning, it becomes possible to identify strategies to promote organizational learning throughout the organization.

This study was designed to examine the impact of trust, psychological safety, and a learning oriented climate on team learning behaviors within a medical setting. By employing SNA, informal networks were also able to be examined. Team learning behaviors were operationalized as 1) the willingness to informally report errors to coworkers and leaders and 2) the willingness to formally report errors to risk management. Tesser and Rosen (1975) described a situation in which individuals had a tendency not to communicate information that is threatening to themselves or others (e.g., admitting lack of knowledge or errors). For this reason, it was expected that trusting relationships and/or a sense of psychological safety among coworkers and direct supervisors would be positively associated with a willingness to informally report errors. Further, it was expected that the attitude towards learning from mistakes (i.e., learning orientation) of the team and team leaders would moderate the relationship between trust/psychological safety and informal error reporting. Because leaders are often

perceived as the 'face of the organization', trust in leadership and psychological safety

promoted by the leader was examined in relation to a willingness to formally report errors

to risk management. Perceived organizational learning orientation was expected to

moderate this relationship.

METHODOLOGY

A total of 76 participants were recruited from two orthopedic inpatient units from two hospitals within a single healthcare system. Due to the overarching healthcare system and similarity in treatment types, the units assumed analogous. Of those whom participated, 89% were female (n = 67) and had a mean age of 38.11 years (SD = 12.62). Most participants were Caucasian (70.7%, n = 53) or Asian (17.3%) (see Table 1). On average, participants had been in the field of nursing for 10.45 years (SD = 10.48) and at the current hospital for 4.82 years (SD = 5.46). Thirty-seven percent of participants indicated their highest levels of education were Registered Nursing certificates, 28.8% have high school diplomas and 15.1% have a Bachelor's degree (see Table 1). The job titles of those whom participated in the study included Patient Care Technicians (38.4%), Clinical Nurse/Registered Nurse (41.1%), Clinical Nurse 3/Patient Care Leader (8.2%), and Licensed Practical Nurse (12.3%).

<u>Procedure</u>

Participants were recruited through a preliminary memo provided by the researcher and distributed by each unit's administrative nurse. The memo provided basic information about the study, benefits to the nurses for participation, researcher contact information, and data collection dates. Once on the unit, the researcher personally invited nurses on shift to participate in the study. Of those nurses and patient care technicians who agreed to participate, each received an informed consent form and were notified of their rights as participants. All questions raised by the participants regarding the purpose of the study, how the data will be used and reported were answered, and any concerns

regarding participation in the study were addressed. Once participants gave informed consent, each received the Time 1 packet. Time 1 packets included individual level questionnaires (e.g., demographics, psychological safety, team learning orientation) and a write-in form to collect data regarding common errors occurring within the department. The Time 2 packet, which included one Social Network Analysis measure was administered a minimum of 2 weeks later to reduce the salience of Time 1 responses. In all cases, the participants had the option to return the packets to the researcher directly or mail the packets to the researcher in self-addressed stamped envelopes. In unit 1, 65% of the unit completed Time 1 measures and 52% completed Time 2 measures. In unit 2, 53% of the unit participated in Time 1 and 44% completed Time 2 measures. Once Time 2 data was collected, participants were debriefed regarding the purpose of the study.

<u>Measures Time 1</u>

Participant Contact Information and Demographics

Due to the data analysis approach used in this study, the identities of each participant must be linked to all data provided. Participants were notified of this in the informed consent form. To protect the respondent's confidentiality, each participant was randomly assigned a unique participant number. The only connection between the participant and this randomly assigned participant number was a participant contact form in which participants wrote in his/her name, email address, and a phone-number to reach them. The participant contact information was collected in order to allow the researcher to link Time 1 and 2 data and in order to inform participants of Time 2 data collection

opportunities. This contact form was kept separate from all additional data collected, was only available to the researcher, and destroyed once all data entry was completed.

Participants also completed a demographic form to gather information about age, gender, ethnicity, tenure in the profession and with the current hospital, current job title, level of education, and shift normally worked.

Trust-related Measures

All participants will be asked to complete measures of trust and psychological safety regarding the team and team leaders (i.e., charge nurses) (See Appendix 3 and 4).

Psychological safety. A seven-item measure using a scale of 1 (*very inaccurate*) to 7 (*very accurate*) by Edmondson (1999) assessing perceptions of psychological safety will be used. Edmondson (1999) reports an alpha level of .82 for the measure. This measure assesses the degree to which department members perceive the team environment as open to questioning norms and asking others for assistance. The measure was adapted to assess perceptions of the team (7 items) and team leaders' support (7 items) for psychological safety. An example item at the team level is "It is safe to take a risk on this team." An example item at the team leader level is "The charge nurses make it safe to take a risk on this team." In this study, the team and leader version of the measures were found to be acceptably reliable (alpha =.72; alpha = .74, respectively)

Trust. Six items were developed measure using a scale of 1 (*very inaccurate*) to 7 (*very accurate*) to assess each of three components of trust (i.e., ability, benevolence, and integrity identified by Mayer and colleagues (1995). Three of these items have the team as the trust referent. An example of these

items is "Members of this team have the knowledge and skills needed to care for our patients." Three of these items have the team leader as the trust referent. An example of these items is, "Charge nurses on this team have the knowledge and skills needed to care for our patients." In this study, the team and leader version of the measures were found to be acceptably reliable (alpha =.75; alpha = .83, respectively)

Learning Orientation. All participants will be asked to complete a measure of the learning orientation climate (i.e., open to new ways of doing work and seeking information to improve safety) perceived within the department and the perceived support for learning by the team leader and the organization (See Appendix 5, 6, and 7). A seven-item measure using a scale of 1 (*very inaccurate*) to 7 (*very accurate*) adapted from Edmondson (1999) assessing learning behaviors will be used. Edmondson (1999) reports an alpha level of .78 for the original measure.

The measure was adapted in two ways. First, the measure has been adapted to specify safety as a learning objective. Second, the measure was initially written with the team as the referent. In this study, the items have also been written with the team leader (7 items) and the organization (7 items) as the referent. An example of an adapted item from the team level is "This team frequently seeks new information that leads us to make important safety related changes." An example of an adapted item from the team leader level is "The charge nurses frequently encourage the team to seek new information that leads us to make important safety related changes." Finally, an example of an adapted item

from the organizational level is "NAME OF MEDICAL INSTITUTION frequently encourages the team to seek new information that leads us to make important safety related changes." In this study, the team and leader version of the measures were found to be acceptably reliable (alpha =.72; alpha = .84, alpha = .84, respectively)

<div align="center">Common Errors and Willingness to Report Errors</div>

To create anchors for the Time 2 data, a questionnaire was designed to ask each participant to write-in up to three errors that he/she believe COULD occur within their unit that he/she considered small, moderate, and large (See Appendix 8). A total of 9 errors for each participant will be potentially identified using this process. A content analysis of these responses was conducted. Based on the analysis, trends in the types of errors considered to be small, moderate, and severe were identified for each unit. Three small, moderate, and severe errors were selected from the analysis based on these trends and used in the Social Network Analysis measure included in the Time 2 packet.

Following each error the participant writes-in, 3 items using a scale of 1 (low) to 7 (high) were developed that ask participants to rate their likelihood of 1) discussing the error with the person(s) involved, 2) to document the error, and 3) formally report the error to the risk management department. Mean scores were calculated for the small, moderate, and severe error examples to determine likelihood of informally discussing errors, documenting the errors, and formally reporting the errors. For both small and moderate errors, most participants indicated that they would informally discuss the errors with those involved in the error. Severe errors were most likely to be formally reported to risk management.

Measures Time 2

Social Network Measure

A SNA measure including 12 items was designed to ask participants a series of questions about each coworker, charge nurse, and administrative nurse (see Appendix 9). In order to do this a roster of all healthcare workers assigned to the units were procured from the administrative nurse and inserted into the measure.

Familiarity and Communication. To assess the informal networks that may exist within the department 6 items were developed. For each person listed on the roster, participants were asked to notate if they know the person, go to the person for work and/or personal advice, whether they are required to interact with him/her due to work responsibilities, and whether they would feel comfortable discussing safety related issues with him/her. An additional item asked participants to rate the frequency of communication with each person listed on the measure on a scale of 1 (*seldom*) to 5 (*frequent*).

Trust. To assess the perceived trustworthiness of those within the department and the charge and administrative nurses, participants rated 1 item about his/her trust towards the identified person on a 1 (negative rating) to 5 (positive rating) scale.

Error reporting. To assess the likelihood the participant is to discuss small, moderate, and large errors with each person listed, three items with a 1 (*would not approach*) to 5 (*would absolutely approach*) scale were included. In order to provide participants a reference to small, moderate, and large errors, a content analysis of the errors provided in the Time 1 error questionnaire was conducted and inserted into the measure as relevant examples of a small, moderate, or large errors. An example of a

small error provided by the participants is: "Taking blood sugars on the wrong patient". An example of a moderate error provided by the participants is: "Not documenting medication – possible double dosage". An example of a severe error provided by the participants is: "Wrong patient transported to surgery".

RESULTS

Analysis was conducted using SPSS 17.0 and UCINET 6.0 (Borgatti, Everett, & Freeman, 2002). Prior to beginning analysis of the proposed hypotheses, reliability of the measures (see Table 2), an outlier analysis, power analysis, and assessment of the measures' discriminant/convergent validity (see Table 3) were conducted. All measures were found to be acceptably reliable (Cronbach alpha ranging from .72 to .84). Outlier analysis was also conducted by converting all independent variables (trust, psychological safety, and learning orientation climate) into standardized scores and removing all participants with scores that were 3 standard scores or greater. This resulted in two participants being removed from the total sample (n = 74).

Next, a power analysis was conducted based on Cohen (1992, p. 154) rule of thumb for effect sizes to determine the appropriate sample size for a medium effect size (D = .50) and large effect size (D = .80). For the purpose of this study, analysis was conducted as one-tailed tests with a significance of .05. It was determined that with a sample size of 74, an effect size as small as .35 with power = .90 (Shavelson, 1988) could be detected. Despite missing data, the smallest sample used for analysis was 49 participants. Using 49 participants, an effect size of .45 with power = .90 or effect size of .35 with power = .80 could be detected. Taken together, the poer analysis results indicate that the sample size is sufficient to detect a moderate effect size or larger.

Discriminant/convergent validity patterns were found to support theoretical expectations. It was proposed that the two psychological safety measures would be moderately correlated to each other and would only have small correlation with the three

learning orientation measures. Likewise, it was expected that the three learning

orientation measures would be moderately correlated to each other and would only have

small correlation with the two psychological safety measures. Results from this sample

support these predictions. Specifically, measures of the same construct but at different

levels (e.g., team trust and leader trust) were more highly correlated with each other (r

= .71) than dissimilar measures at the same level (e.g., team trust and team psychological

safety (r = .41). Finally, measures which were expected to be more theoretically similar

(i.e., trust and psychological safety) were more highly correlated with each other than

measures theorized to be more distinct (i.e., trust and learning orientation climate).

General Data Results

As can be seen in Table 1, the sample mean for each independent variable is

greater than 3.5 with a standard deviation of less than 1 point. This indicates that those

sampled have, on average, high team and leader trust, high team and leader fostered

psychological safety, and a high perception of learning orientation culture within the

team, leadership team, and the organization. The relationship between the independent

variables and demographics were also explored (see Table 4). Using a 2-tailed test

criteria, only ethnicity was significantly correlated with team trust ($r = -.33$, $p < .05$). In

conducting a one-way ANOVA to explore this, it was determined that a significant

difference in team trust exists between ethnicity groups ($F(4, 72) = 6.36$, $p < .001$).

Scheffe' post-hoc tests, a more conservative test that controls family-wise error, were

conducted between all ethnicities. Results of this test find that Caucasians report

significantly higher team trust ($M = 5.00$) than Asian Americans ($M = 3.86$) (mean difference = 1.14, $p < .001$).

The pattern of willingness to report errors is shown in Table 5. As can be seen, as the severity of the error increases, the willingness to report errors also increases. Specifically, nurses in this sample indicated a greater willingness to report severe errors ($x = 5.66$, sd = 1.52) than moderate errors ($t(51) = 6.53$, $p < .001$; $M = 4.59$, $SD = 1.59$) and small errors ($t(55) = 8.88$, $p < .001$; $M = 3.71$, $SD = 1.54$). Nurses were also significantly more likely to report moderate errors over small errors ($t(49) = 4.46$, $p < .001$). The results in Table 5 also show a decreased willingness to report errors as the formality of error reporting increases. Specifically, nurses indicated a greater willingness to discuss errors informally ($M = 5.17$, $SD = 1.61$) than documenting errors in patient charts ($t(61) = 4.16$, $p < .001$; $M = 4.45$, $SD = 1.66$) or formally reporting errors to risk management ($t(61) = 3.66$, $p < .001$) ($M = 4.41$, $SD = 1.48$). Finally, based on independent sample t-tests, Unit 1 is significantly more likely to report small errors, document errors, and formally report errors than Unit 2 (see Table 5).

Finally, differences between units and shifts were assessed for each of the independent variables (trust, psychological safety, learning orientation) using a series of independent samples t-tests between the two departments. A series of one-way Analysis of Variance (ANOVA) were also conducted to assess whether there were significant differences in the independent variables across shifts. Results from the independent t-tests and the one-way ANOVAs did not reach statistical significance (see Table 6) indicating that there were no significant differences between units or shifts. Based on these results, the analyses were not conducted at the unit or shift level

Having discussed some general trends observed in the sample, the following pages focus on testing the proposed hypotheses (see Table 7 for summary of results).

