# A Multi-Level Study of Nurse Leaders, Safety Climate and Care Outcomes

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**A Multi-Level Study of Nurse Leaders, Safety Climate and Care Outcomes**

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The purpose of this study was to use the Leader-Member Exchange (LMX) perspective to examine the association of leadership with safety climate and adverse care outcomes. LMX posits that leaders engage in differentiated dyadic relationships with staff (members) and the quality of these relationships is an important predictor of employee attitudes, beliefs, and thus outcomes. Data for this multi-level cross-sectional study were obtained from 34 unit directors and their associated staff members (n=711) in a large academic medical center. Measures were the Agency for Healthcare Research Hospital Survey on Patient Safety Culture (safety climate), Leader-Member Exchange tool (differentiated relationship), staff characteristics and unit level data (characteristics and adverse outcomes) obtained from hospital information systems.

Differentiated relationships were found between nursing leaders and their respective staff ($p<.0001$). LMX scores demonstrated significant variability both within ($p<.0001$) and among units ($p=.004$). Positive associations were observed with each safety climate dimension and LMX ($p<.0001$). Furthermore, a multivariate model of supervisor expectations and actions promoting safety ($p<.0001$), organizational learning-continuous improvement ($p=0.54$), unit teamwork ($p=.001$), and feedback and communication about error ($p =.001$) together predicted LMX. Significant differences in safety climate ($p=.002$) were found between units with high and low LMX scores in multivariate analysis, irrespective of patient care mix. Supervisor expectations and actions promoting safety ($p<.001$), organizational learning-continuous improvement ($p=.034$), communication openness ($p=.027$), feedback and communication about

error (p=.012), and nonpunitive response to error (p=.005) were significant in univariate analysis. No associations were found between safety climate, staff member/unit level characteristics, LMX scores or adverse outcomes or for any interrelationships of these variables.

These findings indicate high quality LMX relationships were associated with positive staff perceptions of safety behaviors. The observation of positive findings in all patient care units demonstrates LMX's potential applicability to broadly impact safety climate. High scoring units can be identified and used as exemplars. Future studies should test this concept in additional settings to confirm findings and examine how to develop and use LMX as a model to improve staff attitudes, safety behaviors, and patient care outcomes.

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## PREFACE

" The real voyage of discovery consists not in seeking new landscapes but in having new eyes"

Marcel Proust

Embarking on a voyage to achieve a PhD later in one's career is truly a journey of discovery, persistence, a love of learning and a desire to make a contribution to one's profession. I would not have been successful in this journey without the assistance of many individuals, the faculty of the School of Nursing, friends, colleagues, and family.

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# 1.0 INTRODUCTION

Five years after the seminal Institute of Medicine (IOM) (IOM, 2000) report, 55% of patients report feeling less safe, and more lives are being lost to error and adverse outcomes every 6 months than the total number of Vietnam War causalities (Altman, Clancy, & Blendon, 2004; HealthGrades, 2004). An actual near miss or wrong site surgery is reported every other day in Pennsylvania (Patient Safety Authority, 2007). The 2007 Agency for Healthcare Research and Quality (AHRQ) National Healthcare Quality Report finds slight improvement in patient safety, reporting only a 1% annual gain between the years of 2000 and 2005 (AHRQ, 2008). Healthcare agencies, therefore, appear far from providing the consistent high quality, safe care expected by patients (Clancy, 2008). Payors and providers alike are demanding a reduction in adverse outcomes (Center for Medicare and Medicaid Services, 2007a; IHI, 2006).

Effective in Fall 2008, the Centers for Medicare and Medicaid Services (CMS) no longer reimbursed for the associated costs of hospital acquired adverse events; i.e., foreign objects retained after surgery, air embolism, blood incompatibility, pressure ulcers, falls, catheter associated blood stream infections, urinary tract infections and surgical site infection, mediastinsitis after coronary artery bypass surgery (CMS, 2007a; CMS, 2007b). Additional providers such as Aetna and WellPoint issued similar directives (Fuhrmans, 2008). While transforming, a plan that focuses solely on financial incentives without incorporating effective

models that provide direction to improve organizations and safety climate is unlikely to provide full benefit to the health and safety of patients (Wachter, Foster, & Dudley, 2008).

Many practices that ensure patient safety are directly influenced by the nurse, especially surveillance and rescue. As pay for performance moves forward, this nursing role is a crucial element of the organization's armamentarium to ensure patient safety (Price Waterhouse Coopers Health Care Research Institute, 2007). How well patient care is managed by nurses and the organizational climates where nurses work directly affects our health and can be a matter of life or death. To improve patient safety, the IOM ( 2004) recommends that defenses be created in all organizational components: 1) leadership and management, 2) workforce, 3) work processes, and 4) organizational culture. Yet, there continues to be incomplete understanding of how these variables interact to ensure a work environment that promotes patient safety (IOM, 2004).

Empirically, linkages have been found between organizational climate, leadership, nurse outcomes, e.g., nurse job satisfaction, turnover and occupational injuries, and patient outcomes, with less robust findings for patients (Kazanjian, Green, Wong & Reid, 2005; MacDavitt, Chou, & Stone, 2007). High quality leadership and positive organizational culture are more likely to promote safe and healthy organizations (Zohar, 2003). There is growing recognition that frontline leader behaviors and the relationships of these leaders with staff, including nursing, influence safety behaviors and outcomes (Edmondson, 1996; IOM, 2004; Hofmann & Morgeson, 1999; Hofmann, Morgeson, & Gerras, 2003; McClure & Hinshaw, 2002; Naveh, Katz-Navon, & Stern,2005; Nembhard & Edmondson, 2006; Pronovost, et al., 2008; Zohar, 2002b; Zohar & Luria, 2003). However, the literature lacks examples of nurse-specific leadership behaviors that promote patient safety and improve outcomes. The proposed study incorporates concepts from the industrial psychology literature regarding Leader-Member Exchange (LMX) as a mechanism

to improve outcomes. LMX posits that staff member outcomes are improved when leaders develop high quality differentiated relationships (Gerstner & Day, 1997). Industrial studies have found an inverse relationship with LMX and accidents and a positive relationship with LMX and safety behavior improvements (Hofmann & Morgeson, 1999; Hofmann, et al., 2003; Michael, Guo, Wiedenbeck, & Ray, 2006). Potentially, a similar relationship exists in healthcare organizations. To improve patient safety, we need to know more about the characteristics of nursing units and nursing leaders that have the potential to achieve superior patient safety outcomes and factors that promote these outcomes. The proposed study is a foundation for a program of research focusing on increasing the depth of knowledge in theory and empirical evidence that can be applied to improving nursing leadership, redesigning nursing and leadership work, and impacting organizational climate to improve patient care and nursing outcomes.

## 1.1 PURPOSE

The purpose of this study was to use the LMX perspective to examine the association of leadership with safety climate, and adverse patient outcomes.

## 1.2 SPECIFIC AIMS

The specific aims of this study were:

1. To investigate the relationship between the structural variables of safety climate, staff educational preparation, unit turnover, and staffing and the process variable of LMX;
2. To examine if the process variable of LMX and the structural variables of safety climate, staff educational preparation, unit turnover, and staffing are associated with adverse patient outcomes; and
3. To explore the interrelationships among the process variable of LMX, structural variables of safety climate, staff educational preparation, unit turnover, and staffing and adverse patient outcomes.

## 1.3 DEFINITION OF TERMS

**Frontline Leader** = The unit director who has 24 hour accountability and responsibility for the nursing staff and the delivery of patient care at the unit level.

**Safety Climate** = The shared perceptions of employees regarding safety policies and procedures, expected safety behaviors and behaviors reinforced and rewarded by the organization (Schneider, 1990) as measured by the Agency for Healthcare Research & Quality Hospital Survey on Patient Safety Culture (AHRQPSC) at the individual level (AHRQ, 2003).

**Leader-Member Exchange (LMX)** = The differentiated dyadic relationship that develops between a frontline leader and their individual staff member based on mutual trust, respect and obligation. The strength of the relationship will be measured at the individual level by the LMX-7 survey (Graen & Uhl-Bein, 1995).

**Adverse Patient Outcomes** = Injuries to patients due to unintended consequences of medical care that are unrelated to patients' underlying medical condition. When it is due to medical error,

it is deemed preventable (IOM, 2000 p.28). Adverse patient outcomes were those adverse events no longer reimbursed by CMS, i.e., catheter-associated infections, urinary tract, blood stream, and surgical site infection, mediastinitis after cardiac surgery, pressure ulcers, and falls reported for each patient unit.

**Failure-to-Rescue** = The number of staff calls placed to summon an emergency response team to manage the clinical deterioration of a patient as measured by the number of calls reported for each patient unit to summon a Medical Emergency Team (MET) (Peberdy et al. 2007).

**Staff and Unit Characteristics =** Staff characteristics included age, race, initial registered nurse (RN) preparation, additional education, total years of healthcare experience, years of service in the current work unit, years of service in the organization, typical hours worked per week, shift, direct contact with patients, tenure (years) of the unit director in present position, total years of experience as a unit director, initial education level of the unit director, additional education and participation in leadership continuing education of the unit director, which will be measured at the individual level. Nurse-patient ratio, direct hours per patient day including skill mix, vacancy rate, and within unit turnover rate are structural characteristics measured at the unit level.

## 1.4 BACKGROUND AND SIGNIFICANCE

### 1.4.1 Conceptual Framework

The theoretical framework for this study was based on Donabeidan's model for the assessment of quality of care, which theorizes that care structures, processes, and outcomes are linked (Donabedian, 1966; Donabeidan, 1988; Sidani, Doran, & Mitchell, 2004). Donabeidan posits

that good structure potentiates good processes which, in turn, increase the probability of good outcomes. When an imbalance exists in or between these elements, the quality of care is impacted. The assessment of care outcomes requires preexisting knowledge of the interrelatedness of these elements. Inferences about the relationships can then be formed from knowledge about structure and process (Donabeidan, 1988).

Structure connotes the characteristics of the settings where care delivery occurs which may include safety climate, staffing variables, manager variables, and unit and staff characteristics. The factors involved in giving and receiving of care define process. In this study, process will consist of the dyadic differentiated relationships between the unit director and each unit staff member (LMX). The strength of this relationship shapes practice and outcomes (Gerstner & Day, 1997; Graen & Uhl-Bein, 1995). Outcome signifies the effects of structure and process on patient outcomes. For this study, these adverse patient outcomes will include outcomes defined by CMS as preventable and failure-to-rescue events.

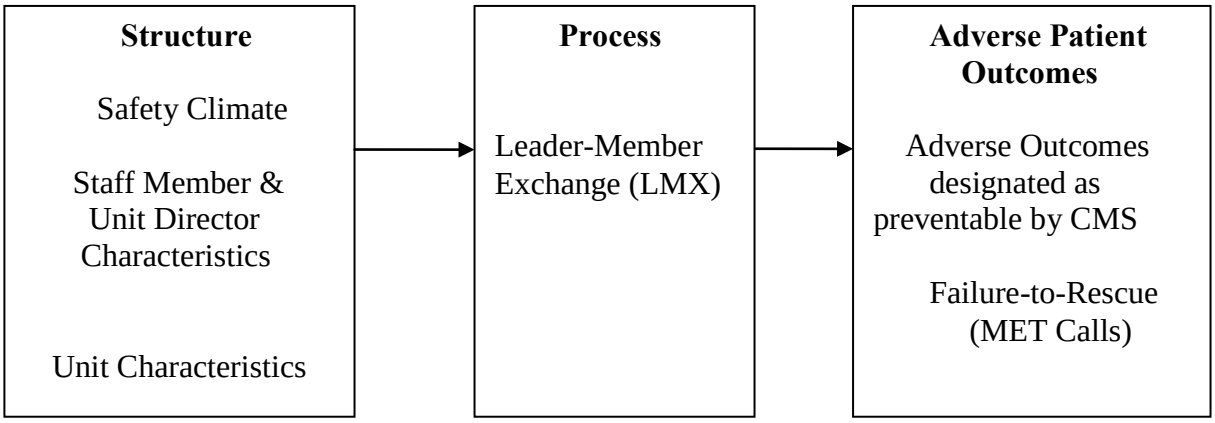


**Figure 1.** Conceptual Framework: Donabedian (Donabedian, 1988)

### 1.4.2 Safety Climate

Schneider defined safety climate as “the shared perceptions of the employees concerning the practices, procedures, and kinds of behaviors that get rewarded, supported, and recognized” (Schneider, 1990 p.384) Operationally, these employee perceptions inform behavioral expectations and provide the impetus for their actions, thus impacting organizational outcomes such as patient satisfaction or decreased injury rates (Zohar, 2003). Four factors are consistently associated with the development of a strong safety climate: 1) managers are perceived by staff as strongly committed to patient safety, (Mark et al., 2008; Naveh et al., 2005) 2) worker productivity and employee safety are balanced, (DeJoy, Gershon, & Schaffer, 2004; Mark, et al., 2007) 3) there is a positive information flow about safety, (Mark, et al., 2008; Naveh, et al., 2005) and 4) a constructive response to unsafe events or errors which supports learning from errors versus a punitive climate (DeJoy, Schaffer, Wilson, & Butts, 2004; Mark, et al., 2008).

Edmondson (1996, 1999) and colleagues (Nembhard & Edmondson, 2006) found healthcare leadership behaviors influenced employees' psychological response, participation in safety improvement efforts and reporting and learning from errors. A study of medication errors in nursing units found when nurse managers had strong positive relationships with staff, staff were more likely to identify errors, thus increasing opportunities for learning, system change and avoiding events likely to cause future errors (Edmondson, 1999).

Quantitative findings on leader inclusiveness suggest when healthcare leaders minimize their professional status and focus on improving psychological safety, staff members are more willing to speak-up and actively engage in problem solving to improve outcomes. A significant finding was that leadership behavior could overcome traditional healthcare barriers and promote nurse and therapist staff members’ engagement in outcome improvements. The need for

articulation of leadership practices to achieve inclusiveness was identified (Nembhard & Edmondson, 2006). These studies support the need to determine whether such relationships exist in some or all units within a complex healthcare institution and, if not uniformly present, to design and test interventions to create an environment that promotes a strong safety climate wherein reporting and learning from adverse outcomes is an expected part of nursing practice.

Although it is known that in multiple industries frontline leaders can influence safety climate by their actions, prior studies have shown significant individual variation in mangers' safety beliefs and attributions (Zohar, 2003). Huang et al.(2007) conducted a study to determine if safety culture factors varied across four intensive care units (ICUs) in the proposed data collection site. The study assessed six factors: job satisfaction, stress recognition, perceptions of management, teamwork climate, safety climate, and working conditions and achieved a 70.2% response rate. Findings indicated that the four ICUs varied significantly, most notably for job satisfaction and working conditions. Unit directors rated their units higher on safety than their staff, especially in the areas of teamwork and working conditions. The authors recommended that safety culture be assessed at the unit level, rather than the hospital level or by relying on director opinions (Huang et al., 2007). A limitation was that this study only examined safety climate in four ICUs, whereas the proposed study will survey staff in all hospital units, allowing a system wide comparison. The finding that unit safety culture may differ across units has important implications for the development of future interventions. Units with high levels of safety culture promotion could be identified and serve as exemplars (Huang et al., 2007). Leaders who exemplify the ability to develop effective trusting relationships and reinforce and reward safety behaviors could be identified to mentor others. Thereby, it may be possible to

reduce adverse outcomes and improve safety climate and safety behaviors (IOM,2004; Moss & Garside, 2001; Zohar, 2002b; Zohar & Luria, 2003).

An interventional study in three separate industries, metal, food and plastics, that provided weekly feedback to front line supervisors regarding monitoring and rewarding of employee safety behaviors found the number of unsafe behaviors declined to a near zero frequency as supervisors improved the frequency and quality of their safety interactions. Safety climate scores were significantly different in pre–post measurements validating the role leaders can play in the improvement of safety (Zohar & Luria, 2003).

Zohar's (2003) review of the influence of leadership and climate on occupational health and safety behaviors in all industries reported a positive relationship between leadership behaviors, safety climate and safety outcomes. Noting research in this arena is sparse, Zohar suggested further exploration of mediated and unmediated relationships involving safety climate and leadership, along with research to develop intervention models to sustain and improve frontline leadership practices.

A recent systematic review of organizational climate and healthcare outcomes supports the benefit of a positive organizational climate in both nursing and patient care outcomes. Implications for future research included the need to better understand the relationship of climate to patient outcomes and develop mechanisms to routinely measure organizational climates and the role of leadership in assuring outcomes (MacDavitt et al., 2007). Few studies exist examining the relationship between safety climate and adverse outcomes (Mark et al., 2008). Clarke's (2006) literature review examining the association between culture, climate, and safety calls for the generation of more empirical evidence on the relationship between safety climate, culture and safety outcomes

### 1.4.3 Patient Safety

In 2008, Health Grades reported that 1.1 million total patient safety incidents occurred in more than 41 million Medicare hospitalizations at a cost in excess of $8.8 billon. Notably, this 3% incident rate was essentially unchanged from previous reports. The top three incidents included failure-to-rescue, pressure sores and post-operative respiratory failure (HealthGrades, 2008). HealthGrades reported fewer patient safety incidents in distinguished hospitals, which are defined as having better risk adjusted mortality and complication rates (HealthGrades, 2008). Because safety and leadership behaviors were not examined, the influence of these on patient safety incidents is unknown.

A systematic review of 20 studies found positive linkages between leadership, organizational climate, nursing and patient outcomes (MacDavitt et al., 2007). When there was high congruence between safety procedures and managerial safety practices, treatment errors were lower (Naveh et al., 2005). A positive organizational climate, strong nursing leadership, high managerial support for safety practices and adequate staffing reduced the incidence of blood and body exposures and needle stick injuries (Aiken, Clarke, & Sloane, 2002; Gershon et al. 2000; Stone & Gershon, 2006). Organizational structure, unit leadership and caregiver interaction positively impacted RN turnover and staff perceptions of quality of care (Shortell et al., 1994). Nurse work environments, nurse staffing levels and level of education influenced 30 day mortality and failure-to-rescue (Aiken, Clarke, Sloane; Sochaski, & Silber 2002; Aiken, Clarke, Cheung, Sloane, & Silber, 2003; Aiken, Clarke, Sloane, Lake, & Cheney, 2008;). When leadership not only focused on safety, but also encouraged staff to learn from errors, there was a positive relationship between the number of medication errors, urinary tract infections, nursing

back injuries, patient satisfaction, and patient perceptions of nurse responsiveness (Hofmann & Mark, 2006).

Errors and adverse events can be caused by a multitude of complex interacting factors, including management decisions, organizational processes, working conditions, unsafe acts, cognitive failures and procedural violations (Vincent, Taylor-Adams, & Stanhope, 1998). When healthcare managers were perceived by staff as strongly committed to patient safety, worker productivity and employee safety were better balanced (DeJoy et al., 2004; Hoffman & Stetzer ;1996). Further, there was a positive information flow about safety and a constructive response to unsafe events or errors, which supports learning from errors versus a punitive climate (Edmondson, 1999; Mark, et al. 2007; Naveh, et al., 2005). One study found treatment errors were reduced when healthcare managers focused on safety as a high priority, procedures were suitable for daily work routines, and safety information was clear and freely available. Furthermore, healthcare managers adjusted safety priorities and information to provide congruence with employee perceptions to minimize errors (Naveh et al., 2005). These results support endeavors to better understand the role of the nurse leader in influencing safety climate dimensions and treatment outcomes.

### 1.4.4 Leader-Member Exchange (LMX)

Conceptually, LMX poses that there is a differentiated dyadic relationship between manager and staff members that influences performance outcomes, which is a direct contrast to the traditional conceptualization that leaders, regardless of setting should use a consistent approach toward all staff to impact performance (Graen & Uhl-Bein, 1995; Schriesheim, Castro, & Cogliser, 1999). The leader develops individual staff relationships through interpersonal exchanges that provide

valued inducements unavailable as part of a formal employment contract. Over time, these relationships are either high or low. High relationships are characterized by mutual trust, respect, and obligation. There is job latitude, influence in decision-making, open, honest communications, and support for actions (Cashman, Dansereau Jr, Graen, & Haga, 1976; Dansereau Jr, Cashman, & Graen, 1973; Dansereau Jr, Graen, & Haga, 1975; Graen & Schiemann, 1978; Graen & Uhl-Bein, 1995; Liden, Sparrowe, & Wayne, 1997). These elements are believed necessary to assure achievement of IOM reinforcing defenses (IOM, 2004).

A meta-analysis of 127 studies conducted in various service and manufacturing organizations found significant positive relationships between the correlates of LMX and objective performance, satisfaction with supervision, overall satisfaction, organizational commitment, and role clarity. Turnover, role conflict, and LMX had significant negative correlations. Findings suggest high quality LMX with a leader positively affects overall performance subjectively and objectively (Gerstner & Day, 1997). In industry, a study of 49 manufacturing leadership dyads reported that when LMX was positive and organizational support was high, safety behaviors, safety communication and accidents were positively affected (Hofmann & Morgeson, 1999). Strong LMX resulted in improved safety behaviors in a US Army transportation unit (Hofmann et al., 2003). In a study of wood manufacturers, individuals who had strong leader-member relationships were less likely to experience a near miss or safety related event (Michael et al., 2006). These studies suggest that safety climate can be positively influenced by the frontline manager exemplified by a high LMX. When nurse managers had a stronger relationship with their immediate supervisor, their job satisfaction was greater in a study of 141 frontline managers (Laschinger, Purdy, & Almost, 2007). When the LMX relationship between frontline leaders and their immediate supervisor was stronger there was a more positive

effect on employees' attitudes towards patients, the organization itself and their perceived value to the organization (Tangirala, Green, & Ramanujam, 2007).

In this conceptualization, manager behaviors influence LMX and safety climate in ways that decrease the number of adverse patient outcomes and failure-to-rescue events. No prior studies were identified that examined these relationships within the context of healthcare.

### 1.4.5 Adverse Patient Outcomes and Failure to Rescue

Adverse events are injuries to patients due to unintended consequences of medical management that are unrelated to patients' underlying medical condition. When it is due to medical error, it is deemed preventable (IOM, 2000 p.28). The seminal IOM report mandated a reduction in frequency of these events through improvement in organizational climate, leadership and management, nurse work design and the nursing workforce, with the goal of transforming the work environment of nurses (IOM, 2004). Since the IOM first reported over 98,000 Americans die every year due to errors and adverse outcomes, (IOM, 2000) attention of consumers, payors and providers has become focused on ways to improve patient safety and reduce adverse outcomes. Rising healthcare costs, in combination with minimal gains in indicators of patient safety, led to a concomitant rise in demands to establish standardized measures of hospital performance and institute pay-for-performance programs designed to minimize these events (Committee on Redesigning Health Performance Measures Payment and Improvement Program, 2006).

