
Electronic Theses and Dissertations, 2004-2019

2011

A Configural Approach to Patient Safety Climate: The Relationship Between Climate Profile Characteristics and Patient Outcomes

Sallie J. Weaver
University of Central Florida



Part of the [Industrial and Organizational Psychology Commons](#)

Find similar works at: <https://stars.library.ucf.edu/etd>

University of Central Florida Libraries <http://library.ucf.edu>

This Doctoral Dissertation (Open Access) is brought to you for free and open access by STARS. It has been accepted for inclusion in Electronic Theses and Dissertations, 2004-2019 by an authorized administrator of STARS. For more information, please contact STARS@ucf.edu.

STARS Citation

Weaver, Sallie J., "A Configural Approach to Patient Safety Climate: The Relationship Between Climate Profile Characteristics and Patient Outcomes" (2011). *Electronic Theses and Dissertations, 2004-2019*. 6655.

<https://stars.library.ucf.edu/etd/6655>



A CONFIGURAL APPROACH TO PATIENT SAFETY CLIMATE:
THE RELATIONSHIP BETWEEN CLIMATE PROFILE CHARACTERISTICS AND
PATIENT OUTCOMES

by

SALLIE J. WEAVER
M.S. University of Central Florida, 2008
B.S. The Florida State University, 2006

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Industrial Organizational Psychology
in the College of Sciences
at the University of Central Florida
Orlando, Florida

Summer Term
2011

Major Professor: Eduardo Salas

© 2011 Sallie Weaver

ABSTRACT

Patient safety climate is defined as a holistic snapshot of enacted work environment practices and procedures related to patient safety, derived from shared perceptions of social and environmental work characteristics. While patient safety climate has been touted as a critical factor underlying safe patient care, our understanding of input factors influencing shared climate perceptions and, in turn, the effects of climate as a collective, group-level construct on important outcomes remains underdeveloped, both theoretically and empirically. Therefore, the current study examines (1) the antecedents that impact individual patient safety climate perceptions and (2) the relationships between hospital unit patient safety climate and two important unit level outcomes: patient willingness to recommend a facility to others and patient safety. This study also examines climate strength—the degree to which climate perceptions are shared—as a moderator of these relationships.

While climate is conceptualized as a holistic description of the working environment, existing evidence has focused on relationships between the independent dimensions of patient safety climate and patient safety. No study to date has examined the configurations (i.e. patterns or profiles) among the multiple dimensions of patient safety climate or how these configurations are related to important employee and patient outcomes.

This gap is redressed in the current study by examining patient safety climate in terms of three profile characteristics: (1) climate elevation (i.e., mean positive or negative valence across all dimensions), (2) climate variability (i.e., variance among dimensions), and (3) climate shape (i.e., the pattern of peaks and valleys among climate dimensions). Evidence from studies of

general organizational climate suggests that the shape of the pattern among climate dimensions, the overall mean score across dimensions, and the degree to which dimension scores vary are predictive of employee attitudes, customer satisfaction, and organizational financial performance (Dickson et al., 2006; Joyce & Slocum, 1984; Jackofsky & Slocum, 1988; Gonzalez-Roma, Peiro, & Zornoza, 1999; Litwin & Stringer, 1968; Schulte et al., 2009). The current study, then, tests a theoretical model of patient safety climate examining the configural nature of the construct.

An archival dataset collected from seven hospitals located in a metropolitan area of the southeastern United States was utilized to test study hypotheses. Data was collected from 3,149 individuals nested within 84 hospital units using the Hospital Survey on Patient Safety Culture (Sorra & Nieva, 2004). Unit level patient safety and patient willingness to recommend was collected by the hospital risk management and nursing administration departments. Hierarchical linear modeling (HLM7; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) was utilized to test hypotheses regarding antecedents of individual level perceptions of patient safety climate to account for the fact that individuals were nested within hospital units. Traditional multiple regression analyses were utilized to test unit level hypotheses examining the relationships between unit level patient safety climate and patient outcomes.

Results indicated that unit membership was significantly related to individual climate perceptions—specifically, individual-level climate profile elevation. In turn, individual climate profile elevation and profile variability were related to employee willingness to recommend their organization to family and friends in need of care. At the unit level of analysis, climate profile variability was significantly related to patient willingness to recommend the organization to

others, and climate shape was found to be related to patient safety. Furthermore, these results were not dependent on climate strength.

The current study meaningfully contributes to the conceptual understanding of the patient safety climate construct by examining the degree to which configural aspects of the construct are predictive of important outcomes across multiple levels of analysis. In this way, it extends beyond existing studies of climate configurations to examine relationships at multiple levels of analysis and to also examine the moderating effects of climate strength. Practically, results provide insight into how the construct of patient safety climate can be used diagnostically and prescriptively to improve patient care and the working environment for providers. In addition to contributing to the theoretical understanding of the patient safety climate construct, this study also augments the evidence-base available to administrators, front-line providers, and regulators regarding how patient safety climate can be used to guide and align quality improvement efforts for greatest impact.

For my parents—thank you for supporting me in taking the road less traveled. It has made all the difference.

ACKNOWLEDGMENTS

This work is undoubtedly the product of the guidance, support, and love of many people. To Eduardo Salas, my mentor and friend—thank you for taking a chance and believing in me. You trusted in me before I trusted in myself. Thank you for always propelling me to push outside of my comfort zone, to grow, and to learn. To Kim Smith-Jentsch—thank you for challenging me to think critically, in new conceptual ways. You have instilled in me the importance of doing rigorous work that has impact. From you I have learned so much and I am proud to call you both a mentor and a friend. To Bob Pritchard— you have my deepest gratitude for providing me with a foundation for success. Thank you for guiding my early years in the program and for continuing to support me as a trusted advisor. I am grateful for your guidance and continuous encouragement both academically and personally. To Lee Adler and Stephen Knych—thank you for sharing your passion for patient safety and for embracing me as part of your multi-disciplinary perspective. Your forward thinking approaches to ensuring safety for patients and a healthy work environment for clinicians inspired in me a commitment to do work that makes a difference. To Nathan Carter—thank you for sharing your analytical expertise and for helping to enrich these ideas. I am grateful for your willingness and enthusiasm to teach and share. We all have much to learn from you. To Louise, Denis, Michelle S., Michelle D., Laurie and the numerous others instrumental in navigating the details of this study. Without your collaboration this would not have been possible. Thank you for being my data angels.

To Wendy, Julia, Dan, Debbie, Liz, Becki, Davin, Joe, Jessie, Marissa, and Millie—thank you for pushing me forward and reminding me to never, never, never give up. Thank you for

sharing this graduate experience and making it one that I cherish. I am lucky and proud to call you colleagues and most of all friends. To my family –this work is dedicated to you. I am indebted to you for your patience, generosity, and understanding throughout my graduate career. Most importantly, to my husband Saverio—thank you for keeping me grounded and for championing me on when I needed it most. Your patience and unending support have given me the strength to overcome setbacks and to stay focused. Thank you for creating beautiful moments during this long journey and reminding me to always enjoy the gifts life brings. Without you, this would not have been possible.

TABLE OF CONTENTS

LIST OF FIGURES	xi
LIST OF TABLES.....	xii
CHAPTER ONE: INTRODUCTION.....	1
1.1 Statement of the Problem.....	2
1.1.1 Gaps in Existing Theory	4
1.2 Purpose of Current Study.....	14
1.3 Organization of This Manuscript.....	15
1.4 Theoretical Approach.....	16
1.4.1 General Organizational Climate	19
1.4.2 Safety Climate.....	21
1.4.3 Multi-Level Theory.....	25
1.4.4 Configural Theory & Climate Profile Characteristics	28
1.4.5 High Reliability Theory	35
1.4.6 Summary of Theoretical Approach.....	39
1.5 Summary of Chapter One	40
CHAPTER TWO: LITERATURE REVIEW.....	42
2.1 Patient Safety Climate.....	42
2.1.1 Defining Patient Safety Climate	43
2.1.2 The Dimensions of Patient Safety Climate.....	48
2.2 Patient Safety Climate as a Dependent Variable: How do Climate Perceptions Arise?	49
2.3 Patient Safety Climate as a Predictor Variable: What Impact Does Climate Have on Outcomes?.....	54
2.3.1 Patient Safety Climate and Patient Safety Behaviors	55
2.3.2 Patient Safety Climate, Errors, and Quality of Care.....	56
2.3.3 Patient Safety Climate & Patient Satisfaction	60
2.3.4 Patient Safety Climate & Employee Satisfaction	61
2.3.5 Configural Studies of Patient Safety Climate	62
2.4 Patient Safety Climate and Climate Strength.....	63
2.5 Chapter Two Summary	66
CHAPTER THREE: HYPOTHESES.....	68
3.1 The Antecedents of Patient Safety Climate: What Factors Shape Individual Perceptions of Patient Safety Climate?.....	70
3.1.1 Organizational Membership.....	71
3.1.2 Type of Unit.....	71
3.1.3 Specific Unit Membership	73
3.1.4 Individual Differences	75
3.2 The Outcomes of Patient Safety Climate: Do Patient Safety Climate Profile Characteristics Predict Patient Outcomes?	77

3.2.1 Patient Safety Climate Profile Characteristics as Predictors of Patient Safety	78
3.3 Does Climate Strength Moderate Patient Safety Climate—Outcome Relationships?	87
3.4 Do Patient Outcomes Affect Subsequent Patient Safety Climate Perceptions?	89
3.5 Chapter Three Summary	92
CHAPTER FOUR: METHODOLOGY	94
4.1 Sample	94
4.2 Power Analysis	95
4.3 Measures	96
4.3.1 Patient Safety Climate	96
4.3.2 Patient Satisfaction	98
4.3.3 Patient Safety	99
4.4 Operationalizing Unit Level Patient Safety Climate Profile Characteristics	100
4.5 Analysis Strategy: Individual Level Hypotheses	102
4.5.1 Cluster Analysis of Individuals	103
4.6 Analysis Strategy: Unit Level Hypotheses	106
4.6.1 Cluster Analysis of Units	107
CHAPTER FIVE: RESULTS	109
5.1 Individual Level Dependent Variables: Analyses and Results	109
5.1.1 Dependent Variable: Climate Profile Elevation	111
5.1.2 Dependent Variable: Individual Climate Shape (Collective Climate Membership)	116
5.1.3 Individual Level Exploratory Analyses	116
5.2 Unit level Dependent Variables: Analyses and Results	119
5.2.1 Climate Profile Characteristics and Patient Safety	120
5.2.2 Climate Profile Characteristics and Patient Willingness to Recommend	123
5.2.3 Climate Profile Characteristics and Patient Safety over Time	123
5.2.4 Climate Profile Characteristics and Patient Willingness to Recommend Over Time	124
5.2.5 Examining Climate Strength as a Moderator	125
5.2.6 Patient Outcomes and Subsequent Patient Safety Climate Profile Characteristics	130
CHAPTER SIX: DISCUSSION	136
6.1 Summary of Theoretical Implications	141
6.2 Practical Implications	143
6.3 Limitations & Avenues for Future Research	145
6.4 Closing Summary	148
APPENDIX A: STUDY HYPOTHESES	150
APPENDIX B: HSOPS DIMENSIONS, CORRESPONDING QUESTIONS, SCALE RELIABILITIES, & ICCs	153
REFERENCES	157

LIST OF FIGURES

Figure 1. A multi-level model of safety climate (Zohar, 2003).....	22
Figure 2. Example of climate profile elevation, variation, and shape adapted from Schulte et al. (2009).....	30
Figure 3. A model of hypothesized relationships tested in the present study.....	70
Figure 4. Five cluster solution for climate shape at the individual level of analysis.....	104
Figure 5. Five climate shapes based on standardized scores.	104
Figure 6. Three climate shapes at unit level of analysis.	107
Figure 7. Three climate shapes at the unit level of analysis with standardized scores.	108

LIST OF TABLES

Table 1. A summary of the theoretical schools of thought underlying the current study.....	17
Table 2. The five processes of collective mindfulness articulated in high reliability theory (Adapted from Weick & Sutcliffe, 1999, 2007).	37
Table 3. A taxonomy of patient safety climate shapes based upon Schneider et al. (1998) and Schulte et al. (2009).	83
Table 4. Study measures and levels of analysis at which they were collected.	100
Table 5. Individual level climate shape descriptive statistics.	105
Table 6. Unit level climate shape descriptive statistics.	108
Table 7. Descriptive statistics and zero order correlations among study variables of interest at the individual level of analysis (n = 3,149).	110
Table 8. Three level null model examining individual climate profile elevation.....	112
Table 9. Two level models examining individual climate profile elevation.....	115
Table 10. Random coefficient model of employee willingness to recommend.....	118
Table 11. Descriptive statistics and correlations for the unit level of analysis.....	121
Table 12. Multiple regression results examining the relationships between the climate profile characteristics, willingness to recommend, and patient safety.	122
Table 13. Multiple regression results examining the change in patient safety between year one and year two on the year one profile characteristics.....	124
Table 14. Multiple regression analysis testing climate strength as a potential moderator of the profile elevation—patient outcome relationships.	127

Table 15. Multiple regression analysis testing climate strength as a potential moderator of the profile variability—patient outcome relationships.	128
Table 16. Multiple regression analysis testing climate strength as a potential moderator of the profile shape—patient outcome relationships.....	129
Table 17. Multiple regression analysis testing year one patient safety scores as a potential moderator of the relationship between profile elevation in year one and elevation in year two.	132
Table 18. Multiple regression analysis testing year one patient safety scores as a potential moderator of the relationship between profile variability in year one and variability in year two.	133
Table 19. Logistic regression analysis for variables predicting supportive climate shape in year two (n = 36) compared to other climate shapes (n = 48).	135

CHAPTER ONE: INTRODUCTION

“The search for safety is not just a hunt for error”

-G. I. Rochlin, *Safe Operation as a Social Construct*

As the US stands at the precipice of a new era in healthcare, the existing evidence strongly suggests that a revolutionary approach to ensure safe, effective, and efficient patient care is needed. In a 2010 report comparing seven well-developed nations (Australia, Canada, US, UK, Germany, Netherlands, New Zealand), the US ranked dead last on safe care and sixth on coordinated care (Davis, Schoen, & Stremikis, 2010). Despite national requirements for error reporting, 31% of providers reported that their organization had no process for identifying adverse events and taking follow-up action. Additionally, 16% of patients believed that a medical mistake had been made in their care within the last two years, 14% believed they had been given the wrong medication or dose, and 17% reported that notification of an abnormal test result was delayed. Similar estimates suggest that over 100,000 patients continue to die annually due to medical errors or hospital acquired infections over a decade after the landmark *To Err is Human* report identified the magnitude of the patient safety problem in the U.S. care system (U.S. Department of Health & Human Services Office of the Inspector General, 2009; Jewell & McGiffert, 2009). While much work has been dedicated to understanding the phenomena of patient safety, this data suggests the need for more in-depth study of the workplace factors, such

as patient safety climate, that contribute to patient harm in order to increase our evidence-base regarding the most effective safeguards.