Hypotheses Testing Results

Hypothesis 1: *The frequency of communication within a team is positively related to trust within the team.*

In order to test this hypothesis, the social network data collected about trust and communication between team members during Time 2 was analyzed using Quadratic Assignment Approach (QAP) correlation for each unit. In each unit, trust and communication were found to have a positive significant correlation ($r=.79$, $p<.001$ and $r = .82$, $p<.001$, Unit and 1 and 2, respectively). This provides evidence that in each unit, the pattern of communication flow is positively related to the pattern of trust relationships that exists within the team.

This relationship was further examined by examining two network centrality measures: Degree and Flow Betweenness (FB). Using UCINET, the overall mean and variance were calculated for Degree of the trust and communication networks and FB for each unit (see Table 8). In addition, an individual score of Degree and FB were calculated for every participant. Those who were found to have a normalized Degree greater than or equal to the group mean were considered 'High Degree'. For FB, a mid-point was calculated based on the maximum score for each network (i.e., trust and communication). Those actors with a FB score above the mid-point were considered 'High Flow'.

Inspection of the patterns of individual Degree and FB scores support the significant positive correlation of trust and communication. In both Unit 1 and 2, a

pattern was observed that participants identified as High Degree on one network (i.e., trust) tended to be High Degree on the other network (i.e., communication). Further, in cross referencing those with High Degree with those with High Flow on both networks, the same pattern emerged. In Table 9, a sample of this comparison is provided such that the order of the highest 15 participants (arranged high to low) from each network (communication and trust) and measure (Degree and FB) is presented. The combined results from the QAP correlation and the descriptive analysis of the network centrality measures support H1.

Hypothesis 2: *Trust in the team leader is positively associated with the frequency of communication with the team leader.*

In order to test this hypothesis, a QAP correlation was not possible due to the inability to statistically isolate a portion of the network (i.e., leaders). For this reason, a descriptive approach is provided regarding the leader networks on trust and communication. Using the centrality measures, Degree and FB, patterns were examined.

For Unit 1, graphical representations of the trust and the communication network are presented in Figures 2 and 3. Each node represents a participant and individuals are identified by their unique participant number. As can be seen, two of the nine leaders were consistently identified as central to the network (#8 and #15). The Degree of each node is represented by the size of the node (larger nodes equate to larger Degree scores). This visual interpretation is supported by calculating the overall group Degree and individual participant Degree scores for both networks (trust and communication) (see Table 10). Degree, as can be recalled, is the proportion of actual linkages between one node and all other nodes to the number of all possible linkages. In both the trust and

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communication networks, leaders #8 and #15 each had Degree scores greater than the overall mean Degree in both networks. All other leaders within Unit 1 had Degree scores below the mean and are represented at the periphery of the Figures.

Betweenness of the leadership team was also examined for Unit 1. In Figures 2 and 3, the Betweenness of each node is represented by the shape of the node (circle = zero Betweenness, square = low Betweenness, down triangle = moderate Betweenness, up triangle = high Betweenness). The leaders identified as having High Degree (#8 and #15) are again identified visually as having high Betweenness in the Figure. This visual interpretation is supported by the calculation of Betweenness and FB (see Table 10). Betweenness measures indicated that leader #8 was High Betweenness on both trust and communication. Leader #15, conversely, was Low Betweenness. FB was also calculated, and both leaders (#8 and #15) were found to have High FB in both the trust and communication networks. All other leaders received a Betweenness and Flow Betweenness score of 0. These zero values indicate that the remaining seven leaders in Unit 1 are not key players in the flow of communication or trust. Taken together, the data and the Figures suggest that there is a positive relationship between communication with leaders and trust in leadership. Specifically, those leaders that are central to the trust network are also central to the communication network. H2 is supported by Unit 1.

Graphical representations of the trust and the communication network for Unit 2 are presented in Figures 4 and 5. In this unit, it can be seen that five of the eight leaders were consistently identified as central to the network (#72, #75, #104, #209, and #211). The Degree of each node is, again, represented by the size of the node (larger nodes equate to larger Degree scores). This visual interpretation is supported by calculating the

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overall group Degree and individual participant Degree scores for both networks (trust and communication) (see Table 10). In both the trust and communication networks, leaders #72, #75, #104, #209, and #211 each had Degree scores greater than the overall group mean Degree. All other leaders within the unit had Degree scores below the mean and are represented at the periphery of the Figures. Betweenness of the leadership team was also examined for Unit 2. In Figures 4 and 5, the Betweenness of each node is represented by the shape of the node (circle = zero Betweenness, square = low Betweenness, down triangle = moderate Betweenness, up triangle = high Betweenness). The leaders identified as having high Degree (#72, #75, #104, #209, and #211) are again identified visually as having moderate/high Betweenness in the Figures. This visual interpretation is supported by calculating the Betweenness and FB (see Table 10). Betweenness and FB measures indicated that all leaders identified as central to the Figures in both networks also had individual scores above the mean. Further, the calculations supported the graphic such that leader # 211 was moderate Betweenness in both trust and communication networks and that that leader #209 was more moderate in Betweenness in communication. All other leaders received a Betweenness and FB score of 0 indicating that they are not key players in the flow of communication or trust. Taken together, the data and Figures 4-5 suggest that there is a significant positive relationship between communication with leaders and trust in leadership. Specifically, those leaders that are central to the trust network are also central to the communication network. H2 is supported by Unit 2.

Hypothesis 3a: *The inclusiveness of the communication network within the team is positively associated with the inclusiveness of the trust network within the team.*

In Unit 1, the mean and standard deviation NOR for the trust and communication networks were calculated ($M = .85$, $SD = .06$; $M = .85$, $SD = .05$, respectively). A positive correlation was found between trust NOR and communication NOR ($r = .43$, $p < .05$). Although these results indicate a relatively high degree of non-symmetric reciprocity in outdegrees, these scores are systematically inflated by the participant response rates of 50% for each unit. Based on the significant correlation, however, there is evidence to suggest that those on the periphery of the trust network also tend to be on the periphery of the communication network. For Unit 1, this provides support for H3a.

The above calculations were repeated for Unit 2. In Unit 2, the mean and standard deviation NOR for the trust and communication networks were calculated ($M = .89$, $SD = .05$; $M = .89$, $SD = .04$, respectively). A non-significant correlation was found between trust NOR and communication NOR ($r = .24$, *n.s.*). In addition to there being slightly higher non-symmetry reciprocity in Unit 2 than in Unit 1, those on the periphery of the trust network are not necessarily on the periphery of the communication network. H3a is not supported in Unit 2.

Hypothesis 3b: *The density of the communication network within the team is not significantly different from the density of the trust network within the team.*

To test H3b, a paired samples t-test was conducted between the Network Density (ND) of the trust network and the ND of the communication network for each unit.

Support of Hypothesis 3b would be a non-significant paired samples t-test indicating that the densities of both trust and communication are similar.

A bootstrap approach using 5,000 samples was used. A bootstrap approach is appropriate because the standard approach underestimates true sampling variability and increases Type I error. The paired samples t-test, used in this way, assesses the differences in the probability that a tie in the communication network and the probability of a tie in the trust network. In order to conduct the analysis, both the communication and trust networks were dichotomized such that values greater than or equal to 3 (on a scale of 1 to 7) were considered a tie and scores less than 3 were not considered a tie.

In Unit 1, a significant difference was found ($t = 4.43$, $p < .001$) between communication ND and trust ND, such that the trust network was more cohesive (see Table 11 and 12). In Unit 2, a significant difference was also found ($t = 4.52$, $p < .001$) between communication ND and trust ND, such that the trust network was more cohesive. Referring back to the Figures 2-5 from H2, the differences in Densities can be observed such that the trust networks for each unit (Figure 2 and 4) are more dense (i.e., cohesive) than the communication networks (Figure 3 and 5). These results fail to provide support for H3b in which it was predicted that the Densities between communication and trust would be similar.

> **Hypothesis 4a:** *The inclusiveness of communication network between the team and the team leader is positively associated with the inclusiveness of trust network between the team and the team leader.*

Using UCINET, NOR was calculated for each network (trust and communication) for each leader. In Unit 1, the mean and standard deviation NOR for the trust and

communication networks were calculated ($M = .84$, $SD = .04$; $M = .88$, $SD = .02$, respectively). However, a correlation was unable to be conducted due to only 2 of 8 leaders responding to the Time 2 data collection. For this reason, support for H4a by Unit 1 was inconclusive.

The calculations described in H3a were able to be repeated for Unit 2. In Unit 2, the mean and standard deviation NOR for the trust and communication networks of leaders were calculated ($M = .87$, $SD = .07$; $M = .87$, $SD = .03$, respectively). A non-significant correlation was found between the trust NOR and communication NOR for Unit 2 ($r = .47$, *n.s.*). These results suggest that those on the periphery of the trust network are not necessarily on the periphery of the communication network. H4a is not supported in Unit 2.

Hypothesis 4b: *The density of the communication network between the team and the team leader is not significantly different from the density of the trust network between the team and the team leader.*

To test H4b, a paired samples t-test was conducted between the ND of the leadership trust network and the ND of the leadership communication network for each unit. Support of H4b would be a non-significant paired samples t-test indicating that the Densities of both trust and communication networks of leaders are similar.

UCINET was used to calculate the average and standard deviation of ND for the leadership team within the trust and communication networks. In Unit 1, the ND of the leadership trust network was not significantly different ($M = .70$, $SD = 1.43$) than the ND of leadership communication network ($M = .61$, $SD = 1.37$) ($t (17) = .30$, *n.s.*). Nor was the ND of the leadership trust network significantly different ($M = 2.22$, $SD = 2.10$) from

the ND of the leadership communication network (M = 1.58, SD = 1.67) (t (15) = 1.34,

n.s.) in Unit 2. Based on the results from the analysis of Unit 1 and 2, H4b was supported

such that the ND of the trust in leadership network is similar to the ND of the leadership

communication network.

> ***Hypothesis 5a/b:*** *Trust (a) and psychological safety (b) in the team are positively*
>
> *associated with a willingness to informally discuss errors with other team*
>
> *members.*

One-tailed Pearson correlations were conducted to test H5a, which specified an

expected positive association between team trust and discussing errors with team

members. Team trust was not found to be significantly correlated with informally

reporting errors (r = .06, *n.s.*). The relationship was further explored by size of the error.

Team trust was not found to be associated with informally reporting small (r = .04, *n.s.*),

moderate (r = .17, *n.s.*), or severe (r = .01, *n.s.*) errors. The results from this analysis do

not provide support for H5a.

A second approach was taken to test H5a. Using SNA data, a QAP correlation

was conducted to determine whether the structure of the trust network within the unit was

positively associated with structure of the error reporting networks (small, moderate, and

sever errors). In Unit 1, the structure of the trust network was positively correlated with

the structure of error reporting of small (r = .71, p < .001), moderate (r = .75, p <.001),

and severe errors (r = .70, p <.001). In Unit 2, the structure of the trust network was

positively correlated with the structure of error reporting of small (r = .78, p < .001),

moderate (r = .81, p <.001), and severe errors (r = .81, p < .001). These results using

SNA data provide support for H5a.

One-tailed Pearson correlations were conducted to test H5b, which specified an expected positive association between team psychological safety and discussing errors with team members. Due to the hypotheses specifying that team psychological safety would be positively associated with discussing errors with other team members, the dependant variable was identified as 'informally reporting errors.' Team psychological safety was not found to be significantly correlated with informally reporting errors (r = .10, *n.s.*). The relationship was further explored by size of the error. Team psychological safety was not found to be associated with informally reporting small (r = .06, *n.s.*), moderate (r = .18, *n.s.*), or severe (r = .09, *n.s.*) errors. The results do not provide support for H5b.

> **Hypothesis 6a/b:** *Trust in the team leader (a) and perceptions of leader's support*
> *for psychological safety (b) are positively associated with willingness to*
> *informally discuss errors with the team leader.*

One-tailed Pearson correlations were conducted to test H6a, which specified an expected positive association between trust in leadership and discussing errors with leaders. Trust in leadership was found to be positively correlated with informally reporting errors (r = .22, $p<.05$). The relationship was further explored by size of the error. Trust in leadership was found to be positively associated with informally reporting severe errors (r = .21, $p < .05$) but not with informally reporting small (r = .16, *n.s.*) or moderate (r = .15, *n.s.*) errors. The results from this analysis provide support for H6a.

One-tailed Pearson correlations were conducted to test H6b, which specified an expected positive association between psychological safety fostered by leadership and discussing errors with leaders. Due to the hypotheses specifying that psychological safety

fostered by leadership would be positively associated with discussing errors with leaders, the dependant variable was identified as 'informally reporting errors.' Psychological safety fostered by leadership was not found to be significantly correlated with informally reporting errors ($r = .13$, *n.s.*). The impact of leader fostered psychological safety was further explored in regards to the size of the error. No significant association was found between leader fostered psychological safety and informally reporting small ($r = .14$, *n.s.*), moderate ($r = .09$, *n.s.),* or severe ($r = .12$, *n.s.*) errors. The results from these analyses do not provide support for H6b.

> **Hypothesis 7a:** *The density of the trust network within a team is not significantly different from the density of the density of an informal error reporting network.*

To test H7a, a paired samples t-test was conducted between the ND of the trust network and the ND of the error reporting network for each unit. Support of H7a would be a non-significant paired samples t-test indicating that the Densities of the trust network and the error reporting networks for small, moderate, and severe errors are similar.