As a first step, as of October 2008, CMS no longer reimbursed the additional costs associated with 9 preventable patient outcomes: foreign objects retained after surgery, air embolism, blood incompatibility, pressure ulcers, falls, injuries, catheter associated infections,

blood stream infections and urinary tract and surgical site infection, mediastinsitis after coronary artery bypass surgery (CMS, 2007b). Many of these adverse outcomes are directly influenced by nursing practice. In April 2009, CMS proposed 9 additional complications be added to this list, including multiple hospital-acquired infections, glycemic control, and delirium (CMS, 2008). Failure-to-rescue is proposed as a future addition (Kurtzman & Buerhaus, 2008). Clearly, healthcare organizations need empirical data to understand how climate and leadership behaviors relate to adverse outcomes and begin to develop programs for their prevention.

Failure-to-rescue is defined as a patient death after the development of a complication due to lack of recognition of patient deterioration and failure to intervene in response to these changes (Schmid, Hoffman, Happ, Wolf, & DeVita, 2007; Silber et al., 2007). Patient mortality can be reduced through nursing surveillance that results in prompt recognition of condition changes and the provision of a Medical Emergency Team (MET). A MET is a group of highly skilled professionals, summoned to the bedside, who can intervene to improve patient outcomes by providing complex assessment, intensive therapies and critical adjustments based on patient response (Peberdy et al.2007; Schmid, et al., 2007). Currently, failure-to-rescue is a AHRQ patient safety indicator (AHRQ, 2006). This indicator is nurse sensitive as it is reflective of the ability of the bedside nurse to detect and prevent complications and adverse outcomes (Needleman, Kurtzman, & Kizer, 2007). A high incidence of failure-to-rescue events has been linked to nurse staffing levels, nurse education, and nurse work environment (Aiken, et al., 2002; Aiken et al., 2003; Aiken, et al., 2008). Studies are inconclusive regarding whether it is the MET team or other variables (i.e., nurse staffing, hospitalists) that improve patient survival (Winters, Pham, & Pronovost, 2006). Further research is needed to determine what variables influence failure-to-rescue. No studies were found that explored failure-to-rescue in relation to safety

climate (Aiken et al., 2003; Aiken et al., 2008; Aiken et al., 2002; Schmid et al., 2007; Winters et al., 2006).

The CMS decision to implement this system of non-reimbursement is an opportunity for nursing to demonstrate its expertise in the prevention of complications. The need to improve practice is clearly evident. Nurse scientists have the expertise to provide the evidence needed to identify problem areas and design and test interventions targeted to improve outcomes. If institutions experience a decline in revenue due to the new CMS payment structure, nursing could become a target for blame for failures (Kurtzman & Buerhaus, 2008). It is essential that nursing be able to quantify its relationship to patient safety, its impact on the prevention of adverse outcomes and identify gaps in the delivery of quality care (Kurtzman & Buerhaus, 2008; Needleman et al., 2007).

**Staff and Unit Staff Characteristics:** The structure of an organization and its interaction with its processes produce the outcomes observed. Nursing unit and staff characteristics are contextual, structural variables, which may be constraining or facilitating to the achievement of effective relationships and outcomes. The diversity of worker and work environments is increasing. The more sophisticated our understanding of organizational context, the richer our description and understanding of empirical findings (Rousseau & Fried, 2001). Nurse staffing patterns, nurse education levels and work climate have been positively linked to increased patient mortality and failure-to-rescue (Aiken , et al., 2002; Aiken et al., 2003; Aiken et al., 2008;). A study of 278 medical-surgical units in 143 hospitals found a significant interaction between the contextual variables of RN skill mix, RN education levels, safety climate, medication errors, and patient falls. When safety climate was low, medication errors were negatively related to RN skill mix and BSN preparation. Conversely, there was no relationship between RN skill mix and BSN

preparation when safety climate was high or average. Skill mix and education level was positively related to falls when safety climate was high, but not at other levels. The variability of these findings reinforces the need to understand other drivers of these differentiated outcomes, one of which may be leadership (Mark et al., 2008). Understanding how contextual variables may impact adverse patient outcomes and failure-to-rescue coupled with empirical evidence enables the pulling together of small pieces of data to provide a much larger whole that can assist in providing meaning and clarity regarding barriers or drivers to improvement in outcomes (John, 2006). Potentially additional relationships may exist between educational levels of nurses, staffing levels, unit characteristics and safety climate, LMX, adverse patient outcomes, and failure-to-rescue.

### 1.4.6 Innovation and Significance

Further research is needed to understand the role of frontline nursing leadership in influencing safety climate, adverse patient outcomes, and failure-to-rescue. The finding that unit safety culture differs within units with a similar patient care mission (ICUs) in the same institution has important implications for the development of future interventions. Units with high levels of safety culture promotion could be identified and serve as exemplars (Huang et al., 2007). Leaders who exemplify the ability to develop effective trusting relationships and reinforce and reward safety behaviors could be identified to mentor others. Thus, it may be possible to reduce adverse patient outcomes and improve safety climate and safety behaviors. No studies in healthcare were found that explored the interaction of safety climate, adverse patient outcomes and failure-to-rescue in a healthcare setting. This study is the first in applying the LMX perspective to safety climate and adverse patient outcomes in a healthcare setting. It will

contribute to the knowledge of the interaction of selected variables in an acute tertiary care center. It has the potential to impact nursing practice by providing evidence on how frontline leaders impact safety and outcomes. Furthermore, this conceptualization could become a model for future research and the development of interventions to improve nursing practice in this important arena.

## 1.5 RESEARCH METHODS

### 1.5.1 Design

The study employed a cross-sectional, multi-level survey design to obtain data on safety climate (defined as responses to the AHRQPSC questionnaire) assessed at the individual staff member level within a given unit level, leader-member exchange (defined as responses to the LMX-7 questionnaire) measured at the individual level within a given hospital unit, and adverse patient outcomes (defined using CMS criteria) and failure-to-rescue (defined as MET calls) aggregated at the unit level in a large quaternary healthcare center.

### 1.5.2 Setting

The setting was the University of Pittsburgh Medical Center (UPMC) Presbyterian Hospital. UPMC Presbyterian is a 700-bed adult, quaternary care hospital located in Southwestern Pennsylvania, which annually admits approximately 32,000 patients per year. This hospital is a regional referral center for patients from the surrounding area and 20 facilities affiliated with the

UPMC. In addition to general medical and surgical units, the UPMC Presbyterian Hospital includes numerous specialties, including organ transplantation, cardiology and cardiothoracic surgery, critical care medicine and trauma services, and neurology. Approval was obtained to conduct the study from the Vice President of Patient Care Services and Chief Nursing Officer at UPMC Presbyterian (Letter of Support Appendix A); the Chief Quality Officer of UPMC Health System (Letter of Support Appendix B); and the Institutional Review Board of the University of Pittsburgh (IRB Approval Appendix C). All responses were anonymous and confidential and informed consent was implied

### 1.5.3 Sample

Participants were a convenience sample of nursing personnel nested within all inpatient units at UPMC-Presbyterian. Nursing personnel consisted of unit directors, registered nurses, licensed practical nurses, patient care assistants, and unit clerk/ secretaries. The eligible number of participants were all (n=34) unit directors and their associated staff members for a total of (n=1762) who were employed in their respective unit for 4 weeks or longer in the institution. Four weeks was judged a sufficient time for exposure to unit safety climate and leadership behavior to allow ratings of study variables (Liden, Wayne, & Stilwell, 1993; Sexton & Thomas, 2003). The units surveyed included 23 medical/surgical, 8 critical care, and 3 special units (1 rehabilitation, 1 transitional care unit and 1 central staffing pool)

### 1.5.4 Sample Size

#### 1.5.4.1 Rationale for sample size

Sample size was determined from a review of the literature that focused on widely cited studies that tested LMX and safety variables. This review identified a sample size that ranged from 20 to 40 units as optimal for the present study. (Hofmann & Morgeson, 1999; Hofmann, et al., 2003; Tangirala et al., 2007; Zohar, 2000; Zohar, 2002a; 2002b). The available sample was 34 units and 1762 staff members (individuals), yielding a mean unit (staff cluster) size of 45. The proposed sample was therefore judged appropriate.

#### 1.5.4.2 Rationale for inclusion criteria

The variables in this study had two levels of analysis: 1) LMX and unit safety climate assessed at the individual level and 2) adverse patient outcomes, failure-to-rescue, staff and unit characteristics assessed at the unit level. Staff and unit characteristics analyzed at the unit level included nurse-patient ratio, staff level of education, unit turnover and vacancy rates. To permit a robust statistical analysis, it was important to insure sufficient numbers of participants and units to reliably estimate the association between LMX and safety climate. (Hofmann, et al., 2003; Klein, Dansereau, & Hall, 1994) The advice of noted safety researchers and personal consultation Dr. R. Ramanujam (Dissertation Committee Member) supported asking all nursing and ancillary staff to participate, rather than limiting participation to bedside nursing staff. Consensus indicated this strategy would have the desired effect of increasing response rate because all personal would feel engaged and representation would be increased across levels (Sexton, 2008).

#### 1.5.4.3 Desired and actual sample size

The desired response rate was 50% -60% or greater (AHRQ, 2003; Sexton & Thomas, 2003; Sexton, 2008;). In the present study, a 40% (n=711/1762) response rate was achieved from all nursing personnel and a 100% response rate from unit directors (n=34/34). This yielded a total sample response rate of 41% (745/1796).

#### 1.5.4.4 Implications for statistical analysis for Aims 1-3

When investigating the association between LMX and safety climate using two-level hierarchical linear modeling (**Aim 1** ) with a total sample size of 711, multiple correlations (based on regression models with a single predictor) as small as R=.218 (or $R^2$=.047) may be detected with .80 power at a testwise significance level of .01 for two-sided hypothesis testing with a maximum intracluster (intraunit) correlation of .10 and an average unit (staff cluster) size of 21. If larger intracluster correlations within units exist (on the order of .30), the effective sample size will be further decreased so that only multiple correlations as small as R=.327 (or $R^2$=.107) may be detected with .80 power at a significance level of .01 for two-sided hypothesis testing.

When examining associations of LMX and safety climate with adverse patient outcomes that are reported only at the unit level (**Aim 2**), the effective sample size is reduced to 34 units, so that multiple correlations as small as R= .567 (or $R^2$=.322) may be detected with .80 power at a significance level of .01 when testing two predictors (LMX and one safety dimension), with smaller effect sizes being detectable when controlling for covariates.

Aim 3 is purely explorational. Therefore this aim was not considered for sample size estimation.

### 1.5.5 Measures

**The A gency for H ealthcare R esearch an d Quality Hospital Survey on P atient S afety Culture (AHRQ PSC)** (Appendix D) is based on the conceptualization of safety climate as the sum of individual and group values, beliefs, attitudes and perceptions regarding what is important, expected and rewarded regarding safety climate. The instrument assesses 8 dimensions of unit level safety climate: 1) supervisor/manager expectations and actions promoting safety; 2) organizational learning-continuous improvement; 3) teamwork within units; 4) communication openness; 5) feedback and communication about error; 6) non-punitive response about error; 7) staffing; and 8) hospital management support for patient safety; two levels of hospital-level aspects of safety culture: a) teamwork across hospital units and b) hospital handoffs. The tool generates four outcomes: an overall perception of safety, frequency of event reporting, a patient safety grade for the assigned hospital unit and number of self-reported events. **Format:** 42 item Likert scale with 5 responses (strongly disagree to strongly agree). Questions are worded to reflect positive, neutral, and negative responses. **Scoring:** Mean scores for each safety measure were calculated. **Time:** 10-15 minutes for completion: **Reliability:** Internal consistency estimates ranged from .63 to.83 with an average of .77, which is acceptable. **Validity:** Convergent validity was confirmed with composite score calculations and with final constructs validated with confirmatory and factor analysis.(AHRQ, 2003; Sorra, Famolaro, Dyer, Nelson, & Khanna, 2008) **Rationale for selection:** This instrument was chosen because of its sound psychometric properties, its ability to measure safety climate at multiple levels, in multiple domains and its benchmarking with a database, supported through 2012, which is fairly representative of the hospitals in the American Hospital Association.(Sorra et al., 2008)

**The Leader-Member Exchange Tool (LMX-7)** (Appendix E) is based on the conceptualization of the relationship between a supervisor and subordinate as a differentiated dyadic relationship. It measures the key dimensions of mutual trust, respect and obligation (Graen & Uhl-Bein, 1995). It is the strength of this relationship that influences outcomes. This instrument is designed to assess staff members' perceptions of their relationship with their leader. **Format**: 8-item adaptation of the original LMX-7(Scandura & Graen, 1984). For response consistency as recommended by Liden, Wayne, & Stilwell (1993), the tool uses a 5-point Likert scale (strongly disagree to strongly agree). One item is split into two items as recommended by Bauer and Green (1996) to provide response clarity. These items measure the key dimensions of an effective leader-member working relationships which are trust, respect and obligation (Graen & Uhl-Bein, 1995). **Time:** 5-7 minutes to complete (Graen & Uhl-Bein, 1995). **Validity:** The instrument has consistent criterion-related validity (Liden et al., 1993). **Reliability:** The modified version of the LMX-7 has Cronbach's alpha of .91 for organizational samples (Liden & Maslyn, 1998). A meta-analysis of LMX studies considering the LMX-7 as a categorical moderator vs. all other measures found a Cronbach's alpha of .89 (Gerstner & Day, 1997). **Rationale for selection:** The LMX-7 was chosen since it consistently demonstrates the highest alpha levels (Gerstner & Day, 1997) and measures the critical conceptual item of the effectiveness of the working relationship of the supervisor (Graen & Uhl-Bein, 1995).

**Staff and Unit Characteristics:** (Appendix D) Information obtained from participants included age, race, initial RN preparation, additional education, total years of experience, years of service in current work unit, years of service in the organization, shift, direct contact with patients, typical hours worked per week, tenure (years) of unit director in present position, total years of experience as a unit director, initial education level of the unit director, additional

education and participation in leadership continuing education of the unit director were obtained from the participants. The unit characteristics of nurse-patient ratio, direct care hours per patient day including skill mix, educational levels, vacancy rate, and turnover rate within unit were obtained from administrative information systems. **Rationale for selection:** It is important to describe the study sample as well as known differences in staff and unit characteristics to explore alternative explanations for results.

**Adverse Outcomes** included catheter-associated infections, urinary tract, blood stream, and surgical site infection, mediastinitis after cardiac surgery, pressure ulcers, and falls reported for each patient unit. Data for the occurrence of adverse outcomes were collected from the hospital's infection surveillance system and performance improvement system. Healthcare-associated infections (HAI) are identified by infection control practitioners using standardized protocols using accurate case finding based on both laboratory and clinical data. Analysis of surveillance data generates the rates for ongoing infection monitoring. Indicators are based on the established CDC National Healthcare Safety Network Benchmarks (Centers for Disease Control, 2008). Data were collected at the unit level. Patient falls were identified upon occurrence by the registered nurse. Specific details of the fall were documented, with classification as to whether or not an injury had occurred and its extent. Additional fall information was provided on a follow-up form. Fall rates and fall injury rates were calculated using the National Database of Nursing Quality Indicators (NDNQI®) (Pollard, Andres, & Dobson, 1996). Adverse outcomes were collected at the unit level and were aggregated at the unit level for analysis. Surveillance and screening for pressure ulcers was conducted on all patients by the registered nurse on the third Wednesday of each month. Skin integrity was assessed; breakdowns were classified as a Stage I-IV with a determination of community or

hospital-acquired. Pressure ulcer rates were calculated using the National Database of Nursing Quality Indicators (NDNQI®) (Pollard et al., 1996). Data were collected at the unit level and are aggregated for each unit. **Rationale for selection:** These outcomes can be impacted by nursing actions through surveillance and prevention of complications. Furthermore, these variables have been judged by CMS as outcomes that should not occur during a patient's hospitalization.

**Failure to Rescue Events:** The number of MET calls was collected from the hospital's performance improvement system. The MET was introduced as a component of care at this institution in 1998. It was designed to supersede the existing cardiac arrest team. Responders include an intensive care physician, intensive care nurse, nurse anesthetist and respiratory therapist. The team can be summoned by anyone in the hospital (RN, nursing assistant, transport aide, information desk clerk) at any time by calling a designated hospital extension. The call creates an electronic page and overhead speaker announcement placed by the hospital operator. The operator records the location and type of condition. The institution posts specific criteria designating when to summon the MET team in each patient room (Appendix F). MET team calls average 5 per day in the study setting.

### 1.5.6 Data Collection

Unit directors received a letter from the Vice President of Patient Care Services (Appendix G), introducing the principal investigator (PI), the background, and objectives of the study, and inviting them to participate in the study and attend an informational meeting. At this meeting, the PI used a script (Appendix H) and reviewed the proposed study plan. A list of all unit personnel (registered nurses, licensed practical nurses, patient care assistants, and unit clerk/secretaries) was provided by the hospital administrative office. The PI requested information regarding the

best date and time for survey administration to minimize staffing impact and ensure broad participation. Surveys were administered in a location near the work unit. Participants were served light refreshments as a token thank you

Nursing and ancillary staff received a letter from the Vice President of Patient Care Services (Appendix I) inviting them to participate in the staff survey. The letter introduced the PI, the background and objectives of the study stating that all responses would remain confidential, that a specific individual cannot be linked to a specific survey, that unit codes are only for the purpose of tracking response rates and responses would be reported in aggregate form. Flyers were then placed in units, staff lounges, and rest rooms reminding staff of the survey. A reminder letter from the Chief Nursing Officer was sent halfway through the 2- month data collection period.

Surveys were administered on all shifts and data were collected from May, 2009 - June 2009. At survey time the PI or designee introduced the survey using a script (Appendix J) that reviewed the background and objectives of the study, the need to identify position type, e.g. RN, patient care assistant, provided survey completion instructions while reinforcing confidentiality and anonymity. Unit directors were asked to complete the AHRQPSC separately from assigned unit staff to avoid staff members feeling uncomfortable being asked to rate their unit or relationship to their leader in the presence of their director. To maximize confidentiality, the PI labeled the AHRQPSC and LMX-7 surveys with a pre-printed unit code and provided a number 2 pencil with an eraser and a plain manila envelope 8 1/2 by 11″ for survey return. Participants were asked to insert their completed surveys into the manila envelope. This return envelope ensured response confidentiality so the person collecting the completed survey could not see the responses. A supply of surveys and return envelopes were left on the units to provide for staff

members who missed a session. A drop-off box was provided in each unit for these surveys. Response rates were monitored throughout the units. This data collection method was chosen in an effort to obtain the highest level of response as response rates of 90% or higher have been reported using this data collection method (Sexton & Thomas, 2003; Sexton, 2008). Adverse patient outcomes and failure-to-rescue were obtained from the hospital surveillance and performance improvement systems. Data on adverse patient outcomes were collected for a 3-month interval prior to the survey since staff were not blinded to the survey; therefore the potential to underreport existed.

### 1.5.7 Limitations

Data collection occurred in one large quaternary academic medical center and findings may not be generalizable to other settings. The study was cross-sectional, thus causality cannot be inferred. Questionnaire data were subject to known limitations of self-report. Adverse outcomes may have been underreported and/or not identified by screening systems or not detected on admission. The systems in place may not have identified or reported all adverse events.

### 1.5.8 Data Management

Oracle (version 9i, Oracle Corporation, Redwood Shores, CA) was used for data management. Form design, data entry, and data verification were performed in Teleform (version 6.0, Verity, Inc., Sunnyvale, CA), a Windows-based software package for automated data entry/verification (Davidson et al., 1996). Pre-coding of data collection forms and the establishment of tolerance standards for verification were employed to minimize error during data processing. Forms were

screened for completeness prior to data entry. Erroneous responses identified during data verification were checked and corrected before data was merged in the Oracle database. Once data were fully verified, scores were computed, variables and values were labeled, and missing values were identified to create the data files for analysis.

### 1.5.9 Data Analysis

For data analysis the statistical software packages SPSS (version 17, SPSS, Inc., Chicago, IL) SAS 9.2 (SAS, Institute, Inc. Cary, NC) and Mplus (6.0, Muthén & Muthén, Los Angeles, CA) were used. SAS 9.2 was used to fit the hierarchical generalized linear models.

#### 1.5.9.1 Preliminary Analysis

As an initial step, AHRQPSC reversed coded variables (that were negatively worded) were transformed to provide a standard scale metric for analysis. Exploratory analysis was performed to determine accuracy of the data. For the established multi-item scales (e.g. AHRQPSC), confirmatory factor analysis via structural equation modeling (SEM) was conducted to validate the factor structure of the scales. Exploratory factor analysis was also conducted to confirm the underlying data structure of the sample. Descriptive statistics were computed for all variables across the across units and by unit, consisting of frequency counts and percentages for categorical variables and means, standard deviations, and measures of skewness and kurtosis for rate and metric variables. Continuous variables were screened for univariate outliers using histograms, box plots, probability plots and the calculation of Z scores. Screening for multivariate outliers was performed using Mahalanobis distance and pairwise scatterplots. Several outliers were indentified; however, a sensitivity analysis with and without outliers

demonstrated no impact on results (i.e. parameter estimates and tests of significance). In general, data for adverse outcomes were nonnormally distributed therefore, data transformations (square root and logarithmic) were applied to induce normality. Some adverse outcomes were extremely rare, in which case a binary indicator format (present/absent) was used. The unit characteristics of nurse patient ratio, reported unit education levels, turnover rates and vacancy rates were also collapsed in an attempt to improve the data distribution and eliminate extreme values or outliers.

Every effort was made to minimize data loss. Nonetheless, some missing data occurred. For item missing data on multi-item scales (e.g., LMX), 75% of item needed to be complete in order to complete mean scores for each safety climate dimension and LMX. The amount of missing data for the LMX variable was 9.5% and for safety climate dimensions items less than 5%, with two exceptions: patient safety grade (21%) and actual number of events reported (10%). The randomness of the missing data was investigated using available information on unit and staff characteristics to help discern patterns in the missing data. Little's MCAR test was conducted and was significant ($\chi 2=524.016$, df 458, $p = .018$). This finding supports that the missingness of data were nonrandom. No specific patterns of missingness were found in the AHRQSC and LMX data. Therefore, data were determined to be missing at random, which is a weaker assumption than missing completely at random, but, nevertheless, provided accurate estimates of model parameters in general linear models (GLM).

Additionally, analysis was performed to investigate whether respondents having complete information differed from respondents having any missing data in terms of key patient and unit characteristics. For these investigations, Chi-square tests of independence analysis (or Fisher's exact test, if cells were sparse) were used for categorical characteristics, while Student’s t-test and Mann-Whitney U-tests were used for continuous type characteristics (e.g., percentage of

BSNs). In a few cases, the adverse outcome data of hospital acquired pressure ulcers and patient falls was found to be missing at random. No unit had more than one month of data missing. In all but one case missing data was bounded on both sides. Therefore data for these cases were imputed using the average of the scores which were present considering missing patterns.