1.1 Statement of the Problem

Efforts to understand human error in the context of complex systems, such as healthcare, suggest that safety climate is an important factor in both the theoretical study and applied practice of safe organizational operations across a variety of high risk environments (Braithwaite, Westbrook, Travaglia, Hughes, 2010; Reason, 1990; Sutcliffe, Lewton, & Rosenthal, 2004; Wiegmann, Zhang, von Thaden, Sharma, & Mitchell, 2002; Schulte, Ostroff, Shmulyian, & Kinicki, 2009; Zohar, Livne, Tenne-Gazit, Admi, & Donchin, 2007). Patient safety climate is defined as a set of attributes describing the psycho-social and structural elements of the work environment including the policies, procedures, norms enacted in daily work regarding patient safety (Hellriegel & Slocum, 1974; Zohar et al., 2007). More specifically, it is a perceptual construct that reflects employee's non-evaluative perceptions of this constellation of attributes and is conceptualized as primarily a group level construct that reflects shared perceptions that emerge among members of meaningful social groups such as teams or units through processes of interaction (Kozlowski & Klein, 2000; Schneider & Reichers, 1983; Smith-Jentsch, Weaver, Wiese, & Kraiger, 2007). Patient safety climate is generally defined as a facet-specific climate, meaning that it is a sub-type of general organizational climate that focuses on employee perceptions of a specific aspect of their work environment such as safety. Specifically, it is characterized by shared, multi-dimensional perceptions of work environment policies, practices,

and norms regarding patient safety. Furthermore, these perceptions are descriptive, rather than evaluative. As defined by Hellriegel and Slocum (1974), climate refers to

“...a set of attributes which can be perceived about a particular organization and/or its subsystems, and that may be induced from the way that organization and/or its subsystems deal with their members and environment (p. 256)”

Climate has primarily been conceptualized as a collective phenomenon that emerges through compositional processes (Kozlowski & Klein, 2000); that is, climate perceptions originate with individual employees and converge at higher levels of analysis (e.g., team, unit, organization). This definition suggests that climate is an isomorphic construct across levels of analysis; that is, at the group level of analysis unit climate retains the same meaning, content, and relationships to other constructs as individual perceptions of climate. Shared perceptions of climate among group members emerge from cognitive appraisal and collective sensemaking processes (James, 1982; Reichers & Schneider, 1990), provide cues to employees regarding behavior-outcome expectancies (Zohar, 2003), and are distinct from perceptions held by other groups within the same organization (Joyce & Slocum, 1984). As such, patient safety climate is a holistic representation of the perceived environmental context that shapes employee behaviors on the job by providing cues regarding the perceived priority of patient safety relative to other competing organizational goals such as production or speed (Zohar & Luria, 2005). In short, climate has been summarized as the personality of a particular working environment.

Because climate is viewed as a holistic representation of the working environment, its scientific conceptualizations include perceptions of both the social and structural aspects of the work environment (Ostroff, Kinicki, & Tamkins, 2003). Social aspects of the work environment

include managerial support for patient safety, teamwork within and across organizational units, perceived psychological safety for speaking up and identifying near misses, and support for continuous learning and structural elements such as staffing (Colla, Bracken, Kinney, & Weeks, 2005; Sorra & Nieva, 2004). While climate is multi-dimensional, it is important to note that it is defined as a gestalt construct; that is, the construct itself represents a holistic perception of the work environment that is greater than the sum of its individual dimensions and that the individual dimensions are not interchangeable or merely compensatory. This definition implies a need to study climate from a configural perspective focused on understanding the constellation of dimensions as whole rather than a reductionist perspective focused on identifying the effects of each dimension in singularity (Meyer, Tsui, & Hinings, 1993). Understanding the relationships among the various dimensions of climate by focusing on understanding climate from a configural perspective has been identified as a critical need (Ostroff et al., 2003; Schneider et al., 2011).

1.1.1 Gaps in Existing Theory

A positive, supportive climate for patient safety has been suggested as a core mechanism underlying safe, effective, and timely patient care. It has been implicated as critical for continuous learning, effective teamwork, safety behaviors such as error reporting, and safety outcomes such as adverse events (AHRQ, 2009; Singer, Gaba, Geppert, Sinaiko, Howard et al., 2003). However, there is a limited body of empirical work informed by this theory that has examined the antecedents and consequences of patient safety climate. Studies of patient safety

climate to date have tended to offer little to no framework, discussion, or theoretical rationale for hypothesized relationships (Reiman, Pietkainen, & Oedwald, 2010). For example, the literature rarely reflects explicit consideration of how patient safety climate perceptions are formed or how patient safety climate relates to incident reporting and other indicators of actual patient harm, such as adverse events (e.g., Braithwaite et al., 2010; Kivimaki, Vanhala, Pentti, Lansisalmi, Virtanen et al., 2007; Weingart, Farberstein, Davis, & Phillips, 2004). Thus, theoretical and empirical questions remain regarding (1) the most important factors influencing individual perceptions of patient safety climate, (2) the relationships between patient safety climate and important outcomes such as patient harm and patient satisfaction, and (3) boundary conditions that potentially moderate these relationships, such as climate strength.

1.1.1.1 Missing Link: Etiology of Patient Safety Climate

Overwhelmingly, the focus of safety research to date has been on the relationship between patient safety climate and outcomes. There has been almost no theoretical consideration regarding how patient safety climate forms or the processes through which employees come to share perceptions of patient safety. Understanding the core influences on climate (i.e., inputs) is critical for developing a comprehensive theory of patient safety climate. However, there is a significant body of work examining the etiology of general organizational climate summarized below that suggests several mechanisms through which patient safety climate may develop.

1.1.1.2 Structuralism, Attraction-Selection-Attrition, and Social Interactionism

Given that climate is defined as an emergent collective property, several theoretical frameworks have been developed for describing the processes through which climate forms and develops (Ashforth, 1985; Ostroff, Kinicki, & Tamkins, 2003; Schneider, Ehrhart, & Macey, 2010; Schneider & Reichers, 1983). While not completely orthogonal, these frameworks differ in the extent to which they view climate as either a product of *structural elements* of the work environment (e.g., size, centralization, specialization, leadership; Payne & Mansfield, 1973; Payne & Pugh, 1976), a product of *attraction-selection-attrition (ASA)* processes (e.g., degree that personal values, personalities, and background characteristics fit with others in the organization or unit [Schneider, 1987; Schneider, Goldstein, & Smith, 1995]), or a product of *symbolic interactionism* (e.g., collective sense-making processes occurring through meaningful interactions among employees; Blumer, 1969; Schneider & Reichers, 1983).

Structuralism posits that the characteristics of the organization provide employees with a common reality. From this perspective simply being exposed to similar stimuli is enough for employees to create similar cognitive perceptions of this environment. There has been limited empirical support for the structuralist perspective, however, especially when operationalized in terms of physical proximity. As pinpointed by Osteroff and colleagues (2003), even though employees may be working in close physical proximity and be exposed to the same organizational characteristics, structuralism does not explicitly account for individual differences among employees in terms of what characteristics of the environment they attend to and the sensemaking processes they use to interpret these characteristics. Thus, the degree to which

structure influences climate is likely to depend on the degree to which organizational characteristics create a strong situation (Mischel, 1973) that provides clear, unambiguous information regarding how to interpret salient cues. This perspective argues that, by creating a strong situation, employees develop shared schemas regarding the relative priority of organizational goals and are provided with strong cues regarding appropriate behavior, attitudes, and cognitions.

The second perspective focuses on the degree of homogeneity among organizational members that is due to the ASA paradigm which argues that organizations become more homogeneous over time because employees are attracted to and stay with organizations that fit well with their personal values and attributes (Schneider & Reichers, 1983). The ASA perspective argues that socialization processes play a significant role in shaping the values and goals of new organizational members and that they became more homogenous in terms of perspectives, goals, and even individual difference characteristics given those individuals who did not fit well with organization would turnover. Relative to the issue of climate formation, the ASA school of thought argues that through these processes of homogeneity that organizational members would perceive their working environment through similar lenses and come to have highly shared perceptions. This perspective suggests that the degree to which members are similar in terms of individual differences such as personality, values, needs, and even professional identity impacts climate.

Contrasting the ASA and organizational paradigms, the third approach, *symbolic interactionism*, suggests that physical proximity and the degree of similarity on deep or surface

level individual differences are not enough to produce shared perceptions of the work environment. Instead, this perspective argues that meaningful social interaction is the critical lever which allows for comprehensive, shared mental models of the work environment to be developed. Mental models refer to an organized cognitive representation of a given system, such as the work environment, one's teammates, or one's tasks (Cannon-Bowers, Salas, & Converse, 1993; Mohammed, Klimoski, & Rentsch, 2000; Smith-Jentsch, Mathieu, & Kraiger, 2005). In essence one's mental model of the work environment refers to one's cognitive map or schemata of the work environment and the relationships among elements of the environment.

These cognitive representations can come to be shared among members of the same work group, team, or other collective through symbolic interaction processes (Cannon-Bowers, Salas, & Converse, 1993). For example, working together interdependently and engaging in social exchange requires employees to jointly consider which aspects of the work environment are most critical to attend to. Doing so helps to develop shared mental models of the environment, task, team interactions and interdependencies, and organizational goals that are necessary to effectively complete interdependent work (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Rouse, Cannon-Bowers, & Salas, 1992). Symbolic interactionism argues that even if employees are co-located and experiencing the same working environments that shared perceptions are primarily constructed through meaningful, repeated social interactions. This perspective has been supported to a larger extent, with studies of collective climate—climates that are formed on the basis of statistical similarity using cluster analysis rather than pre-determined, formally imposed groupings such as workgroups, departments, or units (Joyce &

Slocum, 1984; Smith-Jentsch et al., 2010). For example, studies of collective climates have been shown to account for unique variance in individual climate perceptions above and beyond physical location and to be more related to team membership, suggesting that interdependent social interaction is a critical aspect of climate formation (Smith-Jentsch et al., 2010)

In one of the few attempts to explicitly address the theoretical underpinning of the patient safety climate construct Reiman, Pietikainen, and Oedewald (2010) developed a multi-level framework that conceptualizes patient safety culture in terms of organizational dimensions, social processes, and psychological dimensions at the individual level. Organizational dimensions reflect the systems, policies, and structures in place within the organization, including the management system and hierarchical structure, information flow and cooperation practices, management of resources, and behaviors of management and immediate supervisors regarding patient safety. These dimensions are hypothesized to create the preconditions for the psychological dimensions and provide cues for social processes. Social processes are identified as critical factors in meaning creation and include: collective sensemaking, normalization of cues, optimization and local adaptation, and social identity maintenance processes. Specifically, social processes impact perception and interpretation of the organizational dimensions and also contribute to the development and adaptation of organizational practices over time. They also are conceptualized as constraining and enabling the psychological dimensions at the individual level.

The psychological dimensions are defined as the individual differences among individual employees concerning their work such as perceived meaningfulness and control over their work, sense of personal responsibility, knowledge of safe practices and hazards to patient safety, task

knowledge, and knowledge of stake holder expectations regarding one's own work. The psychological dimensions provide the individual preconditions for safe performance and are hypothesized to direct and steer the organizational dimensions. The psychological dimensions also feed back into the social processes to affect collective interpretation of the organizational dimensions. In this way Reiman et al. (2010) suggest that patient safety climate creates the preconditions for safe employee behavior by influencing the range of task strategies employees draw on to achieve safety.

Overall, these various perspectives suggest that there are multiple factors that uniquely contribute to an individual's patient safety climate perceptions, including organizational membership, unit membership, and the type of unit they are a member of (e.g., surgical unit, intensive care unit). However, no study to date has examined the degree to which such factors impact patient safety climate.

1.1.1.3 Missing Link: Patient Safety Climate and Outcomes

Without firm theoretical grounding it is not overly surprising that only limited evidence has supported the link between safety climate and patient outcomes beyond simple correlational relationships (e.g., Davenport, Henderson, Mosca, Khuri, & Mentzer, 2007; Mardon, 2008). These correlations have tended to be statistically weak (e.g., $r = .17$ to $-.29$) and do not provide insight into a causal relationship between patient safety climate and patient outcomes. This also highlights that studies of patient safety climate to date have primarily taken a reductionistic approach; that is, they have examined each individual dimension of climate in isolation rather than considering climate as a holistic compound construct. This is problematic given that climate

is defined as a gestalt perception of the work environment that *as a whole* provides cues regarding the priority of patient safety relative to other goals such as efficiency or productivity (Ostroff & Schmitt, 1993).

Alternatively, a configural perspective would suggest that the theoretical and empirical focus should be on the pattern of relationships among the components that comprise climate in order to more fully reflect its conceptualization as a compound construct (Meyer, Tsui, & Hinings, 1993). Conceptually, configural theory would suggest that the individual dimensions of climate take their meaning from the whole and that this meaning is lost when they are considered in isolation. Thinking specifically about safe operations in high risk environments such as healthcare, High Reliability Theory (HRT; Weick & Sutcliffe, 2007) incorporates a configural perspective by arguing that safe outcomes are the product of a collection of five organizational processes working in concert, including: a preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise. Specifically, HRT posits that all five processes interact in order to achieve safe outcomes and that organizational climate is one mechanism reflecting the degree to which organizational policies, practices, and norms support these five processes. From this perspective, climates that reflect a pattern of support for these processes are likely to provide clear cues to employees that patient safety is a high priority. By providing consistent, salient cues that patient safety is a valued priority in daily practices, it is likely that such climates motivate employees to engage in safe behaviors that, in turn, result in safer outcomes (Zohar, 2003; Zohar et al., 2007). However, configurations of patient safety climate have yet to be examined in the literature to date.

1.1.1.4 Missing link: Climate Strength as A Boundary Condition of the Patient Safety climate-Outcome Relationship

In addition to identifying whether there is a meaningful relationship between patient safety climate and outcomes, it is important to identify moderating variables that affect the strength and/or direction of these relationships. Examining moderating relationships provides insight into boundary conditions of a particular relationship; that is, it provides insight into the extent to which a relationship changes given a particular set of conditions and helps uncover underlying reasons for differential relationships across groups (Aguinis, 2004).

Given that patient safety climate is conceptualized as an emergent construct, one likely moderator of the relationship between climate and outcomes is climate strength—the degree to which group members share similar perceptions regarding patient safety practices, policies, and values (Dawson, Gonzalez-Roma, Davis, & West, 2008; Dickson et al., 2006; Gonzalez-Roma, Perio, & Tordera, 2002; Schneider, Ehrhart, & Macey, 2011). In the context of multi-level theory, climate has traditionally been conceptualized using a direct consensus or referent-shift model, meaning that within-unit agreement was considered a prerequisite for aggregation of individual climate perceptions to represent higher level unit or organizational constructs (Chan, 1998; Kozlowski & Klein, 2000). These models of climate assume that members of a particular unit would need to show a satisfactory level of agreement before their responses could be combined to form a higher level construct such as unit climate. The majority of studies of patient safety climate have been conducted under this assumption (Braithwaite et al., 2010; Hoffman & Mark, 2006; Huang, Clermont, Kong, Weissfeld, Sexton et al., 2010; Lyons, 2009; Sammer, 2009; Sexton, Helmreich et al., 2006; Sexton, Holzmueller et al., 2006; Singer, Lin, Falwell, Gaba, &

Baker, 2009). Once a threshold level of agreement among group members is reached, as indicated by statistical indicators of agreement such as interclass correlation coefficients, these studies generally consider variation among group members as statistical error.