A bootstrap approach using 5,000 samples was used. The paired samples t-test, used in this way, assesses the differences in the probability that a tie in the trust network and the probability of a tie in the error reporting network. In order to conduct the analysis, the communication and error reporting networks were dichotomized such that values greater than or equal to 3 (on a scale of 1 to 7) were considered a tie and scores less than 3 were not considered a tie.

In Unit 1, a significant difference was found between ND in the trust network and the Densities in the error reporting networks for small ($t = -2.37$, $p < .05$) errors and

moderate (t = -3.55, p <.001) errors (See Table 11 and 12). A significant difference, however, was not found between the ND in the trust network and error reporting network for severe errors (t = -.92, n.s.). In Unit 2, a significant difference was found between the ND of the trust network and the Densities of the error reporting networks of small (t = -3.36, p < .001), moderate (t = -4.27, p < .001), and severe (t = -3.76, p < .001) errors (see Table 11 and 12). H7b is only partially supported for similarities between the Densities of the trust network and the error reporting network for severe errors in Unit 1.

> **Hypothesis 7b:** *The inclusiveness of the trust network within a team is positively associated with a willingness to informally discuss errors with other team members.*

To test H7b, UCINET was used to calculate the NOR for the trust network and error reporting networks of small, moderate, and severe errors. In Unit 1, the mean and standard deviation of the trust network NOR (M = .85, SD = .06) and error reporting networks NORs for small (M=.89, SD = .04), moderate (M = .86, SD = .05), and severe errors (M = .82, SD = .10) were calculated. The trust NOR was then correlated with each level of error reporting networks. The trust network NOR was not found to be significantly correlated with the NORs of error reporting networks for small (r = .21, *n.s.*), moderate (r = .07, *n.s.*), or severe errors (r = .03, *n.s.*). The results suggest that those leaders who are well received in the trust network are not necessarily well received in the error reporting networks, and vice versa. For Unit 1, this does not provide support for H7b.

The above calculations were repeated for Unit 2. In Unit 2, the mean and standard deviation NORs for the trust network (M = .89, SD = .05) and error reporting networks

for small ($M = .87$, $SD = 05$), moderate ($M = 82$, $SD = .07$), and severe errors ($M = .72$, $SD = .10$) were calculated. A non-significant correlation was found between the trust network NOR and error reporting network NORs for Unit 2 for small ($r = .29$, n.s.), moderate ($r = .31$, n.s.), and severe errors ($r = .14$, n.s.). The results suggest that those who are well received in the trust network are not necessarily well received in the error reporting network, and vice versa. H7b was not supported in Unit 2.

Hypothesis 8a: The density of the trust network between the team and team leader is not significantly different from the density of the informal error reporting network between the team and team leader.

To test H8a, a series of paired samples t-tests were conducted between the ND of the leadership trust network and the ND of the leadership error reporting network for each unit. Support of H8a would be a non-significant paired samples t-test indicating that the Densities of both trust and error reporting networks of leaders for small, moderate, and severe errors are not significantly different from each other.

UCINET was used to calculate the average and standard deviation of the ND of the leadership trust network and leadership reporting networks for small, moderate, and severe errors. A paired-samples t-test was then calculated between the ND of trust and the ND of networks for each level of errors (small, moderate, and severe). In Unit 1, the average ND of the leadership trust network ($M = .70$, $SD = 1.43$) was not statistically different than the Densities of the error reporting networks of small ($t(17) = .03$, *n.s.*; $M = .71$, $SD = 1.44$), moderate ($t(17) = .35$, n.s.; $M = .82$, $SD = 1.61$), or severe errors ($t(17) = .65$, *n.s.*; $M = .94$, $SD = 1.85$). In Unit 2, the average ND of the leadership trust network ($M = 2.22$, $SD = 2.10$) was also not significantly different than the Densities of the error

reporting networks for small (t (15) = 1.57, *n.s.*; M = 2.86, SD = 2.32), moderate (t (15) =

1.55, *n.s.*; M = 3.10, SD = 2.43), or severe errors (t (15) = 1.55, *n.s.*; M = 3.10, SD = 2.43).

Based on the results from the analysis of Unit 1 and 2, Hypothesis 8a is supported such

that the ND of the leadership trust network is similar to the ND of error reporting

networks in the leadership team for all levels of errors (small, moderate, and severe).

>**Hypothesis 8b:** *The inclusiveness of the trust network between the team and team*
>
>*leader is positively associated with a willingness to informally discuss*
>
>*errors with the team leader.*

Using UCINET, NOR was calculated for each network (trust and error reporting)

for each leader. In Unit 1, the mean and standard deviation NORs for the trust networks

of leaders (M = .84, SD = .04) and the error reporting networks of leaders for small (M

= .89, SD = .01), moderate (M = .86, SD = .00), and severe errors (M = .73, SD = .08)

were calculated. However, additional analysis was unable to be completed due to only 2

of 8 leaders responding to the Time 2 data collection. For this reason, support for

Hypothesis 8b by Unit 1 was inconclusive.

In Unit 2, the mean and standard deviation NOR for the trust networks of leaders

(M = .87, SD = .07) and error reporting networks of leaders for small (M = .82, SD = .06),

moderate (M = 74, SD = .03), and severe errors (M = .66, SD = .02) were calculated. The

correlations between the leadership trust network NOR and the error reporting networks

of leaders NOR for small (r = .24, *n.s.*), moderate (r = .76, *n.s.*), and severe errors (r = .62,

n.s.) were not significant. For Unit 2, the results suggest that those leaders who are well

received in the trust network are not necessarily well received in the error reporting

network, and vice versa. H8b was not supported in Unit 2.

Hypothesis 9a: *A team learning orientation climate moderates the relationship of trust within the team with the willingness to informally discuss errors with other team members.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, team trust and team learning orientation were entered into the equation but failed to reach significance ($F_{(2, 61)} = 0.19$, *n.s.*). The process was repeated to separately test informally reporting small, moderate, and severe errors. Results for each of these sets of analysis failed to reach significance in informally reporting small ($F_{(2, 57)} = 0.04$, *n.s.*), moderate ($F_{(2, 50)} = 0.71$, *n.s.*), or severe ($F_{(2, 58)} = 0.004$, *n.s.*) errors. The results from these analyses fail to support step 1 of the moderation analysis, step 2 was not conducted. Results do not provide support for H9a.

Hypothesis 9b: *A team learning orientation climate moderates the relationship of psychological safety within the team with the willingness to informally discuss errors with other team members.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, team psychological safety and team learning orientation were entered into the equation and failed to reach significance ($F_{(2, 61)} = 0.66$, *n.s.*). The process was repeated to separately to test the impact of team psychological safety and team learning orientation on informally reporting small, moderate, and severe errors. Results for each of these sets of analysis failed to reach significance in informally reporting small ($F_{(2, 57)} = 0.11$, *n.s.*), moderate ($F_{(2, 50)} = 0.87$, *n.s.*), or severe ($F_{(2, 58)} = 0.24$, *n.s.*) errors. The results from these analyses fail to

support step 1 of the moderation analysis, step 2 was not conducted. Results do not provide support for H9b.

> ***Hypothesis 10a:*** *Perceptions of the team leader's support for a team learning climate moderates the relationship between trust in the team leader and willingness to informally discuss errors with the team leader.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, trust in leadership and leader fostered learning orientation was entered into the equation and failed to reach significance (F (2, 60) = 1.49, *n.s.*). The process was repeated to separately test the impact of trust in leadership and leader support for a learning orientation on informally reporting small, moderate, and severe errors. Results for each of these sets of analysis failed to reach significance in informally reporting small (F (2, 56) = 0.70, *n.s.*), moderate (F (2, 49) = 0.84, *n.s.*), or severe (F (2, 57) = 1.72, *n.s.*) errors. The results from these analyses fail to support step 1 of the moderation analysis, step 2 was not conducted. Results do not provide support for H10a.

> ***Hypothesis 10b:*** *Perceptions of the team leader's support for a team learning climate moderates the relationship between perceptions of the team leader's support for psychological safety and willingness to informally discuss errors with the team leader.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, leader fostered psychological safety and leader fostered learning orientation climate were entered into the equation. The regression failed to reach significance (F (2, 61) = 0.59, *n.s.*). The process was repeated

to separately test the impact of leader fostered psychological safety and learning orientation on informally reporting small, moderate, and severe errors. Results for each of these sets of analysis failed to reach significance in informally reporting small (F (2, 57) = 0.68, *n.s.*), moderate (F (2, 50) = 0.64, *n.s.*), or severe (F (2, 58) = 0.88, *n.s.*) errors. The results from these analyses fail to support step 1 of the moderation analysis, step 2 was not conducted. Results do not provide support for H10b.

> ***Hypothesis 11:*** *Organizational support for learning orientation moderates the association between team trust and willingness to formally report errors.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, team trust and organization fostered learning orientation were entered but failed to reach statistical significance (F (3, 59) = 1.87, *n.s.*). The process was repeated to separately test the impact of team trust and organizational support for a learning orientation on formally reporting small, moderate, and severe errors. Results for these sets of analysis failed to reach significance for small (F (2, 57) = .62, *n.s.*) or moderate (F (2, 51) = .91, *n.s.*) errors. However, when formally reporting severe errors was regressed onto team trust and organizational learning (R = .55, Adj R^2 = .28, F (2, 59) = 12.46, p < .001), organizational learning was found to be a significant predictor (B = .54, p < .001) but team trust was not (B = .25, n.s.). The results from these analyses fail to support step 1 of the moderation analysis, step 2 was not conducted. Results do not provide support for H11.

> ***Hypothesis 12:*** *Organizational support for learning orientation moderates the association between team leader trust and willingness to formally report errors.*

To test the hypothesis of moderation, linear multiple regression was conducted and the variables were entered in two steps. In step 1, trust in leadership and organization fostered learning orientation were entered (R = .37, AdjR^2 = 0.10, F (2, 59) = 4.38, p <.05). Both trust in leadership (B = -.28, p<.05) and organization fostered learning orientation (B = 0.35, p<.01) were significant predictors of formal error reporting. In step 2, the interaction term was added to test moderation. While the overall equation remained significant (R = .37, AdjR^2 = 0.09, F (3, 59) = 3.02, p<.05), the change in R^2 was not significant and only the coefficient for organization fostered learning orientation remained significant (B = .34, p<.05). These results do not support Hypothesis 12 that organizational fostered learning orientation moderates the relationship between trust in leadership and formal error reporting. Instead, these results indicate that organization fostered learning orientation is a unique, direct predictor of formal error reporting.

Due to the unpredicted direct relationship between organization fostered learning orientation with formal error reporting, additional exploratory analysis was conducted to examine the relationship between learning orientation climate and error reporting. Given the significant finding in predicting formal error reporting to risk management, the analysis was conducted to assess the relationship with formally documenting errors in patient's charts. In step 1, trust in leadership and organizational climate were entered into the equations (R = 0.40, Adj R^2 = 0.13, F (2, 59) = 5.39, p < .01). In this analysis, trust in leadership was no longer a significant predictor (B = -.05, n.s.), but organization fostered learning orientation was a strong significant predictor (B = .41, p < .01). In step 2, the interaction term between trust in leadership and organization fostered learning orientation

was entered, but the change in R^2 was not significant. This indicates that there was no significant incremental variance accounted for by the interaction.

Finally, exploratory analysis that was conducted focused on the impact of trust in leadership and organization fostered learning orientation on size of the errors. Since severe errors are the most likely to have life-and-death consequences, this relationship was examined first. Results indicate that again trust in leadership and organization fostered learning orientation are responsible for explaining a significant amount of variance in the decision to report severe errors ($R = .51$, Adj $R^2 = 0.23$, $F (2, 57) = 9.46$, $p < .001$). However, trust in leadership remained a non-significant predictor in the equation ($B = .04$, n.s.) and organization fostered learning orientation was significant ($B = 0.49$, $p<.001$). The addition of the interaction between trust in leadership and organization fostered learning orientation did not result in a significant change in R^2. Next, the analysis was run for reporting moderate and small errors. Neither analysis resulted in significant equations for reporting moderate ($F (2, 49) = 1.88$, *n.s.*) or small ($F (2, 56) = 1.45$, *n.s.*) errors.

<u>Exploratory Analysis</u>

The premise of SNA is the understanding of social structure that may or may not align with the formalized structure imposed by an organization. Despite this, examination of this alignment (or misalignment) was not a focus of the study or formally proposed. However, in the interest of available data, exploratory analysis of the social structure is described. Drawing upon the social network literature, it is known that certain roles and positions within a network are associated with the types of social ties one might expect to

observe. Given this, a clique analysis was conducted for both units on both the communication and trust networks to determine if there is any pattern of cliques based on position. It would be expected that leaders are more likely to span boundaries of any cliques that may exist whether in terms of communication or trust. First, however, a brief explanation of cliques in terms of SNA is needed.

Much of the value offered by SNA is the capability of examining cohesive subgroups within a network. It could be posited that it is within these cohesive subgroups that the action and power exists. Power and influence within the subgroups are due to the tight linkages with a majority of team members and the greater access and ability to distribute information. Although many terms are used interchangeably to describe these cohesive subgroups (e.g., cliques, clans, clubs), the focus herein is on cliques. Cliques have been mathematically defined as "a maximal complete subgraph of three or more nodes…all of which are adjacent to each other…" and more simply as "…a collection of actors all of whom "choose" each other…" (Wasserman & Faust, 1993, p. 254). Actors, or team members, are adjacent to each other when there is a direct tie between them, or a predefined number of linkages apart from each other. Further, the mention of actors 'choosing' each other should bring to mind the discussion of reciprocity or mutuality of relationships between team members earlier in this paper. Much theory has evolved on the importance these cliques play and the methodology used to explore them (e.g., Festinger, 1949; Luce, 1950). Most relevant to the current study is the methodology used to examine n-cliques.