Multicollinearity was assessed through the singular value decomposition of the matrix of independent variables. Using these results, near linear dependencies among the predictors were pinpointed and handled.

#### 1.5.9.2 Primary Analysis

As summarized in Table 1, data on LMX and safety climate were both accessed at the staff member level. Data relating to patient safety outcome variables were only available at the unit level for the 3-month interval prior to administering the surveys to staff members.

Statistical models capable of handling the complexity of hierarchical sampling as well as possibly non-normally distributed dependent variables are hierarchical generalized linear models (HGLMs) (Hofmann, 1997). Hierarchical linear models (HLMs) can accommodate hierarchical sampling frames by incorporating latent random regression coefficients for every sampling level at which correlated responses might occur. HGLMs extend the HLM, which assumes normally distributed errors, to HLMs based on the broader exponential family of distributions (e.g., Poisson, binomial) which were anticipated in this study.

Although hypotheses in this study are directional, a nondirectional approach to testing was adopted. The testwise significance level was set at .01 to limit inflation of type 1 error due to multiple testing. Confidence intervals for point estimates will be computed at 99%.

**Table 1** Variables, Levels of Sampling and Analyses

| Variable | Data Source | Sampling | Analysis |
|---|---|---|---|
| Safety climate | AHRQPSC | Individual | Individual /Unit |
| Leader-member exchange relationship | The LMX -7 | Individual | Individual/Unit |
| Adverse patient outcomes Failure-to-Rescue | Hospital performance improvement system | Unit | Unit |
| Staff characteristics | AHRQPC | Individual | Unit |
| Unit characteristics | Hospital administrative records | Unit | Unit |

### 1.5.9.3 Data Analysis Aim 1

To investigate the relationship between LMX and safety climate, two-level hierarchical linear models were fitted for each safety climate variable assessed for the i-th staff member in the j-th unit, $Y_{ij}$, as a possibly linear function of LMX, $X_{ij}$, assuming normally distributed errors:

*Level-1 (Staff Member/Individual Level):* $Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + e_{ij}$

*Level-2 (Unit Level):* $\beta_{0j} = \gamma_{00} + u_{0j} \quad \beta_{1j} = \gamma_{10} + u_{1j}$

where $\beta_{kj,}$ and $\gamma_{kl}$ $[(k,l) = 0,1]$ are the regression coefficients (intercept and slope) denoting level specific and possibly nested effects for unit; and $e_{ij}$ and $u_{kj}$ $(k = 0,1)$ are random effect parameters. Maximum likelihood methods were used to estimate models. Estimates of regression coefficients and variances/covariances were obtained along with their 99% confidence intervals. Significance testing was conducted using the ratio of the regression parameter estimate to its standard error. Chi-square based test statistics were used to test variance/covariance estimates. The effects of unit and individual characteristics were incorporated into the model at the appropriate level (e.g., a unit-level characteristic, $G_j$, would be included in level-2 with

components, $\gamma_{01} G_j$ and $\gamma_{11} G_{j,}$ for $\beta_{0j}$ and $\beta_{1j}$, respectively). Residual analyses were conducted for the residuals for each random effect to assess whether statistical assumptions were being satisfied.

#### 1.5.9.4 Data Analysis Aim 2

To examine if LMX and safety climate are associated with the occurrence/rate of adverse patient outcomes (e.g., pressure ulcers), regression analysis strategies followed by residual analysis was applied considering the distribution of the particular adverse patient outcome. Data on LMX and safety climate were aggregated across the staff members within each unit since adverse patient outcome data are only available at the unit level. In keeping with organizational research on patient safety, (Hofmann & Mark, 2006; Mark, et al., 2008) aggregation at the unit level is supported by values of within-group agreement, $_{rwg}$, of at least .70 (Bliese, 2000; James, Demaree, & Wolf, 1993). The reliability of the aggregated data was assessed by calculating the proportion of variance explained by unit membership using the intraclass correlation coefficient and mean inter-rater reliability with values of $\geq$.70 suggesting acceptable unit-level reliability.

Since the data were non-normally distributed, multiple approaches to regression were used. As a first step, all possible regression was performed using the outcomes of total infections, total MET calls, fall rates, pressure ulcer rates, total number of falls and total number of pressure ulcers with the square root transformations and log linear transformations of the aforementioned outcomes. Then, the adverse outcome variables of total infections, total MET calls, fall rates, pressure rates were transformed into categorical outcome variables to conduct binary logistic regression.

#### 1.5.9.5 Data Analysis Aim 3

To explore the effect of staff and unit characteristics on the relationship between safety climate and LMX and adverse patient outcomes, the same regression models developed for Aim 2 were extended to also include unit and staff characteristics. To test for moderating effects, interaction terms were developed for each safety climate dimension and LMX variable along with interaction terms for NPR, BSN percent, unit vacancy and turnover rates. Individual-level data assessed from unit staff members were aggregated and evaluated for reliability for Aim 2. For these exploratory investigations, we emphasized parameter estimation, rather than hypothesis testing.

## 1.6 HUMAN SUBJECTS

### 1.6.1 HUMAN SUBJECTS

The unit directors, staff nurses and ancillary personnel who participated in the study were asked to provide data that were identified by a unique unit identifier to link surveys with the patient care unit. The information provided included demographic data and questionnaire data. To increase confidentiality of responses, each participant was provided with a plain brown sealed envelope to return completed surveys. All study data were stored in a locked filing cabinet and all records connecting unit identifiers were stored in a separate locked filing cabinet. All study data were managed in a secure, password-protected database. Per IRB requirements, plans were made to maintain research records for a minimum of 5 years or as long (indefinite) as required to

complete the research study. Individual responses were not shared unless presented in aggregate and individual participants were not identified by name.

#### 1.6.1.1 Protection of Human Subjects

The study was approved by the Institutional Review Board of the University of Pittsburgh and a waiver of informed consent was granted.

### 1.6.2 Source of Materials

The study used two paper and pencil instruments (AHRQPSC and LMX-7) to collect data about safety climate and LMX. Staff characteristics were obtained from a form attached to the AHRQPSC. Unit specific data, e.g., unit nurse-patient ratio, direct hours per patient day including skill mix, vacancy rate, turnover rate, adverse outcomes, and failure to rescue data were obtained from hospital administrative information systems database.

#### 1.6.2.1 Potential Risks

The potential existed that participants may have felt uncomfortable sharing information about unit safety climate and their relationship with their manager. Also, the unit directors may have been uncomfortable having personnel assess the quality of their relationship. At no point in time were results of individual participants' surveys shared with employers unless presented in aggregate. At no point in time, were there any threats for not participating in the survey. Privacy and confidentiality were assured by not providing individual identifiers for the participants. No concerns were expressed by participants regarding loss of confidentiality or discomfort from study participation.

### 1.6.3 Recruitment and Informed Consent

Recruitment was conducted through a letter sent to nursing staff and flyers posted in the facility. The letter and flyers stressed the importance of learning about staff members' perceptions and organizational safety climate and leadership and the potential to understand about their relationship to adverse patient outcomes and failure-to-rescue. Completion of the survey served as informed consent.

### 1.6.4 Protection Against Risks

The letter staff received about the survey clearly stated survey completion was voluntary and findings would only be shared in aggregate. During survey completion staff were provided with a confidentiality statement (Appendix J), the two instruments one with a demographic sheet (Appendix D and Appendix E), with a preprinted unit code and a sealable brown envelope. The return envelope ensured response confidentiality, so the person collecting the completed survey could not see the responses. If a staff member asked to withdraw, they were able to do so at any time during the data collection phase; however, none chose this option. After the data collection, phase there was no way to link the survey respondent to the survey.

### 1.6.5 Potential Benefits of the Proposed Research to the Subjects and Others

While there was no direct benefit from participation in the proposed study, there was the potential that participants would benefit from the information acquired by assisting in the generation and implementation of interventions to improve safety climate, leadership and patient

safety. The principal investigator has in place plans to share findings from the study with nursing and administrative staff and disseminate study findings in articles and presentations.

### 1.6.6 Importance of Knowledge Gained from the Proposed Study

The knowledge gained though this investigation involving minimal risk to participants was anticipated to be of great importance in helping to understand the relationship of safety climate, leader-member exchange, adverse patient outcomes, and failure-to-rescue. The strength of the leader-member relationship and safety climate had not been explored in a healthcare setting.

### 1.6.7 Data Safety Monitoring Plan

Data and safety monitoring were conducted during meetings with the dissertation committee. During these meetings, recruitment accrual, confidentiality issues, and any adverse events were addressed. Any adverse events would have been immediately reported to the IRB. There were no adverse events.

### 1.6.8 Inclusion of Women, Minorities, and Children

The nursing profession is currently dominated by women (approximately 95%) and enrollment was consistent with this statistic. To insure enrollment of male participants consistent with the percentage employed at UPMC, letters and flyers emphasized the participation of all staff in the survey and confidentiality of replies. Approximately 13% of all nurses are minorities, 4.9% are African American, 3.7% are Asian or Pacific Islander; 2% are Hispanic; 0.5% are American

Indian or Alaska Native; and 1.2% categorize themselves as "multiracial" (two or more races). Within UPMC, the minority distribution is 5% African- American, 87% White not of Hispanic Origin, 8% Other. Efforts were made to recruit minority subjects by contacting Nursing Administration at the UPMC Presbyterian and requesting that they inform potential minority participants about the study. Recruitment efforts included publicizing the study via a letter and flyers which depicted male and female nurses and minority representatives. The resulting minority distribution was: 81.6% White not of Hispanic Origin, 12.1% were African-American, 2.8 %, were Asian Pacific Islander 1.4% were Hispanic% and were 2.1% Other .

### 1.6.9 Inclusion of Children

Children are not employed as healthcare providers.

## 2.0 SUMMARY OF STUDY

The purpose of this study was to use the Leader-Member Exchange (LMX) perspective to examine the association of leadership with safety climate and adverse patient outcomes. Two articles describing study results prepared in the format for submission to Medical Care (Aim 1) and the Journal of Nursing Administration (Aim 2) are appended to this chapter. A third article (under revision) describing a framework for examining interrelationships among nurse leader behaviors, the quality of the leader's relationships with frontline staff, staff safety attitudes, behaviors and patient safety outcomes is included as Appendix K.

## 2.1 FINDINGS RELATING TO AIM 1

Aim 1. *To investigate the relationship between the structural variables of safety climate, staff educational preparation, unit turnover and staffing, and the process variable of LMX.*

The study variables for analysis were staff responses to the AHRQPSC safety climate dimensions, unit characteristics of nurse patient ratio, percentage of BSN prepared staff, vacancy rate, turnover rate, and LMX. Prior to analyzing study data, two safety climate outcome dimensions were dropped from the analysis: patient safety grade due to a missing response rate of 21% and actual number of events reported due to nonnormally distributed data with strong floor effects.

Data were analyzed using hierarchical linear modeling to account for the nested structure of the dyadic leadership relationships within hospital units. Both “all available” and “a listwise deletion”, for handling of missing data during analysis approaches (n=637) were used for the analysis. Findings were similar with both methods. Results from the listwise deletion approach are reported in the manuscript.

Results of the study indicated that differentiated relationships existed between leaders and unit staff members (M=3.69, SE=0.059, t=62.91, p<.0001).Variability in these relationships was found both within units (Z=17.36, p <.0001) and among units (Z=2.67, p=.0038). Additionally, a positive relationship between each safety climate dimension and LMX was supported (p<.0001). A multivariate model including supervisors’ expectations and actions regarding safety (p<.0001), organizational learning-continuous improvement (p=.054), teamwork within hospital units (p=.001) and feedback and communication about error (p=.001) provided evidence that a set of reinforcing dimensions successfully predicted LMX (p<.0001). No significant relationships were found between unit and staff characteristics and LMX.

Study findings support a positive relationship exists between staff perceptions of safety climate and the strength of the leader’s relationship with staff.

## 2.2 FINDINGS RELATED TO AIM 2

*Aim 2: To examine if the process variable of LMX, structural variables of safety climate, staff educational preparation, unit turnover, and staffing are associated with adverse patient outcomes.* In general, study data reporting the adverse outcomes were nonnormally distributed, therefore data transformations (square root and logarithmic) were applied. Some adverse

outcomes were extremely rare. Consequently, a binary indicator format (present/absent) was used. The unit characteristics of nurse patient ratio, reported unit education levels, turnover rates and vacancy rates were collapsed in an attempt to improve the data distribution and eliminate extreme values or outliers. Multiple linear regression analyses using all possible regression model and multivariate logistic regression was performed with untransformed and transformed variables. No significant associations were found between adverse outcomes and the safety climate dimensions scores, LMX scores, nurse-patient ratio, percentage of nurses with a baccalaureate degree, unit turnover, and unit vacancy rates.

Several reasons may have accounted for lack of significance including the low reported number and abnormal distribution of the selected outcome variables, the short (3-month) data collection period, small sample size (n=34 units) and/or the number of predictors in the model. Further, the adverse outcomes selected for analysis were those that the Center for Medicaid and Medicare deemed as non-reimbursable. For this reason, they may have been targeted early on for reduction by the organization and therefore rarely present. Variables such as percentage of BSN's, nurse-patient ratios and turnover are influenced by factors not under direct control of the unit director.

To further understand the relationship between safety climate dimensions and LMX scores, the data were analyzed using a multivariate analysis of variance (MANOVA) followed by a one- way between groups analysis of variance (ANOVA) procedures to compare nursing staff perceptions of safety climate in clinical units characterized by high, medium, and low ratings of LMX and exploration of characteristics that might account for these differences. The second manuscript reports findings from this analyses. Using the LMX scores, the 34 units were equally divided into three groups (tertiles). Using data from individual scores, mean scores (for each

safety climate dimension and LMX when 75% of the data were present) were calculated for each unit safety climate dimension and LMX. “High” scoring units were those in the upper tertile LMX > 3.86 and “low” scoring units LMX < 3.50. Multivariate analysis (MANOVA) was used to determine if significant differences existed between groups based on tertiles of LMX. One-way analysis of variance (ANOVA) with planned linear contrasts was used to compare high and low scoring units. Contingency tables analyses with chi-square tests of independence were performed to determine differences in unit and staff characteristics and LMX across the three groups. We conducted a similar analysis using one standard deviation from the mean LMX score as cutpoints and obtained similar results.

Using MANOVA, a significant difference between groups (tertiles) based on LMX scores for safety climate dimensions was found Wilk’s statistic ($F(28,36) = 2.88$, $p=.002$). ANOVA with planned comparisons between groups found significant differences between clinical units with high and low LMX scores. Significant differences were found on five measures of unit level of safety climate: supervisor safety expectations, organizational-learning-continuous improvement, total communication, feedback and communication about errors, and nonpunitive response to errors. No significant differences were found among LMX groups in regard to unit characteristics or unit director characteristics..

These findings support that the LMX perspective can be used to identify differences in perceptions of safety climate.

## 2.3 FINDINGS RELATING TO AIM 3

Aim 3: *To explore the interrelationships among the process variable of LMX, structural variables of safety climate, staff educational preparation, unit turnover, and staffing and adverse patient outcomes.* Using the same regression models developed for Aim 2, these models were extended to also include unit and staff characteristics. To test for moderating effects, interaction terms were developed for each safety climate dimension and LMX variable, along with interaction terms for NPR, BSN percent, unit vacancy, and turnover rates. Individual level data assessed from unit staff members was aggregated and evaluated for reliability. No significant associations were found for any of these of predictors or their interactions.

## 2.4 LIMITATIONS

The study is subject to several limitations. Study limitations of a cross-sectional survey, self-report and the fact that all measures were collected at one point in time in a single quaternary academic medical center are addressed in the articles. There were also differences related to sample characteristics which may have influenced study findings. Respondents were younger and included a larger percentage of BSN educated staff than reported in prior studies. Furthermore, unit directors were experienced and well educated. Registered nurses could not be examined independently from other participants since eliminating non-nursing participants would have reduced sample size below that judged to be an appropriate size for analysis.

Responses were anonymous and the principal investigator was not an employee of the organization. Nonetheless, concerns about confidentiality may have influenced replies. The

analysis of differences in the missingness of data by respondent characteristics found those participants who had more missing data were older (> 41 years of age), had non-nursing educations, worked more than 40 hours per week and where not Caucasian or African-American. These factors, in addition to the 41% response rate, although acceptable for survey research, limit the generalizability of the findings.

## 2.5 RECOMMENDATIONS

Recommendations for future research include examination of these relationships in a variety of healthcare settings and professions. The relationships among safety climate, LMX scores and adverse outcomes should also be explored in a multi-site study to provide a larger sample for analysis with adverse outcomes data collected over a longer time period. Little is known about the development of LMX in organizations. It would be interesting to examine LMX from the perspective of the staff member and administration. Though the employee perspective is meta-analytically supported, the leaders' perspective could prove to be of interest. Minimal safety research has been conducted from the patient and family perspective. An innovative study would be to examine safety climate and LMX from the perspective of "how safe" do the patient and family feel when receiving care.

The existence of positive LMX relationships in all types of patient care units indicates potential broad applicability in healthcare. Furthermore, the findings of positive relationships between LMX and safety climate dimensions is timely in light of the most recent AHRQ (2010) report that encourages use of insights from industrial and systems engineering in healthcare to bring about wide scale "breakthrough" change. LMX is grounded in the industrial psychology

literature with strong empirical support for its impact on employee attitudes, beliefs, and performance outcomes (Graen & Uhl-Bien,1995; Gerstner & Day, 1997), all critical elements to bring about large-scale change in healthcare. This study provides a starting point to conduct further research that can assist organizations in moving forward to improve patient safety as well as other needed organizational change.

# 3.0 RESULTS MANUSCRIPT #1 IMPROVING SAFETY CLIMATE: ARE HIGH QUALITY LEADERSHIP RELATIONSHIPS THE WAY TO GO?

## 3.1 ABSTRACT

**Background:** Studies in the field of industrial psychology have identified the relational perspective known as Leader-Member Exchange (LMX) as a critical factor in promoting positive staff behaviors that influence safety. This perspective, which remains under explored in healthcare, may assist in explaining employee attitudes, behaviors and performance outcomes.

**Objective:** To examine the relationship between staff perceptions of safety climate and the strength of the leader's individual relationship with a staff member (LMX). Additionally, we examined the relationship between unit structural characteristics and LMX.

**Research D esign:** Multi-level, cross-sectional analysis of survey responses of nursing staff employed in a 700-bed adult quaternary care hospital in the mid-Atlantic region.

**Subjects:** Thirty-four frontline managers and 711 patient care personnel (nursing and assistive staff).

**Measures:** Instruments included the Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (AHRQPSC) and Leader-Member Exchange (LMX-7). Unit characteristics were obtained from hospital information systems and the AHRQPSC.

**Results:** Differentiated relationships were found between frontline nursing leaders and their respective staff ($p<.0001$). LMX scores demonstrated significant variability both within ($p < .0001$) and among units ($p=.004$). Positive relationships were found between the 14 safety climate dimensions and LMX ($p<.0001$). No significant relationships were found between unit characteristics and LMX ($p \geq .05$).

**Conclusions:** LMX provides a potential means to identify leadership behaviors and practices that may result in a positive safety climate. Studies are needed to test this relationship in other healthcare settings and identify ways to promote attitudes and behaviors that enhance patient safety.

**Key words:** Safety climate, patient safety, leadership, leader-member exchange

## 3.2 INTRODUCTION

Leader behaviors and the relationships of these leaders with staff, including nursing, are widely acknowledged as positive influences on the adoption of safety behaviors (IOM,2004; Pronovost, et al.,2008; Wachter, 2010). The changes necessary to create an environment in which safety is an organizational goal must involve nursing at all levels and, most importantly, the bedside nursing staff. Nurses are the individuals who spend the most time with patients in the healthcare delivery system. Given this central presence, nurse leaders, nurse actions, and their work environments are critical to improving patient safety (Cummings et al., 2008; IOM, 2004; Pronovost, et al., 2008; Wachter, 2010; Wong & Cummings, 2007).

Safety climate is defined as "the shared perceptions of the employees, concerning the practices, procedures, and kinds of behaviors that get rewarded, supported and recognized by the

organization to prevent harm." Schneider (1990, p.384). Leaders influence safety climate in multiple ways. They must demonstrate a strong commitment to safety (Mark, et al., 2008; Naveh et al., 2005), balance worker productivity and employee safety (DeJoy, et al., 2004; Mark, et al. 2007), provide a positive information flow about safety (Mark, et al, 2008; Naveh, et al., 2005) and promote a nonpunitive response to unsafe events or errors that supports learning from errors (DeJoy, et al., 2004). However, questions remain regarding the most effective ways to accomplish safety goals (Cummings, et al., 2008; IOM, 2004; Wong & Cummings, 2007). A logical first step involves developing a better understanding of how leadership behaviors influence actions at the patient level.

Nursing has examined leadership behaviors from multiple perspectives, including leader traits, behaviors, styles, and employee characteristics (Bono.& Judge, 2002; Burke et al., 2006; Judge & Piccolo, 2004; Vance & Larson, 2002). Studies in the field of industrial psychology have identified the relational perspective known as Leader-Member Exchange (LMX) as a critical factor in promoting positive staff behaviors, including safety. This perspective posits that differentiated dyadic relationships exist between a leader and staff member within the same work unit and the quality of a leader's dyadic relationship with an individual employee is a powerful determinant of a wide range of employee attitudes, behaviors, and performance outcomes (Gerstner & Day, 1997) Several industrial studies support use of the relational perspective to better understand the interrelationships of nurse leader behaviors, staff, and safety climate. A study of 49 manufacturing dyads found when LMX relationships were positive and organizational support was high, safety behaviors, safety communication, and accidents were positively affected (Hofmann & Morgeson, 1999). In an Army transportation unit, strong LMX

and expanded safety role definitions predicted staff behaviors that focused on safety improvements for the staff and the organization when moderated by a strong safety climate (Hofmann, et al., 2003). Self-reported near-misses or a safety-related event were improved in a study examining the relationship between high LMX and safety communication in the wood pulping industry (Michael, et al., 2003). These findings support using this perspective to better understand the relationship between behaviors of frontline nursing leaders and safety climate.

Although the impact of LMX on attitudes, beliefs and behaviors is well supported theoretically and empirically (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Hofmann & Morgenson, 1999; Hoffman, et al, 2003, Michael, et al, 2006) the concept remains under explored in healthcare. No studies were found exploring the association between safety climate and LMX in healthcare settings. The purpose of this study was to examine the association between staff perceptions of safety climate and the strength of the frontline leader's individual relationship with a staff member from the staff member's perspective. In the healthcare setting a frontline leader is the unit director (nurse) who has 24-hour accountability and responsibility for the nursing staff and the delivery of patient care services at the hospital unit level. Also, we examined the relationships between the unit structural characteristics of nurse-patient ratio, level of RN education, vacancy rates, and turnover rates with LMX.