However, multi-level theory suggests that while within-unit agreement is an important aspect of a higher order construct such as unit level climate, there are likely varying degrees of agreement among unit members and that this variation can impact the relationships with high order constructs. That is, members of the same unit or group are unlikely to agree 100% on their perceptions of climates and this variation is likely to affect the degree to which climate has an effect on outcomes. While consensus models of climate disregard within group variance once a particular threshold necessary to justify aggregation is reached, dispersion models assume that the degree of variability among members of a given unit, group, or other meaningful social entity is a critical aspect of higher order constructs (Chan, 1998; Kozlowski & Klein, 2000).

Specifically, stronger climates suggest that group members perceive events similarly, use similar sensemaking processes to interpret stimuli, and that there are salient, unambiguous expectations regarding behavioral norms which, in turn, are likely to create behavioral, attitudinal, and cognitive consistency among group members (Schneider, Salvaggio, & Subirats, 2002). Strong climates theoretically produce strong situational influences on behavior by providing consistent, unambiguous cues regarding the relative priority of patient safety, information about the likelihood of reinforcement for engaging in behaviors that support safety, and negative consequences for unsafe behavior (Dickson, Resick, Hanges, 2006). Empirically, the theoretical effect of climate strength has been supported in studies of general organizational climate, safety

climate, and organizational outcomes (e.g., Schneider, Salvaggio, Subirats, 2002; Colquit, Noe, & Jackson, 2002; Zohar & Luria, 2005). However, the impact of climate strength on the patient safety climate—outcome relationship has only begun to be investigated (Zohar et al., 2007; Zohar, 2010).

1.2 Purpose of Current Study

The current study, thus, aims to extend our understanding of both the inputs and outcomes of patient safety climate through the lens of configural theory (Meyer, Tsui, & Hinings, 1993, multi-level theory (Chan, 1998; Kozlowski & Klein, 2000), and high reliability theory (Weick & Sutcliffe, 2007). Specifically, this study will examine: (1) the degree to which organizational membership, unit membership, and clinical specialization (i.e., unit type) impact individual perceptions of climate in order to better understand the antecedents that affect individuals perceptions of climate; (2) how the patterns among the dimensions of climate at the unit level of analysis (i.e., climate profile characteristics), in turn, affect unit level patient satisfaction and patient safety; and (3) how the degree to which climate perceptions are shared among unit members (i.e., climate strength) moderates the unit climate—unit outcome relationships . This study will supplement previous work exploring the relationship between configurations of climate and important outcomes (e.g., Schulte et al., 2009; Sine & Northcutt, 2008) by examining the relationship between three safety climate profile characteristics (elevation, variability, and shape), patient satisfaction, and patient safety. Profile elevation refers to the overall positive or negative valence across all of the climate dimensions and it is operationalized as the overall mean across all dimensions. Profile variability refers to the

average degree of variation among all dimensions and profile shape refers to the pattern of peaks and valleys among the dimensions (Joyce & Slocum, 1984; Schulte et al., 2009; Tabachnick & Fidell, 2001). These characteristics are defined and discussed in greater detail in later sections of this chapter.

Overall, this work will provide a unique contribution to the existing literature on patient safety climate by providing insight into the factors that shape individual patient safety climate perceptions, introducing configural thinking to the theoretical development of the patient safety construct, and also examining potential boundary conditions that affect the relationship between patient safety climate and outcomes. Methodologically, this study introduces pattern-based measurement approaches to the patient safety construct and includes two years of archival data in order to begin testing reciprocal relationships between variables of interest.

1.3 Organization of This Manuscript

The remainder of this manuscript is organized as follows. The remaining sections in Chapter One provide a more detailed introduction to the theoretical foundations guiding the current study. Specifically, theories of general organizational climate and general safety climate are summarized to provide the foundations of a nomological net for the patient safety construct, an introduction to configural theory and the notion of climate profile characteristics is provided, and the tenants of high reliability theory are reviewed to provide a theoretical foundation for the specific hypotheses tested in this study. Chapter Two summarizes results of a review of relevant literature dedicated to examining existing theories and empirical studies of patient safety climate

to date. This review focuses on reviewing existing theory and literature concerning the antecedents and outcomes of climate, as well as summarizing existing literature regarding climate strength. Building on this review Chapter Three outlines the specific hypotheses tested in this study and Chapter Four describes the methodology used to test hypothesized relationships among focal variables. Chapter Five presents study results and Chapter Six includes a discussion of study results, limitations, and suggestions for future research.

1.4 Theoretical Approach

This study draws from several schools of thought including theories of general organizational climate (i.e., molar organizational climate; Schneider, 1983), multi-level theories of safety climate (Zohar 2000; 2005), and conceptual frameworks describing high reliability organizations (Weick & Sutcliffe, 2001, 2007). These theoretical perspectives are summarized here to provide context for the current study. Table 1 summarizes key aspects of each theory relevant to the present study.

Table 1. A summary of the theoretical schools of thought underlying the current study.

<i>Theory</i>	<i>Contributions</i>	<i>Relevant Citations</i>
General Organizational Climate Theory	<ul style="list-style-type: none"> • Climate represents perceptions of general enforced policies, procedures, and reward structures that provide cues regarding behavior-outcome contingencies. • Climate is conceptualized as both a multi-dimensional construct and a holistic representation of contextual factors impacting organizational behavior. • Given this holistic conceptualization, the greatest contribution to climate theory comes from studies of the dimensions as a bundle or configuration. • The effect of climate on employee performance and organizational effectiveness depends on degree to which perceptions are shared among members of a given collective (i.e., organization, unit, or other meaningful social entity). • Facet-specific climate perceptions (e.g., climate for safety) exist given that organizations strive to attain multiple goals simultaneously. 	Carr et al., 2003; Ostroff et al., 2003; Schneider et al., 2011; Schulte et al., 2009
Safety Climate Theory	<ul style="list-style-type: none"> • Safety climate refers to shared perceptions of enacted safety policies and procedures. • Safety climate impacts perceived behavior-outcome contingencies that motivate safe behavior. • Employees develop concurrent, coexisting safety climate perceptions across multiple levels of analysis by redefining their perception referent as either the organization as a whole or their local unit, group, or team. 	Zohar 2000, 2003; Zohar & Luria, 2005
Multi-Level Theory	<ul style="list-style-type: none"> • A multi-level model includes any model that uses data gathered at one level of analysis (e.g., from individual employees) to represent a higher level construct (e.g., unit level climate) • Multi-level models of climate (either implicitly or explicitly) have tended to be <i>compositional models</i>—meaning that they assume that the higher level construct is essentially the same as the sum of its lower level components. • Agreement among group-members is a critical assumption of compositional models. • Organizational climate and safety climate have primarily been conceptualized using the assumptions of “direct consensus” models, meaning that lower level individual perceptions of climate converge to form the higher level climate construct (e.g., unit climate, organizational level) that essentially has shares the same properties as the lower level components. 	Chan, 1998; Klein & Kozlowski, 2000; Kozlowski & Klein, 2000; Klein, Conn, Smith, & Sorra, 2001

<i>Theory</i>	<i>Contributions</i>	<i>Relevant Citations</i>
Multi-Level Theory –Con’t-	<ul style="list-style-type: none"> • In direct consensus models within-unit agreement is a prerequisite for aggregation of individual climate perceptions to represent higher level constructs such as unit-climate. • Dispersion models assume within-unit variability is critical aspect of higher order constructs. Instead of treating within-unit agreement as a pre-requisite for aggregation, dispersion models are specifically concerned with the antecedents and consequences of within group differences. • Climate strength is an example of a higher level construct based in a dispersion model. 	
Configural Theory	<ul style="list-style-type: none"> • Focus on the pattern of relationships among the components that comprise climate to more fully reflect its conceptualization as a compound construct comprised of multiple dimensions. • Suggests that the individual dimensions of climate take their meaning from the whole and that this meaning is lost when they are considered in isolation. • Assumes there are complex interactions and nonlinear relationships among the constellation of climate dimensions and that they reciprocally influence one another. Assumes the dimensions are not interchangeable or necessarily compensatory. • Drawing on mathematical conceptualizations of patterns, <i>profile elevation</i>, <i>variability</i>, and <i>shape</i> have been suggested as three profile characteristics that capture unique aspects of compound constructs. 	Adler & Borys, 1996; Meyer, Tsui, & Hinings, 1993; Miller, 1996; Schneider et al., 2011; Schulte et al., 2009
High Reliability Theory	<ul style="list-style-type: none"> • Highly reliable outcomes (e.g., safety) are the product of continual mutual re-adjustment of collective activities underlain by a common, cognitive framework dedicated to identification of unanticipated cues indicative of potentially unfavorable or dangerous outcomes. • Three processes of anticipation—preoccupation with failure, reluctance to simplify, sensitivity to operations—and two processes of containment—commitment to resilience and deference to expertise—create a state of collective mindfulness that drives the adaptive behaviors that produce reliably safe outcomes. • Organizational culture and climate are suggested as a means to institutionalize collective mindfulness and support use of the five HRT processes. 	Reason, 2000; Weick & Sutcliffe, 1999, 2001, 2007; Wilson, 2007; et al., 2005

1.4.1 General Organizational Climate

Theories of general organizational climate describe the construct as subjective, malleable collective perceptions of enacted organizational policies, procedures, behavior-outcome contingencies, and other reward structures; that is, perceptions based on policies (either formal or informal) that are actually reinforced during daily operations (Ostroff, Kinicki, & Tamkins, 2003; Schneider, Ehrhart, & Macey, 2011). Compared to facet-specific types of climate such as climate for safety or customer service, general organizational climate is defined as perceptions of general organizational goals and contingencies that suggest how to best attain these goals (Carr, Schmidt, Ford, & DeShon, 2003). As such, molar organizational climate has been identified as a core theoretical driver of collective attitudes and behaviors, which in turn drive organizational outcomes (Campbell, Dunnette, Lawler, & Weick, 1970).

Overall, climate is conceptualized as a multi-dimensional construct designed to represent a holistic snapshot of the context impacting organizational behavior (James et al., 2008; Schein, 2000). Originally defined as a holistic construct representing the overarching psychosocial context influencing collective behavior (e.g., Lewin, 1951), climate is rarely studied as such. As suggested by Shulte and colleagues (2009), most studies of climate focus on individual dimensions of climate (e.g., teamwork, supervisor/management expectations) without considering the configurations or interactions among these various dimensions. As such, studies focused on individual dimensions are deficient in operationalizing climate as a holistic construct. It has been suggested that studying the patterns among climate dimensions may provide more theoretically meaningful insight into the construct and its relationships with collective processes

and outcomes (Rousseau & Fried, 2001). The limited empirical work to date that has explicitly examined climate profiles in terms of the pattern or configuration among dimensions suggests that this holistic approach explains significant variance in both internal and external organizational outcomes. For example, in two studies of general organizational climate perceptions in a sample of bank employees Schulte et al. (2009) found that the average level of climate across all dimensions accounted for 30-78% of the variance in employee attitudes, employee perceptions of service quality, and turnover intentions. Variability among the climate dimensions accounted for an additional 3% of the variance in these internal outcomes. Conversely, climate profile shape (i.e., the pattern of scores among climate dimensions) accounted for nearly 20% of the variance in organizational financial performance.

The general climate literature also suggests that climate exerts the strongest effect on collective attitudes, behaviors, and cognitions when characterized by a strong emergent process; that is, when these perceptions are highly shared among members of a meaningful social group such as a team or unit (James & Joyce, 1974; Ostroff et al., 2003). Highly shared climate perceptions theoretically create a strong situation that exerts a robust influence over the behavioral, affective, and cognitive aspects of employee performance, which, in turn impact collective organizational outcomes (Lievens, Chasteen, Day, & Christiansen, 2006). Conversely, when climate perceptions vary among group members there is theoretically greater variability in the three core aspects performance and thus a weaker relationship between climate and organizational outcomes. This is supported by findings from studies of climate strength, a construct representing the degree to which climate perceptions are shared among members of a given group, unit, or organization (Carr, Schmidt, Ford, & DeShon, 2003).

To best understand a specific criterion, such as patient safety, a specific predictor is needed. While general organizational climate has been empirically linked to patient safety, generally these results have been weak correlations (Flin, 2007; Tregunno, 2004), suggesting that the bandwidth of the predictor needs to be more narrowly matched to the criterion (Ajzen & Fishbein, 1973; Carr et al., 2003). In this instance bandwidth refers to the complexity or breadth of a construct. Conceptually, Schneider and Reichers (1983) and Rousseau (1988) argued that, to be meaningful as a construct, climate must have a facet-specific referent; that is, a “climate for” something such as a climate for safety or a climate for customer service. In line with this notion, organizational climate theorists suggest that multiple climates for particular domains such as safety (Zohar, 2000), customer service (Schneider, White, & Paul, 1998), creativity and innovation (Ekvall, 1996; Klein & Knight, 2005), and justice and ethics (Dickson, Smith, Grojean, & Ehrhart, 2001; Liao & Rupp, 2005; Offerman & Malmut, 2002) exist simultaneously given that organizations strive to attain multiple goals (Ostroff & Schmitt, 1993; Zohar, 2003). These “facet-specific” climates (Anderson & West, 1998, p. 237) offer a more narrowly defined predictor from which to assess the impact of climate on important processes and outcomes.

1.4.2 Safety Climate

Safety climate is defined as “shared perceptions with regard to [enacted] safety policies, procedures, and practices” (Zohar, 2003, p. 125). In this sense Zohar conceptualizes safety climate as arising across multiple levels of analysis (e.g., unit safety climate vs. organizational safety climate) with the primary referent for perception formation being patterns of managerial action regarding safety. Furthermore, Zohar (2000, 2003) argues that safety climate perceptions

refer exclusively to perceptions of policies actually enforced in daily work activities given that local managers at the unit or department level can vary the degree to which they enforce formal organizationally-declared safety policies. Empirical examinations of multi-level models of safety climate have supported the notion that employees develop complementary climate perceptions across multiple levels of analysis (e.g., overall organizational safety climate vs. unit safety climate) based upon consensual referent shift (Zohar, 2000; 2003; Zohar & Luria, 2005). Specifically, the current study draws on the multi-level model of safety climate developed by Zohar (2003), which suggests that employees develop concurrent, coexisting climate perceptions by redefining their perception referent as either the organization as a whole or their local unit, group, or team (see Figure 1).