Clique analysis, in general, provides information on all cliques greater than the specified size within a given network. This analysis was refined using an algorithm by

Bron and Kerbosch (1973) to identify cliques. The analysis, called *n*-cliques, is .

identifies cliques based on the geo-distance between members within a network.

Specifically, the *n* value is the maximum number of linkages connecting any two

members of the network and still be considered a cohesive subgroup. For example,

consider a subgroup of three members (A, B, C, D) where A ties to B and B ties to C.

This group of ABC would be considered a *n*-clique because there are only two linkages

between A and C. As *n* increases, the maximum distance between members also

increases. However, it is generally accepted that a value greater than 2 or 3 becomes

meaningless in understanding social behavior in terms of a cohesive subgroup (Scott,

2000). The second reason is that *n*-cliques are considered a more 'relaxed' approach for

examining cohesive subgroups and are thought to be a closer modeling of how groups

actually behave (Scott, 2000). It has been noted that an alternative to *n*-cliques that has a

more stringent requirement for inclusion into the subgroup is n-clans (Alba & Moore,

1978; Mokken, 1979) because it restricts the diameter of the subgraph (see Wasserman &

Faust, 1993). Due to the exploratory nature of the current examination, it was determined

that the less stringent approach was appropriate.

In order to conduct the *n*-clique analysis, recommendations provided by

Wasserman and Faust (1993) were followed. First, the communication and trust networks

were dichotomized. In order to reduce stringency, the ratings of a 0 (no contact) or 1

(very low communication, trust) were transformed to 0. Those ratings of a 2 through 5

were transformed to a rating of 1. Next, the matrix for both communication and trust

were transformed to be symmetrical. Symmetry, in this context, relates to reciprocity of

ratings between participants. Thus, in pairs where both members gave a rating of 2 or

greater (dichotomized to a rating of 1), a rating of 1 was given. In pairs where either of the pair gave a rating of 1 or lower (dichotomized to a rating of 0), a rating of 0 was given. Using UCINET, n-clique analysis was conducted on the newly dichotomized and symmetrical matrix. The n-clique analysis was conducted.using an n value of 2 and the restriction of cliques with no fewer than 3 members to be generated.

<div align="center">Communication and Trust Clique Analysis</div>

Unit 1 was examined first. Using n-clique analysis, 50 cliques were identified, but only 2 met the two 2-cliques requirement. The results from this clique analysis were then visually displayed to examine the connections between members. It was able to be determined that of the 27 participants that remained in the data set, 16 of them were members of both cliques. In other words, 16 of them are boundary spanners. Two interesting findings emerged from the analysis. First, one of the two cliques consisted nearly exclusively of boundary spanners (with the exception of one person). The second clique, conversely, contain 9 participants that had no overlap with the boundary spanner clique. The second interesting finding is that the two leaders in the sample, were not in the 'boundary spanner' clique. This suggests that the only way for the leaders to pass or receive information to the one person in the 'boundary spanner' clique is through one of the boundary spanners. It is also worth noting that of the 36 participants from this unit, 9 of them are not included in this clique. From a social network perspective, this indicates that at least 25% of the respondents are on the periphery of the communication network and are unlikely to give or receive information. This also indicates the the leaders from Unit 1 are not in close communication with at least 25% of their unit. Next, the trust network was examined for Unit 1.

Using the same methodology described above, only one 2-clique was identified in the trust network. In this 2-clique, 26 participants were included. The members of this clique were compared to the communication cliques discussed previously. The interesting finding from the comparison between the communication and trust networks is that the one person that was only linked to the 'boundary spanner' clique is not a member of this trust clique. It may suggest that this person is included in the communication network due to the strong propensity for communication among the boundary spanners, but the type of communication that flows is likely not requiring much trust. Although the overall results seem to bode well to have only one clique, the same 9 people that were on the periphery of the communication network are also not trusting or trusted by the majority of the unit.

Analysis was then conducted for Unit 2. Unlike Unit 1, this unit had a single 2-cliquewithin the communication network suggesting a relatively free-flowing communication pattern within the unit. All leaders whom responded were included in the communication network as well. Additionally, only 10% of the respondents were on the periphery of the communication network (i.e., not members of the n-clique). When the trust network was examined for Unit 2, two 2-cliques were generated. Although this might have suggested that there were potentially trust concerns within the unit, closer examination of the members of the two cliques provided insight. In each clique there was only 1 member in each that did not overlap with the other. In one clique, it was a leader. In the other clique, a team member was the non-overlapping member. Given the nearly 100% overlap (which would have resulted in a single clique), it would suggest that there is a trust issue between this leader and team member. In addition, it was noted that one person in the communication network for Unit 2 did not appear in the trust network. As

suggested in regards to Unit 1, the topics discussed by/with the person are not ones requiring high levels of trust.

In summary, the results from this exploratory analysis provide confirmation that the formal position one holds does not always fully align with the informal position one holds in the social environment. Despite leaders' obligation to maintain strong communication and trust with all members of their team, it is seen that this is not the case for the sample used in the current study. Further, the results from these exploratory analyses provide additional support for the analysis in H3a and H4b, in which it was proposed that the inclusiveness of the communication network would be similar to the inclusiveness of the trust network.

DISCUSSION

The purpose of the study described in this paper was to examine the impact of trust, psychological safety, and a learning oriented climate on error reporting intentions in a medical setting. In order to conduct the study, two hospital units were compared and two analysis methodologies were employed – traditional surveys and SNA. Findings of this study support previous research indicating that trust and communication are associated (e.g., Shapiro, 1990; Treadway, et al., 2004, Zucker, 1986) within the team, as well as with the leadership team.

The relationship between trust and communication was also examined in regards to the informal networks existing within the two hospital units. The inclusiveness and ND (i.e., cohesion) of the networks were examined. Upon examining the inclusiveness of the trust and communication networks, the results at the team level were mixed. Only one unit showed evidence of a network of individuals within the team that trust each other and are willing to discuss errors, as well as a group of outsiders whom people do not trust or talk to about errors. At the leadership level, however, no evidence was found that the inclusiveness of the communication network was associated with the inclusiveness of the trust network. The cohesiveness (i.e., ND) of the networks for communication and trust were also examined. Although it was expected that teams that were cohesive in communicating with each other would also be more cohesive in trusting each other, this was not supported at the team level using measures of ND. However, using exploratory clique analysis, it was found that in general those who were central to communication within the unit also tended to be central to the trust network. Upon examining the

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leadership team's relationships, the results indicated that those leaders whom were frequently in communication with their team were also trusted more.

The take-away from the analysis of the relationship between communication and trust is that while they are significantly related, understanding the mechanics of the relationship is complex. At the team level, it appears be that team members talk to each other regardless of whether they trust each other. But, it appears that those whom are central to communication within the unit, earn it via giving and earning the trust of those within their unit.Thus, it might be important to examine whether this relationship is strengthened or weakened by *what* is spoken about (e.g., innocuous versus a severe error). Conversely, at the leadership level the relationship appears more straight forward, in that team members do not communicate with leaders they do not trust.

To further investigate whether what is communicated about matters in relation to trust, the relationship between trust and a willingness to informally discuss errors that might occur was examined. At the team level, the results indicate that the willingness to discuss an error, regardless of the size of that error, is not influenced by whether the team members trust each other. One interpretation of these findings may be that team members do not feel the responsibility or permission to discuss errors with each other. This is a red-flag that team members are not sharing critical information, which is known to be critical to team success. Leaders have the responsibility to ensure that team members have shared mental models of their roles and responsibilities within the team, which include the empowerment to discuss errors with each other for the purpose of immediate improvement.

Although no significant relationship was found between team trust and a willingness to informally discuss errors within the team using traditional surveys, a significant relationship was found using SNA in one of the units. SNA findings indicate the many of connections that exist within the trust network are replicated in the error reporting network. One reason that this finding may appear to contradict the traditional survey results is that by asking targeted questions about specific individuals, it reduces error variance in team trust ratings that may be skewed by one or two members of the team who are 'really trusted' or 'really un-trusted.' Since there is only mixed support for this finding between the two units, the interpretation should be investigated more thoroughly in future research.

When the relationship between trust and informally error reporting is examined at the leader level, a positive association is observed. The relationship was explored further by the severity of the errors (small, moderate, severe) and support was found trust in leadership correlating with informally discussing severe errors. Although it is possible that the relationship was supported for leaders because they have the 'authority' to discuss and provide feedback about errors with team members, it is more likely that trust plays a larger role in the nurses' willingness to discuss errors with them than with their teammates. It may be the vulnerability inherent in discussing errors with leaders that influences the need for trust. This interpretation would provide support to past research indicating that trust in leadership will lead to increased communication and willingness to engage in 'risky' behavior (i.e., admitting to errors) (Baer & Frese, 2000; Weymes, 2003). Using the social network results, relationship was explored further.

The social network results support and expand the understanding of the relationship between trust and a willingness to informally discuss errors. Using the social network data, a relationship between trust in leadership and informally reporting small, moderate, and severe errors. Again, this correlation indicates that connections with leaders in the trust network are replicated in the error reporting networks. The prior interpretation of why there appears to be a conflict with the results from the traditional survey results again applies. By asking targeted questions about specific leaders, error variance in the broader questionnaire caused by one or two leaders who are 'really trusted' or 'really un-trusted' is alleviated

Psychological safety, which is similar to trust, was also examined in relation to the willingness to discuss errors. Prior research had indicated that psychological safety was related an increased willingness to admit to and address errors and openness to feedback (e.g., Arygris & Schon, 1978; 1996; Baer & Frese, 2003; Edmondson, 1999). Results from this study fail to support prior research. This finding is unexpected due to the relatively high rating of perceived psychological safety in the team and fostered by the leader. Given that the primary difference between trust and psychological safety is the perception that it is 'ok' to engage in behaviors that will improve team performance, it may be that a negative perception of how reported errors are actually used (i.e., indictment versus improvement). This interpretation lends itself naturally to discussing the moderating effect of a learning orientation that is perceived/fostered by the team, the leader, and/or the organization.

Learning orientation climate was hypothesized to moderate the relationship between trust/psychological safety and a willingness to report errors. Prior research

suggested that a learning orientation, whether fostered at the team, leader or organizational level, was a shared mental model that errors were opportunities for developing new solutions and improve processes (e.g., Cannon & Edmonson, 2001; Lipshitz et al., 2002). Learning orientation was proposed as a moderating variable that would bolster or constrain the relationship between trust and psychological safety with error reporting Morrison & Milliken, 2000). In other words, people who perceive a learning orientation believe that something good will come of risking their reputation and job by discussing errors with others. Despite this, when learning orientation was examined at the team, leader, and organizational levels it was not found to be a moderator. Instead, results from this study indicate that the perception that the organization has a learning orientation directly predicts a willingness to formally report errors to risk management. Team and leader fostered learning orientation were not found to be significantly correlated with informally or formally reporting error.

Organizational learning orientation was analyzed in conjunction with team trust and leader trust. Results from these analyses suggest that only trust in leadership and organizational learning orientation were significant predictors of a willingness to formally report errors to risk management. Additional exploratory analysis found that organizational learning orientation was a significant predictor of documenting errors in patients' charts and of reporting severe errors whereas trust in leadership was not a significant predictor. The results from this set of analyses have significant implications. First, that a 'Culture of Safety' is not just a catchy phrase, but that the organization's approach to handling error reporting (censure vs. learning) has a significant impact on patient safety based on whether healthcare workers are willing to report errors that are

occurring. Second, the results of this study strengthen the call for multilevel research. The results from this study indicate that while micro-factors such as trust within the team and with leadership are influential in the willingness to report errors, the macro-factor of organizational culture is a driving force that can 1) make up for lower levels of trust at the micro-level or 2) wipe away any benefit that could be gained by trust at lower levels of the organization.

<div align="center">Limitations</div>

In conducting this study, a number of limitations were identified. The two issues of largest concern are the potential for socially desirable responding and the familiarity of persons within the unit. In self-report surveys there is always a risk for socially desirable responses. Socially desirable responses (SDR) have been defined as "the tendency to for people to present themselves favorably..." (Mick, 1996, pg. 106) and are a threat when the norms of the group might be perceived as different from themselves. The result of SDR is that participants are likely to under- or over-report his/her attitudes or behaviors as a means to manage impressions or as an inadvertent attempt to maintain a positive self-image (Paulhus, 1991). In this study, systematic SDR may have occurred not only because the topic was sensitive (e.g., trust in leadership), but because participants responses were directly linked to their names. If SDR was acting in this study, it may have resulted in an over-reporting of the trust that exists and an inflated willingness to report errors.

A second limitation of this study may have impacted the social network data. Upon commencing data collection, it became apparent that there was a disconnect

between employee names in the hospital roster and the names commonly used by individuals on the unit. In both units, it was determined that even nurses who worked together regularly were unaware of their coworkers' legal names. The impact of this is that those individuals who do not use their 'legal' names may have received an under-endorsement of the relationships that they hold with others within the unit. As a result, these individuals may appear to be less central to the unit due to the names used in the survey rather than due to their actual interactions or relationships with others on the unit.