## 3.3 METHODS

### 3.3.1 Site and Sample

Participants were unit directors (n=34) and their respective staff members (n=711) recruited from an acute quaternary care hospital in the mid-Atlantic region. Using a cross-sectional design, a survey was conducted over a 2-month period (May to June, 2009). Participants were recruited from 23 medical-surgical, 8 critical-care and 3 special units, including a central staffing pool whose census included general medicine and surgery, cardiovascular, neurosurgical, trauma, transplant, rehabilitation, and long-term care admissions. All personnel (registered nurses, licensed practical nurses, patient care assistants, unit secretaries) were eligible to participate to ensure generalizability of study findings and adequate sample size for each unit for analysis. Usable responses were obtained from 41% of 1,796 distributed surveys. Individual unit return rates ranged from 17% (10/56) to 71% (25/35). This response rate met the minimum number of 10 respondents per unit required for statistical analysis. Unit directors provided a 100% (n=34) response rate.

### 3.3.2 Data Collection Process

The survey was introduced by a letter from the Chief Nursing Officer. Surveys were administered in face-to-face sessions in the patient care areas, with light refreshments provided as a token thank you. A minimum of two sessions per unit were conducted; additional surveys and a collection box were provided for staff unable to attend. Reminders consisted of flyers, frequent rounding, and a follow-up letter mid-survey. Study approval was granted by the

University of Pittsburgh Institutional Review Board with implied consent as surveys were anonymous.

### 3.3.3 Measures

The *Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (AHRQPSC)* was used to assess perceptions of safety climate. The AHRQPSC was chosen because of its sound psychometric properties ability to measure safety climate at multiple levels, and in multiple domains (AHRQ, 2003). This 42-item instrument measures staff perception of 14 safety climate dimensions at 3 organizational levels (hospital-wide, unit level, and outcomes). Forty items use a 5-point Likert scaling (1= strongly disagree to 5= strongly agree). A traditional letter grade is assigned for unit patient safety and each respondent is asked to report a range of actual incidents reported.

The *Leader-Membership Exchange Tool (LMX-7)* (Bauer & Green, 1996; Scandura & Graen, 1984) with wording changes suggested by Liden, Wayne and Stilwell ( 1993) was used to measure strength of the differentiated dyadic relationship. The wording change divided one of the original questions into two questions for clarity. The title of immediate supervisor was changed to reflect the current title of unit director. The adapted 8-item tool measures staff members' perceptions of mutual trust, respect, and obligation with their respective leader using a 5-point Likert scale (1=strongly disagree to 5=strongly agree). The tool is widely recommended due to its ability to measure the critical conceptual item of the effectiveness of the working relationship of the supervisor (Graen & Uhl-Bien, 1995) and has consistently demonstrated the high levels of internal consistency (Gerstner & Day, 1997). The unit directors' assessment of

their relationship with each staff member was not collected since leaders may have a much more complex, multi-dimensional perspective than staff (Gerstner & Day, 1997).

*Unit characteristics, nurse-patient ratios, educational levels, vacancy and turnover rates* were obtained from the hospital information system. Additional researcher-developed items captured type of position, education level, years of experience, time at the organization, shift work and direct patient contact.

### 3.3.4 Analytic Approach

Data analysis was conducted using SPSS (version 17, SPSS, Inc., Chicago, IL), SAS (version 9.2, SAS Institute, Inc., Cary, NC) and Mplus (version 6.1, Muthén & Muthén, Los Angeles, CA). The main analytic approach was hierarchical linear modeling (HLM) (Hofmann, 1997; Raudenbush & Bryk, 2002). This method was chosen to account for the hierarchical data structure of the dyadic relationships between staff members and unit directors at the individual staff member level nested within units. Table 1 provides levels of sampling and analysis. Descriptive and exploratory data analyses were performed to assess for data anomalies (missing data, outliers, nonnormality, nonlinearity). Except for floor effects in the safety dimension of actual number of events reported, safety and LMX data were approximately normally distributed. The unit characteristics of nurse-patient ratio, turnover rates, and vacancy rates were, however, nonnormally distributed and therefore collapsed into smaller ranges in an attempt to normalize the distributions. Several outliers were identified; however, a sensitivity analysis with and without outliers demonstrated no impact on regression results (i.e., parameter estimates and tests of significance). To corroborate construct validity and reliability of the AHRQPSC, we conducted exploratory factor analysis using principal component extraction followed by varimax

rotation and computed Cronbach's alpha coefficients. Cronbach's apha for each safety climate dimension was acceptable, ranging from .70 to .81, similar to reported AHRQPSC reliabilities. The internal consistency for staffing was .58, which was slightly lower than the AHRQPSC value of .63. The internal consistency for the LMX instrument was .94.

Missing data analysis revealed all LMX and safety climate items had 5% or less missing data except "patient safety grade" and "actual number of events" with 21% and 10% missing data, respectively. A decision was made to delete these items from the analysis due to missing data. Mean scores were calculated for each of the 12 multi-item AHRQPSC dimensions and the LMX total score for participants who provided responses to at least 75% of the items imputing missing items using the mean item response based on available items. Based on a contingency table analysis, we found that having missingness on any AHRQPSC dimension scores or the LMX total score was associated with several staff characteristics. Staff respondents who were older (> 40 years), not educated as nurses, worked more than 40 hours per week and not Caucasian or African-American were more likely to have missing data.

Initially, an unconditional means model using a restricted maximum likelihood approach was estimated to determine if LMX scores varied within and between units. To examine the relationship between safety climate dimensions and the process outcome of the strength of the leader's relationship with staff (LMX), two-level hierarchical linear models were estimated with each uncentered safety climate variable and the LMX score. To examine the relationship between unit characteristics as structural variables and LMX as the process outcome variable, we also estimated two-level models for each of these structural variables and the LMX score. To further explore the relationship between safety climate dimensions and LMX, a saturated multivariate model was initially fitted. Using a backward elimination approach with the p-value

for removal of predictors set at p=.10, the removal of predictor variables was accomplished manually and incrementally with careful evaluations of intermediate models before arriving at a final parsimonious model. A listwise deletion approach (i.e., including only those respondents with complete data for all variables was considered for the multivariate analysis ) was used when modeling. Therefore, sample size for analysis was 637 staff members nested in 34 units. Similar results were obtained using all available data approach for handling missing data.

## 3.4 RESULTS

### 3.4.1 Respondent Characteristics

Respondents consisted of unit directors (100%), registered nurses (72%) and assistive personnel (LVN/LPN, aides, unit clerks) (28%) (Table 2). The distribution of respondents was similar to the overall mix of nursing personnel in these patient care units, which is a 75% RN mix with 25% ancillary personnel. The majority (97%) reported direct contact with patients. Most were employed for 1-5 years in the organization and 1-5 years on their current unit. The majority of nurses responding (53%) were prepared at the baccalaureate level in nursing (BSN). Almost half (44%) of the unit directors reported nursing management experience of 6-10 years, with 31% having 10 or more years of experience. Half (50%) reported being in the position of unit director for 1-5 years. All had at least a bachelor's degree; 60% reported preparation at the master's level in nursing, business or health administration.

### 3.4.2 LMX Ratings Within and Among Units

Based on the unconditional means model, LMX ratings varied within each unit ($Z=17.36$, $p<.0001$) and among units ($Z=2.67$, $p=.0038$), demonstrating moderate intracluster correlation within units, as measured by an intraclass correlation coefficient (ICC) of 0.1082. The existence of differentiated relationships between leaders and their unit staff was supported ($M=3.69$, $SE=0.059$, $t=62.91$, $p<.0001$).

### 3.4.3 LMX Ratings, Safety Climate, and Unit Characteristics

Table 3 reports descriptive statistics and intercorrelations among safety climate variables and LMX. Based on a conditional model considering each safety climate dimension separately, a positive relationship was found at the individual and unit level for LMX and each safety climate dimension ($p<.0001$), including the safety outcome dimensions of frequency of event reporting and overall perceptions of safety (Table 4). A positive association was also found with the unit dimensions of supervisor expectations and actions promoting safety, organizational learning-continuous improvement, teamwork within hospital units, communication openness, feedback and communication about errors, nonpunitive response to errors, staffing and hospital management support for safety ($p<.0001$). The relationships of LMX and hospital-wide safety climate dimensions of teamwork across hospital units and hospital handoffs and transitions were also significant again showing positive associations with LMX. There were no significant relationships between LMX and the unit characteristics of nurse-patient ratio, level of RN education, and turnover or vacancy rates.

When considering safety climate dimensions multivariately, the safety climate dimensions of supervisor expectations and actions regarding safety ($p < .0001$), organizational learning ($p=.054$), unit teamwork ($p=.001$), and feedback and communication about error ($p=.001$) together significantly predicted LMX (Table 5). As for the univariate models, all predictors in this multivariate parsimonious model were positively associated with LMX. However, the adjusted regression coefficients in the multivariate model were all smaller but remained positive than those in univariate model.

## 3.5 DISCUSSION

To our knowledge, this is the first study in healthcare that examined safety climate using the LMX perspective at the organizational and unit level. Our results support a positive association between staff perceptions of safety climate and the strength of their differentiated relationship with their unit director. Not only did the strength of LMX differ within the same unit, but also among units. Our analysis revealed positive associations with all safety climate dimensions and LMX. Furthermore, our findings of a positive relationship between LMX scores and supervisors' expectations and actions regarding safety, organizational learning, unit teamwork, feedback and communication about error suggests a set of reinforcing behaviors that are directly under the control of the unit leader. The institution that served as the data collection site included a wide variety of patient care units (critical care, medical surgical, and specialty) and a staffing pool suggesting that our findings can be applied in a wide variety of general and specialty settings. These findings are consistent with findings from industrial and other empirical studies that link positive leadership behaviors with safety climate (Hofmann & Morgeson, 1999; Hofmann, et al.,

2003; Michael, et al., 2006; Naveh, et al. 2005; Zohar, 2003). These results are also consistent with the view that it is the quality of the LMX relationship that impacts employee attitudes, behaviors and ultimately performance outcomes, including safety, rather than unique characteristics of the setting (Gerstner & Day, 1997).

No significance was found between LMX and unit structural characteristics of nurse-patient ratio, level of RN education, vacancy rates, and turnover rates, a finding that may relate to the short (3-month) data collection period or other factors not examined in this study. Nurse patient ratios, level of staff education, turnover and vacancy rates are influenced by factors not under the direct control of the unit leader. The study facility has a higher percentages of BSN (53%) prepared RNs than the recent HRSA report (37%) (HRSA, 2010). Vacancy and turnover rates were minimal. Other factors including the economy and human resource practices can influence these variables.

Positive associations regarding overall perceptions of safety suggest that strong frontline leaders recognize the need to balance safety and staff workload and develop proactive systems to prevent errors. These findings, in conjunction with findings regarding frequency of event reporting, have important implications for error prevention. Potentially, when relational skills are high, staff are more likely to report latent errors which can go unrecognized and lead to sentinel events (IOM, 2000). Relational leaders who emphasize these behaviors may have the potential to reduce errors.

Our finding of a significant relationship between LMX and unit level dimensions of supervisor expectations and actions regarding safety, organizational learning-continuous improvement, teamwork, communication openness, feedback and communication about error, and nonpunitive response to error, staffing, hospital management support for patient safety

suggest a compendium of behaviors that frontline leaders can use to increase safety climate. A relational leader may identify safety as a top priority, promote adherence to safety practices, be receptive to staff input and able to manage the demands of a complex work environment in ways that promote safety.

The positive relationship between the LMX score and a nonpunitive response to errors coupled with significance in the communication openness dimension highlights the importance of developing a safety climate where employees feel psychologically safe and empowered to identify unsafe activities or behaviors. Psychological safety, which occurs when there is the shared belief that it is safe for an individual to take an interpersonal risk, can promote candid discussion, problem-solving, and improvement (Edmondson, 1996; 1999; Nembhard & Edmondson, 2006). Furthermore, this type of interaction directly supports the underlying tenets of mutual trust, respect and obligation of the relational leadership perspective. Without these effective relationships, opportunities to improve safety can be lost.

To keep patients safe, the IOM (2004) recommends engagement of frontline nursing staff at the point-of-care while fostering a climate of learning (IOM, 2004). Our findings suggest a means to identify differences in relational aspects of leadership using a brief survey, identify exemplar units and units in need of change and develop targeted plans to promote unit transformation to improve safety. In a healthcare environment where resources are shrinking and nursing staff are faced with multiple demands, the relational leader may have the ability to support the staff regardless of the situation at hand.

The fact that there was a positive association between the relational perspective of the hospital wide behaviors of teamwork across hospital units and handoffs and transitions may indicate that these leaders are working toward cooperative relationship with other hospital units.

This is especially important to ensure continuity of care for handoffs as patients move through the organization. This finding must be interpreted cautiously, however, due to the multiple factors, e.g., policies, procedures, and practices, including leadership at other levels of the organization that may impact staffs' perception of safety climate.

This study makes several important contributions to the literature and practice. It is the first study in healthcare that examined safety climate using the LMX perspective at the organizational and unit level. While it is widely accepted that frontline nursing leaders play an important role in the creation of safety climate, it has been difficult to objectively measure this relationship or quantify its variability within an organization. Our study suggests that LMX has promise as a mechanism to assist in the development of specific leader behaviors that can be used to positively impact safety climate. The behaviors associated with the development of a differentiated relationships, e.g. active listening, discussion of staff problems and concerns, avoidance of imposing their own frame of reference or the organizations on staff in their interactions with staff, clarifying job expectations, behavioral expectations and overall expectations about working relationships are behaviors that can be taught and developed in frontline leaders (Graen, Novak, & Summerkamp, 1982). These behaviors can be developed in formal education and by mentoring and modeling. Our findings support the need for future studies to learn more about how these relationships are developed, not only at the frontline but at multiple levels of the organization.

Our findings of LMX and safety climate variability within and among units can be easily used in varied settings to examine factors influencing patient safety. The strategy used provided extensive data in a cost effective manner. The assessments are free and with a survey completion

time of 15 minutes. These tools coupled with our study findings could provide a reliable benchmarking process to grow and develop a strong culture of safety.

### 3.5.1 Limitations

This study had several limitations. Results were based on a self-report, cross-sectional survey in a single academic medical center with a 41% response rate. The majority of respondents were registered nurses (72%). We could not examine RNs as an independent group due to needed sample size for analysis. Those who did not participate or provided incomplete responses or units with higher versus lower response rates may have differed from others in ways that were not discernable. Although responses were anonymous, staff responses may have been influenced by confidentiality concerns. These factors limit generalizability of these findings.

## 3.6 CONCLUSION

Leadership behaviors are increasingly stressed as an important element in improving safety climate. This study deepens our understanding of how multiple aspects of safety climate can be positively impacted by LMX. Our findings suggest that LMX leaders have the potential to create climates where both staff and patients feel safe. In addition, our results suggest several avenues for further study. These relationships should be examined at multiple organizational levels in other healthcare disciplines and in other types of healthcare environments to gain more understanding regarding their application to improve safety climate. We measured the relationship from the staff member's point of view, which is meta-analytically supported as an

accurate assessment of the relationship (Gerstner & Day, 1997). However, it would be interesting to examine this from the leader's point of view. Another untapped area is the impact of the LMX on patient and family expectations regarding care and safety.

These results are particularly timely in light of the most recent AHRQ report identifying industrial and systems engineering as critical areas of research in health care to bring about breakthrough change versus incremental change (Valdez, Ramly, & Brennan, 2010) LMX is grounded in the industrial psychology literature with strong empirical support for its impact on employee attitudes, behaviors and performance outcomes (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Ilies, Nahrgang & Morgeson, 2007). All critical elements to bring about large-scale change in healthcare. This study provides a starting point to conduct further research that can assist organizations in moving forward to improve patient safety as well as other needed change.

**Table 2** Variables, Sources of Data, and Levels of Sampling and Analysis

| Variable | Data Source | Sampling/Analysis |
|---|---|---|
| Safety climate | AHRQPSC | Individual/Unit |
| LMX relationship | LMX -7 | Individual/Unit |
| Unit characteristics | Hospital administrative records | Unit |
| Staff characteristics | Hospital administrative records/AHRQPSC | Unit/Individual |

AHRQPSC = Agency for Healthcare Research and Quality Patient Culture Safety Survey;
LMX-7 = Leader-Member Exchange-7

**Table 3** Staff Members (n=711) and Unit Director (n=34) Characteristics

| **Staff Members** | **%** | **Staff Members** | **%** |
|---|---|---|---|
| Position | | Unit service (years) | |
| RN | 72 | < 1 | 21 |
| Assistive staff | 28 | 1-5 | 49 |
| | | 6-10 | 17 |
| | | 11-15 | 5 |
| | | >16 | 8 |
| Level of Education | | Hours worked (week) | |
| Non-nursing | 27 | <20 | 3 |
| Non-BSN | 29 | 20-39 | 61 |
| BSN or more | 44 | 40-59 | 31 |
| | | >59 | 5 |
| Age (years) | | Race | |
| <30 | 42 | African-American | 13 |
| 31-40 | 22 | Caucasian | 81 |
| 41-50 | 20 | Other | 6 |
| 51-60 | 14 | | |
| >60 | 2 | | |
| **Unit Directors** | **%** | **Unit Directors** | **%** |
| Highest level of education | | Leadership experience(years) | |
| BSN | 38 | <1 | 9 |
| BS other | 2 | 1-5 | 16 |
| Masters | 60 | 6-10 | 44 |
| | | >10 | 31 |
| Additional management education | | Unit service(years) | |
| | | <1 | 16 |
| Continuing education | 82 | 1-5 | 50 |
| Executive development | 44 | 6-10 | 22 |
| College level courses | 71 | >10 | 12 |
| Age (years) | | Race | |
| 31-40 | 21 | Caucasian | 100 |
| 41-50 | 38 | | |
| 51-60 | 41 | | |

**Table 4** Means, Standard Deviations and Intercorrelations Among Safety Climate Dimensions and with Leader-Member Exchange

| Variable | N | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Overall perceptions of safety** | 711 | 3.25 | .76 | | | | | | | | | | | | |
| **2. Frequency of event reporting †** | 711 | 3.30† | .95 | .38* | | | | | | | | | | | |
| **3. Supervisor/Manager expectations and actions promoting safety** | 711 | 3.84 | .73 | .46* | .29 * | | | | | | | | | | |
| **4. Organizational learning-continuous improvement** | 711 | 3.70 | .63 | .54* | .29* | .52* | | | | | | | | | |
| **5. Teamwork within hospital units** | 711 | 3.95 | .68 | .38* | .17* | .35* | .30* | | | | | | | | |
| **6. Communication openness** | 711 | 3.67 | 72 | .39* | .33* | .46* | .40* | .43* | | | | | | | |
| **7. Feedback and communication about error** | 711 | 3.61 | .78 | .49* | .38* | .53* | .60* | .38* | .60* | | | | | | |
| **8. Nonpunitive response to error** | 711 | 3.04 | .82 | .45* | .27* | .44* | .37* | .30* | .39* | .36* | | | | | |
| **9. Staffing** | 711 | 3.29 | .7 | .46* | .18* | .32* | .21 | .34* | .29* | .24* | .38* | | | | |
| **10. Hospital management support for patient safety** | 711 | 3.01 | .94 | .55* | .31* | .33* | .47* | .23* | .30* | .45* | .35* | .34* | | | |
| **11. Teamwork across hospital units** | 711 | 3.1 | .69 | .43* | .30* | .27* | .36* | .23* | .24* | .41* | .33* | .27* | .51* | | |
| **12. Hospital handoffs and transitions** | 711 | 2.91 | .76 | .47* | .33* | .29* | .28* | .29* | .28* | .36* | .33* | .34* | .41* | .56* | |
| **13. Leader-Member Exchange** | 711 | 3.67 | .85 | .38* | .23* | .69* | .47* | 0.34* | .43* | .51* | .36* | .20* | .30* | .29* | .22* |

Items were rated using a Likert scale (1= strongly disagree to 5= strongly agree,†1=never to 5= always) * One tailed p <.05

**Table 5 Univariate Hierarchical Linear Modeling of Leader-Member Exchange as Predicted by a Single Safety Climate Dimension**

| **Dimensions** | b* | SE | CI |
|---|---|---|---|
| ***Outcomes*** | | | |
| Overall Perceptions of safety | 0.452 | 0.052 | 0.318 – 0.59 |
| Frequency of events reported | 0.233 | 0.038 | 0.134 - 0.331 |
| ***Unit level*** | | | |
| Supervisor expectations promoting safety | 0.793 | 0.036 | 0.699 – 0.886 |
| Organizational learning-continuous improvement | 0.609 | 0.069 | 0.130 – 0.787 |
| Teamwork within hospital units | 0.475 | 0.054 | 0.335 – 0.614 |
| Communication openness | 0.511 | 0.045 | 0.394 – 0.627 |
| Feedback and communication about error | 0.524 | 0.038 | 0.425 – 0.622 |
| Nonpunitive response to error | 0.357 | 0.049 | 0.230 – 0.483 |
| Staffing | 0.285 | 0.05 | 0.155 – 0.414 |
| Hospital management support for safety | 0.301 | 0.033 | 0.215 – 0.386 |
| ***Hospital-wide*** | | | |
| Teamwork across hospital units | 0.324 | 0.045 | 0.207 - .440 |
| Hospital handoffs and transitions | 0.25 | 0.051 | 0.118 - 0.382 |

*All regression coefficients, b, were significant ($p<.0001$).
b=estimated regression coefficient, SE=standard error of b; CI =confidence interval

**Table 6 Multivariate Hierarchical Linear Modeling of Leader-Member Exchange as Predicted by Safety Climate Dimensions**

| Dimension | b | SE | p | CI |
|---|---|---|---|---|
| Supervisor expectations and actions promoting safety | 0.608 | 0.195 | <.0001 | 0.104 - 1.11 |
| Organizational Learning | 0.100 | 0.052 | .054 | -0.03 - 0.234 |
| Teamwork within hospital units | 0.134 | 0.042 | .001 | 0.025 - 0.243 |
| Feedback and communication about error | 0.138 | 0.040 | <.001 | 0.035 - 0.241 |

b=estimated regression coefficient; SE=standard error of b; CI=confidence interval

# 4.0 RESULTS MANUSCRIPT #2 A RELATIONAL PERSPECTIVE ON UNIT LEVEL SAFETY CLIMATE

## 4.1 ABSTRACT

**Objective:** The purpose of this study was to compare nursing staff perceptions of safety climate in clinical units characterized by high and low ratings of Leader-Member Exchange (LMX) and explore characteristics that might account for these differences**.**

**Background:** The actions of frontline nursing leaders within their practice environment are viewed as critical determinants of measures to ensure patient safety. However, specific leadership behaviors that prompt actions to achieve this goal are under examined. The relational perspective, LMX, has shown promise in other settings as a means to explain perceptions regarding safety climate.