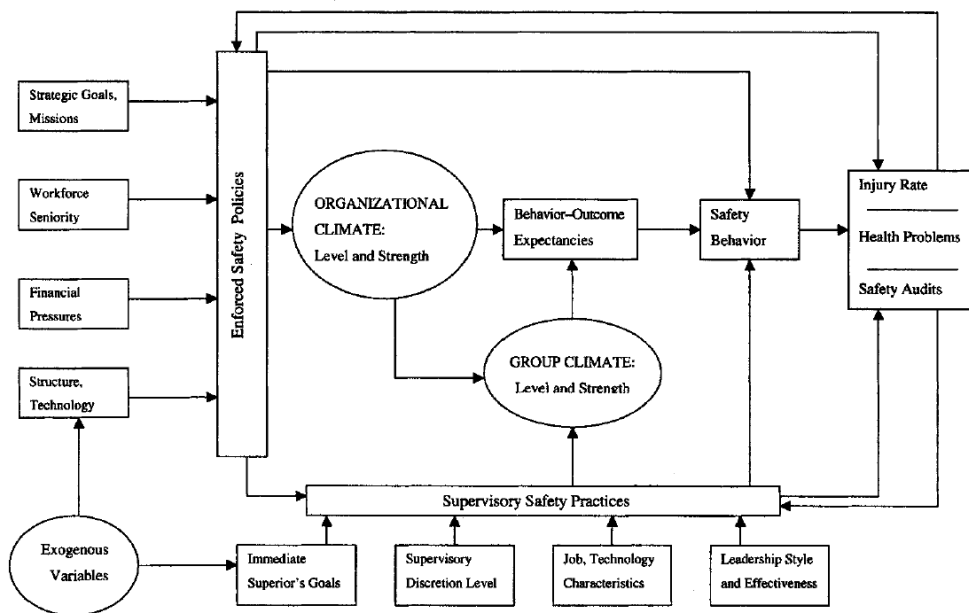


Figure 1. A multi-level model of safety climate (Zohar, 2003).

As a multi-level variation of an *input-mediator-outcome-input* (IMOI) model (Ilgen, Hollenbeck, Johnson, & Jundt, 2005), Zohar postulates that both organizational and group (i.e., unit level) climate impact employee perceptions of behavior-outcome contingencies; that is, climate at both levels helps employees identify the likely consequences of engaging in a given behavior. Various inputs are hypothesized to shape supervisory safety practices and enforced safety policies, which, in turn, serve as inputs that affect organizational and group level climate perceptions. The relationship between climate and safety outcomes is mediated by behavior-outcome contingencies perceived by employees. These contingencies shape actual behaviors on the job, which in turn, impact safety outcomes. In this model safety outcomes are focused on the employees themselves (e.g., employee injury rates). Additionally, safety outcomes are conceptualized as not simply a final outcome, but also as an input variable—hypothesized to impact future climate perceptions through a feedback loop connecting outcomes to enforced safety policies and managerial safety practices.

The model was developed as a mechanism to understand empirical findings indicating that there is often significant between-unit (group) variation in climate perceptions within a single organization. Within healthcare, significant variation in climate among units within same hospital also suggests the need to examine variation in climate perceptions between and within units or other meaningful collective entities (France et al., 2009; Huang, Clermont, Sexton et al., 2007; Zohar, Livne et al., 2007). Tests of Zohar's model support the notion that healthcare providers are most likely to engage in high levels of patient safety oriented behavior in their daily work when unit and hospital level safety climate are aligned (i.e., both high or both low; Zohar, Livne, et al., 2007). However, the degree to which congruence between unit and hospital

climate perceptions impacts other critical patient safety behaviors such as error reporting and patient safety outcomes (e.g., adverse incidents such as patient mortality or permanent injury) has yet to be established in the existing literature.

Overall, safety climate has been shown to be a stronger predictor of safety outcomes such as employee injury rates compared to general organizational climate measures and to mediate the relationship between molar organizational climate and safety-related behaviors on the job (Neal, Griffin, & Hart, 2000). General safety climate has been found to be linked with personal injury rates across a varied sample of organizational contexts (Beus, Payne, Bergman, & Arthur, 2010; Christian, Bradley, Wallace, & Burke, 2009; Schneider, Ehrhart & Macey, 2011). Similar studies of general safety climate in healthcare suggest a similar relationship with personal injuries of healthcare providers (e.g., needle sticks, Smith et al., 2007; 2010). However, it is unclear if such results generalize to the construct of patient safety climate given that the outcome referent for patient safety climate is the patient, not personal injury of the provider themselves. Traditional safety climate research, however, focuses on the occupational health of organizational employees. Thus, the relationship between climate and safe behavior may be confounded by employee concern to protect their own health and well-being. Conversely, patient safety climate can be considered a more specific form of safety climate where the referent for safety outcomes is the patient, not necessarily the provider/employee themselves. This raises interesting theoretical questions about the degree to which findings from the general safety climate literature regarding the relationship between safety climate and personal safety outcomes are mirrored in studies of patient safety climate where outcomes do not generally involve personal safety, but the safety of another relatively unfamiliar person.

1.4.3 Multi-Level Theory

Given that climate is primarily conceptualized as a social construct, a brief discussion of multi-level theory is helpful to understand the general assumptions underlying the current dissertation. Multi-level theory combines both micro (i.e., individual) and macro level perspectives (i.e., social or other contextual factors) to describe complex phenomena such as climate (Kozlowski & Klein, 2001). Multi-level theory is important to the theoretical and empirical study of climate because it provides a way to conceptualize how phenomena occurring at one level of analysis (e.g., individual perceptions of climate) coalesce to represent a higher level construct (e.g., unit level or organizational climate).

Organizational climate has primarily been described as a shared property of an identifiable group that develops through bottom-up processes, meaning that lower level phenomena (i.e., individual perceptions of climate) interact to form collective phenomena (i.e., unit level climate; Klein & Kozlowski, 2000). Theoretical models of organizational climate and safety climate, either implicitly or explicitly, have tended to be *compositional models*—meaning that they assume that the higher level construct is essentially the same as the sum of its lower level components (James, 1982; James & Jones, 1974; Schneider, 1983; Zohar, 2003). As summarized by Chan (1998), compositional models suggest that the functional relationship that enables a higher level construct to be isomorphic (i.e., share the same content) to the lower-level components is within-group agreement (i.e., sharedness among individuals). Chan further developed a typology of composition models that delineates five types of models: (1) additive

models, (2) direct consensus models, (3) referent shift models, (4) dispersion models, and (5) process models.

Additive models are based on theoretical relationships that assume higher level constructs are best conceptualized as the sum of lower level components. Operationally, additive models assume that summing or averaging individual perceptions of climate are an accurate reflection of the unit level climate regardless of the degree of agreement among unit members. The majority of research on patient safety climate to date has conceptualized climate in this way (e.g., Cooper, 2000; Cooper et al., 2008; Halbes-Iben et al., 2008; Holden, Watts, Walker, 2010). *Direct consensus models* assume that the meaning of the higher level construct is a functional product of agreement among the lower level components. These models require within-group consensus as a pre-requisite for justifying the aggregation of individual scores to form group-level constructs. Direct consensus models assume that higher level constructs are conceptually the same as lower level constructs. Some studies of patient safety climate have adopted this approach, reporting statistical indices of agreement such as r_{wg} (James, Demaree, & Wolf, 1984, 1993) as justification for aggregating individual perceptions of climate to the unit level or higher (e.g., Pronovost et al., 2008; Sorra & Nieva, 2004). *Referent-shift models* share this same requirement as consensus models, however, these models assume that higher level constructs are conceptually different in meaningful ways from their collective subcomponents. Constructs conceptualized from a referent-shift perspective are often operationalized in terms of “we” or other collective terminology, whereas constructs conceptualized using a basic consensus model are operationalized in terms of “I” (Chan, 1998).

While direct consensus and referent-shift models rely on within-group agreement as a pre-requisite for higher level constructs, *dispersion models* posit that the meaning of the higher level construct is captured functionally in the degree of variance among group members (Chan, 1998). Dispersion models assume that the variability among group members is a critical aspect of higher order constructs, not simply a pre-requisite for aggregation. They are specifically concerned with the degree of heterogeneity among group members. For example, climate strength is modeled under these assumptions and is specifically defined in terms of within-group variance.

The four model types described so far are primarily concerned with relatively static attributes of a given group. *Process composition models*, however, are qualitatively different in that they are concerned with dynamic, episodic mechanisms (i.e., processes) that connect more stable variables or states (Chan, 1998; Giffin & Mathieu, 1997). Processes models focus on how particular higher or lower level constructs come to be. For example, a process model of patient safety climate would be specifically focused on identifying explaining how individual perceptions of climate emerge upward to form unit level patient safety climate. Overall, the current study combines the assumptions of process models, direct consensus models, and dispersion models to investigate the antecedents of individual-level perceptions of patient safety climate, the relationship between higher order patient safety climate (i.e., unit climate) and outcomes, and the extent to which dispersion among unit members impacts this relationship.

1.4.4 Configural Theory & Climate Profile Characteristics

Configural thinking refers to consideration of the pattern, or configuration, among the various components of a particular system, organization, or compound phenomena (Meyer, Tsui, & Hinings, 1993; Miller, 1996). In organizational analysis, a configuration has been defined as “any multidimensional constellation of conceptually distinct characteristics that commonly occurs together” (Meyer, Tsui, & Hinings, 1993, p. 1175). With roots in the Gestalt Psychology school of thought (Kohler, 1947), the configural approach to examining multi-dimensional phenomena such as climate assumes that it is the unique configuration, or the profile, of the underlying elements uniquely impact individual or organizational behavior (Kozlowski & Klein, 2000; Miller, 1996). Much like theories of team performance and effectiveness that argue that the synergy created among multiple team members leads to outcomes that are greater than the sum of individual attributes or efforts (e.g., McIntyre & Salas, 1995), configural theory argues that the individual component of compound social variables, in this case the dimensions of climate, take their meaning from the whole and that meaning is lost when they are considered in isolation.

Configural theory is grounded in several underlying assumptions (Meyer, Tsui, & Hinings, 1993; Miller, 1996). First, configural theory focuses on holistic synthesis as the core mode of inquiry. Unlike a reductionist approach which aims to isolate the effects of each individual component or dimension, the configural approach incorporates the assumption that there are likely complex interactions and nonlinear relationships among the constellation of dimensions and that the dimensions reciprocally influence one another. As such, configural

theory assumes that the various dimensions are not interchangeable or necessarily compensatory. Configural theory is also based in the premise of equifinality; that is, that there are multiple paths to achieve effective outcomes. Additionally, configural theory integrates the assumption of punctuated equilibrium to suggest that phenomena are dynamic, that change is likely to occur in episodic bursts, and that temporality is important to consider in the development and maturation of compound constructs.

Theories of general organizational climate and safety climate suggest that there are interactions and important non-linear relationships among the various dimensions of climate that impact important outcomes (Hellriegel & Slocum, 1973; Ostroff et al., 2003; Schneider et al., 2011; Schulte et al., 2006; Schulte et al., 2009). For example, congruence theory (Adler & Borys, 1996; Nightingale & Toulouse, 1977) and theories of multiple climates (Zohar, 2007, 2010) argue that interactions and non-linear relationships among the various climate dimensions and the degree of compatibility among dimensions impact important outcomes by providing either consistent or inconsistent cues regarding the relative priority of organizational goals such as safety, productivity, and efficiency. From this theoretical perspective it is likely that a climate that provides consistent cues regarding patient safety as a high priority in both the social and structural aspects of the work environment will have more positive safety outcomes.

1.4.4.1 Climate Profile Characteristics

Conceptually, the configural perspective argues that it is the pattern of relationships among the dimensions of organizational climate, or the characteristics of the *patient safety climate profile*, that matter in understanding both how climate develops and the relationship

between patient safety climate and patient outcomes. Based in mathematical concepts of dispersion and patterns, three core profile characteristics have been identified: (1) *profile elevation* (i.e., overall mean across multiple dimensions), (2) *profile variability* (i.e., variance among the dimensions) and (3) *profile shape* (i.e., pattern of peaks and valleys among climate dimensions; Joyce & Slocum, 1984; Schulte et al., 2009; Tabachnick & Fidell, 2001). Profile elevation represents the overall positive or negative valence of a particular climate and is most similar to the concept of an overall “level” of climate. Profile variability can be conceptualized as the average amplitude (or “flatness” [Tabachnick & Fidell, 2001]) of a particular climate profile and profile shape refers to the specific pattern of slopes (i.e., peaks and valleys) among the dimensions. Figure 2 depicts examples of each type of characteristic graphically.

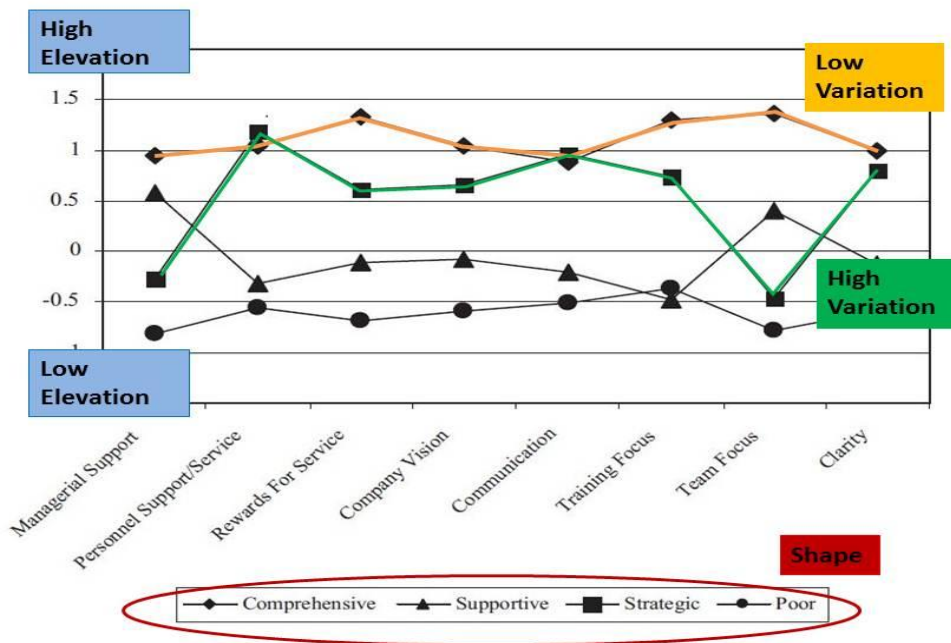


Figure 2. Example of climate profile elevation, variation, and shape adapted from Schulte et al. (2009).

While elevation and variance are conceptualized quantitatively, climate profile shape requires a categorical framework in order to classify particular patterns. Most of work examining climate shape has been exploratory to date—with categorical frameworks derived post analysis. For example, studies of collective climate utilize statistical clustering techniques to identify categories of climate shapes into which individual employees can be grouped based on the degree to which they share a particular pattern. However, studies to date have varied to some extent in the number of shapes investigated and the theoretical premise for classifying particular shapes. For example, in line with the tenets of configural theory, climate shape assumes that the specific dimensions are not interchangeable.