A third limitation identified within this study was sample size. Although the full sample met the minimum requirement for statistical power, SNA has been estimated to require a minimum of 50-60% response rate to accurately predict behaviors within a given network. In both units, nearly 50% of the networks responded. However, past research has indicated that there may be a substantial difference between those who do and do not respond to surveys (e.g., Bean & Roszkowski, 1995). The impact of this is that the current results may be a biased view of the true networks within each unit. For instance, it may be those with low trust and/or those who are more peripheral to the units who chose not to participate. Not only will the impact of non-responders potentially reduce the variability of scores and the strength of the relationships, it may also reduce the ability to generalize the results more broadly.

Future Directions and Implications

Traditional surveys are commonly used to measure the perceptions of individuals about his/her team. However, it is unlikely that a person perceives everyone within the team similarly. Traditional surveys do not provide adequate opportunity for participants

to disclose these differing perceptions. The responsibility is therefore placed on the participant to do the mental calculations to average his/her perceptions of each team member into a single rating for each item on the survey. Based on the results of this study, there is evidence to suggest that while participants will provide a team rating, it may not accurately reflect the interpersonal relationships that actually exist within the team. In fact, during the data collection for this study, numerous participants would anecdotally say, "it really depends on which team member" when it comes to being willing to discuss errors. By implementing SNA into team research, the theory of teams may be able to expand their understanding of team processes and team effectiveness. Based on the current research, it becomes apparent that effects that were not evident through traditional surveys (e.g., team trust and willingness to report errors) were observable using SNA. Given these findings, it is hoped that future team research will begin including SNA in their studies to better understand the dynamics that exist between individuals.

Another finding in this study that has theoretical implications is the differences found in ratings of trust by ethnicity. The current findings support past research that has found that Japanese typically report lower trust than Americans (Hayashi, Suzuki, Suzuki, & Murakami, 1982; Yamagishi & Yamagishi, 1994). The differences found in trust across ethnicities provide evidence of a continued undercurrent of racial bias that is assumed to be a 'thing of the past' in modern society. Furthermore, the implications for this finding in a medical setting on a willingness to report errors is alarming. During data collection, participants anecdotally reported that certain ethnicities would "protect each other no matter what" when it came to reporting or documenting errors within the unit.

Despite this comment being made anecdotally, the current findings that team trust is in fact viewed differently by ethnicity, future research is needed to understand whether the finding is unique to this study or whether it has broader implications for understanding error reporting behaviors.

A final theoretical implication discussed here is the finding that organizational perceptions are a greater predictor of reporting errors than trust in the leadership team. Yet, past research has indicated that organizational climate is sometimes inferred by employees based on the actions of their leaders who enact the policies and procedures of the organization (Tyler & Lind, 1992). It may be that because formally reporting errors to risk management takes place outside of the department, that less emphasis is placed on the direct interactions with leaders and more with the overarching perceptions of the organization. Future research should examine how individuals develop perceptions of an organizational learning orientation unique from perceptions of the leadership team.

Research on patient safety and human error in general, has found that it is often the interplay of many organizational, social, and environmental factors that lead to fatal outcomes (e.g., Reason 1990). It has been suggested that small errors are often the building block to fatal outcomes if they are not prevented early (see Reason, 2000; Swiss Cheese Model). One practical implication of this study is the finding that trust in leadership correlates to a willingness to report errors. Specifically, results from this study indicate that leaders who focus on developing trust with team members are more likely to hear about even small errors. Several leaders in this sample were identified as being outside the flow of communication within their units and not being a conduit of information about errors that may be occurring. As a leader, it is critical that they have a

full understanding of situational information in order to assist the team in adapting and coordinating their activities (e.g., Salas, Dickinson, Converse, & Tannenbaum, 1992; Day, Gronn, & Salas 2004). Taken together, when leaders are not trusted or are within in the flow of communication within their units, they are limited in the ability to coordinate behavior and they are less likely to be aware of smaller patterns of errors that can be prevented. In short, the developing trust is not just a 'nice to have' but rather a 'must have' in this environment because the failure to trust may have life and death implications.

A final practical implication of this study is the strong influence that organizational climate has on the behaviors of its employees – especially those behaviors that are critical to organizational sustainability. As a preface to this study, it was argued that organizational success and sustainability depends on employees helping the organization identify process improvements (e.g., Argote, 1999; Conner & Prahalad, 1996; Grant, 1996; Grant et al., 1995; Lewis, 2004; Liebeskind, 1996; Wernerfelt, 1984). Findings from this study suggest that organizational climate has a more powerful effect on employees' willingness to 'go out on a limb' to report errors than those whom they come into contact on a daily basis. These findings may support past research that suggests that when employees are provided guidance on how to contribute to the organization, they will (Boswell & Boudreau, 2001; Pritchard, Youngcourt, Philo, McMonagle, & David, 2007). One recommendation offered by Pritchard and colleagues (2007) was regularly meeting to discuss improvement strategies. This suggestion goes beyond the team literature describing the benefit of after-action-reviews for team process improvement (e.g., Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995) by not

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requiring a focus on past behavior. Instead, the suggestion is to focus on future behaviors and concretely discussing the individual's responsibility and suggested activities to improve the performance of the team and the organization.

CONCLUSION

Organizations and researchers alike are interested in understanding the conditions under which employees share information (e.g., Lesser & Prusak, 2004), especially when the shared information poses a great personal risk to those who share the information. This is of utmost importance in a field where poor communication can contribute to avoidable deaths (Andrews et al. 1997). The results from this study provide strong evidence that trust and a learning orientation can positively influence healthcare works in the decision to report errors. It is through the movement towards a 'Culture of Safety' (i.e., open discussion of and learning from errors), that a greater emphasis will be placed on understanding the relational components of knowledge transfer needed for organizational learning and safer healthcare. This study also successfully utilized two distinct data analytic approaches in an effort not only to bring awareness to Social Network Analysis, but also to have a richer insight into team dynamics in a complex environment. In conclusion, three take-aways from this study include 1) the importance of employing multiple methods of measurement to provide greater direction in interpretation of findings, 2) support prior calls for multilevel research which provides insight into the interplay of micro and macro variables, and 3) findings that leaders and organizational climate are crucial in the ultimate goal of safer practice of medicine and reducing needless deaths.

TABLES

TABLE 1. SAMPLE DEMOGRAPHICS

Sample Demographics		
	Mean Years	**St. Dev of Years**
Age	38.1	12.6
Tenure in Nursing	10.3	10.5
Tenure at Medical Institution	4.8	5.4
Gender	**n = 76**	**%**
Male	8	10.5
Female	68	89.5
Ethnicity	**n = 76**	**%**
African American	5	6.6
Asian American	13	17.1
Caucasian	54	71.1
Hispanic/Latino	2	2.6
Other	2	2.6
Education	**n**	**%**
High School Diploma	21	28.8
Associates Degree	8	11
Bachelors Degree	11	15.1
Masters Degree	2	2.7
Registered Nurse	27	37
Other	4	5.5
Job Title	**n = 74**	**%**
Patient Care Technician/CNR	29	39.2
Licensed Practical Nurse	9	12.2
Clinical Nurse/Registered Nurse	30	40.5
Clinical Nurse 3/Patient Care Leader	6	8.1
Shift	**n = 73**	**%**
7am – 7pm	35	46.1
3pm – 11pm	20	26.3
7pm – 7am	12	15.8
11pm – 7am	6	7.9
Independent Variables	**Mean**	**St Dev.**
Team Trust	4.74	0.86
Trust in Leadership	4.89	0.86
Team Psychological Safety	5.31	0.84
Leader Fostered Psychological Safety	5.29	0.92
Team learning Orientation Climate	5.26	0.71
Leader Fostered Learning Orientation Climate	5.23	0.88
Organization Fostered Learning Orientation Climate	5.62	0.80

TABLE 2. CONSTRUCT RELIABILITY

Construct	Cronbach's Alpha	Number of Items	n
Team Trust	.75	10	71
Leader Trust	.83	10	71
Team Psychological Safety	.72	7	75
Leader Psychological Safety	.74	7	75
Team Learning Orientation	.72	7	74
Leader Learning Orientation	.84	7	75
Organization Learning Orientation	.84	7	75

TABLE 3. DISCRIMINANT/CONVERGENT VALIDITY

	1	2	3	4	5	6	7
Team Trust (1)	-						
Leader Trust (2)	.71**	-					
Team Psychological Safety (3)	.41**	.34**	-				
Leader Psychological Safety (4)	.27*	.41**	.65**	-			
Team Learning Orientation (5)	.35**	.36**	.33**	.35**	-		
Leader Learning Orientation (6)	.23*	.40**	.37**	.46**	.74**	-	
Organization Learning Orientation (7)	.27*	.30**	.26*	.27*	.48**	.52**	-

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed)

TABLE 4. CORRELATION OF DEMPGRAPHICS, INDEPENDENT VARIABLES, AND DEPENDENT VARIABLES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Gender	1																
Age	-.211*	1															
Ethnicity	-.116	-.020	1														
Tenure in nursing	.062	.699**	-.004	1													
Tenure at hospital	.023	.449**	-.219*	.614**	1												
Education	.034	.189	.055	.090	.198*	1											
Department	-.055	.210*	-.185	.182	-.034	-.174	1										
Team Trust	-.151	.163	-.301**	.049	.186	.229*	.008	1									
Leader Trust	-.073	.192	-.235*	.148	.211*	.043	.154	.714**	1								
Team Psych Safety	.025	.143	-.186	.155	.205*	.096	.031	.450**	.464**	1							
Leader Psych Safety	-.031	.021	-.165	.114	.098	.033	.016	.317**	.493**	.691**	1						
Team Learn. Orient.	.182	.166	-.053	.162	.254*	.207*	-.163	.242*	.281**	.286**	.297**	1					
Leader Learn. Orient.	.163	.088	-.085	.101	.153	.219*	-.177	.174	.357**	.355**	.422**	.786**	1				
Org Learn. Orient.	.132	.039	-.031	-.036	.027	.113	-.090	.305**	.387**	.345**	.335**	.440**	.501**	1			
Informally reporting	-.057	-.018	-.107	-.107	-.151	-.133	-.045	.085	.248*	.149	.160	.003	.127	.234*	1		
Documenting errors	-.089	-.215*	-.004	-.282*	-.218*	.130	-.411**	.176	.083	.273*	.215*	.140	.252*	.387**	.581**	1	
Formally reporting	-.144	-.127	.203	-.167	-.149	.146	-.347**	-.013	-.100	.190	.065	.001	.090	.266*	.366**	.667**	1

TABLE 5. MEAN SCORE OF WILLINGNESS TO REPORT ERRORS ACROSS METHODS AND ERROR SEVERITY

Mean Willingness to Report Errors	Units Combined	Unit 1	Unit 2	t-test (sig)
Overall				
Small Errors	3.71 (sd = 1.54)	*4.18 (sd = 1.56)*	3.21 (sd = 1.38)	t (58) = 2.55**
Moderate Errors	4.59 (sd = 1.59)	4.84 (sd = 1.34)	4.28 (sd = 1.83)	ns
Severe Errors	5.66 (sd = 1.52)	6.00 (sd = 1.10)	5.28 (sd = 1.82)	ns
Informally	**5.17 (sd = 1.61)**	**5.20 (sd = 1.71)**	**5.14 (sd = 1.52)**	**ns**
Small Errors	4.73 (sd = 1.91)	4.93 (sd = 1.82)	4.51 (sd = 2.01)	ns
Moderate Errors	5.30 (sd = 1.76)	5.29 (sd = 1.62)	5.30 (sd = 1.95)	ns
Severe Errors	5.64 (sd = 1.78)	5.72 (sd = 1.71)	5.55 (sd = 1.89)	ns
Document in Charts	**4.45 (sd = 1.66)**	*5.01 (sd = 1.47)*	**3.79 (sd = 1.65)**	**t(61) = 3.11 ****
Small Errors	3.48 (sd = 1.98)	*4.29 (sd = 1.89)*	2.64 (sd = 1.73)	t(57) = 3.50 ***
Moderate Errors	4.32 (sd = 1.95)	*4.83 (sd = 1.50)*	3.69 (sd = 2.28)	t(52) = 2.22 *
Severe Errors	5.47 (sd = 1.87)	*5.92 (sd = 1.54)*	4.95 (sd = 2.09)	t(60) = 2.09 *
Formally Report to Risk Management	**4.41 (sd = 1.48)**	*4.84 (sd = 1.31)*	**3.90 (sd = 1.53)**	**t(61) = 2.62 ****
Small Errors	2.89 (sd = 1.88)	3.28 (sd = 2.00)	2.48 (sd = 1.68)	ns
Moderate Errors	4.15 (sd = 1.87)	4.38 (sd = 1.74)	3.87 (sd = 2.03)	ns
Severe Errors	5.87 (sd = 1.58)	*6.35 (sd = 0.90)*	5.32 (sd = 2.00)	t(60) = 2.67 **

* Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed); *** Correlation is significant at the 0.001 level (2-tailed)

TABLE 6. INDEPENDENT T-TESTS AND ONE-WAY ANOVA FOR UNITS AND SHIFTS

	t-statistic	df	p-value	F-statistic	df	p-value
Team Trust	.31	71	n.s.	1.08	4, 72	n.s.
Leader Trust	.87	71	n.s.	1.53	4, 72	n.s.
Team Psychological Safety	.21	71	n.s.	.23	4, 72	n.s.
Leader Fostered Psychological Safety	.24	71	n.s.	1.68	4, 72	n.s.
Team Learning Orientation	1.18	71	n.s.	1.28	4, 72	n.s.
Leader Fostered Learning Orientation	1.42	71	n.s.	64	4, 72	n.s.