**Methods:** Cross- sectional survey of staff (n=711) and unit directors from 34 inpatient units in a large academic medical center.

**Findings:** Significant differences were found between clinical units with high and low LMX scores on five measures of safety climate: supervisors' safety expectations, organizational learning-continuous improvement, total communication, feedback and communication about errors, and nonpunitive response to errors.

**Conclusion:** The LMX perspective can be used to identify differences in perceptions of safety climate. Future studies are needed to identify strategies to improve staff safety attitudes and behaviors across units.

## 4.2 INTRODUCTION

Nurses' attitudes, behaviors, and actions are consistently cited as essential components of defenses that keep patients safe. Frontline nursing leaders, and, in particular, the bedside nurse, are noted to be influential in creating safe patient care environments and preventing adverse outcomes (Kurtzman & Buerhaus, 2008; Pronovost, et al., 2008; Wong & Cummings, 2007). Therefore, it is important that we understand the relationship between leadership behaviors and safety climate. To keep patients safe, nurse executives must provide strategic direction and communicate core safety values, while fostering a climate where patient safety is a priority. Simultaneously, they must develop frontline leaders to implement programs and processes to keep patients safe at the point-of-care (AONE, 2005; IOM, 2004). As we learn more about patient safety, the role of the frontline nursing leader is being redefined from one whose major goal is prevention of errors to one who promotes safety by eliciting employee commitment, engagement, and continuous learning to improve organizational performance (Edmondson, 1996, 1998; Nembhard & Edmondson, 2006). Frontline leaders are those unit directors with 24- hour accountability and responsibility for staff and patient care at the unit level.

One aspect of leadership behavior that is a focus in industry, but remains under examined in healthcare, involves the relational perspective termed Leader-Member Exchange (LMX). This relational perspective is grounded in social exchange theory, and well supported theoretically

and empirically (Gerstner & Day, 1997, Graen & Uhl-Bien, 1995; Ilies, et al., 2007).. However, few studies exist testing its application in healthcare (Katrinli, et al., 2008; Laschinger, et al., 2007; Tangirila, et. al., 2007). LMX posits that leaders who are successful develop individualized dyadic relationships with each staff member over time, based on trust, respect, and mutual obligation.[10] When these reciprocal relationships are positive, staff members respond by expanding job roles and perform in a manner desired by the leader (Dansereau, et al., 1975; Graen & Uhl-Bien, 1995; Liden, et al., 1997). Staff are willing to devote increased time, energy, responsibility, and commitment to organizational outcomes (Gerstner & Day, 1997; Graen & Uhl-Bien,1995; Liden, et al, 1997). elements believed necessary to improve patient safety. Conversely, when this relationship is negative, staff tend to fulfill minimal job requirements (Dansereau, et al, 1975; Liden, et al., 1997). At the meta-analytic level, findings suggest a positive association with organizational citizenship behavior, performance, job climate and overall satisfaction with the supervisor in multiple industrial settings (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Ilies, et al, 2007). .Studies in industry positively link this perspective to safety (Hofmann & Morgenson, 1999; Hofmann, et al. 2003; Michael, et al. 2008). Studies in healthcare settings, although limited, are similarly supportive (Katrinli, et al., 2008, Laschinger, et al., 2007; Tangirala, 2007).

The purpose of this study was to compare nursing staff perceptions of safety climate in clinical units characterized by high and low ratings of LMX. We hypothesized that perceptions of safety climate would differ in clinical units with higher ratings compared to those with lower ratings. In addition, we explored staff and unit director characteristics that might account for these differences.

## 4.3 METHODS

### 4.3.1 Participants and Setting

The study was a unit level analysis of cross-sectional data from survey responses of 34 unit directors and their respective nursing staff in a large quaternary academic medical center. We surveyed all nursing personnel (nurses, licensed practical nurses, nursing assistants and unit secretaries) to provide a broad perspective and ensure appropriate cell size for analysis. The sample included critical care (n=8), step-down (n=11), medical-surgical (n=12) and specialty (n=3) units, e.g. rehabilitation, skilled care, and the central staffing pool. Staff on these units provided care for trauma, transplant, cardiology, cardiovascular, neurological, neurosurgical, general surgery and medicine patients. The study was approved by the Institutional Review Board. All responses were anonymous and confidential and informed consent was implied.

The study was introduced to participants via a letter from the Chief Nursing Officer. Data collection occurred in investigator led face-to-face sessions in each unit scheduled over a two-month period (May 1, 2009 to June 30, 2009). Light refreshments were provided as a thank you for survey completion. Collection boxes and additional surveys were provided for staff unable to attend these sessions. Staff reminders consisted of posters, frequent rounding to retrieve surveys, and a letter from the Chief Nursing Officer sent halfway through the survey period. The final sample for data analysis included 34 unit directors (100% response) and 711 staff members (40% response) totaling a 41% response. Responses examining the relationship between frontline nursing leaders and safety climate at the institutional level were reported elsewhere (Thompson et al. under review). For this report, analysis was conducted at the unit level resulting in a sample size of 34 units.

### 4.3.2 Measures

Table 1 presents a summary of measures. Respondents perceptions of the key dimensions of the differentiated relationship (mutual trust, respect, and obligation) were measured using the *Leader-Membership Exchange Tool (LMX-7)* (Bauer & Green, 1996; Graen & Uhl-Bien, 1995; Liden, et al, 1993; Scandura & Graen, 1984). Safety climate was measured using the *Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture Survey (AHRQPSC)* (AHRQ, 2003) The AHRQPSC included 42 items that measured 14 dimensions associated with a positive safety climate (8 at the unit level, 2 hospital-wide, 4 outcomes). Individual staff demographics described age, race, education, role, hours worked, and years of unit service. Unit director demographics described age, race, education, additional management education, leadership experience and years of unit service.

### 4.3.3 Data analysis

SPSS (Version 17.0; Chicago, IL) was used to conduct descriptive, exploratory, and group comparative analyses. Hierarchical linear modeling (HLM) using SAS (Version 9.2, Cary, NC) was performed to explore associations between safety climate dimensions and LMX scores. Using LMX scores, the 34 units were divided into three groups (tertiles). Mean scores for AHRQPSC subscales and the LMX scale were calculated for each participant on both instruments when 75% or more of the item data were present. Using data from individuals, mean scores were calculated at the unit level for each AHRQPSC dimension and LMX. Units were classified into tertiles based on the distribution of the mean LMX scores. “High” scoring units were those in the upper tertile with LMX scores $\geq$ 3.86. The lower tertile determined low scoring

units with LMX scores $\leq$ 3.50. One subscore, patient safety grade, was not included in this analysis due to a nonnormal distribution at the unit level and high missing response rate (21%). Multivariate analysis of variance (MANOVA) was used to determine if significant differences existed between tertiles. To determine significance between high and low LMX units, one way analysis of variance (ANOVA) with planned comparisons with linear contrasts was used. Contingency table analyses with chi-square tests of independence were performed to determine differences in unit director and staff characteristics. We conducted a similar analysis using one standard deviation from the mean score for LMX as cutpoints with similar results.

## 4.4 RESULTS

### 4.4.1 Participant Characteristics

The staff typical respondent was a registered nurse prepared at the BSN or higher level, Caucasian, less than 30 years of age who worked on the current unit between 1 and 5 years. The typical unit director was Caucasian, 51-60 years of age with 6 to 10 years leadership experience who worked on the current unit for 1-5 years. All unit directors were prepared at the bachelors level. Over half had a master's degree in nursing or another field. Executive, college level or continuing education courses in management were reported by 80% of unit directors (Table 2).

### 4.4.2 LMX Scores

Based on HLM, LMX scores demonstrated significant variability (Z = 2.67, $p$ = .004) among the 34 units. For the total sample, positive relationships were found between all safety climate dimensions and LMX scores (p<.0001), indicating high quality relationships were associated with positive staff perceptions of safety behaviors. The LMX mean scores ranged from 3.00 to 4.29. The low tertile units (LMX M=3.27, SD±.15) included 4 medical-surgical, 4 critical care /specialty, and 3 step down units. The middle tertile units (LMX M=3.69, SD ±.085) included 1 step down, 6 medical-surgical, and 5 critical care/specialty units The high tertile units (LMX M=4.08, SD ±.11) included 7step down, 2 medical-surgical, and 2 critical care/specialty units.

### 4.4.3 High and Low LMX Scores and Safety Dimensions

Using MANOVA a significant difference between groups (tertiles) for AHRQPSC scores for safety climate dimensions was found Wilks's statistic (F (28,36)= 2.88 p=.002). ANOVA with planned comparisons between high and low LMX units identified 5 of 8 unit safety climate dimensions (Table 3) as being different. Significant between group differences were found for supervisor expectations and actions promoting safety, organizational learning-continuous improvement, communication openness, feedback and communication about error, and nonpunitive response to error. No significant between group differences were found for perception of teamwork, staffing or hospital management support for safety. For safety dimension outcomes, no significant between group differences were found for overall perception of safety, frequency of events reported, or actual numbers of events reported (Table 4). No significant between group differences were found for the dimensions of teamwork across units or

hospital handoffs. No significance was found among groups for AHRQPSC scores for safety climate for any staff or unit director characteristics.

## 4.5 DISCUSSION

This study is the first that we know of to compare staff perceptions of safety climate dimensions in clinical units within the same institution characterized by low, medium and high LMX scores. Our hypothesis, that staff perceptions of safety climate would differ in units with higher LMX ratings compared to those units with lower LMX ratings was supported for the majority of the unit comparisons. This finding suggests that frontline leaders with higher quality relationships may have an effect on patient safety, especially in regard to dimensions that are directly impacted by the leader's differentiated relationship with individual staff members. It is interesting that varied types of patient care units were present in the high and low tertiles, suggesting that a more direct relationship to leadership behavior than unit type. This finding is consistent with prior studies that link leader behaviors to development of a more robust safety climate (DeJoy, et al, 2004a, DeJoy et al, 2004b; Edmondson, 1996, 1999; Hofmann & Mark, 2006; Nembhard & Edmondson, 2006; Mark, et a,l.; 2007, Mark, et al., 2008; Naveh , et al., 2005).

Our finding of higher LMX scores for the safety climate dimensions of supervisor expectations and actions promoting safety provides additional support for our hypothsis. Frontline leaders who have a more positive relationship with their staff may engage in practices that promote compliance with safety practices, consider staff suggestions for improving safety, address ongoing safety concerns and when unit workload is high, do not ask staff to take

shortcuts that would compromise safety. These findings suggest that a commitment to safety on the part of frontline nursing leaders can influence outcomes through actions that balance productivity and safety, a finding supported in the literature (DeJoy, et al, 2004 a, DeJoy et al, 2004b; Hofmann & Mark, 2006; Mark, et al., 2007; Mark et al., 2008)

Our finding of differences between higher and lower LMX scores on the dimension of communication openness is supported by findings from an earlier industrial study that reported that high LMX scores were associated with more frequent communication about safety (Hofmann & Morgeson, 1999).It is likely that, due to unit director behaviors, staff feel more comfortable reporting their observations when they see something that will contribute to unsafe patient care. Even more important, staff may feel more comfortable questioning decisions or actions of those with more authority and be more likely to raise questions if something does not seem right.

Organizational citizenship behaviors are defined as expanded staff job behaviors that go beyond traditional role expectations (Illies, et al., 2007; Smith, Organ & Near, 1983). These expanded work behaviors are believed to be increased when staff have high quality leadership relationships (Illies, et al., 2007). Positive organizational citizenship behaviors can create innovation and spontaneity at the unit level (Smith et al, 1983) enabling successful frontline staff responses. Positive associations have been found between the relational perspective of leadership and organizational citizenship behaviors in the presence of expanded safety role behaviors and a strong safety climate (Hofmann et al., 2003).

Findings of significance for higher relational leaders in the dimension of feedback and communication about error imply these leaders foster improved information sharing about practice changes based on incident reports, how errors occurred in the unit, and whether there is

discussion regarding how to prevent reoccurring errors. For effective change to occur, frontline leaders must share information about errors and safety and create a climate wherein staff feel safe to report errors, learn from example, and support actions for prevention.

Our finding that higher relational and lower relational leaders differed on the dimensions of organizational learning and non-punitive response to error suggests higher leaders foster psychological safety and learning from things gone wrong. These findings may indicate higher leaders foster learning by actively encouraging safety improvements when errors occur, that these safety changes are positive, and include evaluation as part of the change process. Edmondson's (1996, 1999) and colleagues work (Nembhard & Edmondson, 2006) that found staff members willingness to discuss errors was systematically influenced by the leader response, the consequences of making a mistake, and perceptions regarding ability to openly discuss errors.

Semel and colleagues recently reported that use of a surgical checklist generated cost savings and prevented at least five major complications in the operating room setting (Semel, et al., 2010). While effective, such checklists are, by necessity, limited to one aspect or area of practice. To ensure patient safety in our increasingly complex healthcare environment, we need staff who feel safe to report errors, motivated to suggest solutions to remedy problems, are recipients of current evidence regarding patient safety initiatives, and perceive their leader supports a balanced workload while simultaneously fostering engagement in learning from errors and improvements for patient safety.

The lack of significance between higher and lower relational scores in the safety dimensions of total staffing, hospital management support for patient safety, teamwork across hospital units, hospital handoffs, and transitions and unit characteristics may reflect the fact that

these variables are not under direct control of the frontline leader or a lack of differences across clinical units within the institution. Policies regarding overall hospital safety practices and staffing levels are frequently determined by organization-wide mechanisms.

### 4.5.1 Limitations

The results of this study need to be considered within the scope of its limitations. This was a cross-sectional design and all measures were collected at one point in time in one academic medical center. The sample included a high percentage of BSN prepared staff and unit directors who were highly experienced, factors which may have influenced findings. Survey responses were anonymous and the data collector (DNT) was not an employee of the institution; nevertheless, concerns about confidentiality may have influenced replies. These factors, in addition to the 41% response rate, although acceptable for survey research, limit generalizability of the findings.

### 4.5.2 Practice Implications

Our findings suggest several practice implications. Our study provides evidence that higher relationship leaders can positively impact safety climate. Likely, successful frontline leaders have identified strategies that promote and reinforce safety behaviors at the unit level. These strategies need to be identified and modeled through leadership development programs. Leaders with higher relational scores can become mentors for lower scoring units. In addition, higher relational units with their corresponding constellation of safety behaviors have the potential to become innovation and demonstration units for patient safety. Future studies are needed to

determine how relational leadership develops over time and at multiple levels within the organization and ways to promote modeling behavior.

## 4.6 CONCLUSION

This study is the first to compare staff perceptions of safety climate dimensions in clinical units within the same healthcare institution characterized by high and low LMX scores. Our hypothesis, that staff perceptions regarding various safety climate dimensions would differ in units with higher LMX ratings compared to units with low LMX was supported for supervisors expectations and actions regarding safety, organizational learning-continuous improvement, communication openness, feedback and communication about error, and nonpunitive response to error. Our findings suggest that high relational leaders can have significant impact on safety climate at the unit level, especially since these behaviors appear not to be linked to a specific unit type. Such individuals can be identified using survey tools and used as models to promote patient safety across the institution. Future studies are needed to identify how frontline staff safety attitudes and behaviors can impact patient safety perceptions and thus ultimately care outcomes. The need to identify leader behaviors and an organizational climates where patient safety is fostered and rewarded will be increasingly critical as we move deeper into healthcare reform. A high relational leadership perspective provides opportunities for the creation of a robust safety climate to keep patients safe.

**Table 7** Measures For Relational Leadership And Safety Climate

| Dimension | Measure | Items | Reliability and Validity | Scoring | Example Item |
|---|---|---|---|---|---|
| **Strength of Leader-Member Relationship** | LMX-7 modified [19-21] | 8 | α = .91 | Likert * Higher scores = stronger relationship | My unit director understands my problems and needs. I would view my working relationship with my unit director as extremely effective. |
| **Safety Climate** | AHRQPSC[22] | | Construct Validity confirmed by confirmatory factor analysis | | |
| *Outcome Measures* | | | | | |
| | Overall perceptions of safety | 4 | α = .74 | Likert* | Our procedures and systems are good at preventing errors from happening. |
| | Frequency of event reporting | 3 | α =.84 | Likert ** | When a mistake is made but has no potential to harm the patient how often is it reported? |
| | Patient safety grade | 1 | | Likert *** | Please give your work unit an overall grade on patient safety. |
| | Number of Events Reported | 1 | | Likert | In the past 12 months, how many event reports have you filled out and submitted? |
| *Unit Level Measures* | Supervisor/ Manager expectations and actions promote safety | 4 | α =.75 | Likert* | My supervisor/manager overlooks patient safety problems that happen over and over. (reverse worded) |
| | Organizational learning-continuous improvement | 3 | α =.75 | Likert * | Mistakes have led to positive changes around here. |
| | Teamwork within hospital units | 4 | α =.83 | Likert* | In this unit we treat each other with respect. |
| | Communication openness | 3 | α =.72 | Likert ** | Staff are afraid to ask questions when something does not seem right (reverse worded). |
| | Feedback and | 3 | α =.78 | Likert** | In this unit, we discuss ways to prevent errors from |

| | | | | | |
|---|---|---|---|---|---|
| | communications about error | | | | happening again. |
| | Nonpunitive response to error | 3 | α =.79 | Likert * | When an event is reported, it feels like the person is being written up, not the problem. ( reverse worded) |
| | Staffing | 4 | α =.63 | Likert * | Staff in this unit work longer hours than best for patient care. ( reverse worded) |
| | Hospital management support for patient safety | 3 | α =.83 | Likert * | The actions of hospital management show that patient safety is a top priority. |
| *Hospital-wide measures* | Teamwork across hospital units | 4 | α =.80 | Likert * | Hospital units work well together to provide the best care for patients. |
| | Hospital handoffs & transitions | 4 | α =.80 | Likert * * | Shift changes are problematic for patients in this hospital. ( reverse worded) |

Abbreviations: LMX-7, Leader-Member Exchange; AHRQPSC = Agency for Healthcare Quality and Research Patient Safety Culture Survey
* 1=strongly disagree to 5=strongly agree ,**1=never to 5=always ,***,1= Excellent to 5 Failing ,**** 1= No events reported to 6 = ≥ 21

**Table 8** Demographic Characteristics of Unit Directors, Nursing and Assistive Staff (LPNs, Patient Care Assistants, Unit Secretary)

**Unit Directors (n=34)**

| | | | |
|---|---|---|---|
| Age, % | | Race, % | |
| 31-40 yrs | 21 | Caucasian | 100 |
| 41-50 yrs | 38 | | |
| 51-60 yrs | 41 | | |
| Highest education, % | | Leadership Experience, % | |
| BSN | 38 | <1 yr | 9 |
| Baccalaureate, non BSN | 2 | 1-5 yrs | 16 |
| Masters | 60 | 6-10 yrs | 44 |
| | | >10 yrs | 31 |
| Additional management education, % | | Unit service, % | |
| Continuing education | 82 | <1 yr | 16 |
| Executive development | 44 | 1-5 yrs | 50 |
| College level courses | 71 | 6-10 yrs | 22 |
| | | >10 yrs | 12 |

**Staff (RNs, LPNs, Nursing Assistants, and Unit Secretaries (n=711))**

| | | | |
|---|---|---|---|
| Age, % | | Race, % | |
| <30 yrs | 42 | African-American | 13 |
| 31-40 yrs | 22 | Caucasian | 81 |
| 41-50 yrs | 20 | Other | 6 |
| 51-60 yrs | 14 | | |
| >60 yrs | 2 | | |
| Education, % | | Hours worked per week, % | |
| BSN or higher | 44 | <20 | 3 |
| Nursing non BSN | 29 | 20-39 | 61 |
| Non Nursing | 27 | 40 -59 | 31 |
| | | >59 | 5 |
| Role, % | | Unit service, % | |
| Professional Nurse | 72 | < 1 year | 21 |
| Assistive staff | 28 | 1-5 yrs | 49 |
| | | 6-10 yrs | 17 |
| | | 11-15 yrs | 5 |
| | | > 16 yrs | 8 |

Abbreviations: Yr or yrs = years

**Table 9** One way ANOVA of AHRQPSC Unit Level Safety Climate Scores In Units Grouped by High, Middle, And Low Tertiles

| **AHRQPSC Dimension**<br><br>**Safety Climate*** | **LMX High Tertile (n=11)**<br><br>**(M ± SD)** | **LMX Middle Tertile (n=12)**<br><br>**(M ± SD)** | **LMX Low Tertile (n=11)**<br><br>**(M ± SD)** | **F-ratio (df 2,31)** | ***p*** |
|---|---|---|---|---|---|
| Supervisor expectations and actions promoting safety | 4.19 ± 0.14 | 3.81 ±0.19 | 3.55 ± 0.28 | 26.65 | <.001 |
| Organizational learning – continuous improvement | 3.84 ± 0.11 | 3.71 ± 0.27 | 3.59 ± 0.21 | 3.79 | 0.034 |
| Communication openness | 3.80 ± 0.14 | 3.61 ± 0.21 | 3.57 ± 0.25 | 4.05 | 0.027 |
| Feedback and communication about error | 3.83 ± 0 .26 | 3.59 ± 0.29 | 3.44 ± 0.31 | 5.16 | 0.012 |
| Nonpunitive response to error | 3.27 ± 0 .26 | 3.05 ± 0.24 | 2.88 ± 0.28 | 6.28 | 0.005 |
| Teamwork within hospital units | 4.01 ± 0 .30 | 3.94 ± 0.33 | 3.82 ± 0.51 | 0.707 | 0.501 |
| Staffing | 3.34 ± 0 .40 | 3.36 ± 0.31 | 3.17 ± 0.44 | 0.771 | 0.471 |
| Hospital management support for safety | 2.99 ± 0.27 | 3.22 ± 0.37 | 3.01 ± 0.19 | 2.17 | 0.132 |

Abbreviations: AHRQPSC = Agency for Healthcare Quality and Research Patient Safety Culture Survey; M= mean score; SD = standard deviation

*Items were rated using a 5 point Likert scale (1=strongly disagree to 5=strongly agree)

**Table 10** Comparison Of AHRQPSC Hospital Wide and Outcome Scores Grouped by High, Middle, And Low Tertiles

| AHRQPSC Dimension* | LMX High Tertile (n=11) (M ± SD) | LMX Middle Tertile (n=12) (M ± SD) | LMX Low Tertile (n=11) (M ± SD) | F ratio (2,31) | *p* |
|---|---|---|---|---|---|
| ***Hospital wide*** | | | | | |
| Teamwork across hospital units * | 3.16 ± 0.15 | 3.18 ± 0.19 | 3.02 ± 0.19 | 2.50 | .099 |
| Hospital handoffs and transitions* | 2.98 ± 0.21 | 2.91 ± 0.22 | 2.80 ± 0.31 | 1.51 | .237 |
| ***Outcomes*** | | | | 1.83 | .177 |
| Frequency of event reporting ** | 3.49 ± 0 .24 | 3.38 ± 0.38 | 3.23 ± 0.31 | | |
| Overall perceptions of safety * | 3.38 ± 0.21 | 3.30 ± 0.28 | 3.12 ± 0.33 | 2.55 | .095 |
| Number of events reported in the last 12 months*** | 1.71 ± 0.17 | 1.73 ± .0.23 | 1.69 ± 0.18 | .192 | .826 |

Abbreviations: AHRQPSC = Agency for Healthcare Quality and Research Patient Safety Culture Survey ; M= mean score; SD = standard deviation

* = Items were rated using Likert scales (*1=strongly disagree to 5=strongly agree,** 1=never to 5=always,*** 1= No events reported to 6=21 or >)

# APPENDIX A

## LETTER OF SUPPORT CHIEF NURSING OFFICER

UPMC Presbyterian

*Clinical Administration*

*Part of*
*UPMC Presbyterian Shadyside*

Thompson, Debra N. Appendix A (letter of Support Holly Lorenz):

Lorenz, RN, MSN
ing Officer and Vice President
Care Services

rop Street
739 MUH
gh, PA 15213-2586
-1429
2-647-5551
@upmc.edu

Dear Sir or Madam:

I am writing to share my enthusiastic support for the study entitled A Multi-Level Study of Nurse Leaders, Safety Climate, and Outcomes proposed by Ms. Debra Thompson, RN, MSN, and to assure that she will have access to the data necessary to complete the proposed analysis. We have discussed several approaches for data collection and her proposed method of using staff meetings on individual units is well justified. To promote participation, I will notify unit directors of the study through a personal letter that introduces Debra as study PI, provides a brief overview of the study and encourages attendance at an informational meeting and will enthusiastically support the study in staff meetings. As well, will introduce nursing and ancillary staff to the study and encourage their participation.