From a theoretical perspective climate profile characteristics are important for capturing the total social context, providing insight into the degree to which climate is consistent, and for indicating the degree to which various dimensions complement one another (Joyce & Slocum, 1984). While climate strength provides information regarding the degree of within-group agreement, the climate profile characteristics are indicative of the degree to which the various aspects of organizational or unit operations collectively provide consistent, salient information regarding the priority of patient safety relative to other goals (Schneider, Salvaggio, & Subirats, 2002). For example, a climate profile that demonstrates high elevation, low variance among dimensions, and a comprehensive shape may provide consistent cues that patient safety is important, but may not provide clear cues regarding its relative priority to other goals, such as efficiency. In units with such profiles employees may feel that all organizational outcomes are equally weighted and may struggle in striving to achieve them all simultaneously all of the time. Employees working in units with these profile characteristics may thus, have the motivation to

engage in behaviors that support patient safety, but may find it difficult to engage in safe behaviors all of the time. In such climates employees may perceive that they are only reinforced for “doing it all (i.e., being safe, efficient, effective), all of the time.” Additionally, the profile characteristics provide theoretically unique information. For example, if profile variability matters in the prediction of particular outcomes then it is irrelevant which dimensions of climate are above or below the overall mean. This would suggest that the dimensions are relatively interchangeable and that they can compensate for one another. However, if shape is what matters, then the individual dimensions are not interchangeable and theoretically each dimension needs to be at a certain point on the continuum to predict a given outcomes. For example, if a supportive climate shape that is high on dimensions of social support, leadership support, and learning orientation is predictive of patient safety outcomes and profile variability is not, then theoretically this means that these three aspects of patient safety climate are the key drivers of safe outcomes and need to be at a higher level compared to the other dimensions in order to achieve safe outcomes. Practically, this would suggest that improvements in other aspects of climate are unlikely to meaningfully contribute much to improvements in patient safety and that efforts to optimize safe outcomes through improvements in climate should focus on achieving a supportive climate shape.

Empirically, initial support for the validity of a configural approach can be found in studies of general organizational climate. For example, in a two study series of 120 bank branches and 86 food distribution stores, Schulte et al. (2009) found each of the three profile characteristics to be differentially related to employee and organizational outcomes. While elevation and variability were related to affective employee outcomes, shape was related to

financial outcomes. Specifically, results demonstrated that profile elevation accounted for up to 75% of the variance in employee job satisfaction and job commitment, up to 30% of the variance in their turnover intentions, and up to 38% of the variance in employee ratings of service quality. Profile variability among the dimensions was found to predict employee affect, turnover intentions, and employee perceptions of service. However, its effect size was small, only accounting for an additional 3% to 4% of the variance in outcomes. Climate shape, operationalized as the pattern among climate dimensions identified via clustering, was related to objective measures of organizational financial performance and also accounted for 10% of the variance in customer satisfaction after controlling for measures of climate elevation (i.e., absolute positive or negative level) and variability among organizational members. Earlier studies also found that climate shape accounted for unique variance in employee performance and job satisfaction (Jones & Joyce, 1979, Joyce & Slocum, 1984). Additionally, findings have supported the hypothesis that employees working in climates that are more consistent (e.g., high peaks for innovation and autonomy) perform better than employees working in climates that are inconsistent (e.g., high on innovation, but low on autonomy; Fredriksen, 1968; Naveh, Katz-Navon, & Sterm, 2005).

Early work within the healthcare domain has provided initial support for this theoretical perspective as well. In their study of patient safety climate conducted with 241 healthcare providers, Naveh and colleagues (2005) examined not only the main effects of four dimensions of safety climate on treatment errors, but also the interactions between the dimensions. Their results found that treatment errors were lowest when providers perceived managerial safety practices *and* also perceived safety procedures suitable for the unit's daily

work demands and processes of care. Managerial practices also interacted with perceptions regarding the flow of safety information, such that errors were lowest when perceptions of managerial practices were congruent with perceptions of information flow. Interestingly, errors were also low when both perceptions of managerial practices and perceptions of safety information flow were low, suggesting that it is the congruence (i.e., pattern) between the various dimensions of patient safety climate – not necessarily the overall positive or negative elevation of climate – that matters for the prediction of errors. Qualitative studies of patient safety climate also suggests that strategic planning for patient safety initiatives should be based upon how specific dimensions of patient safety climate interact and influence each other (Sine & Northcutt, 2008).

In addition, the research on patient safety culture to date suggests that overall profile elevation (i.e., overall positive or negative scores) may be an easy to measure but less powerful indicator of the relationship with patient and provider outcomes compared to other climate profile characteristics. For example, patient safety culture has been related to provider attitudes and incident reporting behavior (e.g., Braithwaite et al., 2010; Kivimaki et al., 2007; Weingart et al., 2004); however, little empirical evidence to date has supported the link between measures of patient safety culture/climate when operationalized as either percent positive scores or mean averages and patient safety outcomes (Davenport et al., 2007). Previous work has demonstrated correlational relationships between patient safety climate and AHRQ Patient Safety Indicators (PSIs), as well as Hospital Quality Alliance Core Measures (Mardon, 2008). While establishing such relationships are critical first steps in validation of patient safety climate as a critical factor in safe care, results have generally been weak (e.g.,

correlations of -.17 to -.29) and mixed. Thus, applying a configural approach to patient safety climate may provide much needed insight into these relationships.

1.4.5 High Reliability Theory

High reliability theory [HRT] (Weick & Sutcliffe, 1999, 2001, 2007) offers additional insight into the mechanisms underlying the relationships between patient safety climate, error, and employee behaviors that support safety, such as error reporting. HRT suggests that a certain set of organizations, identified as high reliability organizations (HRO), have mastered the ability to remain adaptive, anticipate the unexpected, and produce highly reliable safe outcomes through processes of collective mindfulness and adaptation (Weick & Sutcliffe, 2001). They operate in complex, high risk environments, where the impact of error can be catastrophic; yet they are able to learn from, adapt to, and utilize this complexity to their advantage. Furthermore, these organizations are better able to mitigate major errors through mindful management of near misses, unexpected outcomes, and minor errors (Weick, 1999). Nuclear submarines (e.g., Bierly & Spender, 1995), the US Naval aircraft carrier fleet (e.g., Rochlin, 1989), and healthcare teams (Edmondson, 2004; Weick & Sutcliffe, 2007) are examples of HROs cited in existing literature.

The question relevant for the current dissertation is: What role does climate play in helping these organizations maintain highly reliable safety outcomes? Weick and Sutcliffe (1999) argue that reliable outcomes (e.g., safety, quality) are the “result of stable processes of cognition directed at varying processes of production that uncover and correct unintended consequences” (p. 35). While the term reliability is often used synonymously with the notion of highly standardized routines or algorithms, HRT suggests that reliable outcomes are actually the

product of highly flexible procedures. This capacity to adapt behaviorally is underlain by a stable cognitive framework designed to maintain a collective state of mindfulness that Weick and Sutcliffe argue is vital for detecting and correcting minor unintended consequences that can snowball into serious adverse events. They argue that organizations focused solely on efficient production maintain stable activity patterns in order to “get things done.” However, members often vary in cognitive patterns of awareness, relying on simplified heuristics and biases that can lead to distraction, rushing, and careless errors that go unnoticed. These cognitive shortcuts and variation in attention are argued to lead to *mindless* operations; where details are left out and new information is interpreted through a confirmatory lens (i.e., interpretations are biased toward confirming preconceived notions that operations are safe and effective).

Additionally, HRT argues that there is inherent variation in any standardized routine and as such, the notion of reliability as synonymous with inflexible routines is erroneous. Environmental, situational, and social influences impact how even the most highly structured routine unfolds at different times and across different employees. HRT suggests that standardization of procedures and scripts are insufficient means of mitigating serious errors. HRT argues that members of highly reliable organizations engage in on-going mutual re-adjustment of their activities, but share a common, cognitive framework dedicated to identifying unanticipated cues indicative of potentially unfavorable outcomes. Termed *collective mindfulness*, HRT argues that this shared cognitive framework is built upon three processes of anticipation—preoccupation with failure, reluctance to simplify, sensitivity to operations—and two processes of containment—commitment to resilience and deference to expertise (Weick & Sutcliffe, 2007). These five processes are defined in detail in Table 2.

Table 2. The five processes of collective mindfulness articulated in high reliability theory

(Adapted from Weick & Sutcliffe, 1999, 2007).

<i>Process</i>	<i>Definition</i>
Preoccupation with failure	Error is considered an inevitable component of operations. Thus, close attention is paid to weak signals and early identification of potential symptoms of system malfunctioning is explicitly encouraged. Success is approached with a warily in order to avoid over confidence and complacency. Additionally, effort is dedicated to imagining potential mistakes and simulations of potential failure pathways are encouraged.
Reluctance to simplify interpretations	Details are preserved. Assumptions, heuristics, categories, and biases are openly identified in an effort to limit the tunnel vision created by assumptions and labels. Negotiations and decisions focus on points of divergence versus convergence in order to detect anomalies and to elicit unique information.
Sensitivity to operations	A deep situational awareness that reflects objective observations of actual work processes, rather than intentions or formal procedures. “Seeing what we are actually doing regardless of what we are supposed to do based on intentions, designs, or plans” (2007, p. 59). Near misses are devalued and are not interpreted with a confirmatory bias that suggests that current approaches or operations are sufficient to mitigate error. Instead, near misses are attributed to luck and interpreted as cues indicative of potential system failures in order to prevent complacency.
Commitment to resilience	Acceptance of the inevitability of error and a commitment to absorb changes, persist, and continuously incorporate lessons learned from these inevitable errors. This commitment is demonstrated through support for improvisation, use of ad-hoc networks, and wariness about the applicability of past practice.
Deference to expertise/ Underspecification of structure	Traditionally hierarchical structures of command and decision making are opened to all organizational team members, especially during crisis situations. Decision making authority is pushed downward to frontline experts. Structure and routines are fluid with that intention that (1) decoupling vital decisions from higher ranking positions far removed from frontline operations improves the efficiency of critical decisions and (2) expands the variety of expertise available to make sense of cues that might suggest the potential for unintended consequences.

HRT indicates that these processes to lead to a rich, mindful awareness that optimizes collective capacity for action which in turn leads to adaptive behaviors and reliable collective

outcomes. In this sense, reliability results from enlarging the knowledge space regarding weak situational cues through high quality collective attention, differentiation of information about these cues, and reframing of these cues (Weick & Sutcliffe, 1999). However, this increased knowledge space must be tightly coupled with a comparable behavioral repertoire—that is, organizational members must have the resources and support to act on concerns regarding these cues in order for mindfulness to translate into reliable, safe outcomes.

In terms of patient safety, HRT suggests that organizational culture and climate are mechanisms for institutionalizing the five processes of collective mindfulness. Weick and Sutcliffe (2007) argue that “culture affects how departures from expectations are detected, interpreted, managed, and used as pretexts for learning” (p. 115). While they use the term culture, their definition also includes aspects of climate—including assumptions about applications of lessons learned and actual daily practices or ways of doing business. Since climate helps employees to form expectations about behavior-outcome contingencies, climate supports high reliability when four conditions are met. First, climate supports highly reliable performance when employees perceive that reporting errors and concerns is actively supported, encouraged and rewarded by managers and peers. Second, climate helps reliability when employees perceive that there are clear definitions of acceptable versus unacceptable behavior and trust in the mechanisms for determining accountability for unacceptable behavior. Third, climate can positively impact reliability when employees perceive that enacted practices are flexible, adaptability is encouraged and rewarded, and that deference is given based on expertise. Finally, climate can support reliability when employees perceive that continuous learning is enacted through candid and timely sharing of information. From this perspective, patient safety climate

should impact the degree to which errors are reported and the degree to which safe patient outcomes are maintained over time (e.g., are highly reliable). Initial evidence investigating patient safety climate has supported this hypothesis and suggests that examining the relationship among dimensions of patient safety climate may provide more theoretically meaningful insight into these relationships (Naveh, Katz-Navon, & Stern, 2005; Wilson, 2007; Zohar et al., 2007).

1.4.6 Summary of Theoretical Approach

Overall, the current dissertation draws on the five theoretical schools of thought summarized above to form a foundation for specific hypotheses regarding the antecedents and outcomes of patient safety climate. Theories of general organizational climate and safety climate suggest that there are likely multiple influences on individual perceptions of patient safety climate and that social interaction is a critical aspect of the development of shared climate perceptions. Multi-level theory suggests that the functional relationship between lower-level and higher order constructs can be conceptualized in terms of within-group agreement, but that dispersion among group members cannot be ignored, even if statistical pre-requisites for within-group agreement are met. Configural theory suggests that compound constructs, such as patient safety climate, are likely characterized by complex interactions and reciprocal relationships among the specific dimensions that comprise them. As such, investigating patient safety climate profile characteristics may provide a more comprehensive view of the patient safety climate construct. Finally, high reliability theory suggests that patient safety climate is likely to affect patient outcomes by providing either strong or weak situational cues regarding the priority of

patient safety relative to other goals and the likely consequences of engaging in safe or unsafe behavior, which, in turn, affects patient outcomes.

1.5 Summary of Chapter One

Overall, Chapter one identified that there is a defined need to expand the evidence-base concerning the patient safety climate construct, specifically a need for more comprehensive investigation of its antecedents and outcomes. Existing theory and research regarding patient safety climate has done little to explore which factors impact individual perceptions of climate, the relationships among the various dimensions comprising patient safety climate and the effects of patterns among the dimensions on patient outcomes, and potential moderators of these relationships. The current dissertation was thus conceptualized to draw upon several existing theoretical perspectives including general theories of organizational climate (Ostroff, Kinicki, & Tamkins, 2003), multi-level theories of safety climate (Zohar, 2005), multi-level theory (Chan, 1998; Kozlowski & Klein, 2000), configural theory (Meyer, Tsui, & Hinings, 1993) and high reliability theory (Weick & Sutcliffe, 2005) to develop a parsimonious model of theoretically relevant antecedents affecting individual perceptions of patient safety climate and the relationships between patient safety climate profile characteristics and patient safety outcomes. To this end, Chapter Two summarizes the results of a detailed review of relevant literature. This review summarizes core theoretical and empirical research regarding patient safety climate and related constructs in order to develop a foundational nomological net for the patient safety climate construct. Building on this review and the theoretical assumptions summarized here in Chapter One, Chapter Three outlines a parsimonious model of patient safety climate and specific

hypotheses to be tested in the current dissertation. Chapter Four describes the study methodology used to test hypothesized relationships among focal variables and Chapter Five presents study results. Finally, Chapter Six presents a discussion of study results, limitations, and presents avenues for future research that build on study findings.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this chapter is to develop a nomological net examining the focal construct of this dissertation, patient safety climate. To this end Chapter Two is organized into four sections. First, the patient safety climate construct is defined and existing theoretical development of the construct is reviewed. This section includes literature regarding the related constructs of general organizational climate, safety climate, safety culture, and in order to provide construct clarity, and the foundation for a nomological network of patient safety climate. Drawing on this combined base of literature, section two summarizes existing theory and previous research examining climate perceptions as a dependent variable; that is, how shared climate perceptions emerge and arise. Section three considers relevant theory and existing studies investigating climate as a predictor variable; that is, how climate impacts outcomes such as patient safety and patient satisfaction. In this section, the configural approach examining profile characteristics representing the patterns among the various dimensions of climate is covered in detail. Finally, section four reviews existing theory and research regarding climate strength—the degree to which climate perceptions are shared among group members—as a potential boundary condition affecting patient safety climate-outcome relationships.