TABLE 7. SUMMARY OF HYPOTHESES FINDINGS

Hypotheses	Findings	Decision
H1: *The frequency of communication within a team is positively related to trust within the team.*	Patterns of communication are correlated with patterns of trust. Degree and Flow Betweenness of members across communication and trust network support the correlation.	Supported
H2: *Trust in the team leader is positively associated with the frequency of communication with the team leader.*	Graphical interpretation of Figures 2-5 and patterns of Degree and Betweenness provide support of the association between communication with leadership and trust in leadership.	Supported
H3a: *The inclusiveness of the communication network within the team is positively associated with the inclusiveness of the trust network within the team.*	Observed reciprocity (i.e., inclusiveness) in the communication network is associated with the reciprocity observed in the trust network indicating that inclusiveness in one unit.	Mixed
H 3b: *The density of the communication network within the team is not significantly different from the density of the*	ND of the communication network differed from the ND of the trust network. In both units, trust networks were more dense than the communication network.	Not supported

trust network within the team.		
H4a*: The inclusiveness of communication network between the team and the team leader is positively associated with the inclusiveness of trust network between the team and the team leader.*	Observed reciprocity (i.e., inclusiveness) in the communication network of the leader is not found to be associated with the reciprocity observed in the leader's trust network indicating the leaders' networks are not similarly inclusive.	Not supported
H4b*: The density of the communication network between the team and the team leader is not significantly different from the density of the trust network between the team and the team leader.*	ND of the leaders' communication network was not significantly different from the ND of the leader's trust network.	Supported
H5a: *Trust in the team is positively associated with a willingness to informally discuss errors with other team members.*	Using traditional survey data, team trust was not associated with a willingness to informally discuss errors with other team members. Using social network data, a significant relationship was found between trust and a willingness to discuss small, moderate, and severe errors.	Mixed
H5b: *Psychological safety in*	Psychological safety within the team was	Not

the team is positively associated with a willingness to informally discuss errors with other team members.	not found to be associated with a willingness to informally discuss errors.	supported
H6a: *Trust in the team leader is positively related with willingness to informally discuss errors with the team leader.*	Trust in the team leader is associated with a willingness to informally discuss errors in general, and with a willingness to informally discuss severe errors.	Supported
H6b: P*erceptions of leaders' support for psychological safety are positively related with willingness to informally discuss errors with the team leader.*	Perceptions of leaders' support for psychological safety were not found to be associated with a willingness to informally discuss errors.	Not supported
H7a*: The density of the trust network within a team is not significantly different from the density of the density of an informal error reporting network.*	ND of the trust network was not significantly different from the ND of willingness to report severe errors in one unit.	Mixed
H7b: *The inclusiveness of the trust network within a team is*	The reciprocity trust network was not found to be associated with the reciprocity	Not supported

positively associated with a willingness to informally discuss errors with other team members.	observed in the error reporting networks for small, moderate, or severe errors.	
H 8a: *The density of the trust network between the team and team leader is not significantly different from the density of the informal error reporting network between the team and team leader.*	ND of the leaders' trust network was not significantly different from the leader's error reporting network for small, moderate, and severe errors.	Supported
H8b: *The inclusiveness of the trust network between the team and team leader is positively associated with a willingness to informally discuss errors with the team leader.*	The reciprocity of the leaders' trust network was not found to be associated with the reciprocity observed in the leaders' error reporting networks for small, moderate, or severe errors.	Not supported
H9a: *A team learning orientation climate moderates the relationship of trust within the team with the willingness to informally discuss errors with other team members.*	Team learning orientation was not found to moderate the relationship between team trust and a willingness to informally report errors. Further, team trust was not found to be a significant predictor of a willingness to informally report errors.	Not supported

H9b: *A team learning orientation climate moderates the relationship of psychological safety within the team with the willingness to informally discuss errors with other team members.*	Team learning orientation was not found to moderate the relationship between team psychological safety and a willingness to informally report errors. Further, team psychological safety was not found to be a significant predictor of a willingness to informally report errors.	Not supported
H10a: *Perceptions of the team leader's support for a team learning climate moderates the relationship between trust in the team leader and willingness to informally discuss errors with the team leader.*	Leaders' support for a learning orientation was not found to moderate the relationship between trust in the leader and a willingness to informally report errors. Further, trust in the leader was not found to be a significant predictor of a willingness to informally report errors.	Not supported
H10b: *Perceptions of the team leader's support for a team learning climate moderates the relationship between perceptions of the team leader's support for psychological safety and willingness to informally*	Leaders' support for a learning orientation was not found to moderate the relationship between perceptions of the team leaders' support for psychological safety and a willingness to informally report errors. Further, trust in the leader was not found to be a significant predictor of a willingness to informally report errors.	Not supported

discuss errors with the team leader.		
H11: *Organizational support for learning orientation moderates the association between team trust and willingness to formally report errors.*	Organizational support for learning orientation was not found to moderate the relationship between team trust and a willingness to formally report errors. Further, team trust was not found to be a significant predictor of a willingness to formally report errors. However, organizational support for learning orientation was found to predict a willingness to formally report severe errors.	Not supported
H12: *Organizational support for learning orientation moderates the association between team leader trust and willingness to formally report errors.*	Organizational support for learning orientation was not found to moderate the relationship between leader trust and a willingness to formally report errors. However, trust in leadership and organizational support for learning orientation were found to have direct main effects on a willingness to formally report errors. However, organizational support for learning orientation was found to predict a willingness to formally report severe errors.	Not supported

TABLE8. DEGREE CENTRALITY ACROSS VARIABLES OF INTEREST

		Unit 1			Unit 2		
		Degree	**Norm. Degree**	**Flow Between**	**Degree**	**Norm. Degree**	**Flow Between**
Trust	*Mean*	150.75	51.98	.85	140.57	47.65	.29
	Variance	4610.02	548.16	1.05	4768.08	547.90	.13
	Network Centralization	49.35%		3.78%	54.16%		.94%
	Heterogeneity	2.04%			2.07%		
Communication	*Mean*	119.46	41.19	.82	109.17	37.01	.32
	Variance	3174.55	377.47	.90	3034.81	348.73	.14
	Network Centralization	55.16%		2.42%	44.13%		.71%
	Heterogeneity	2.07%			2.09%		
Small Errors	*Mean*	160.10	55.21	.34	159.70	54.14	.75
	Variance	4993.31	593.74	.14	6112.71	702.41	.94
	Network Centralization	46.36%		.63%	47.45%		2.06%
	Heterogeneity	2.03%			2.07%		
Moderate Errors	*Mean*	173.80	59.93	.35	171.93	58.28	.76
	Variance	5266.13	626.18	.15	6409.60	736.52	.84
	Network Centralization	41.48%		.61%	43.16%		1.89%
	Heterogeneity	1.99%			2.03%		
Severe Errors	*Mean*	173.19	59.72	.36	179.90	60.98	.79
	Variance	5971.34	710.03	.16	6884.19	791.06	.99
	Network Centralization	41.69%		.60%	40.36%		2.37%
	Heterogeneity	2.03%			2.02%		

TABLE 9. COMPARISON OF TOP 15 PARTICIPANTS ACROSS DEGREE AND BETWEENESS FLOW

Order (high to low)	Trust Degree	Communication Degree	Trust Betweenness Flow	Communication Betweenness Flow
1	43*	30***	7*	30***
2	30***	25***	30***	25***
3	88*	3*	88*	4***
4	47**	40**	48***	106
5	102***	48***	102***	46***
6	46***	102***	43*	47**
7	25***	86***	25***	8***
8	3*	15	4***	48***
9	86***	100*	46***	49***
10	48***	46***	49***	37*
11	49***	6	47**	61
12	40**	21	100*	40**
13	37*	8***	8***	102***
14	8***	4***	86***	86***
15	4***	49***	37	7*

Note: To protect participant anonymity, only participant numbers were used.
* Name appears in two columns
** Name appears in three columns
*** Name appears in four columns

TABLE 10. COMPARISON OF LEADER SCORES ON DEGREE, BETWEENNESS, AND FLOW BETWEENNESS

Part #	Trust			Communication		
Unit 1	Nrm Degree (M= 51.98)	Between.	Between. Flow (M = .85)	Nrm Degree (M = 41.19)	Between.	Between. Flow (M= .82)
8	75.17		1.88	60.69		2.10
15	68.97		1.62	65.17		1.65
29	40.35	0	0	28.97	0	0
011	35.52	0	0	21.03	0	0
012	31.72	0	0	24.14	0	0
013	39.66	0	0	20.69	0	0
014	32.41	0	0	21.72	0	0
015	28.28	0	0	20.69	0	0
016	30.69	0	0	28.28	0	0
Unit 2	(M= 47.57)	(M= .07)	(M= .29)	(M= .37.01)	(M = .04)	(M= .32)
72	88.14	.69	1.21	72.88	.13	1.02
75	84.07	.16	.79	61.36	.13	.79
104	100.00	.16	1.02	47.12	.11	.71
209	46.78	.58	.68	49.49	.12	.67
211	74.58	.14	.79	51.19	.05	.68
021	30.17	0	0	22.71	0	0
022	36.27	0	0	27.12	0	0
023	38.64	0	0	21.02	0	0

TABLE 11. SUMMARY T-STATISTICS FOR SOCIAL NETWORKS

	t-statistic	St. Error for the difference	p-value	Std. Density 1	Std. Density 2
Unit 1					
Trust/Communication	-4.43	.0239	.001	.345	.241
Trust/Small Errors	-2.37	.0249	.05	.345	.404
Trust/Moderate Errors	-3.55	.0244	.001	.345	.432
Trust/Severe Errors	-.92	.0255	n.s.	.345	.369
Small/Moderate Errors	-2.31	.0119	.05	.404	.432
Small/Severe Errors	1.48	.0241	n.s.	.404	.369
Moderate/Severe Errors	3.10	.0204	.01	.432	.369
Unit 2					
Trust/Communication	-4.52	.0224	.001	.307	.204
Trust/Small Errors	-3.36	.0192	.001	.307	.372
Trust/Moderate Errors	-4.27	.0188	.001	.307	.388
Trust/Severe Errors	-3.76	.0202	.001	.307	.383
Small/Moderate Errors	-2.01	.0080	.05	.372	.388
Small/Severe Errors	-.99	.0117	n.s.	.372	.383
Moderate/Severe Errors	.46	.0099	n.s.	.388	.383

TABLE 12. SUMMARY OF DENSITY ACROSS VARIABLES OF INTEREST

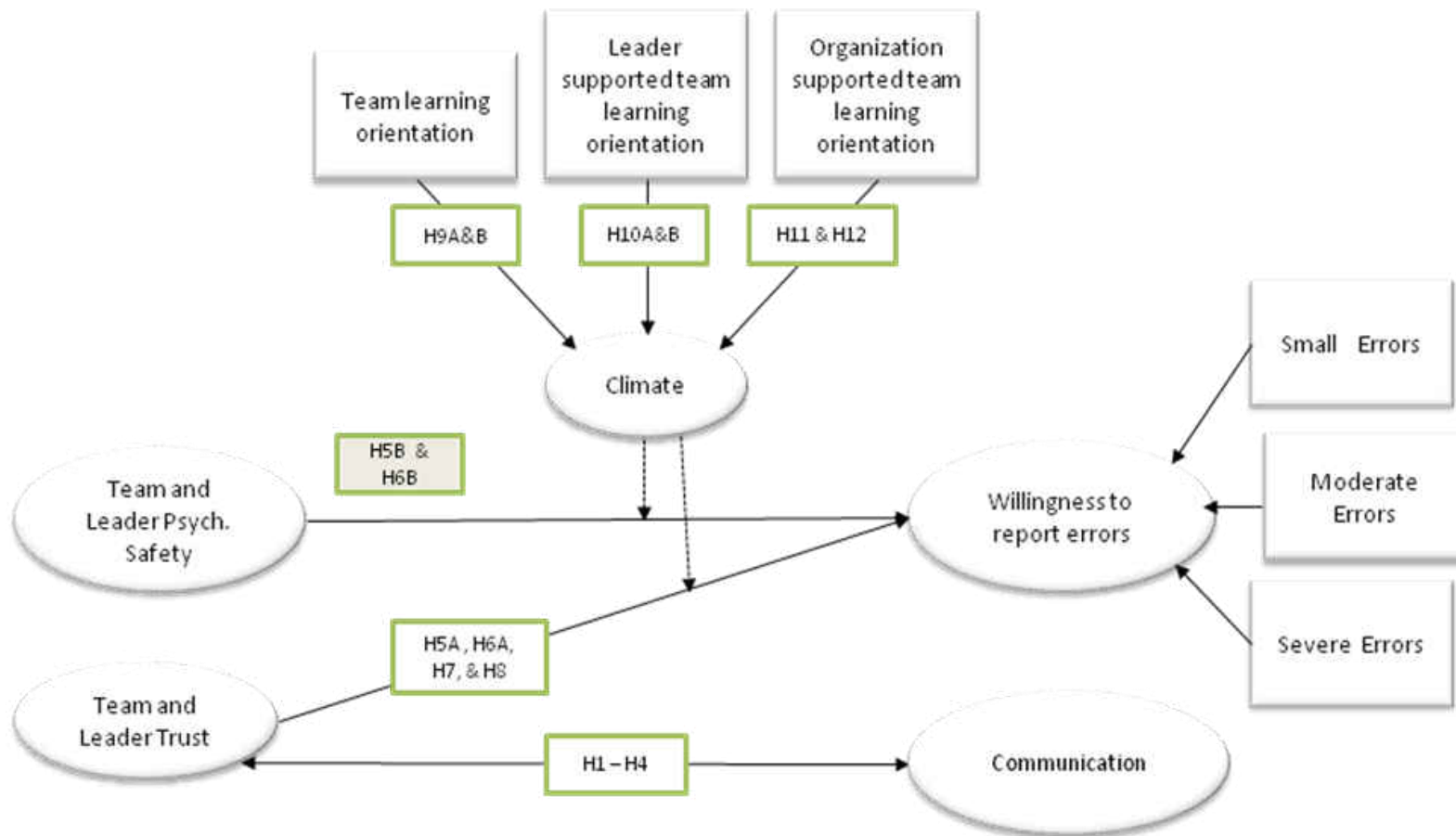| UNIT 1				
	Density	St. Deviation	Standardized Density	Number of ties
Trust	1.60	1.99	.345	1182
Communication	1.26	1.74	.241	826
Small Errors	1.71	2.02	.404	1384
Moderate Errors	1.86	2.15	.432	1478
Severe Errors	1.84	2.22	.369	1262
UNIT 2				
	Density	St. Deviation	Standardized Density	Number of ties
Trust	1.43	1.95	.307	1087
Communication	1.11	1.63	.204	723
Small Errors	1.64	2.12	.372	1315
Moderate Errors	1.78	2.25	.388	1372
Severe Errors	1.87	2.36	.383	1356