I have known Debra for many years as an administrator, colleague, and peer. She is a highly regarded nursing leader who has made many contributions to the community and region with her work on patient safety, work redesign and performance improvement. I can assure you that she has the commitment, energy, knowledge, and skills to achieve her professional goals. Her research interests of patient safety, leadership, and work environment are congruent with the research and patient care goals of UPMC.

Committing nursing staff time to research is an important component of our practice environment. We are pleased to be able to provide the clinical facilities for her study. Our support will include release of staff time to complete the survey, space for survey completion and provision of the data identified in the study.

We look forward to the results of her innovative study. Debra is an excellent candidate for this award.

Sincerely,

Holly L Lorenz

Holly L. Lorenz, BSN, MSN
Vice President, Patient Care Services and Chief Nursing Officer
UPMC Presbyterian
200 Lothrop Street
Pittsburgh, PA 15213
lorenzhl@upmc.edu

# APPENDIX B

## LETTER OF SUPPORT CHIEF QUALITY OFFICER

UPMC | University of Pittsburgh Medical Center

Name of Applicant Thompson, Debra N. Appendix B (Letter of Support Tami Merryman):

200 Lothrop Street
Pittsburgh, PA 15213-2582

July 16, 2008

Dear Sir or Madam:

I am writing to share my enthusiastic support for the study proposed by Ms. Debra Thompson, entitled A Multi-Level Study of Nurse Leaders, Safety Climate, and Care Outcomes. As Chief Quality Officer , UPMC Health System, I can assure that she will be provided data necessary to document the outcomes she has identified, i.e., catheter-associated infections, urinary, blood stream, and surgical site infections, pressure ulcers, and falls. We routinely collect these data using standard protocols as part of the hospital's infection surveillance and performance improvement system. A prior study conducted at UPMC-Presbyterian, which focused solely on ICUs, had excellent support (70.2% participation rate) and I anticipate the same high level of support for this study.

I have known and worked with Debra since she functioned in the capacity as Director, Corporate Nursing, Special Projects. The broad experience she has as a nursing administrator for multiple hospital services and settings including research programs have provided her with a unique perspective for a career in research. Three frontline staff members at UPMC participated in the Nurse Navigators Fellowship she led. Through their participation, our system was the beneficiary of improvements in nurse retention, health-associated infections, and nurse driven therapy in the management of septic shock. She has proven she can work collegially in complex environments.

We were delighted when Debra approached us to use UPMC Presbyterian as the clinical site for her research. Her study is timely and relevant to work of the Center of Quality Improvement and Innovation. We will be providing staff time and space for survey completion, in addition to the requisite outcome data needed for the study.

Debra is knowledgeable, creative, energetic and has the ability to convert action into outcomes, which is important in the pursuit of research. She has been able to disseminate the outcomes of her work in presentations and publications. Together we worked on a care redesign project that improved nursing and patient satisfaction. I look forward to the results of her study; it has significant implications for nurse leaders and the impact they have on safety climate and care outcomes. Debra is an excellent candidate for this award.

Sincerely,

Tami Merryman

Tami Merryman, MSN, RN, FACHE

Chief Quality Officer

UPMC Health System

# APPENDIX C

## INSTITUTIONAL REVIEW BOARD APPROVAL

**University of Pittsburgh**
***Institutional Review Board***

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
http://www.irb.pitt.edu

**Memorandum**

To: Debra Thompson
From: Sue Beers , Vice Chair
Date: 3/27/2009
IRB#: PRO09030438
Subject: A Mutli-Level Study of Nurse Leaders, Safety Climate and Care Outcomes

The University of Pittsburgh Institutional Review Board reviewed and approved the above referenced study by the expedited review procedure authorized under 45 CFR 46.110 and 21 CFR 56.110. Your research study was approved under:
45 CFR 46.110.(7) characteristics/behaviors

The IRB has determined the risk to be minimal risk.

Please note that the waiver for the requirement to obtain a written informed consent has been approved.

Approval Date: 3/27/2009
Expiration Date: 3/26/2010

Please note that it is the investigator's responsibility to report to the IRB any unanticipated problems involving risks to subjects or others [see 45 CFR 46.103(b)(5) and 21 CFR 56.108(b)]. The IRB Reference Manual (Chapter 3, Section 3.3) describes the reporting requirements for unanticipated problems which include, but are not limited to, adverse events. If you have any questions about this process, please contact the Adverse Events Coordinator at 412-383-1480.

The protocol and consent forms, along with a brief progress report must be resubmitted at least one month prior to the renewal date noted above as required by FWA00006790 (University of Pittsburgh), FWA00006735 (University of Pittsburgh Medical Center), FWA00000600 (Children's Hospital of Pittsburgh), FWA00003567 (Magee-Womens Health Corporation), FWA00003338 (University of Pittsburgh Medical Center Cancer Institute).

**Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.**

# APPENDIX D

## AGENCY FOR HEALTHCARE RESEARCH AND QUALITY PATIENT SAFETY CULTURE SURVEY

Instrument Number: 2 9 5

Shade circles like this: ●
Not like this: ⊗ ✓

**Please use BLACK Pen Only!**

Study ID: 1 4 4

# HOSPITAL SURVEY ON PATIENT SAFETY CULTURE

Participant Number:

Administration Date: ___ / ___ / ___ (month) (day) (year)

Unit Number:

| | | | | |
|---|---|---|---|---|
| ○ 1 | ○ 9 | ○ 18 | ○ 26 | ○ 34 |
| ○ 2 | ○ 10 | ○ 19 | ○ 27 | ○ 35 |
| ○ 3 | ○ 11 | ○ 20 | ○ 28 | ○ 36 |
| ○ 4 | ○ 12 | ○ 21 | ○ 29 | ○ 37 |
| ○ 5 | ○ 14 | ○ 22 | ○ 30 | |
| ○ 6 | ○ 15 | ○ 23 | ○ 31 | |
| ○ 7 | ○ 16 | ○ 24 | ○ 32 | |
| ○ 8 | ○ 17 | ○ 25 | ○ 33 | |

1 ○ 2 ○

*( FOR OFFICE USE ONLY )*

## Instructions:

**This survey asks for your opinions about patient safety issues, medical error, and event reporting in your hospital and will take about 10 to 15 minutes to complete. Please answer each question to the best of your knowledge, but, if an item does not apply to you or you do not know the answer, you may leave your answer blank.**

- *An **"event"** is defined as any type of error, mistake, incident, accident, or deviation, regardless of whether or not it results in patient harm.*
- ***"Patient safety"** is defined as the avoidance and prevention of patient injuries or adverse events resulting from the processes of health care delivery.*

## Section A: Your Work Area/Unit

**In this survey, think of your "unit" as the work area, department, or clinical area of the hospital where you spend *most of your work time or provide most of your clinical services*.**

**a. What is your *primary* work area or unit in this hospital? (Select ONE answer only.)**

| | |
|---|---|
| ○ 1 Many different hospital units/No specific unit | ○ 8 Psychiatry/mental health |
| ○ 2 Medicine (non-surgical) | ○ 9 Rehabilitation |
| ○ 3 Surgery | ○ 10 Pharmacy |
| ○ 4 Obstetrics | ○ 11 Laboratory |
| ○ 5 Pediatrics | ○ 12 Radiology |
| ○ 6 Emergency department | ○ 13 Anesthesiology |
| ○ 7 Intensive care unit (any type) | ○ 14 Other; please specify: _____ |

(for office use only)

26372

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only)  Date: _ _ / _ _ / _ _ (for internal use only)  Study ID: 1 4 4

## Section A: Your Work Area/Unit *(continued)*

**Please indicate your agreement or disagreement with the following statements about your work area/unit.**

**Think about your hospital work area/unit . . .**

| | Strongly Disagree 1 | Disagree 2 | Neither 3 | Agree 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| 1. People support one another in this unit. | ○ | ○ | ○ | ○ | ○ |
| 2. We have enough staff to handle the workload. | ○ | ○ | ○ | ○ | ○ |
| 3. When a lot of work needs to be done quickly, we work together as a team to get the work done. | ○ | ○ | ○ | ○ | ○ |
| 4. In this unit, people treat each other with respect. | ○ | ○ | ○ | ○ | ○ |
| 5. Staff in this unit work longer hours than is best for patient care. | ○ | ○ | ○ | ○ | ○ |
| 6. We are actively doing things to improve patient safety. | ○ | ○ | ○ | ○ | ○ |
| 7. We use more agency/temporary staff than is best for patient care. | ○ | ○ | ○ | ○ | ○ |
| 8. Staff feel like their mistakes are held against them. | ○ | ○ | ○ | ○ | ○ |
| 9. Mistakes have led to positive changes here. | ○ | ○ | ○ | ○ | ○ |
| 10. It is just by chance that more serious mistakes don't happen around here. | ○ | ○ | ○ | ○ | ○ |
| 11. When one area in this unit gets really busy, others help out. | ○ | ○ | ○ | ○ | ○ |
| 12. When an event is reported, it feels like the person is being written up, not the problem. | ○ | ○ | ○ | ○ | ○ |
| 13. After we make changes to improve patient safety, we evaluate their effectiveness. | ○ | ○ | ○ | ○ | ○ |
| 14. We work in "crisis mode" trying to do too much, too quickly. | ○ | ○ | ○ | ○ | ○ |
| 15. Patient safety is never sacrificed to get more work done. | ○ | ○ | ○ | ○ | ○ |
| 16. Staff worry that mistakes they make are kept in their personnel file. | ○ | ○ | ○ | ○ | ○ |
| 17. We have patient safety problems in this unit. | ○ | ○ | ○ | ○ | ○ |
| 18. Our procedures and systems are good at preventing errors from happening. | ○ | ○ | ○ | ○ | ○ |

ID Number: _ _ _ _ _ _ _ _ _ _ _ _ (for internal use only)  Date: _ _ / _ _ / _ _ (for internal use only)  Study ID: 1 4 4

## Section B: Your Supervisor/Manager

**Please indicate your agreement or disagreement with the following statements about your immediate supervisor/ manager or person to whom you directly report . . .**

| | Strongly Disagree 1 | Disagree 2 | Neither 3 | Agree 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| 1. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures. | ○ | ○ | ○ | ○ | ○ |
| 2. My supervisor/manager seriously considers staff suggestions for improving patient safety. | ○ | ○ | ○ | ○ | ○ |
| 3. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts. | ○ | ○ | ○ | ○ | ○ |
| 4. My supervisor/manager overlooks patient safety problems that happen over and over. | ○ | ○ | ○ | ○ | ○ |

## Section C: Communications

**How often do the following things happen in your work area/unit? Think about your hospital work area/unit . . .**

| | Never 1 | Rarely 2 | Sometimes 3 | Most of the Time 4 | Always 5 |
|---|---|---|---|---|---|
| 1. We are given feedback about changes put into place based on event reports. | ○ | ○ | ○ | ○ | ○ |
| 2. Staff will freely speak up if they see something that may negatively affect patient care. | ○ | ○ | ○ | ○ | ○ |
| 3. We are informed about errors that happen in this unit. | ○ | ○ | ○ | ○ | ○ |
| 4. Staff feel free to question the decisions or actions of those with more authority. | ○ | ○ | ○ | ○ | ○ |
| 5. In this unit, we discuss ways to prevent errors from happening again. | ○ | ○ | ○ | ○ | ○ |
| 6. Staff are afraid to ask questions when something does not seem right. | ○ | ○ | ○ | ○ | ○ |

## Section D: Frequency of Events Reported

**In your hospital work area/unit, when the following mistakes happen, *how often are they reported*?**

| | Never 1 | Rarely 2 | Sometimes 3 | Most of the Time 4 | Always 5 |
|---|---|---|---|---|---|
| 1. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported? | ○ | ○ | ○ | ○ | ○ |
| 2. When a mistake is made, but has no potential to harm the patient, how often is this reported? | ○ | ○ | ○ | ○ | ○ |
| 3. When a mistake is made that could harm the patient, but does not, how often is this reported? | ○ | ○ | ○ | ○ | ○ |

## Section E: Patient Safety Grade

**Please give your work area/unit in this hospital *an overall grade* on patient safety:**

| ○ "A" Excellent (1) | ○ "B" Very Good (2) | ○ "C" Acceptable (3) | ○ "D" Poor (4) | ○ "E" Failing (5) |
|---|---|---|---|---|

## Section F: Your Hospital

**Please indicate your agreement or disagreement with the following statements about your hospital.**

**Think about your hospital . . .**

| | Strongly Disagree 1 | Disagree 2 | Neither 3 | Agree 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| 1. Hospital management provides a work climate that promotes patient safety. | ○ | ○ | ○ | ○ | ○ |
| 2. Hospital units do not coordinate well with each other. | ○ | ○ | ○ | ○ | ○ |
| 3. Things "fall between the cracks" when transferring patients from one unit to another. | ○ | ○ | ○ | ○ | ○ |
| 4. There is good cooperation among hospital units that need to work together. | ○ | ○ | ○ | ○ | ○ |
| 5. Important patient care information is often lost during shift changes. | ○ | ○ | ○ | ○ | ○ |
| 6. It is often unpleasant to work with staff from other hospital units. | ○ | ○ | ○ | ○ | ○ |
| 7. Problems often occur in the exchange of information across hospital units. | ○ | ○ | ○ | ○ | ○ |
| 8. The actions of hospital management show that patient safety is a top priority. | ○ | ○ | ○ | ○ | ○ |
| 9. Hospital management seems interested in patient safety only after an adverse event happens. | ○ | ○ | ○ | ○ | ○ |
| 10. Hospital units work well together to provide the best care for patients. | ○ | ○ | ○ | ○ | ○ |
| 11. Shift changes are problematic for patients in this hospital. | ○ | ○ | ○ | ○ | ○ |

## Section G: Number of Events Reported

***In the past 12 months*, how many event reports have you filled out and submitted?**

- ○ 1) No event reports
- ○ 2) 1 to 2 event reports
- ○ 3) 3 to 5 event reports
- ○ 4) 6 to 10 event reports
- ○ 5) 11 to 20 event reports
- ○ 6) 21 event reports or more

## Section H: Background Information

**This information will help in the analysis of the survey results . . .**

1. **How long have you worked in this hospital?**

   ○ 1) Less than 1 year
   ○ 2) 1 to 5 years
   ○ 3) 6 to 10 years
   ○ 4) 11 to 15 years
   ○ 5) 16 to 20 years
   ○ 6) 21 years or more

2. **How long have you worked in your current hospital work area/unit?**

   ○ 1) Less than 1 year
   ○ 2) 1 to 5 years
   ○ 3) 6 to 10 years
   ○ 4) 11 to 15 years
   ○ 5) 16 to 20 years
   ○ 6) 21 years or more

3. **Typically, how many hours per week do you work in this hospital?**

   ○ 1) Less than 20 hours per week
   ○ 2) 20 to 39 hours per week
   ○ 3) 40 to 59 hours per week
   ○ 4) 60 to 79 hours per week
   ○ 5) 80 to 99 hours per week
   ○ 6) 100 hours per week or more

4. **What is your staff position in this hospital? Select ONE answer that best describes your staff position . . .**

   ○ 1 Registered Nurse
   ○ 2 Physician Assistant/Nurse Practitioner
   ○ 3 LVN/LPN
   ○ 4 Patient Care Asst/Hospital Aide/Care Partner
   ○ 5 Attending/Staff Physician
   ○ 6 Resident Physician/Physician in Training
   ○ 7 Pharmacist
   ○ 8 Dietician
   ○ 9 Unit Assistant/Clerk/Secretary
   ○ 10 Respiratory Therapist
   ○ 11 Physical, Occupational, or Speech Therapist
   ○ 12 Technician (e.g., EKG, Lab, Radiology)
   ○ 13 Administration/Management
   ○ 14 Other; please specify: _____

(for office use only)

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## Section H: Background Information *(continued)*

5. **In your staff position, do you typically have direct interaction or contact with patients?**

   ○ 1 Yes
   ○ 2 No

6. **How long have you worked in your *current* specialty or profession?**

   ○ 1) Less than 1 year
   ○ 2) 1 to 5 years
   ○ 3) 6 to 10 years
   ○ 4) 11 to 15 years
   ○ 5) 16 to 20 years
   ○ 6) 21 years or more

7. **What shift do you normally work?**

   ○ 1) Days
   ○ 2) Evenings
   ○ 3) Nights
   ○ 4) 7 am to 7 pm
   ○ 5) 7 pm to 7 am
   ○ 6) Other; please specify: _____

(for office use only)

8. **If you are a nurse, what was the level of your *first* nursing degree?**

   ○ 1 LPN
   ○ 2 Diploma
   ○ 3 Associate Degree
   ○ 4 Baccalaureate Degree
   ○ N/A; I am NOT a nurse

9. **If you are a nurse, what is your highest level of NURSING education?**

   ○ 1 LPN
   ○ 2 Diploma
   ○ 3 Associate Degree
   ○ 4 Baccalaureate Degree in Nursing
   ○ 5 Baccalaureate Degree Other
   ○ 6 Masters in Nursing
   ○ 7 Masters Degree Other
   ○ 8 PhD / DNSc / DNP
   ○ N/A; I am NOT a nurse

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only)

Date: _ _ / _ _ / _ _ (for internal use only)

Study ID: 1 4 4

## Section H: Background Information *(continued)*

**10. What is your age?**

- ○ 1) 20 years old or younger
- ○ 2) 21 to 30
- ○ 3) 31 to 40
- ○ 4) 41 to 50
- ○ 5) 51 to 60
- ○ 6) 61 or older

**11. Do you consider yourself Hispanic or Latino; this is, of Mexican, Puerto Rican, Cuban, Caribbean, or of Latin American descent?**

- ○ 1 Yes
- ○ 2 No
- ○ 3 Do not know

**12. What is your race? Select all categories that apply . . .**

(1)
- ○ a. White (Caucasian)
- ○ b. Black or African American
- ○ c. American Indian; specify tribe: _____
- ○ d. Alaska Native

(1)
- ○ e. Native Hawaiian or other Pacific Islander
- ○ f. Asian
- ○ g. Unknown
- ○ h. Other(s); specify: _____

(for office use only)

## Your Comments

**Please feel free to write any comments about patient safety, error, or event reporting in your hospital . . . .**

(for office use only)

***THANK YOU FOR COMPLETING THIS SURVEY.***

Sorra JS, Nieva VF. Hospital Survey on Patient Safety Culture. (Prepared by Westat, under Contract No. 290-96-0004). AHRQ Publication No. 04-0041. Rockville, MD: Agency for Healthcare Research and Quality. September 2004.

Instrument Number: 296

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Please use BLACK Pen Only!

Study ID: 144

# HOSPITAL SURVEY ON PATIENT SAFETY CULTURE:
# UNIT DIRECTOR ONLY

Participant Number: ☐☐☐☐☐☐☐☐☐☐

Administration Date: ☐☐ / ☐☐ / ☐☐☐☐ (month) (day) (year)

Unit Number:

| | | | | |
|---|---|---|---|---|
| ○ 1 | ○ 9 | ○ 18 | ○ 26 | ○ 34 |
| ○ 2 | ○ 10 | ○ 19 | ○ 27 | ○ 35 |
| ○ 3 | ○ 11 | ○ 20 | ○ 28 | ○ 36 |
| ○ 4 | ○ 12 | ○ 21 | ○ 29 | ○ 37 |
| ○ 5 | ○ 14 | ○ 22 | ○ 30 | |
| ○ 6 | ○ 15 | ○ 23 | ○ 31 | |
| ○ 7 | ○ 16 | ○ 24 | ○ 32 | |
| ○ 8 | ○ 17 | ○ 25 | ○ 33 | |

*( FOR OFFICE USE ONLY )*

1. How long have you worked in your current "unit director" position?
   - ○ 1) Less than 1 year
   - ○ 2) 1 to 5 years
   - ○ 3) 6 to 10 years
   - ○ 4) 11 to 15 years
   - ○ 5) 16 to 20 years
   - ○ 6) 21 years or more

2. How many years of experience do you have in nursing management?
   - ○ 1) Less than 1 year
   - ○ 2) 1 to 5 years
   - ○ 3) 6 to 10 years
   - ○ 4) 11 to 15 years
   - ○ 5) 16 to 20 years
   - ○ 6) 21 years or more

3. Which of the following have you taken? Select all that apply . . .
   - (1) ○ a. College-level management/administration courses
   - ○ b. Continuing Education programs on management/administration
   - ○ c. Leadership academy
   - ○ d. Executive management courses
   - ○ e. Other; please specify: _____

(for office use only) ☐☐☐

28574

# APPENDIX E

## LEADER-MEMBER EXCHANGE TOOL

Instrument Number: 2 9 7

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Please use BLACK Pen Only!