2.1 Patient Safety Climate

Recognizing that employee performance is a product of more than simply individual skill or motivation, the concept of patient safety climate and its close relative patient safety culture was introduced to the study of the systems of healthcare provision in a significant way in the late

1990's, following seminal reports regarding the prevalence of adverse events caused by systematic errors such as lapses in communication, lack of standardized care processes, and a psychologically unsupportive work environment (Leape, Bates, et al., 1995; Kohn et al., 2000; Shojania et al., 2001). Borrowing from the science of organizational safety systems and organizational climate, the concept of patient safety climate evolved as a mechanism for describing the work context in which care processes occur and the effects of the environmental factors on the safety and quality of care.

2.1.1 Defining Patient Safety Climate

Patient safety climate describes the work context—both social and structural—in which healthcare providers perform their daily work. For the purposes of this dissertation patient safety climate is defined as a group-level construct that emerges from shared, multi-dimensional perceptions of work environment policies, practices, and norms regarding patient safety that: (1) emerges from the individual level to the group level through collective sensemaking processes (Reichers & Schneider, 1990), (2) provides cues to employees regarding behavior-outcome expectancies (Zohar, 2003), and (3) is distinct from perceptions held by other groups (Joyce & Slocum, 1984).

The patient safety climate construct developed from a rich history of theoretical and empirical work dedicated to examining the impact of contextual workplace factors on employee behaviors and performance. The related constructs of organizational climate, team climate, safety climate and their culture counterparts (i.e., safety culture) have been focal aspects of attempts to understand and predict organizational phenomena and each is reviewed in greater detail later in

this chapter. Despite the breadth and depth of the theoretical lineage from which patient safety climate developed, a singular agreed upon definition of the construct is missing from the current literature.

As pinpointed by Reiman and colleagues (2010) there has been limited conceptual development of the patient safety climate construct to date. Most often, authors cite a definition of general safety climate (i.e., climate focused upon injury to the employee themselves, not necessarily their client or patient) and leave readers to infer how patient safety climate is similar or different from this general safety construct. The Agency for Healthcare Research and Quality (2009) describe a culture of patient safety as including an understanding of organizational beliefs, values, and norms in addition to an understanding of “what attitudes and behaviors related to patient safety are expected and appropriate (pg. 1).” Similarly, Pronovost and colleagues (2003) draw on the general safety culture literature to suggest that patient safety culture reflects the degree to which safety is a strategic priority and as such is reflected in a combination of leader attitudes and behaviors toward patient safety and use of the systems in place to report and analyze events and near misses. Thus, patient safety climate refers specifically to perceptions about enforced patient oriented safety policies and practices.

2.1.1.2 Patient Safety Climate Versus Patient Safety Culture

The terms patient safety culture and patient safety climate tend to be used interchangeably within the contemporary literature to describe similar phenomena, thus literature on both topics were drawn on in the current proposal. However, climate and culture have traditionally been differentiated in terms of their focus and breadth, and operationally in the way

they are measured. Thus, some general construct clarification is necessary in order to detail the definition of patient safety climate used in this dissertation and to explain the rationale for including studies of both patient safety climate and patient safety culture in the review of existent literature.

The healthcare literature tends to use the term patient safety culture as a blanket terminology to describe a range of psychologically meaningful organizational factors that impact safe patient care, including deep rooted organizational values and beliefs regarding patient safety, and employee perceptions regarding the actual informal patient safety policies and procedures that are enacted and reinforced in daily practice (Sleutel, 2000). For example, the Agency for Healthcare Research and Quality (2009) describe a culture of patient safety as including an understanding of organizational beliefs, values, and norms in addition to an understanding of “what attitudes and behaviors related to patient safety are expected and appropriate (pg. 1).” Similarly, Pronovost and colleagues (2003) draw on general safety culture literature to suggest that patient safety culture reflects the degree to which safety is a strategic priority and as such is reflected in a combination of leader attitudes and behaviors toward patient safety and use of the systems in place to report and analyze events and near misses. Schein (1990, 2000) points out that the term culture in the literature today is often used to describe a broad range of ‘softer’ organizational phenomena such as employee perceptions of management or other organizational characteristics that have traditionally been considered aspects of climate.

Climate is generally considered to have been developed as a scientific construct before organizational culture and the two constructs developed from different scientific perspectives. Climate arose mainly from theories of social psychology, whereas culture arose from sociology

and anthropological schools of thought (see Schneider, Ehrhart, & Macey, 2011 for a thorough discussion on this topic). As such, culture is defined in terms of deep level organizational values, ideologies, and the artifacts and symbols used to transmit and instantiate these values and ideologies (Schein, 1990; Schneider, 1975). Conversely, climate is concerned with employee perceptions of policies, procedures and managerial practices that provide critical information on behavior-outcome contingencies that influence safe behavior and outcomes (Denison, 1996; Schneider et al., 2011). As such, organizational climate has generally has been conceptualized as having a narrower breath and a greater focus on employee perceptions of their work environment compared to organizational culture research. Climate, thus, refers to the “policies, practices, procedures, and behaviors that get rewarded, supported, and expected in a work setting and the meaning those imply for the setting’s members (Schneider, Ehrhart, & Macey, 2011, p. 373). In this sense, culture reflects what should be important (i.e., values), how things should work (i.e., norms), and how things should ideally be done (i.e., behavioral expectations and norms) (Uttal, 1983). Conversely, climate can be conceptualized as employee perceptions regarding what is actually important on the job (i.e., shared perceptions regarding the relative priority of patient safety), how things actually work in daily operations (i.e., perceived behavior-outcome contingencies and the likelihood of reinforcement/sanctions for engaging in behaviors that support/do not support patient safety), and how things are actually done on the job.

Theoretically, both climate and culture are conceptualized as multi-dimensional constructs that create a holistic picture of the work environment and affect member behavior by providing a framework that defines acceptable and unacceptable behaviors, attitudes, and thoughts (Guion, 1973). Empirically, both climate and culture have been shown to facilitate

shared situational understanding of situations among organization members, making coordination and cooperation possible (Alvesson, 2002; Gulenmund, 2000).

Operationally, climate and culture have also traditionally been differentiated in terms of how they are measured. Given that organizational climate developed from the social psychology tradition and is defined in terms of perceptions shared among organizational members it has traditionally been measured using surveys or questionnaires of individual employees whose responses are then aggregated to formulate higher level constructs such as team climate, unit climate, or organizational climate if a threshold level of overlap exists among member perceptions. Conversely, given the anthropological roots of the organizational culture construct, studies of organizational culture are argued to require a qualitative approach to measurement (i.e., ethnographical observations, interviews, etc.) in order to assess norms, rules, and values sans the lens of employee self-reported perceptions (see Choudhry, Fang, & Mohamed, 2007 for a detailed discussion). Thus, the differentiation between the two constructs in many ways comes down to matters of measurement, with traditionalists viewing studies of culture as those based on qualitative, ethnographic approaches and studies of safety climate based upon employee perceptions captured through survey methods (Choudhry, Fang, & Mohamed, 2007; Schein, 2000).

Examining the traditional theoretical and measurement differences between climate and culture are relevant to the current dissertation given that the overwhelming majority of theoretical and empirical work using the terminology of patient safety culture has relied on survey based measures that capture individual employee perceptions of various aspects of the work environment which are then aggregated to higher levels of analysis such as the unit or

organization to examine relationships with outcomes of interest (Colla et al., 2005). Arguably then, much of the work examining patient safety culture to date is in fact examining patient safety climate and the differences among the terms are more superficial than conceptual. Therefore, most modern day researchers use the terms interchangeably and cite both climate and culture research when discussing either construct. While patient safety climate is the focal construct of interest in the current dissertation, studies using the term patient safety culture are also cited given that many of them actually collected employee perceptions using survey based measures. This greatly increases the base of available evidence to date considering that ethnographic studies of patient safety culture are few.

2.1.2 The Dimensions of Patient Safety Climate

Patient safety climate has been conceptualized as a multi-faceted, multi-dimensional construct that is based on shared perceptions of a given work environment (Fletcher & Jones, 1992; Naveh et al., 2005; Reinman et al., 2010; Sorra & Nieva, 2004; Sorra & Dyer, 2010). The dimensions of safety climate identified in the existing literature have generally included both structural and social aspects of the work environment. However, the number of dimensions proposed to comprise patient safety climate vary among theorists with some proposing as few as four (Naveh et al., 2005; Weingart et al., 2004) and some proposing as many as 20 (Smetzer et al., 2003). Colla (2005) examined themes among dimensions included in nine measures of patient safety climate and identified *leadership, policies and procedures, staffing, communication, and reporting* as the five most common dimensions. Similarly, Naveh and colleagues (2005) identified four broad dimensions of safety climate: *suitability of safety*

procedures to the given operational context, the provision and flow of safety information to frontline staff members, managerial safety practices, and the degree to which messages sent by organizational leadership indicate that safety is a salient and clear priority.

In a somewhat different approach, Sexton and colleagues (2006) conceptualize patient safety climate as a meta-climate comprised of *teamwork climate, safety climate, perceptions of management, and structural aspects* of the working environment (e.g., staffing and equipment). Sorra and Dyer (2010) conceptualized climate as not only including perceptions of error reporting systems as just and non-punitive, but also including perceptions of perceived barriers such as lack of *feedback after reporting* and perceptions that no *system changes* will result from reporting or speaking up. As noted earlier however, the limited conceptual development of the patient safety construct to date means that there has been a general lack of theoretical support for hypothesized dimensions (Flin, Burns, Mearns, Yule, & Robertson, 2006; Gershon, Stone, Bakken, & Larson, 2004).

2.2 Patient Safety Climate as a Dependent Variable: How do Climate Perceptions Arise?

As summarized in Chapter One the general organizational literature has dedicated considerable effort to developing several theoretical frameworks concerning the processes through which climate forms and develops (Ashforth, 1985; Ostroff, Kinicki, & Tamkins, 2003; Schneider, Ehrhart, & Macey, 2011; Schneider & Reichers, 1983). Specifically, climate has been conceptualized as a product of structural elements of the work environment (e.g., size, centralization; Payne & Mansfield, 1973; Payne & Pugh, 1976), as arising through attraction-selection-attrition (ASA) processes (e.g., degree of fit between individual values and

organizational values [Schneider, 1987; Schneider, Goldstein, & Smith, 1995]), and as a result of symbolic interactionism (e.g., collective sense-making processes occurring during interactions among employees; Blumer, 1969; Schneider & Reichers, 1983). Empirically, the interactionist perspective has arguable received the most empirical support in the general climate literature to date (Cannon-Bowers, Salas, & Converse, 1993; Mohammed, Klimoski, & Rentsch, 2000; Smith-Jentsch, Mathieu, & Kraiger, 2005). Conversely, there has been limited investigation to date regarding how facet-specific climates, such as patient safety climate, develop.

In one of the few theoretical discussions of the patient safety climate construct, Reiman and colleagues (2010) proposes that climate perceptions are shaped by organizational processes, social processes, and individual psychological processes. Similarly, in their integrative model of organizational climate for healthcare, MacDavitt, Chou, and Stone (2007) and suggest both macro level organizational structures and leadership impact unit level processes of supervision, group behavior, and the degree to which quality is emphasized, as well as work design factors. These unit level characteristics, in turn, are predicted to impact outcomes for both patient and healthcare workers.

There have been few empirical studies to date investigating the antecedents of patient safety climate and those that have been conducted have tended to be relatively weak in both theoretical development and empirical design. Overall, studies investigating the antecedents of patient safety climate have tended to focus on shared physical location/level of interaction, individual differences of respondents (e.g., job position, age, tenure or experience) or psychosocial aspects of the work environment (e.g., empowerment, leadership support, teamwork). For example, Sorra and Dyer (2010) reported that between 2% and 10% of the

variance in individual responses to individual patient safety climate items could be attributed to hospital membership. They also found that unit/department membership accounted for 6% to 23% of the variance in individual perceptions of climate. However, the primary purpose of this study was psychometric validation and there was no theoretical reasoning offered to guide interpretation of these results.

Sexton, Holzmueller, and colleagues (2006) also found significant variation in teamwork climate among units in a study of labor and delivery units in 44 U.S. hospitals. At the unit level, results also indicated that familiarity with unit colleagues was positively correlated with teamwork climate. Additionally, their results suggested significant variation in climate perceptions based on which hospital a unit was nested in. Similar results were found by France and colleagues (2009) in a study of 67 ICUs from 41 U.S. hospitals. Using hierarchical clustering to account for ICUs nested within the same hospital and random effects regression modeling, results indicated that unit membership was a significant, unique predictor of patient safety climate.

Armstrong, Laschnger, and Wong (2009) investigated employee perceptions of empowerment and work environment characteristics as predictors of patient safety climate. Measures of work environment characteristics focused on mainly psychosocial aspects of environment including collaborative relationships among staff members, support for nurse participation in case processes, and nurse manager ability, leadership, and support for nurses. Results from a random sample of 152 nurses found that perceptions of empowerment and perceptions of hospital characteristics were both unique predictors of patient safety climate and in combination they accounted for 50% of the variance in individual climate perceptions.

Similarly, a study of 800 Saudi Arabian clinicians found that management support ($\beta = 0.32$), the organization's error reporting system ($\beta = 0.27$), and access to adequate information technology and staffing resources ($\beta = 0.20$) were significant unique predictors of individual patient safety climate perceptions (Walston, Al-Omar, & Al-Mutari, 2008). Type of hospital (e.g., private vs. state owned) was not found to be a significant predictor of climate perceptions, however. As these results demonstrate, however, the majority of studies examining potential predictors of individual patient safety climate perceptions have relied on cross-sectional designs to date; precluding causal inferences from being drawn.

While not specifically focused on predictors of climate, a study that examined both hospital climate and unit climate found a significant interaction between the two. The characteristics of the interaction suggested that a highly positive patient safety climate at the unit level can compensate for lower organizational patient safety climate in terms of promoting positive safety behavior and safe outcomes (Zohar & Luria, 2005; Zohar et al., 2007). These results support the notion that individuals can differentiate between organizational and unit level patient safety climate and that both organizational membership and unit membership may exert parallel, but orthogonal influences on one's perception of climate.