FIGURES

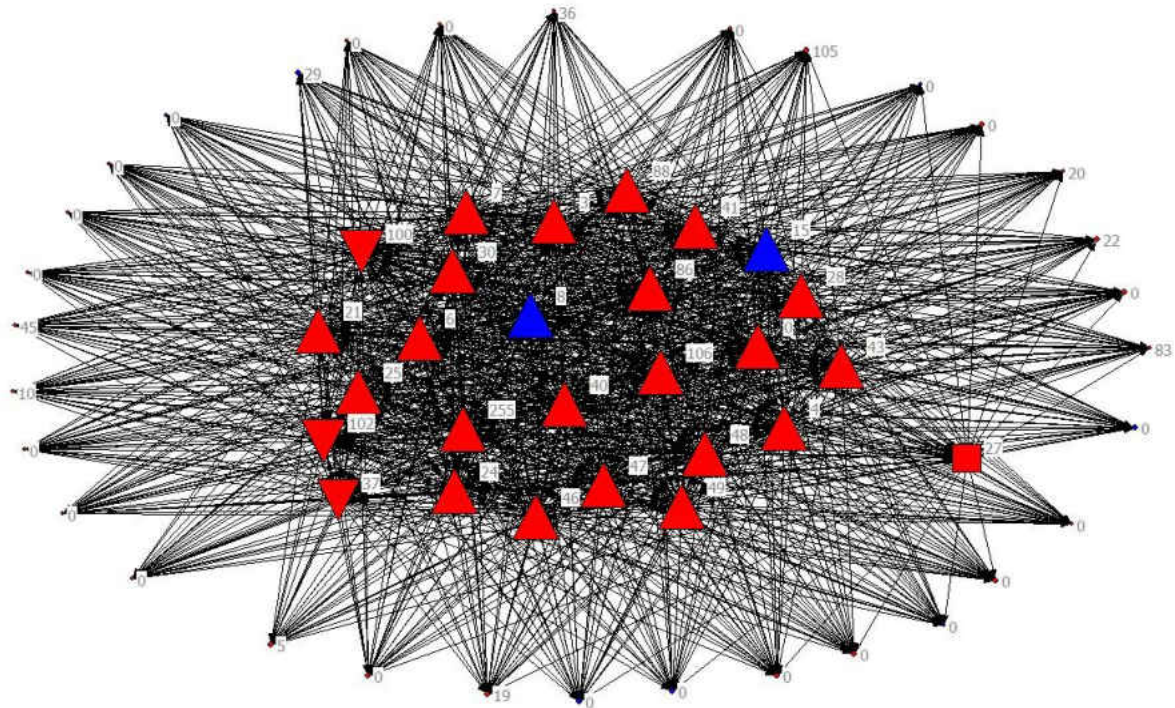**FIGURE 1. THEORETICAL MODEL AND PROPOSED HYPOTHESES**

**FIGURE 2. UNIT 1 TRUST NETWORK REPRESENTING DEGREE
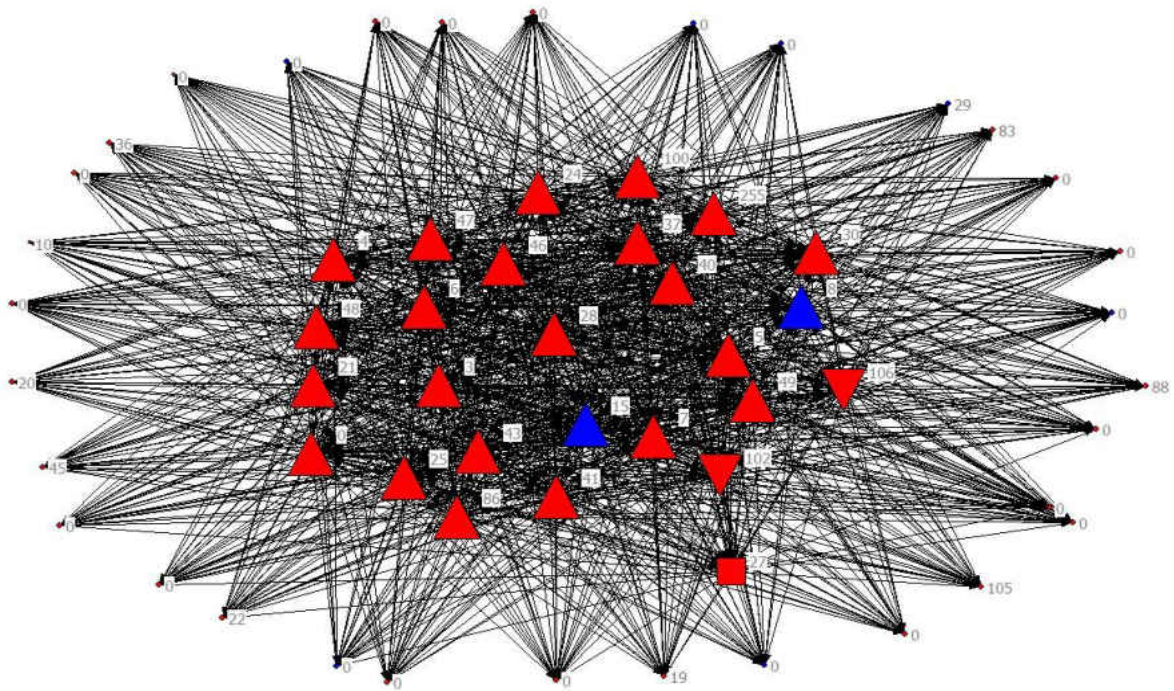CENTRALITY AND BETWEENNESS**

**FIGURE 3. UNIT COMMUNICATION NETWORK REPRESENTING DEGREE
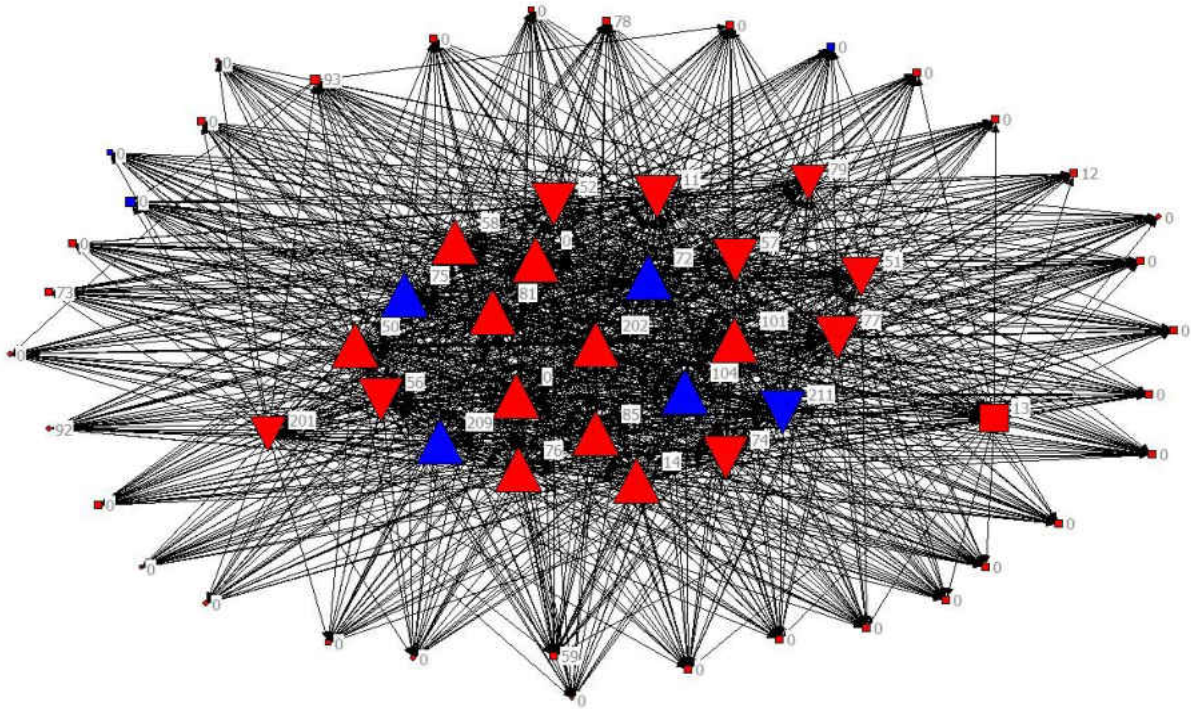CENTRALITY AND BETWEENNESS**

FIGURE 4. UNIT 2 TRUST NETWORK REPRESENTING DEGREE CENTRALITY AND BETWEENNESS
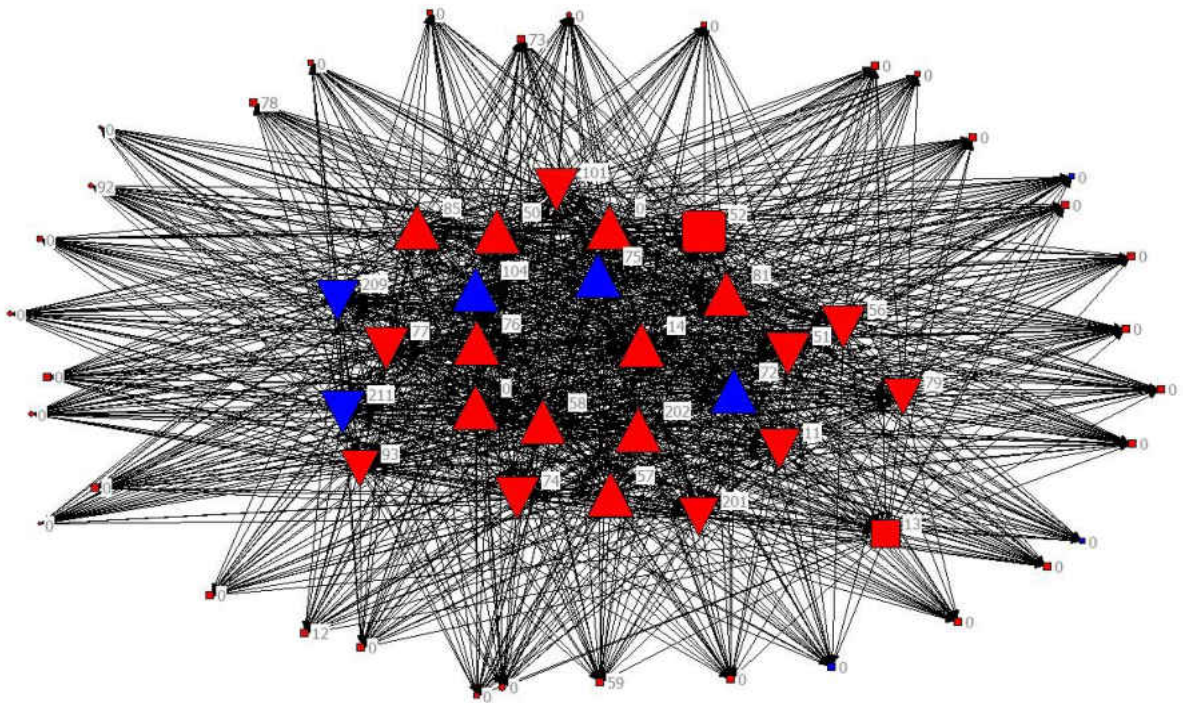
**FIGURE 5. UNIT 2 COMMUNICATION NETWORK REPRESENTING
DEGREE CENTRALITY AND BETWEENNESS**

APPENDIX A: CONTACT SHEET

Contact Form

The purpose of this study is to understand patterns of communication within a department and how that relates to error reporting. In order to examine communication patterns within the department, we will need to be able to track your specific responses across data collection periods. In order to this, we will provide you a unique participant number that will be linked to your data.

☐ Your data will not be seen by anyone other than those on the research team.
☐ No one within your department or MEDICAL INSTITION will see your responses connected to your name.

Participation in this study is voluntary. Please provide the following information so that we may follow up with you to provide you additional information regarding the study, follow up data collection, as well as compensation for your participation in the study.