Study ID: 1 4 4

# LEADERSHIP MEASUREMENT TOOL

Participant Number: _____

Administration Date: ___ / ___ / ____ (month) (day) (year)

Unit Number:

| | | | | |
|---|---|---|---|---|
| ○ 1 | ○ 9 | ○ 18 | ○ 26 | ○ 34 |
| ○ 2 | ○ 10 | ○ 19 | ○ 27 | ○ 35 |
| ○ 3 | ○ 11 | ○ 20 | ○ 28 | ○ 36 |
| ○ 4 | ○ 12 | ○ 21 | ○ 29 | ○ 37 |
| ○ 5 | ○ 14 | ○ 22 | ○ 30 | |
| ○ 6 | ○ 15 | ○ 23 | ○ 31 | |
| ○ 7 | ○ 16 | ○ 24 | ○ 32 | |
| ○ 8 | ○ 17 | ○ 25 | ○ 33 | |

*( FOR OFFICE USE ONLY )*

As you complete this survey, please consider your relationship with your unit director . . .

| | Strongly Disagree 1 | Disagree 2 | Neutral 3 | Agree 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| 1. My unit director understands my problems and needs. | ○ | ○ | ○ | ○ | ○ |
| 2. My unit director would be personally inclined to use his/her power to help me solve problems in my work. | ○ | ○ | ○ | ○ | ○ |
| 3. I can count on my unit director to "bail me out," even at his/her own expense when I really need it. | ○ | ○ | ○ | ○ | ○ |
| 4. I would view my working relationship with my unit director as extremely effective. | ○ | ○ | ○ | ○ | ○ |
| 5. I have enough confidence in my unit director that I would defend and justify his/her decisions if he/she were not present to do so. | ○ | ○ | ○ | ○ | ○ |
| 6. I usually know where I stand with my unit director. | ○ | ○ | ○ | ○ | ○ |
| 7. I usually know how satisfied my unit director is with me. | ○ | ○ | ○ | ○ | ○ |
| 8. My unit director recognizes my potential well. | ○ | ○ | ○ | ○ | ○ |

26394

GRE - 297LMX, V1.0
March 16, 2009

Graen, G.B., 1995.
Modified by Bauer, T.N. and Green, S.G., 1996.

# APPENDIX F

# EMERGENCY MEDICAL TEAM CALLS

## Criteria for Initiating A MET Response

**RESPIRATORY:**

- rate <8 or >36
- new onset difficulty breathing
- new pulse oximetry reading less than 85% for more than 5 minutes

(unless patient known to have chronic hypoxia)

- new requirement for >50% $O_2$ to saturation >85

**HEART RATE:**

<40 or >140 with new symptoms; or any rate >160

**BLOOD PRESSURE:**

<80 or >200 systolic or 110 diastolic with symptoms

(neurologic change, chest pain, difficulty breathing)

**ACUTE NEUROLOGIC CHANGE**:

- acute loss of consciousness,
- new onset lethargy or difficulty waking,
- seizure (outside of seizure monitoring unit)
- sudden loss of movement (or weakness) of face, arm or leg

**OTHER:**

- more than 1 stat page required to assemble team needed to respond to a crisis
- patient complaint of (cardiac) chest pain, (unresponsive to nitroglycerine, or MD unavailable)
- color change (of patient or extremity): pale, dusky, gray or blue
- unexplained agitation more than 10 minutes
- suicide attempt
- uncontrolled bleeding or large acute blood loss
- bleeding into airway
- Narcan use without immediate response
- Crash carts must be used for rapid delivery of medications

# APPENDIX G

## UNIT DIRECTOR LETTER

Dear Unit Director:

I am writing to invite you to a luncheon meeting on _____ to introduce Debra Thompson, MSN, RN, a full-time PhD student at the University of Pittsburgh, and discuss a study that she will be conducting about leadership and patient safety at UPMC Presbyterian. The purpose of the study is to examine the effects of leaders' relationships on staffs' opinions about patient safety, errors, and reporting of events and their relationship to adverse patient care outcomes. In industrial settings, the relationships frontline leaders have with their staff called Leader-Member Exchange have been linked to safety behaviors and adverse events or accidents. Potentially these relationships exist in healthcare but have never been examined. At this meeting, Debra will be discussing the background of the study, its purpose and working with you to determine the best times to survey your staff.

All members of the nursing staff (Unit Directors, Registered Nurses, Licensed Practical Nurses, and Health Unit Coordinators) on the inpatient medical-surgical and critical care units are invited to participate. Participation is voluntary. All survey responses will remain anonymous and confidential, no specific individual can be linked to a specific survey. Each survey will have a unit code placed on it only for the purpose of tracking the rate of response for each unit. All data will be reported aggregately and no individual responses will be provided to the organization. The time for completion of the patient safety survey and the leadership survey along with demographic information will take 20-30 minutes. Locations near the patient care units will be provided for staff completion of surveys along with a light meal as a thank you for participation. Debra will provide you with additional surveys with a cover letter and a survey drop-off box for those staff unable to attend a survey completion meeting. The Institutional

Review Board of the University of Pittsburgh has approved this study. You will be asked to complete a Patient Safety Culture Tool for your unit and provide some background information (i.e. age, race, education, and work experience).Debra will work with you to set up a mutually convenient time for survey completion.

Thank you taking the time to participate in this meeting. Results of the study will be shared with you and the nursing staff.

Sincerely,

Holly L Lorenz, MSN, BSN
Vice President Patient Care Services and Chief Nursing Officer

CC: Debra N. Thompson MSN, RN

# APPENDIX H

# UNIT DIRECTOR SCRIPT

Thank you for coming to the meeting today. I am Debra Thompson, a PhD student in Nursing at University of Pittsburgh. I have received permission from UPMC Presbyterian to collect the data for my dissertation. This study has been approved by the Institutional Review Board of the University of Pittsburgh. As you know, there is an increasing interest in the safety of patients and the role nursing staffs play in keeping patients safe. This is increasingly important in the light of the recent decision by CMS to no longer reimburse for the associated costs of hospital acquired adverse events such as blood stream infections, urinary tract infections, pressure ulcers and patient falls, etc..

Links have been established between organizational climate, leadership, nurse outcomes such as job satisfaction, turnover, and occupational injuries and patient outcomes, with less being known about these relationships with patient care outcomes. There is growing recognition that frontline leader behaviors and the relationships leaders have with their staff influence outcomes. In industrial settings, the relationships frontline leaders have with their staff called Leader-Member Exchange have been linked to safety behaviors and adverse events or accidents. Potentially these relationships exist in healthcare, but they have never been examined in this setting.

The purpose of the study I am conducting is to examine the effects of leadership relationships on staffs' opinions about patient safety, errors, and reporting of events and their relationship to adverse patient care outcomes.

What I would like to do is review the plan for data collection and your role in the survey. I have received permission to survey the staff at a location near the patient care unit. Each staff member will be receiving a letter from Holly Lorenz, Vice President of Patient Care Services, the week prior to data collection inviting him or her to participate in the study. The purpose of

the study will be explained along with confidentiality and the mechanisms for survey completion .I have provided you each with a copy of the letter the staff will receive.

I along with specially trained students from the University of Pittsburgh, under the direction of Dr. Helen Burns, Associate Dean for Clinical Education, and myself will be collecting data from the Nursing Staff (Registered Nurses, Licensed Practical Nurses, Patient Care Assistants, and Health Unit Coordinators). A script will be used to inform the participants about the background and the purpose of the study. Risks, benefits, confidentiality, and anonomynity will be explained (I have provided you with a copy of the script for your information).

The estimated time for completion of the survey is 20-30 minutes. As a token of appreciation, staff will receive a light meal while they complete the survey.

All units will be assigned an identification code for linking responses to a specific unit. No questionnaire can be linked to a specific individual participant. All data will be reported aggregately, no individual responses will be provided to the organization. To provide further confidentiality each participant will be given a sealable manila envelope to place their completed questionnaires in so their responses will be visible to no one.

To maximize participation I will provide you with a supply of surveys, a cover letter and sealable manila envelopes and a drop off box for your unit. I or another student will be stopping by daily to pick up any surveys. I would like to set up a time within the next week to review your staff roster with you for accuracy and to ensure staff members who work in multiple units are assigned to complete the survey where they work more than 50% of their time. At the same time, I will drop off a copy of the Hospital Patient Safety Culture for you to complete and arrange a time to pick it up. It should take you 15-20 minutes to complete the questionnaire. The Hospital

Patient Safety Culture Tool asks your opinions about patient safety issues, medical error, and event reporting on your unit and in the hospital.

The only risk there may be to you in participation in this survey is you may feel uncomfortable having staff complete a questionnaire about the quality of their relationship with you. There are no direct benefits to you It is hoped that information acquired will assist in the generation and implementation of improvements to improve safety climate, leadership, and patient safety. A light meal is being provided to today as a token of appreciation for your assistance and participation in the study.

Your participation in this study is voluntary and you may chose to withdraw from the study at any time. Your responses to this survey are confidential and anonymous and will be kept in a locked file cabinet All results from this survey will only be shared in aggregate (as a group) no individual responses will be reported to the organization. There is no way this survey can be linked to you. A code is on the surveys and the return envelope to identify your unit only for the purpose of unit identification and the tracking of unit response rates. The principal investigator is the only individual with access to the unit codes and they are kept in a separate location under a double lock. To provide further confidentiality of your responses please place your completed survey in the manila envelope that way no one can see your responses. Your completion of the survey and returning it serves as informed consent for the study.

I would also like your input on what would be the best times of day to survey the staff, since I have students to assist in survey completion we would like to do this over a period of two –three weeks.

I am here to answer any questions you may have, if you have further questions or your staff has questions I can be reached at djt17@pitt.edu or 412-576-0918.

# APPENDIX I

# STAFF LETTER

Dear Nursing Staff Member

I am writing to invite you to participate in a survey about leadership and patient safety that Debra Thompson, MSN, RN, a full-time PhD student at the University of Pittsburgh will be conducting at UPMC Presbyterian Hospital. The purpose of the study is to examine the effects of leadership on staffs' opinions about patient safety, errors, and reporting of events and their relationship to adverse patient care outcomes. In industrial settings, the relationships frontline leaders have with their staff (called leader-member exchange) have been linked to safety climate and accidents. These relationships have never been examined in healthcare.

All members of the nursing staff (Unit Directors, Registered Nurses, Licensed Practical Nurses, and Health Unit Coordinators) on the inpatient medical-surgical and critical care units are invited to participate. Your participation is voluntary. All survey responses will remain anonymous and confidential, no specific individual can be linked to a specific survey. Each survey will have a unit code placed on it only for the purpose of tracking the rate of response for each unit. The time for completion for the surveys along with demographic information will take 20-30 minutes. You will be invited to attend a meeting in a location near your unit to complete the survey. Debra Thompson or another University of Pittsburgh, student will review the study background, purpose and provide you with instructions on how to complete the survey. A light meal will be provided for you while you complete the survey. All surveys will be returned in a sealed manila envelope so no one will see your responses. All responses will be reported aggregately so no individual survey can be linked with a specific individual. Your completion of the survey will serve as your consent for participation in the survey. Results will be shared with you and the organization.

Your unit director will be providing information about the times and locations for survey completion in the next week. If you are unable to attend one of the scheduled sessions your unit

director will have surveys available in the unit for completion that can be placed in your unit drop off box. You will be seeing reminder flyers posted throughout the organization

If you have further questions about the study, you may contact Debra N. Thompson at djt17@pitt.edu or 412-576-0918.

I thank you for taking the time to participate in this worthwhile survey.

Sincerely,

Holly L Lorenz BSN, MSN
Vice President, Patient Care Services and Chief Nursing Officer,
UMPC Presbyterian Hospital

CC: Debra N. Thompson MSN, RN
PhD Student, University of Pittsburgh, School of Nursing

# APPENDIX J

# STAFF SCRIPT

Welcome and thank you for coming to this survey completion session. I am Debra Thompson, PhD student or _____ a nursing student at the University of Pittsburgh. We have a light meal with some beverages for you as you complete these surveys. I have information for you about the study and instructions on how to complete the questionnaires.

There is an increasing interest about the safety of patients and the role nursing staffs play in keeping patients safe. Links have been established between organizational climate, leadership, nurse satisfaction, and patient outcomes, with less being known about these relationships with patient care outcomes. There is growing recognition that frontline leader behaviors and the relationships leaders have with their staff influence outcomes. In industrial settings, the relationships frontline leaders called Leader-Member Exchange) have with their staff have been linked to safety climate and accidents. These relationships potentially exist in healthcare but have never been examined. The purpose of the study is to examine the effects of leadership relationships on staffs' opinions about patient safety, errors, and reporting of events and their relationship to adverse patient care outcomes.

For that reason, we are surveying all members of the nursing staff (Unit Directors, Registered Nurses, Licensed Practical Nurses, and Health Unit Coordinators) on the inpatient medical-surgical and critical care units at UPMC Presbyterian. We are asking that you complete two questionnaires the Hospital Survey on Patient Safety Culture with background information (i.e. your position, age, race, type of education and work experience) , and the Leader-Member Exchange Measurement Tool. The Patient Safety Culture Tool asks your opinions about patient safety issues, medical error, and event reporting on your unit and in the hospital. The Leader-Member Exchange Measurement Tool asks you about your relationship with your Unit Director. It should take between 20-30 minutes to complete the two questionnaires.

There are no foreseeable risks associated with your participation in this project nor are there any direct benefits to you. It is hoped that information acquired will assist in the generation and implementation of improvements to improve safety climate, leadership, and patient safety. A light meal is being provided to you as you complete the questionnaires as a token of appreciation.

Your participation in this study is voluntary and you may chose to withdraw from the study at any time. Your responses to this survey are confidential and anonymous and will be kept in a locked file cabinet All results from this survey will only be shared in aggregate (as a group) no individual responses will be reported to the organization. There is no way this survey can be linked to you. A code is on the surveys and the return envelope to identify your unit only for the purpose of unit identification and the tracking of unit response rates. The principal investigator is the only individual with access to the unit codes and they are kept in a separate location under a double lock. To provide further confidentiality of your responses please place your completed survey in the manila envelope and seal it so no one can see your responses. Your completion of the survey and returning it serves as informed consent for the study.

Please use the black ink pen to complete the questionnaire. Please shade your answers in the circle fully. As you answer the questions, please use the following definitions.

An “event” is defined as any type of error mistake, incident, accident, or deviation, regardless of whether or not it results in patient harm.

“Patient Safety” as the avoidance and prevention of patient injuries or adverse events resulting from the processes of health care delivery.

Your opinions are important to us please answer all the questions to the best of your knowledge, but if an if an item does not apply to you or you simply don't know the answer you should feel free to leave it blank. As you complete the pages, please take a moment and check that you filled out every question that you wanted to answer. . Please make sure you identify your position type.

The results of the survey will be shared with you and the organization. Thank you for taking the time to complete this survey. If you have, any questions as you complete the survey please approach me and I will be happy to answer your questions.

If you have, any additional questions about the survey please feel free to contact Debra N. Thompson, MSN, RN, at either djt17@pitt.edu or 412-576-0918.

# APPENDIX K

## MANUSCRIPT #3 A RELATIONAL FRAMEWORK OF NURSE LEADERSHIP AND SAFETY OUTCOMES

**Discussion Paper: A Relational Framework of Nurse Leadership and Safety Outcomes**

**Aim:** This paper presents a discussion of a relational framework for examining interrelationships among nurse leader behaviors, the quality of the leader's relationships with frontline staff, and patient safety outcomes.

**Background:** The literature lacks examples of nurse-specific leadership behaviors that promote patient safety and improve outcomes. Nursing research has not fully explored the concept of individualized, differentiated relationships between leaders and staff members (LMX) as a mechanism to impact staff safety attitudes, behaviors and learning from errors and provide greater insight into ways to improve patient safety.

**Data Sources**: Computerized searches were used to identify articles from nursing, organizational behavior, and industrial psychology literature from 1966 to 2009 relevant to integration of safety climate, LMX, and outcomes.

**Discussion:** Research on nursing leadership can benefit from adopting a LMX perspective based on insights from industrial psychology. This perspective posits that leaders engage in ongoing differentiated dyadic relationships with staff and the quality of these relationships is an important predictor of employee attitudes, beliefs, and thus outcomes.

C**onclusion:** This conceptualization can be used as a model to guide future research exploring the interaction of selected variables at different organizational levels in multiple health care settings. It has potential to impact nursing practice by providing evidence demonstrating how nurse leaders impact individual employee behaviors, nursing practice, patient safety and outcomes through the development of strong relationships. Furthermore, it could become a model to guide the design of interventions to improve nursing practice in complex organizations.

**Keywords:** leader-member exchange, leadership, safety climate, nurse leaders, outcomes, patient safety, integrative framework

**Summary Statement:**

**What is already known about this topic:**

- Nurse leaders and their work climate are viewed as critical factors in effecting change in patient outcomes.
- Nursing literature lacks examples of specific leadership behaviors that promote patient safety and improve outcomes.
- Other disciplines have explored leadership behavior and identified leader member exchange (LMX) as a concept which can begin to explain safety behaviors.
- LMX posits that a leader engages in ongoing dyadic relationships with staff and the quality of these relationships can predict employee attitudes, beliefs and thus outcomes.

**What this paper adds:**

- Conceptual and methodological means to explore how a relational leadership perspective can begin to influence outcomes at multiple organizational levels from individual employees to work units.
- A mechanism to explore linkages between leadership behavior, safety climate, safety behaviors, and care outcomes.
- A framework with the potential to impact nursing practice by providing direction for interventions to test how nurse leaders improve practice, patient safety and outcomes.

**Implications for practice and/or policy:**

- Once validated, this model can be used to study interrelationships between leadership, safety attitudes, safety behaviors, safety climate, and care outcomes.

- This model can be used to test ways to develop high quality differentiated relationships between nurse leaders and staff that positively impact safety climate and care outcomes.

- Organizations that display positive outcomes can be identified and serve as learning exemplars.

## Introduction

Frontline nurses play a critical role safeguarding patients from the adverse effects of errors and unexpected situations in the routine delivery of care. As the care providers who spend the most time with patients, nurses are uniquely positioned to observe and respond to early signs of threats to the safety of their patients (IOM 2004). Therefore, system-wide improvement in patient safety relies extensively on the willingness of frontline nurses to actively contribute to efforts to address the underlying causes of these threats. Such actions, however, go far beyond the formal requirements of their jobs. In other words, system-wide improvements in patient safety depend on the willingness of frontline nurses to engage in behaviors that are voluntary, extra-role, and may risk blame and reprisal.

Hence, there is growing interest worldwide in understanding the dynamic role of frontline nurse managers in motivating frontline nurses to contribute to patient safety improvement efforts (ICN 2000, CNAC 2002, IOM 2004, Wong & Cummings 2007, Pronovost et al. 2008). In this paper, we draw from industrial psychology leadership research to highlight the importance of taking into account the quality of nurse manager's work relationships with frontline nurses as a means to better understand the safety behaviors of frontline nurses. Specifically, we propose a relational framework of frontline nurse leadership that can be used to examine interrelationships among leader behaviors, the quality of the relationship between leader and employees, the work unit's safety climate, frontline nurses' safety behaviors, and patient safety outcomes.

## Background

An important shift is underway in how the managerial challenges of improving patient safety are viewed. When patient safety first emerged as a salient issue, improvement strategies emphasized compliance with safety rules and procedures i.e., reducing "wrong dose" or "wrong

drug" (Perrow 1984, Naveh et al. 2005, Hofmann & Mark 2006). As the patient safety movement continued to evolve, this viewpoint broadened to recognize that many threats to patient safety are dynamic, local, and unpredictable. Accordingly, patient safety calls for more than simple compliance with rules and procedures. It calls for ongoing actions at the point of care to detect errors, respond to unexpected situations and learn from adverse events to prevent their recurrence (Hofmann & Mark 2006). As a result, safety strategies increasingly emphasize continuous learning and improvement. This focus prompted a rethinking of the role of frontline managers - from supervisors who prevent errors to leaders who promote safety by eliciting the commitment of their employees (Edmondson 1999, Nembhard & Edmondson 2006).

Although this shift is widely acknowledged in the nursing literature, basic questions remain unanswered. For example, how are the actions of frontline nurse leaders linked to the motivation of frontline nurses and unit safety climate? How are their actions related to safety behaviors and outcomes? Answers to such questions are critical to understanding the role of frontline nurse leaders in promoting patient safety and designing interventions to foster a strong safety climate, change the way nurses work, prevent adverse outcomes, and learn from errors (Edmondson 1999, IOM 2004, Kazanjian et al. 2005). In this conceptualization, safety climate is defined as "the shared perceptions of the employees, concerning the practices, procedures, and kinds of behaviors that get rewarded, supported and recognized by the organization to prevent harm" (Schneider 1990 p.384.)

Leadership behaviors have been examined in multiple studies in industrial organizational psychology (see for example meta-analyses by Gerstner & Day 1997, Bono & Judge 2004, Judge & Piccolo 2004, Burke et al. 2006). These studies included a wide range of theoretical perspectives and focused on different aspects of leadership, such as the leader's traits, behaviors,

and style, and characteristics of the employees. With respect to understanding the voluntary citizenship behaviors of employees such as those necessary for safety, the single most theoretically developed and empirically supported perspective is the relational perspective. Central to this perspective is the concept Leader -Member Exchange (LMX) which posits 1) a differentiated dyadic relationships exist between a leader and staff member within the same work unit and 2) the quality of a leader's relationship with an individual employee (i.e., the quality of the dyadic relationship) is a powerful determinant of a wide range of employee attitudes, behaviors, and performance outcomes (Gerstner & Day 1997). Most relevant to this paper were several recent empirical studies from the industrial psychology field that examined the effect of leaders' relationships with their employees in non-health care settings (Hofmann & Morgeson 1999, Hofmann et al. 2003, Michael et al. 2006).

To date, the nursing literature has not adequately benefited from the insights generated by the relational perspective and the opportunities it offers for better understanding the role of frontline nurse leaders in advancing patient safety. In this paper, we begin by discussing the concept of LMX, its antecedents and the potential impact of LMX on employee attitudes and behaviors. We then discuss the potential impact of safety behaviors on outcomes, how leadership influences safety climate and implications for nursing research and practice.