Descriptive findings compiled from large patient safety climate surveys also suggest several factors may influence individual perceptions of patient safety climate (e.g., AHRQ, 2009, 2010; Campbell et al., 2010;)Descriptive statistics reported by Campbell and colleagues (2010) suggest potentially meaningful variation among unit types (critical care, emergency, operating room, medical, surgical, other). For example, the reported descriptive statistics suggest that the inpatient units (e.g., ICU) tended to have more positive patient safety climate than short-term

care units such as the emergency department and operating room. Within each unit type, however, they also reported a large amount of variation. No statistical tests were conducted, however to determine if these trends were statistically meaningful. Similarly, Sexton and colleagues (2006) reported variation among clinical areas in a study of ICU, OR, general inpatient, and general ambulatory care units. For example, some clinical areas none of the respondents reported a negative climate for speaking up, whereas nearly half of the respondents in other clinical areas did. However, statistical comparisons were not reported.

Findings from examinations of individual differences as predictors of patient safety climate have tended to be mixed. For example, several studies have found professional affiliation to be related to patient safety climate (e.g., Campbell et al., 2010; France et al., 2009; Walston, Al-Omar, & Al-Mutari, 2008; Thomas, Sexton, & Helmreich, 2003; Sexton, Holzmueller et al., 2006). However, others have not found support for this relationship (e.g., Kho et al., 2009). In terms of demographic individual differences, there has been limited evidence to date that gender or age are related to individual patient safety climate perceptions (Kho et al., 2009; Walston, Al-Omar & Al-Mutari, 2008). There has also been only limited evidence that years of experience or tenure is related to individual patient safety climate perceptions (France et al., 2009; Jasti et al., 2009). However, studies of general organizational climate have found tenure to be significantly related to climate perceptions (Gonzales-Roma et al., 1999).

Meta-analytic results from the safety climate literature also suggest a potential feedback loop between patient outcomes and climate perceptions. In a sample of 25 studies including over 17, 000 participants, Clarke (2006) found that safety climate accounted for 22% of the variance in accident/injury rates. However, this relationship was moderated by study design. Safety

climate was positively related to accidents in both prospective designed studies ($\rho = .35$), in which accidents were recorded after administration of the climate survey, and retrospective designed studies ($\rho = .22$), in which participants self-reported accidents or injuries experienced during a given period of time prior to the climate survey. However, only the credibility values for prospective studies met the criteria for validity generalization—suggesting that results from prospective studies regarding the effects of safety climate on accident rates were the most robust across occupational settings.

Overall, the theoretical and empirical findings regarding how patient safety climate perceptions form have generally align with theories of general organizational climate and general safety climate which suggest that multiple influences shape individual climate perceptions, but that the most proximal—interaction with workgroup members—may exert the most pronounced influence (Ashforth et al., 1985). These results also parallel empirical studies that have found support for both proximal and distal predictors of individual perceptions of general organizational climate (Joyce & Slocum, 1984) and team climate (Smith-Jentsch et al., 2010).

2.3 Patient Safety Climate as a Predictor Variable: What Impact Does Climate Have on Outcomes?

As described in Chapter One theories of organizational climate and safety climate suggest that climate affects safety related behaviors (e.g., use of safety protocols or protective equipment, error reporting) by providing cues regarding the priority of safety compared to other organizational or work group goals. It is through these behaviors that climate is theoretically able to impact more distal collective outcomes such as actual harm, accidents, or errors. In the subsequent sections, literature examining the impact of climate on patient safety behaviors is first

reviewed followed by studies of the relationship between climate and more distal outcomes such as indices of harm and error.

2.3.1 Patient Safety Climate and Patient Safety Behaviors

In one of the few theoretically developed examinations of the impact of climate on patient safety behaviors, Wakefield and colleagues (2010) leveraged the theory of reasoned action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Ajzen, 1991) to suggest that climate shapes attitudes toward patient safety oriented behaviors such as speaking up or intervening when a potential error is observed, perceived norms regarding acting in ways that support safety, and perceptions of control which coalesce to impact behavioral intentions and, in turn, actual behavior. Based on this theory they examined predictors of patient safety behavioral intent and found that an individual's belief that engaging in a given behavior would lead to increased patient safety (preventative action belief) and perceptions regarding the patient safety behaviors of one's professional colleagues (professional peer behavior) were the two strongest predictors of patient safety behavioral intentions. Additionally, moderator analyses suggested that the predictors of behavioral intent varied among provider type (clinicians vs. nurses vs. allied health professionals) and based on seniority (e.g., junior physicians vs. senior physicians).

In terms of actual behavior, error reporting has been one of the most widely studied. Error reporting is theoretically conceptualized as a critical aspect of active learning, error management, and future error mitigation. Models of safety climate operationalize error reporting as one of the behavioral mechanisms that mediate the relationship between climate and indicators of harm (Zohar, 2003). High reliability theory underscores that even near misses

provide an opportunity to diagnose and address potential system weaknesses. Studies of For example, in a study of the construction industry Probst, Brubaker, and Barsotti (2008) found that organizations with poor safety climate had significantly higher rates of underreporting than those with positive safety climate, with nearly 81% (versus 47%) of eligible injuries going unreported to the relevant federal reporting agency. Empirically, climate has been related to provider motivation and willingness to report near misses and critical events. Specific to patient safety climate, Braithwaite and colleagues (2010) found that providers who perceived that their organizational had a non-punitive culture and supported error reporting were more likely to use hospital electronic error reporting systems. Correlations between patient safety climate and the number of errors reported have been relatively weak (Sorra & Dyer, 2010; Wilson, 2007). These studies have focused on examining the relationship between error reporting and specific dimensions of patient safety culture. Conceptually, however, there is a mismatch in bandwidth between such a specific predictor (i.e. a specific dimension of climate) and a relatively broad behavioral outcomes (i.e. error reporting). Therefore, operationalizing climate configurally may uncover a stronger relationship with error reporting behavior.

2.3.2 Patient Safety Climate, Errors, and Quality of Care

Theories of general safety climate propose that by motivating employees to engage in safe behaviors (e.g., wearing protective equipment) that climate impacts incidents of actual employee harm (Zohar, 2003; Merns, Whitaker, & Flin, 2003; Weigmann et al., 2002). Studies examining the relationship between climate and harm to care providers have found patient safety climate to be related to both behavioral compliance with safety protocols and outcomes such as

provider exposure to blood-borne pathogens, needle sticks, and back injuries (Gershon et al., 2000; Hofmann & Mark, 2006; Smith et al., 2010; Zohar et al., 2007).

While climate has been related to outcomes for the care provider, patient safety climate is explicitly concerned with the safety of the patient. Adverse patient outcomes tend to be broadly defined as “harm to a patient that results from medical care” (U.S. Department of Health and Human Services Office of the Inspector General, 2008, p. ii). For example, the U.S. Food and Drug Administration (FDA) and Joint Commission, the accreditation body for U.S. hospitals, defines serious adverse events as those most serious negative outcomes, such as patient death, hospitalization or prolonged hospitalization, and permanent or prolonged disability (U.S. Food and Drug Administration, 2009). These outcomes are extremely rare, thus the statistical power to detect relationships between aspects of the work environment such as patient safety climate and such patient outcomes has been relatively limited in much of the published literature to date (see Mann et al., 2006 for a noted exception). Two reviewed studies have found significant negative relationships between climate and patient mortality rates (Estabrooks et al., 2005; Sexton, 2002); however, effect sizes were small. Wilson (2007) also investigated the relationship between adverse incident rates, unit reporting rates, and climate. Reporting rates captures all items—regardless of severity—that were reported to risk managers, while incidents reflected only those instances of severe patient harm. Several dimensions of climate were significantly related to reporting rates (hospital management support for safety, non-punitive response to error), however, a significant relationship was not detected with adverse incidents. In a study of 36 medical units within two hospitals Naveh et al., (2005) found that safety climate/culture accounted for nearly 30% to 58% of the variance in treatment errors, with greater explanatory

power when the pattern among the various dimensions is considered. Similar reviews also suggest that the evidence for the safety climate—patient outcome relationship is mixed and have suggested that climate may be a stronger predictor of affective outcomes (e.g. job satisfaction, burnout) than patient outcomes (e.g. MacDavitt, Chou, & Stone, 2007).

Studies of events such as patient falls have been mixed. For example, Sammer (2009) found teamwork climate to be negatively associated with falls and falls with injury. However, O'Brien (2009) did not find a relationship between patient safety climate and falls. Both studies used the same measure of patient safety.

One of the most prevalent ways to measure patient safety in the US are a set of Patient Safety Indicator (PSI) measures defined by AHRQ that are calculated based on inpatient discharge data (AHRQ, 2006). The AHRQ PSIs are designed as proxy measures of patient safety indicative of the rate of potential adverse events or unintended complications following surgical or procedural care. For example, post-surgical PSIs include rates of respiratory failure, embolism/deep vein thrombosis (i.e. blood clot), and infections. Studies of the AHRQ PSIs have generally found that they are negatively related to climate; that is, that hospitals with more positive safety climates tend to have lower rates of negative patient outcomes. However, effect sizes have been small. For example, Mardon (2008) correlated individual dimensions of patient safety climate with AHRQ PSIs and found negative correlations ranging from $-.17$ to $-.29$. Using a composite of 12 AHRQ PSIs, Singer and colleagues (2009) suggested that every 1% increase in patient safety climate scores was associated with a 3.4% decrease in the composite PSI risk. Singer also found that senior management perceptions of climate were not related to individual PSI indicators, however, perceptions of frontline staff were.

Given that measuring safety in terms of error rates is problematic due to low base rates, studies have also included other indicators of patient safety based on the degree to which evidence based care algorithms are applied. Similar to the AHRQ PSIs these indicators have been conceptualized as indicators of quality of care (i.e., how closely actual care follows evidence-based best practice care algorithms). For example, the Hospital Quality Alliance Core Measures (Joint Commission, 2010a) are indices of hospital care processes designed to measure the extent to which patients suffering heart attacks, heart failure, pneumonia, or undergoing surgery receive recommended care. These indicators have demonstrated positive relationships with the dimensions of patient safety climate, suggesting that hospitals with more positive safety climates are also more reliable in providing recommended care to patients (Mardon, 2008). Prospective observational studies of patient safety practices have found that both hospital referenced climate perceptions and unit referenced climate perceptions predicted observed patient safety practices and medication safety practices collected six months later (Zohar, Livine et al., 2007).

Overall, there is evidence that the individual dimensions have been related to patient outcomes and indices of care quality. The relatively small effect sizes, however, are likely related to a mismatch in bandwidth between predictors and criteria given that a single dimension of climate is a narrowly defined predictor and patient outcomes such as adverse events are a much more broad criterion. Configural theory and multi-level theory suggest that examining climate in terms of the pattern among dimensions may provide a better match between predictor and criteria bandwidth, thus increasing the power of statistical tests to detect such a relationship.

2.3.3 Patient Safety Climate & Patient Satisfaction

The general organizational literature has linked climate with important outcomes, such as customer satisfaction and effectiveness. For example, Gillespie and colleagues (2008) found that perceptions of organizational culture accounted for 11% to 28% of the variance in customer satisfaction ratings. From a configural perspective, Schulte and colleagues (2009) found that while climate profile elevation was predictive of internal outcomes such as employee attitudes and perceptions of customer service, profile shape was predictive of external outcomes such as customer satisfaction and financial performance. Specifically, results of their two studies showed that a climate shape accounted uniquely for 10% of the variance in customer satisfaction ratings.

In healthcare, the patient is the customer and providers must demonstrate both clinical and interpersonal skills to successfully satisfactorily fulfill patient expectations regarding care (Travaline, Ruchinskas, & D'Alonzo, 2005). In a study of healthcare providers, Bellou (2007) found that provider perceptions of organizational culture significantly impacted their customer service orientation, defined as their ability to adjust their service, in order to take patients' reality into account (Daniel & Darby, 1997). Perceptions of culture also were found to account for 18% of the variance in provider customer service orientation. In terms of customer satisfaction, Wolosin (2008) demonstrated a significant correlation between patient safety culture and patient satisfaction ratings ($r = .57, p < .001$). Mardon and colleagues (2008) also found that dimensions of patient safety climate were positively correlated with patient satisfaction, as measured using the HCAHPS patient survey that hospitals conduct for the Center for Medicare and Medicaid Services ($r = .24$ to $.46$). Similarly, Shortell et al. (1994) found that climate perceptions of unit

leadership and teamwork were positively related to patient perceptions of care quality. Additionally, Weingart and colleagues (2006) also found a significant negative relationship between adverse incidents and patient satisfaction such that adverse incidents decreased, patient satisfaction increased.

2.3.4 Patient Safety Climate & Employee Satisfaction

Early in the study of general organizational climate, there much debate regarding whether climate perceptions were actually meaningfully different constructs than employee attitudes such as job satisfaction. Compared to similar constructs such as job satisfaction, climate perceptions are descriptive, rather than evaluative, and are conceptualized as a primarily social (vs. individual) phenomenon (Joyce & Slocum, 1984; Schneider et al., 2011). The discriminant validity of safety climate and job satisfaction has been supported and models of organizational climate suggest that employee attitudes may mediate the relationship between climate perceptions and safety behaviors (Kopelman, Brief, & Guzzo, 1990). For example, meta-analytic results examining the relationships between climate and job performance at the individual level suggest that this relationship is mediated by both organizational commitment and job satisfaction (Carr, Schmidt, Ford, & DeShon, 2003).

Within healthcare, studies of general organizational climate and culture have found positive relationships with nurse job satisfaction (Kangas et al., 1999; Tzeng et al., 2002), organizational commitment (Gifford et al., 2002) and negative relationships with nurse burnout (Halbeslben et al. 2008). Studies of patient safety climate have found positive relationships at the dimension level between job satisfaction and perceptions of management support (Aiken,

Clarke, & Sloane, 2002; Warren et al., 2007), teamwork (Stone, Du, & Gershon, 2007; Warren et al., 2007), and aspects of work design such as staffing and autonomy (Aiken, Clarke, Sloan, Sochalski, Silber, 2002; Aiken, Clarke, Sloane, 2002). However, few studies have examined how climate's impact on other employee attitudes, such as their willingness to recommend their organization to family and friends, or how such attitudes affect employee behaviors and patient outcomes. For example, in their review of measures of safety climate in healthcare Flin et al. (2007) called for investigation of the psychological mechanisms that may mediate the relationships between safety climate and safety-related behaviors. Overall, gaps in our understanding of the relationship between patient safety climate and employee attitudes remain, especially when climate is operationalized from a Gestalt perspective that considers the patterns among climate dimensions.