Name: _____

Email: _____

Phone number: _____

Your Participant

Please remember this number as it will be used in
all future study related forms to protect you and to maintain confidentiality.

APPENDIX B: DEMOGRAPHICS SHEET

General Information

Gender: Male_____   Female_____

Age in years: _____

Ethnicity (please circle one)

     Caucasian/non-Hispanic

     African American

     Asian American

     Hispanic/Latino

     Native American

     Other _____

Tenure in profession: _____ years _____ months

Tenure at MEDICAL INSTITUTION: _____ years _____ months

Current job title: _____

Education: (please circle all that apply)

     High school diploma   M.D.

     Associate's   R.N.

     Bachelor's   Physician's Assistant

     Master's   Nurse Practitioner

     Other _____

Shift normally work: (please circle one)

     Day (7am – 3pm)

     Evening (3pm – 11pm)

     Night (11pm – 7am)

     Other: _____

APPENDIX C: TEAM TRUST MEASURE

Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Neither Agree nor Disagree 4	Slightly Agree 5	Agree 6	Strongly Agree 7

In answering the following questions, please think about your **teammates** or those whom you work with on a regular basis.

1. If I had my way, I wouldn't let my **teammates** have any influence over issues that are important to me.

     1   2   3   4   5   6   7

2. I would be willing to let my **teammates** have complete control over my future at MEDICAL INSTITUION.

     1   2   3   4   5   6   7

3. I really wish I had a good way to keep an eye on my **teammates**.

     1   2   3   4   5   6   7

4. I would be comfortable giving my **teammates** a task or problem which was critical to me, even if I could not monitor their actions.

     1   2   3   4   5   6   7

5. I would tell my **teammates** about mistakes I've made on the job, even if they could damage my reputation.

     1   2   3   4   5   6   7

6. I would share my opinion about sensitive issues with my **teammates** even if my opinion were unpopular.

     1   2   3   4   5   6   7

7. I am afraid of what my **teammates** might do to me at work.

     1   2   3   4   5   6   7

8. If my **teammates** asked me why a problem happened, I would speak freely even if I were partly to blame.

     1   2   3   4   5   6   7

9. If someone questioned my **teammates'** motives, I would give my teammates the benefit of the doubt.

     1   2   3   4   5   6   7

10. If my **teammates** asked me for something, I respond without thinking about whether it might be held against me.

     1   2   3   4   5   6   7

TT (1-10)

APPENDIX D: LEADER TRUST MEASURE

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

In answering the following questions, please think about your <u>**supervising nurse(s)**</u> whom you work with on a regular basis. Supervising nurses could include such positions as Clinical Nurse 3 (CN3) or Patient Care Leaders (PCL).

1. If I had my way, I wouldn't let my **supervising nurse** have any influence over issues that are important to me.

       1   2   3   4   5   6   7

2. I would be willing to let my **supervising nurse** have complete control over my future at MEDICAL INSTITUION.

       1   2   3   4   5   6   7

3. I really wish I had a good way to keep an eye on my **supervising nurse**.

       1   2   3   4   5   6   7

4. I would be comfortable giving my **supervising nurse** a task or problem which was critical to me, even if I could not monitor his/her actions.

       1   2   3   4   5   6   7

5. I would tell my **supervising nurse** about mistakes I've made on the job, even if he/she could damage my reputation.

       1   2   3   4   5   6   7

6. I would share my opinion about sensitive issues with my **supervising nurse** even if my opinion were unpopular.

       1   2   3   4   5   6   7

7. I am afraid of what my **supervising nurse** might do to me at work.

       1   2   3   4   5   6   7

8. If my **supervising nurse** asked me why a problem happened, I would speak freely even if I were partly to blame.

       1   2   3   4   5   6   7

9. If someone questioned my **supervising nurse**'s motives, I would give my supervising nurse the benefit of the doubt.

       1   2   3   4   5   6   7

10. If my **supervising nurse** asked me for something, I respond without thinking about whether it might be held against me.

       1   2   3   4   5   6   7

TL (1-10)

APPENDIX E: TEAM PSYCHOLOGICAL SAFETY MEASURE

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

In answering the following questions, please think about your **teammates** or those whom you work with on a regular basis.

1. If you make a mistake on this team, it is often held against you by my **teammates**.

     1   2   3   4   5   6   7

2. Members of this **team** are able to bring up problems and tough issues.

     1   2   3   4   5   6   7

3. People on this **team** sometimes reject others for being different.

     1   2   3   4   5   6   7

4. It is safe to take a risk on this **team**.

     1   2   3   4   5   6   7

5. It is difficult to ask other members of this **team** for help.

     1   2   3   4   5   6   7

6. No one on this **team** would deliberately act in a way that undermines my efforts.

     1   2   3   4   5   6   7

7. Working with members of this **team**, my unique skills and talents are valued and utilized.

     1   2   3   4   5   6   7

PST (1-7)

APPENDIX F: LEADER PSYCHOLOGICAL SAFETY MEASURE

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

In answering the following questions, please think about **supervising nurse(s)** with whom you work with on a regular basis. Supervising nurses could include such positions as Clinical Nurse 3 (CN3) and Patient Care Leaders (PCL).

1. If you make a mistake on this team, it is often held against you by the **supervising nurses**.

    1   2   3   4   5   6   7

2. Members of this team are able to bring up problems and tough issues to the **supervising nurses**.

    1   2   3   4   5   6   7

3. The **supervising nurses** on this team sometimes reject others for being different.

    1   2   3   4   5   6   7

4. The **supervising nurses** make it safe to take a risk on this team.

    1   2   3   4   5   6   7

5. It is difficult to ask the **supervising nurses** for help.

    1   2   3   4   5   6   7

6. The **supervising nurse** would not deliberately act in a way that undermines my efforts.

    1   2   3   4   5   6   7

7. Working with the **supervising nurses**, my unique skills and talents are valued and utilized.

    1   2   3   4   5   6   7

PSL (1-7)

APPENDIX G: TEAM LEARNING ORIENTATION MEASURE

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

Please circle the number that most closely describes your opinion about your **teammates** or those whom you work with on a regular basis.

1. We regularly take time to figure out ways to improve the safety of our team's work processes.

    1   2   3   4   5   6   7

2. This **team** tends to handle differences of opinion regarding safety privately or off-line, rather than addressing them directly as a group.

    1   2   3   4   5   6   7

3. **Team members** go out and get all the information they possibly can from others to improve safety – such as patients, or other parts of the organization.

    1   2   3   4   5   6   7

4. This **team** frequently seeks new information that leads us to make important safety related changes.

    1   2   3   4   5   6   7

5. In this **team**, someone always makes sure that we stop to reflect on the safety of the team's work processes.

    1   2   3   4   5   6   7

6. People in this **team** often speak up to test assumptions about safety related issues under discussion.

    1   2   3   4   5   6   7

7. We invite people from outside the team to present safety information or have discussion with us.

    1   2   3   4   5   6   7

TLT (1-7)

APPENDIX H: LEADER LEARNING ORIENTATION MEASURE

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

Please circle the number that most closely describes your opinion about your **supervising nurse(s)** with whom you work with on a regular basis. Supervising nurses could include such positions as Clinical Nurse 3 (CN3) or Patient Care Leaders (PCL).

1. The **supervising nurses** regularly encourage the team to take time to figure out ways to improve the safety of our team's work processes.

    1   2   3   4   5   6   7

2. The **supervising nurses** encourage the team to handle differences of opinion regarding safety privately or off-line, rather than addressing them directly as a group.

    1   2   3   4   5   6   7

3. The **supervising nurses** encourage team members to go out and get all the information they possibly can from others to improve safety – such as patients or other parts of the organization.

    1   2   3   4   5   6   7

4. The **supervising nurses** frequently encourage the team to seek new information that leads us to make important safety related changes.

    1   2   3   4   5   6   7

5. In this team, the **supervising nurses** always make sure that we stop to reflect on the safety of the team's work processes.

    1   2   3   4   5   6   7

6. The **supervising nurses** encourage people in this team to speak up to test assumptions about safety related issues under discussion.

    1   2   3   4   5   6   7

7. The **supervising nurses** invite people from outside the team to present safety information or have discussions with us.

    1   2   3   4   5   6   7

TLL (1-7)

APPENDIX I: ORGANIZATIONAL LEARNING ORIENTATION MEASURE

Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Neither Agree nor Disagree 4	Slightly Agree 5	Agree 6	Strongly Agree 7

Please circle the number that most closely describes your opinion about **MEDICAL INSTITUTION.**

1. **MEDICAL INSTITUTION** regularly encourages our team to take time to figure out ways to improve the safety of our team's work processes.

    1   2   3   4   5   6   7

2. **MEDICAL INSTITUTION** tends to handle differences of opinion regarding safety privately or off-line, rather than addressing them directly as a group.

    1   2   3   4   5   6   7

3. **MEDICAL INSTITUTION** regularly seeks out all the information they possibly can from others to improve safety – such as patients or other hospitals.

    1   2   3   4   5   6   7

4. **MEDICAL INSTITUTION** frequently seeks new information that leads to important safety related changes.

    1   2   3   4   5   6   7

5. **MEDICAL INSTITUTION** always encourages us to reflect on the safety of our team's work processes.

    1   2   3   4   5   6   7

6. **MEDICAL INSTITUTION** encourages people to speak up to test assumptions about safety related issues.

    1   2   3   4   5   6   7

7. **MEDICAL INSTITUTION** invites people from outside the organization to present safety information or have discussions with us.

    1   2   3   4   5   6   7

TLO (1-7)

APPENDIX J: ERROR REPORTING MEASURE

This form is designed to collect information about errors that *could* occur in your ward and how you would handle them. For legal reasons, it is requested that you provide examples of errors that COULD happen as opposed to those have ACTUALLY happened.

1. Please provide up to three examples of what you would consider a SMALL, MODERATE, and SEVERE errors that *could* happen within your ward.

2. On a scale of 1 (low) to 7 (high), please rate how likely you are to discuss, document, and/or report the error.

***All information gathered with this form will be used for research purposes only, will not be used against anyone, and will be aggregated to protect your confidentiality.**

Please Begin on Next Page

Three errors that I perceive to be **SEVERE** that *could* occur in my ward are:

1. _____

_____

_____

_____

- How likely are you to informally discuss this with the person(s) involved? 1(low) 2 3 4 5 6 7 (high)
- How likely are you to formally document this in a patient's chart?   1(low) 2 3 4 5 6 7(high)
- How likely are you to formally report this to Risk Management?   1(low) 2 3 4 5 6 7(high)

2. _____

_____

_____

_____

- How likely are you to informally discuss this with the person(s) involved? 1(low) 2 3 4 5 6 7 (high)
- How likely are you to formally document this in a patient's chart?   1(low) 2 3 4 5 6 7(high)
- How likely are you to formally report this to Risk Management?   1(low) 2 3 4 5 6 7(high)

3. _____

_____

_____

_____

- How likely are you to informally discuss this with the person(s) involved? 1(low) 2 3 4 5 6 7 (high)
- How likely are you to formally document this in a patient's chart?   1(low) 2 3 4 5 6 7(high)
- How likely are you to formally report this to Risk Management?   1(low) 2 3 4 5 6 7(high)

APPENDIX K: SOCIAL NETWORK DATA COLLECTION

For each person below, please check as many boxes that apply.

	I do not know this person.	I am required by my work to interact with the person.	I go to this person for advice about work.	I go to this person for advice about personal issues.	I am comfortable discussing safety issues with this person
Patient Care Technicians, LPN2, CN1/2					
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
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	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

	Frequency of Communication				
	Seldom (Less than once a day)				**Often** (More than 10 times per day)
Patient Care Technicians, LPN2, CN1/2					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

For the following section, please rate each how much you trust each of the following people and would be willing to rely on them at work.

	I trust this person very little regarding work related concerns.				I trust this person a great deal regarding work related concerns.
Patient Care Technicians, LPN2, CN1/2					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

SMALL ERRORS

Below are examples of errors that could occur within your unit. These errors were identified by you or others in your unit as small errors. Please think about the following SMALL errors when making your ratings.

1. Taking blood sugars on the wrong patient.
2. Discharging a patient from the computer when they are still on the unit
3. Not dumping the urinal in a timely fashion.
4. Not having an opportunity to check on a patient every hour when an independent is in the room.
5. Not charting 'on the spot'.

IMPORTANT

Before going on, imagine that you just observed a coworker performing one of the above SMALL errors. Consider the likelihood that you would make time to discuss the small error you observed that person making.

In the following section you will be rating your willingness to address each of your coworkers if you had observed them making a SMALL error.

	Likelihood of approaching someone about a SMALL error				
	Absolutely not approach	Most likely not approach	May or may not approach	Likely approach	Absolutely approach
	0%	25%	50%	75%	100%
Patient Care Technicians, LPN2, CN1/2					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

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APPENDIX L: HUMAN SUBJECTS APPROVAL FORM

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From :   **UCF Institutional Review Board**
         FWA00000351, Exp. 5/07/10, IRB00001138

To   :   **Dana E Sims**

Date :   **June 18, 2008**

IRB Number: SBE-08-05625

Study Title: **The impact of intra-organization trust and learning oriented climate on error reporting.**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB Chair on 6/18/2008. **The expiration date is 6/17/2009.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The category for which this study qualifies as expeditable research is as follows:

7.   Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Please provide a copy of the Morton Plant Mease Hospital IRB approval when it becomes available.

The IRB has approved a **consent procedure which requires participants to sign consent forms.** Use of the approved, stamped consent document(s) is required. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu .

Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 06/18/2008 01:53:54 PM EDT

IRB Coordinator

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