**Data Sources**

To address our interest in the linkages among LMX, safety climate and outcomes, we considered literature from the nursing and industrial psychology/organizational behavior fields. Multiple electronic data bases including MEDLINE, PsycINFO, Business Source Premier, EBSCO HOST were searched to find English language research articles using the following terms: leadership, nurse leadership, nurse leader, patient safety, adverse outcomes, safety

climate, safety culture, and LMX from 1966 until 2009. The terms LMX, safety climate, culture, and outcomes were combined to locate articles that used these concepts as a focus. In addition, references in articles identified by this search were reviewed for additional relevant citations. Publications of noted authors in this field were reviewed and/or the authors contacted to determine if any additional papers existed on the topic of safety climate, LMX and outcomes. Contact of noted authors in the field affirmed no additional studies on LMX, safety climate, and outcomes. Inclusion criteria were theoretically relevant LMX studies, empirical validation of LMX, studies which combined LMX, safety climate and outcomes, leader behaviors influencing safety climate, safety behaviors and learning from errors, leadership and outcomes in nursing and other disciplines. Only studies in English were reviewed so some relevant studies may have been missed. A total of 22 relevant studies were identified. No studies were identified that linked LMX, safety climate and care outcomes in healthcare. We found 18 studies that addressed safety and leadership. Using a deductive approach we developed our integrative framework from these data sources.

**Discussion:**

**Integrative Framework**

The proposed framework in Figure1 illustrates how leadership style and behaviors affect safety outcomes from a LMX perspective. Essentially, we propose that leader behaviors can shape frontline nurses' safety behaviors in several ways. First, from the viewpoint of an individual employee, leader behavior determines the quality of that employee's relationship with the leader (LMX); in turn, this relationship influences the employee's safety behaviors. Second, from the viewpoint of the work unit, leader behaviors in respect to safety establish the safety climate of the unit; in turn, the safety climate influences the safety behaviors of frontline nurses within the unit. Third,

LMX can be different for different employees within a unit. Through these relationships, the safety behavior of frontline nurses influences patient safety outcomes.

**Leader-Member Exchange**

Central to this framework is the concept of leader-member exchange (LMX). LMX poses that leaders develop different relationships with staff members based on individual needs and concerns rather than using a uniform approach (Danserau et al. 1975, Graen & Uhl Bien 1995, Liden et al. 1997, Schriesheim et al.1999). These relationships create a sense of trust, respect, and mutual obligation that generates influence and motivates the member to act in a manner valued by the leader (Graen & Uhl-Bien 1995). When the relationship is high and the member has increased influence, attention and support from the leader, the member expends more time and energy on work issues. A low LMX relationship is characterized by weak negotiating latitude with low trust, respect and obligation (Danserau et al. 1975, Cashman et al. 1976, Graen & Uhl-Bien 1995, Liden et al. 1997). Individuals with high quality exchanges have higher job satisfaction, are more positive toward work outcomes and have stronger interpersonal relationships. When high quality relationships exist, there is greater congruency between leader and staff members. In this conceptualization the sustentative work of the leader entails building strong relationships with staff members that consider their individual needs and promote learning and mutual accommodation (Graen & Uhl-Bien 1995).

It is important to note that, by definition, LMX refers to the quality of a *dyadic* relationship. That is, it refers to the quality of a leader's relationship with a specific employee. LMX can be different for different staff members reporting to the same nurse leader. This differentiated view is in marked contrast to the traditional view of a leader as having a uniform or "average" style when interacting with unit staff. Table 1 provides a comparison of these two approaches.

LMX is related to, but different from, leadership style. LMX refers to the quality of the relationship whereas leadership style refers to behaviors and practices. Leadership style is described in multiple ways, e.g., hands-on, value-driven, visionary, charismatic, inspiring, participative, promoting autonomy (Vance & Larson 2002, Upenieks 2003, Cummings et al. 2008) These behaviors contribute to effective nursing leadership but do not capture the differentiated approach that LMX posits.

Many nursing practice environments recognize differences in experience and competency as important considerations when attempting to engage staff in decentralized decision-making, work redesign, innovative care delivery and learning from poor outcomes (McClure & Hinshaw 2002, IOM 2004). However, many of these approaches focus on a uniform style to achieve these outcomes. Determining critical leadership behaviors that develop effective relationships with staff is a requisite for future nursing leaders.

The measurement of the LMX construct is informed by the previously described conceptualization of the relationship between a supervisor and subordinate as a differentiated dyadic relationship wherein the strength of this relationship influences outcomes. The most recommended instrument is the LMX-7 (Graen & Uhl-Bien 1995, Gerstner & Day 1997). This tool is designed to test staff members' perceptions of their relationship with their leader using a 5-point Likert scale (strongly disagree to strongly agree). The LMX-7 tool (Scandura & Graen 1984, Graen & Uhl-Bien 1995) presented in Table 3 is a revised version of the original instrument that splits one item into two as recommended by Bauer & Green (1996).

The LMX relationship can be measured at the individual dyadic level or scores can be summated to provide measurement at the group or network levels (Graen & Uhl-Bien 1995). Gerstner & Day (1997) in their meta-analytic review suggest that LMX may be more reliably

measured from the member perspective, since the leader may have a much more complex, multi-dimensional perception. This position is supported by their findings of lower overall Cronbach's level from managers. The LMX-7 has consistent criterion-related validity (Liden et al. 1993) and a Cronbach's alpha of .91 for organizational analysis (Liden & Maslyn 1998). Administration is simple and requires 5-7 minutes for the participant to complete.

**Antecedents of LMX**

There is strong theoretical and empirical evidence that differentiated leadership relationships positively impact employee attitudes, actions and outcomes (Graen & Uhl-Bien 1995, Gerstner & Day 1997, Liden et al. 1997). Liden and colleagues (1997) posit the relationship begins with the initial interaction; both leader and member characteristics influence the process. Employees are tested with a series of work assignments that are assessed in regard to performance. Attributions are made about the outcomes by both parties dependent on varied influencing factors, e.g., personality traits, demographic similarity, leader delegation as well as staff members' upward influencing behaviors including assertiveness, leader and staff competence. Additional influencing factors include organizational culture, work group size, organizational practices and policies (Liden et al. 1997).

An early field study explored the development of LMX (Graen et al. 1982) using four treatment interventions, LMX, job design, LMX and job design and placebo. Findings suggested that the LMX approach was most effective in forming a high quality relationship, i.e., leaders used active listening, discussed staff problems and concerns, refrained from imposing their own or the organization's framework, clarified expectations about job and member expectations and the overall working relationship. The employee's need for development moderated these effects. These high reciprocal exchanges resulted in improved productivity and high quality

relationships. This ability to adopt a staff member's perspective may be very effective in expanding the outcomes of relationships beyond the individual to impact work and organizational performance (Gerstner & Day, 1997). These findings support continued research to determine how to develop differentiated relationships and better understand how they can impact healthcare outcomes.

**Effects of LMX on Employee Attitudes and Behaviors**

The effect of LMX on employee attitudes and behaviors is explained by social-exchange theory. A leader participates in an ongoing reciprocal relationship with each of their employees that is characterized by the exchange of valued resources, information and rewards. Obligation is a key component. When a person provides a service for an individual, there is an expectation of gratitude and, at some point, positive reciprocation. This reciprocal behavior becomes the keystone of a long-term mutually beneficial relationship (Blau 1964, Liden et al. 1997).When the exchange is favorable, the employee is motivated to balance the exchange by engaging in valued job behaviors. In contrast, when the relationship is poor, the employee is less likely to offer valued leader resources, e.g., accepting greater responsibility, expending extra effort and greater organizational commitment (Liden et al 1997). Social exchange theory has been used to generate and test hypothesis about a wide range of employee attitudes and behaviors.

LMX is positively associated with organizational citizenship behaviors. When staff perform outside of their traditional roles, these actions are labeled organizational citizenship behaviors (Smith et al. 1983, Ilies, et al. 2007).When employees have high-quality supervisory relationships, they tend to expand work behaviors beyond specific job expectations (Ilies et al. 2007). These expanded roles contribute to improved unit performance via innovation and

spontaneity and expand actions beyond traditional job roles. Katz (1983) purports this spontaneous innovative behavior is necessary to ensure a high performing organization since no organization can prescribe how an employee should behave in response to every situation that arises. A meta-analysis of 50 independent studies between LMX and citizenship behaviors found a moderately strong positive relationship (Ilies et al. 2007). This finding is supported by Gerstner and Day's (1997) earlier meta-analysis examining LMX. In these studies, LMX predicts citizenship behaviors as well as task performance behaviors.

Several industrial studies provide further evidence regarding the impact of LMX on employee safety behaviors. When employees felt supported and valued by the organization and had a high quality LMX relationship with their immediate supervisor, they were more likely to communicate about safety. Staff who had high quality LMX relationships were more committed to safety (Hoffman & Morgeson1999). Using safety climate as a moderator, Hofmann and colleagues (2003) found a positive relationship between a strong LMX relationship, expanded safety role definitions, and safety citizenship behaviors. Together, safety role definitions and LMX predicted safety citizenship behaviors.

These findings support LMX as a means to better understand how safety behaviors can be promoted. This is particularly important for nursing staff who are responding to changing patient needs that require a rapid intervention to assure safety. How staff respond is a local behavior at the point-of-care. We need to develop leaders who can engage every care provider to be vigilant and to go beyond "the call of duty" to prevent patient harm. A leadership style that promotes a dyadic (versus uniform) approach to relationship management is one of the mechanisms that appears to be successful in achieving this goal.

Several nursing studies examined the effect of LMX on nursing attitudes or behaviors. A study of 14 unit directors and associated nursing staff using an LMX approach in three Taiwanese hospitals found that the quality of the LMX relationship indirectly influenced organizational citizenship behavior by its positive and significant effect on nurses' level of trust and perceived support from their unit directors (Chen et al. 2008). When nurse managers had a stronger relationship with their immediate supervisor, they felt more empowered both psychologically and structurally, resulting in greater job satisfaction (Laschinger et al. 2007). A Canadian study tested a multi-level model of LMX quality and structural empowerment on frontline nurses' perception of psychological empowerment and organizational commitment. Findings indicated the quality of the LMX relationship directly impacted individual levels of psychological empowerment and organizational commitment at the unit level (Laschinger et al. 2009).A cross-level analysis of 581 frontline nurses and 29 supervisors in a Midwestern hospital found that a stronger LMX relationship between frontline leaders and their immediate supervisor had a more positive effect on employee attitudes towards patients, the organization itself and the nurses perceived value to the organization (Tangirala et al. 2007). A significant and positive relationship was found between LMX quality and organizational identification which was mediated by job involvement in a study of 148 Turkish nurses (Katrinli et al. 2008). These findings warrant further exploration of the quality of the LMX relationship on employee safety behaviors and care outcomes.

**Effect of Safety Behaviors on Outcomes**

Numerous studies were identified that described characteristics believed necessary to promote behavioral change that can translate to improved safety and patient outcomes. Nurse leaders were advised to focus on the development of relationships versus use of “top-down

decision-making", task analysis and tight control (Anderson & McDaniel 2000, Porter O'Grady & Malloch 2007). They were counseled to tap employee creativity and learning capacity to create organizations where nursing staff engage in learning from errors (Edmondson 1996, 1999, IOM 2004; Nembhard & Edmondson 2006). Nursing leaders of the future were described as those who were able to develop frontline staff who would intervene for patient safety, take the initiative to identify opportunities to learn, give safety a high priority, and reward error reporting and worker safety practices (Anderson & McDaniel 2000, IOM 2004, AONE 2005).

Studies exploring the relationship of LMX and safety in the industrial setting support the potential to achieve these goals using a leadership style focused on LMX. A study of 49 manufacturing leadership dyads reported that when LMX was positive and organizational support for safety was high, frontline safety role behaviors were improved and accidents were positively affected (Hofmann & Morgeson 1999). A study of 5 wood manufacturers employing over 500 workers analyzed relationships between LMX and communication regarding safety-related events; individuals who had strong LMX were less likely to experience a self-reported near miss or safety-related event (Michael et. al. 2006). These studies suggest that safety climate and outcomes can be positively influenced by the frontline manager.

**Leadership and Safety Climate**

In the literature reviewed, four factors were consistently associated with the development of a strong safety climate: 1) managers were perceived by staff as strongly committed to patient safety (Mark et al. 2008, Naveh et al. 2005); 2) worker productivity and employee safety were balanced (DeJoy et al. 2004, Mark et al. 2007); 3) there was a positive information flow about safety (Mark et al. 2008, Naveh et al. 2005); and 4) the organization promoted a response to unsafe events or errors that supported learning from errors versus a punitive climate (DeJoy et al.

2004, Mark et al. 2008). There was a common consensus that errors and adverse events were caused by complex interacting factors that included management decisions, organizational processes, working conditions, unsafe acts, cognitive failures and procedural violations (Vincent et al. 1998). When the organization's structure provided evidence that it promoted safety as a high organizational priority and leadership, similarly, provided evidence that it was actively engaged in promoting safety, outcomes were improved (Hoffman & Morgeson 1999; Zohar 2002). Several authors have defined the product of these actions as “safety climate”.

Traditionally, safety climate has been viewed as a uni-dimensional construct consisting of organizational policies, procedures and consequent outcomes. As noted previously, one approach to achieve improved safety climate involves revisiting the “rules” and attempting to improve adherence to these rules (Naveh et al. 2005, Hofmann & Mark 2006). However, empirical findings have demonstrated that safety climate is a multi-dimensional construct where the leader can influence multiple variables that interact with staff perceptions to influence employee perceptions and valued outcomes (Zohar 1980, Naveh et al. 2005, Hofmann & Mark, 2006). In the model considering LMX as a differentiated relationship that can improve behaviors, this examination would focus on leader safety practices, the priority placed on safety and ways to insure safe care delivery practices.

Several studies from industrial psychology provide strong preliminary evidence for success when using this approach. In a high-risk Army transportation unit consisting of 25 teams comprised of leaders/associated members, investigators explored the relationship of LMX with organizational safety behaviors and safety climate. Findings suggested a high quality LMX relationship was significantly related to safety citizenship behaviors and safety role behaviors with moderation by safety climate (Hofmann et al. 2003). The authors (Hofmann et al. 2003)

most notable finding was that safety climate acted as a contextual moderator for the LMX relationship. The more positive the safety climate, the more staff viewed safety as part of their role.

This finding has important implications given current United States Center for Medicare and Medicaid Services regulations which no longer include payment for adverse outcomes, e.g., falls, central line infections, pressure ulcers, surgical site infections that are deemed preventable (Kurtzman & Buerhaus 2008). Studies conducted in diverse settings support this potential. In a study of acute care units in Israel, treatment errors were reduced when leaders valued and exemplified safe care delivery practices; employees responded by emulating these behaviors (Naveh et al. 2005). Hoffmann and Mark (2006) examined the relationship between safety climate and organizational outcomes in a random sample of 81 general medical-surgical units in 42 US hospitals. Fewer adverse events, e.g., back injuries, urinary tract infections, medication errors, and more positive clinical ratings (nurse responsiveness, patient satisfaction and nurse job satisfaction were found when frontline nursing leaders valued and exemplified safe care delivery practices. Edmondson (1996, 1999) and colleagues (Nembhard & Edmondson, 2006) found leadership behaviors influenced employees psychological response, participation in safety improvement efforts, and reporting and learning from errors. Qualitative findings indicated that managers in units that reported more errors were more open in discussing errors and fostered learning vs. blame (Edmondson 1999). Quantitative findings on leader inclusiveness conducted in 23 neonatal care units suggested that when healthcare leaders minimized their professional status and focused on improving psychological safety, staff members were more willing to speak-up and actively engage in problem solving (Nembhard & Edmondson 2006). These

findings support the need to develop differentiated relationships in healthcare to improve learning from things gone wrong and engage frontline staff in improvement efforts.

Huang and colleagues (2007) conducted a study in four intensive care units (ICU) to determine if safety culture factors were similar in practice settings with a similar patient care mix. Findings indicated that the four ICUs varied significantly in perceptions of safety climate, most notably for job satisfaction and working conditions. The finding that unit safety culture may differ across units has important implications for the development of future interventions. Units with high levels of safety promotion could be identified and serve as exemplars (Huang et al. 2007). The benefit of the dyadic model is that is enables the researcher to consider relationships, not only within units, but among units. By developing effective leaders who focus on safety, it may be possible to reduce adverse outcomes and improve safety climate and safety behaviors (Moss & Garside 2001, Zohar 2002, Zohar & Luria 2003, IOM 2004).

**Nursing Implications**

The demand for safe care environments, coupled with the reimbursement and reporting changes is a significant opportunity for the nursing profession (Kurtzman & Buerhaus 2008). Nursing has consistently played a key role in the surveillance and rescue of patients to prevent adverse outcomes (Clarke 2004). However, we have not always been able to cogently measure the professions' impact on outcomes. The evidence confirms the critical role that leaders have in improving staff safety behaviors. However, specific leadership behaviors that will create changes in frontline staff behaviors are not well defined. Additionally, to fully understand the choices of frontline staff regarding safety behavior, it appears insufficient to examine safety climate or leadership in isolation. For complete understanding, both should be examined.

Leadership is both behavioral and relational. Nursing research can benefit from a relational perspective. Further research is needed to understand the role of nurse leaders in developing and managing effective differentiated staff relationships, influencing safety climate, impacting frontline care safety citizenship behaviors and vigilance in the delivery of care, to prevent adverse patient outcomes and respond effectively when a threat to patient safety exists. Leaders who exemplify the ability to develop effective differentiated relationships and reinforce and reward safety behaviors could be identified to mentor others.

This model enables nursing to raise questions regarding the "right mix" of differentiated relationships to impact outcomes. Should the goal be to have a strong relationship with every staff member? How do these relationships develop at different levels of the organizational and what is their impact? What is the most effective structure to ensure development of strong relationships, safety citizenship behavior and prevent unsafe care? This relational conceptualization can become a model for future research on the interaction of selected variables at multiple levels in different types of organizations. The coupling of the relational perspective on leadership on staff behaviors and unit safety climate has the potential to impact outcomes by providing evidence on how nurse leaders impact frontline staff behaviors patient safety and outcomes while cultivating climates that are conducive to patients and employees alike.

**Conclusion**

Safety is a requisite for healthcare. International, federal, state agencies, consumers and healthcare providers all want safer patient care. Effective interventions require conceptual models to guide research, decision-making and practice. The IOM (2004) recommends leaders establish a trusting transformational relationship with staff to improve outcomes while balancing efficiency Relationship development and management is a critical skill for nurse leaders in our complex

healthcare delivery system. The dyadic relationship developed with LMX holds promise for health care in achieving this goal by identifying a means to measure impact and test interventions to impact change.

**Figure 1 Integrative Framework**

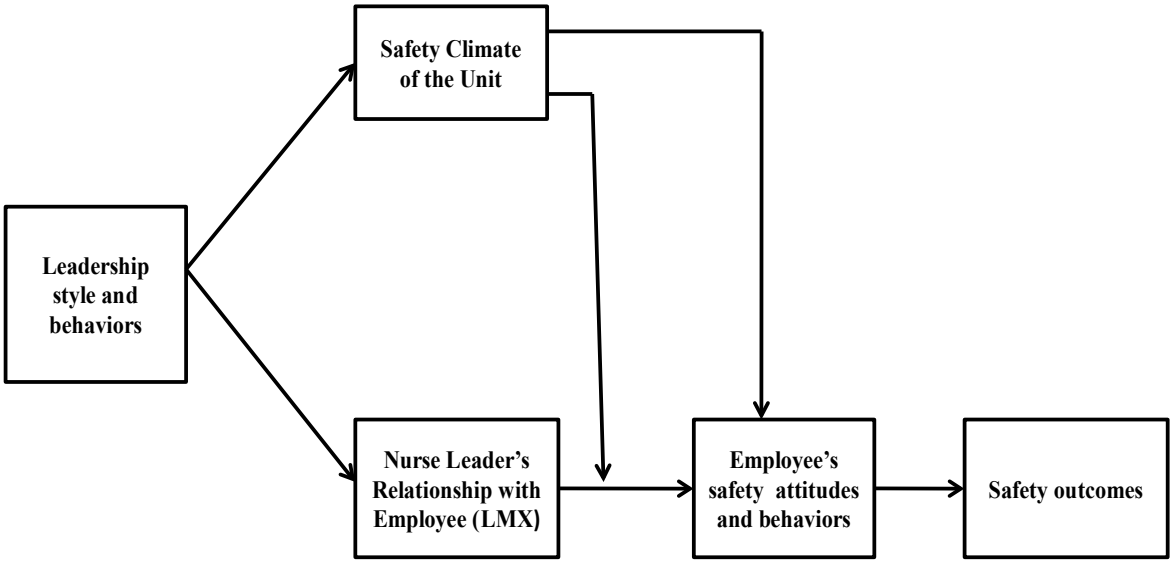

**Table 1 A comparison of uniform (average leadership style) and LMX**

| Attribute | Average Leadership Style | Leader-Member Exchange |
|---|---|---|
| **Leadership approach** | Homogenous to all employees, | Differentiated based on assessment of employees'<br>a. competence and skill<br>b. trust for independent action<br>c. Motivation for greater responsibility |
| **Leader's focus** | Group | Individual |
| **Leader's scope of influence** | Formal authority, organizational rules and regulations | Relationship based, mutual trust respect and obligation, based on followership needs. |
| **Staff perceptions, interpretations, and reactions** | Homogeneous | Heterogeneous |
| **Compliance** | Formal role requirements | Individualized based on support and sensitivity to their needs |
| **Employment contract** | Formal<br>Universal | Differentiated based on need trust and recognition |

| | | |
|---|---|---|
| **Reward** | Salary increases<br>Good performance evaluation<br>Compliance | Subordinate valued outcomes such as job latitude , autonomy influence in decision-making, open and honest communication, support of members action confidence, consideration<br>Staff member contributes at a higher level of organizational behavior |
| **Outcomes** | Compliance with limited expansion outside established standards and protocols | Latitude and discretion on outcomes are achieved<br>Results yield contributions beyond traditional scope of job boundaries to contribute to overall unit success |
| **Measurement and Analysis** | Supervisor characteristics in how effective or ineffective | Levels approach to understand the relationship between leaders at all levels, within group, among groups, and others<br>Allows for subtleties of leadership behavior that may |

not have been seen before

Sources: Dansereau et al. 1973, Dansereau et al. 1975, Liden & Graen, 1980, Graen & Uhl-Bien 1995, Liden et al.1997

**Table 2. LMX-7 measurement**

Questions

1. My unit director understands my problems and needs

2. My unit director would be personally inclined to use his/her power to help me solve problems in my work.

3. I can count on my unit director to "bail me out," even at his/her own expense when I really need it

4. I would view my working relationship with my unit director as extremely effective

5. I have enough confidence in my unit director that I would defend and justify his/her decisions if he/she were not present to do so

6. I usually know where I stand with my unit director.

7. I usually know how satisfied my unit director is with me.

8. My unit director recognizes my potential well.

Adapted from Scandura & Graen 1984, Graen & Uhl-Bien 1995, Bauer & Green 1996

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