2.3.5 Configural Studies of Patient Safety Climate

As detailed in Chapter One, configural theory suggests that there is a need to focus on the pattern of relationships among the components that comprise climate to more fully reflect its conceptualization as a compound construct comprised of multiple dimensions. The configural perspective has yet to be meaningfully applied to the study of patient safety climate; however, some of the work to date suggests that the patterns among dimensions are important. For example, Sine and Northcutt (2008) used qualitative analysis of focus group data to develop a conceptual framework regarding the relationships among the various dimensions of patient safety climate. Specifically, their results suggest that the dimensions of climate are related through a series of reciprocal relationships and can be classified as either upstream or

downstream drivers of safety. For example, management support for patient safety, feedback and communication about safety, communication openness, and support for reporting errors/close calls were identified as the four primary upstream drivers of safety. Conversely, handoffs of patient information, organizational learning, punitive response to error, and teamwork across hospital units were identified as downstream aspects of climate that are likely influenced to a large degree by the upstream dimensions. While this specific model of climate has yet to be validated empirically, it provides a conceptual foundation emphasizing that the dimensions of climate “influence each other as interactive elements within a larger system” (pg. 78) and suggests the need to examine the patterns among dimensions.

2.4 Patient Safety Climate and Climate Strength

Climate strength is defined as the degree to which climate perceptions are shared among members of a given group, unit, or organization (Carr, Schmidt, Ford, & DeShon, 2003). As summarized in Chapter One, climate is inherently a multilevel construct—requiring some level of overlap or sharedness among individual perceptions to exist as a group level construct (Kozlowski & Klein, 2000). Using the language of multi-level theory, climate has traditionally been studied through the lens of direct consensus models or referent-shift models that focus primarily on the overall level of climate (Chan, 1998). However, these models only consider the aggregated mean of individual climate perceptions. Dispersion models, on the other hand, are explicitly concerned with the degree to which climate perceptions vary among group members (Brown & Kozlowski, 1999). In line with the dispersion school of thought, the concept of climate strength reflects the notion that while perceptual sharedness may exist among group

members that meaningful within-group variance may still remain (Schneider, Salvaggio, & Subirats, 2002). Strong climates conceptually are a sign of robust, unambiguous situational, environmental, and social cues. These, in turn, formulate relatively uniform behavior-outcome expectations among individual members and strong norms (Dickson, Resick, & Hanges, 2006). Conceptually, multi-level theory and high reliability theory suggest that the more unambiguous these situational cues are (i.e., the stronger climate is) the more likely individuals are to engage in behaviors that are reinforced and to, thus, achieve desired outcomes.

Empirical evidence examining general organizational climate and team climate has supported this hypothesis. Specifically, the literature suggests that climate strength often moderates the relationship between climate and outcomes of interest; that is, the extent to which group perceptions are heterogenous or homogenous can either strengthen or weaken the relationship between climate and outcomes of interest (e.g., Colquitt, Noe, & Jackson, 2002; Gonzales-Roma et al., 2002; Schneider, Salvaggio et al., 2002; Zohar & Luria, 2005). For example, Schneider and colleagues (2002) found that the interaction between climate strength and mean climate level significantly predicted customer perceptions of service over time. Neither climate strength, nor mean climate level was a significant unique predictor of customer satisfaction however. Their results further suggest that under conditions of low climate strength, there was also greater variation in customer satisfaction. González-Romá, Fortes-Ferreira, and Peiró (2009) similarly found that only the interaction between climate strength and team climate level was predictive of team financial performance, suggesting that only strong climates were predictive of performance.

Other work also suggests that climate strength is related to organizational climate type. For example, Dickson and colleagues (2006) found support for a curvilinear relationship between strength and climate type. Perceptions were most highly shared when climates were perceived as highly mechanistic (i.e., hierarchical, centralized, formalized) or highly organic (i.e., decentralized, autonomous, democratic). However, when perceptions tended to fall near the mid-point of the continuum, they also tended to be less shared. Similarly, Dawson (2008) found a curvilinear relationship between climate strength and performance in a sample of UK hospitals. Their results suggest that moderate climate strength is associated with higher levels of hospital performance, while very high and very low climate strength is associated with lower performance scores. Other studies of healthcare providers also suggest curvilinear relationships between climate strength and outcomes such as innovation (González-Romá & West, 2005; as cited in Dawson et al., 2008).

Overall, there is a need to better understand the impact of climate strength on patient safety climate. There is not yet a clear understanding of the effects of climate strength on patient safety climate-outcome relationships when climate is operationalized from a configural perspective (i.e., in terms of the climate profile characteristics of elevation, variability, and shape). Multi-level theory would suggest that climate elevation, variability, and shape would have a more pronounced relationship with both patient and employee outcomes when climate perceptions are highly shared among unit members. From this perspective, strong climates produce strong situations which, in turn, produce greater behavioral consistency among work group members (Schneider et al., 2002). However, findings regarding the effects of climate strength have been mixed and this hypothesis has yet to be thoroughly tested in the context of

facet-specific forms of climate such as patient safety climate (Schneider, Ehrhart, & Macey, 2011).

2.5 Chapter Two Summary

Patient safety climate is a facet-specific type of safety climate defined as shared perceptions about enforced patient oriented safety policies and practices. While the theoretical development of the patient safety climate construct itself has been relatively limited to date, much of the research draws on existing models of general safety climate. While this is a reasonable foundation there are some important unique aspects of patient safety climate that must be considered in theoretical models of the construct: (1) patient safety concerns outcomes for the patient, not the provider themselves necessarily, (2) individual variation among patients, and (3) the complex systems of care.

Overall, the empirical evidence to date suggests that patient safety climate is related to important aspects of healthcare provider performance (e.g. job attitudes, behaviors) and patient outcomes (e.g. satisfaction, harm). However, the majority of empirical research has been cross-sectional and has focused on relating the individual dimensions of climate to outcomes of interest. This creates a mismatch in predictor and criterion bandwidth; that is a single dimension of climate is likely much too specific to account for significant variance in a broad outcome such as incidents of patient harm. Theoretical models of general organizational and safety climate emphasize climate as a holistic construct—designed to describe the working environment as a whole. However, there has been limited investigation of configurations among the dimensions patient safety climate. The results of this review emphasize that future studies of

patient safety climate are needed that investigate the influences on individual perceptions of climate and, in turn, examine the relationships between climate and outcomes from a configural perspective. The current study is specifically designed to redress these gaps and contribute to the theoretical and practical understanding of the patient safety construct. Specific study hypotheses are outlined in Chapter Three.

CHAPTER THREE: HYPOTHESES

The review of extant theoretical and empirical literature presented in Chapter Two suggests several factors that may impact individual-level patient safety climate perceptions and, in turn, several outcomes that may be affected by group-level patient safety climate. Given that the patient safety construct is explicitly focused upon the safety of the patient rather than the safety of the provider themselves, the current study focuses purposely on patient outcomes. The literature review also suggests that there are likely complex interactions and reciprocal relationships among the various dimensions of climate. Therefore, the configuration or pattern among the dimensions of patient safety climate (i.e., climate profile characteristics) is likely to enable a more comprehensive understanding of both how climate forms and its effects on outcomes. Thus, the current study focuses on testing a parsimonious model of the antecedents of individual-level perceptions of patient safety climate, the consequences of group-level patient safety climate configurations, and the potential moderating effects of climate strength on climate-outcome relationships. This model is presented graphically in Figure 3. The remainder of this chapter is dedicated to describing each construct included in the model and the rationale for specific hypotheses to be tested in the current study. Specific study hypotheses are numbered in Figure 3 in order to provide a graphical representation of each hypothesized relationship.

In line with multi-level theory (Kozlowski & Klein, 2000) and the theoretical work on patient safety climate to date by Reiman et al. (2010), Zohar (2007), and Sine and Northcutt (2008), this model suggests that patient safety climate is most meaningfully conceptualized at the group level, as a compositional variable that emerges based upon perceptions of the work environment that are shared among group members. The model also suggests that multiple

factors influence individual perceptions of patient safety climate. Individual perceptions of climate are the lower level components of unit level patient safety climate. These individual level perceptions coalesce and emerge upward to form the higher level construct. Through collective sensemaking processes these individual perceptions become shared among members of meaningful social groups in the work place (James et al., 2008; Schneider & Reichers, 1983). In this way the model depicts that there are likely both proximal (e.g., specific unit membership) and distal influences (e.g., organizational membership) on individual perceptions of patient safety climate.

Overall, the current model extends previous models of general safety climate (e.g., Zohar's [2000] model of safety climate summarized in Chapter Two) by focusing on the holistic profile of patient safety climate rather than specific individual dimensions and by also incorporating outcomes focused on patients rather than the employees themselves. Additionally, targeted outcomes include affective aspects of the patient's experience (i.e., patient satisfaction).

The remaining sections of this chapter are dedicated to explicitly defining each construct included in Figure 3, discussing the hypothesized relationships among identified constructs in the model, and providing a theoretical rationale for each hypothesis suggested by the model.

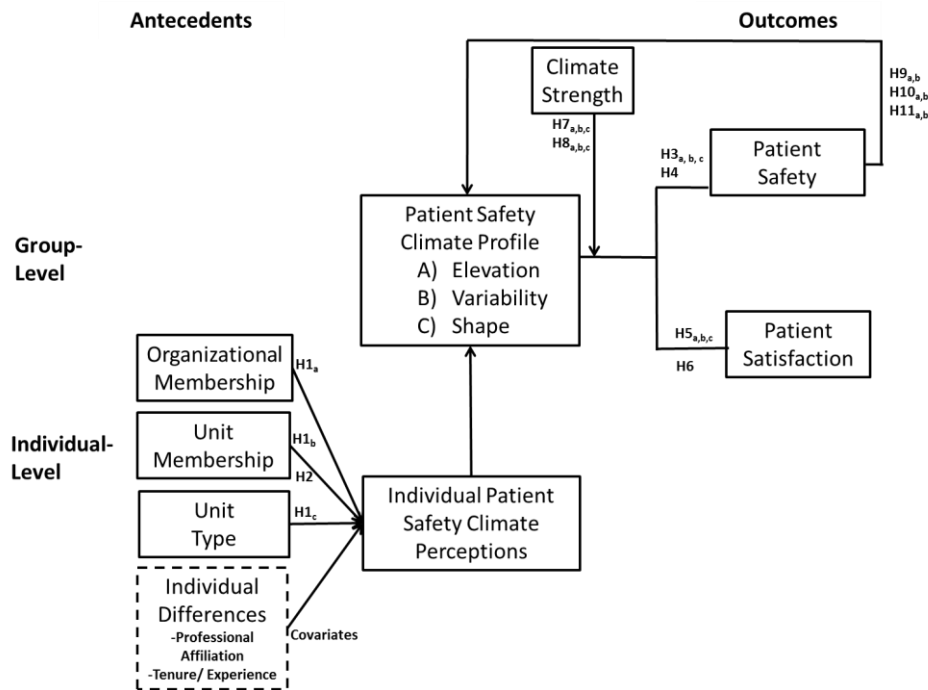


Figure 3. A model of hypothesized relationships tested in the present study.

3.1 The Antecedents of Patient Safety Climate: What Factors Shape Individual Perceptions of Patient Safety Climate?

As summarized in Chapter Two, theorists have advanced several competing frameworks for describing the processes through which climate develops (Ashforth, 1985; Schneider, Ehrhart, & Macey, 2011). While not completely orthogonal, these frameworks differ in the extent to which they view climate as either a product of *structural elements* of the work environment (e.g., degree of organizational centralization, formalization, specialization [Payne & Mansfield, 1973; Payne & Pugh, 1976]), a product of *attraction-selection-attrition* processes (e.g., degree that personal values, personalities, and background characteristics fit with others in the organization or unit [Schneider, 1987; 1995]), or a product of *symbolic interactionism* (Blumer, 1969),

collective sense-making processes occurring through meaningful interactions among employees [Schneider & Reichers, 1983]). These various perspectives suggest that there are multiple factors that are likely to uniquely contribute to an individual's patient safety climate perceptions, including organizational membership, unit membership, and the type of unit they are a member of (e.g., surgical unit, intensive care unit).

3.1.1 Organizational Membership

The structuralist perspective argues that various characteristics of the organization such as size, power structure, and degree of formalization/standardization contribute to the development of climate. While there is limited support for the notion that these structural elements directly influence climate (e.g., Chen, 2007; Payne & Mansfield, 1973; Payne & Pugh, 1976; Porter & Lawler, 1965) the structural aspects of the organization may influence climate indirectly by affecting formal organizational policies, the degree that formal organizational policy is used to standardize employee behavior, and by the way the organization enforces sanctions for violations of formal policies or non-conformity (Lawler, Hall, & Oldham, 1974; Zohar, 2003). Considering that formal organizational policies provide overt statements regarding the value of specific organizational goals, such as patient safety, organizational membership is one factor likely to influence individual perceptions of climate.

3.1.2 Type of Unit

Formal policies and enacted policies and procedures may vary among particular types of units, with some types of units having more highly standardized or overt policies or procedures

regarding patient safety. For example, policies, procedures, and practices regarding patient safety may be more formally standardized in surgical units compared to other types of units given that there is a high degree of regulation in place regarding how organizations must protect the safety of surgical patients. For example, all accredited U.S. hospitals must have formal policies regarding a mandatory team timeout that occurs immediately before the first incision of all surgical procedures and documentation procedures in place to ensure that all surgical patients are identified properly and that the correct surgical site it operated on (Joint Commission, 2010b). However, the degree to which specific procedures and task strategies related to patient safety are formalized and standardized is likely to differ across different types of units. For example, in highly proceduralized clinical areas such as surgical units, there is a relatively linear, step-wise progression to each patient encounter and clearly defined patient safety policies and procedures that apply across all hospitals. More specifically, all surgical patients must receive prophylactic antibiotics 30 minutes prior to the first cut of their procedure. Conversely, ICU or PCU units deal with greater variation in the type of patients they care for and a larger breadth of applicable care algorithms (i.e., task strategies) to choose from. Additionally, these types of units have fewer standardized regulations regarding patient safety. As such, there is likely to be greater variation in enacted policies, procedures, and norms regarding patient safety in these types of units compared to surgical units. This suggests that the type of unit an individual works in is likely to have a significant and unique impact on their perceptions of patient safety climate.

3.1.3 Specific Unit Membership

The interactionist perspective regarding climate development draws on the tenants of social learning theory (Bandura, 1977), to suggest that shared climate perceptions emerge from interactions among employees. Specifically, this functional perspective suggests that employees learn the relative priority of organizational goals such as patient safety mostly through direct interactions with co-workers and colleagues, observation of colleagues on the job, and feedback (Louis, 1980; Miller & Jablin, 1990). Through these interactions, employees formulate perceptions about which behaviors and attitudes are actually reinforced by their immediate supervisors and peers, the degree to which formal organizational policies and procedures are enforced (or disregarded), and the relative rankings of multiple goals within their unit (e.g., is efficiency or safety valued more highly?). For example, if surgical unit leaders and the surgeons on a particular unit believe that a timeout is a waste of time and consistently expect other unit members to bend this safety rule whenever workload is high, than a low patient safety climate is promoted by providing cues to employees that patient safety is a relatively less valued goal than efficiency.

Ashforth (1985) further suggests that social comparison and conformity theory also play a role in the way individual climate perceptions develop. Specifically, Ashforth argues that individuals compare and adjust their own climate perceptions based on comparisons with compelling referents—other individuals who are considered “similar, valued, salient, and/or accessible” (p. 839). These referents provide frames of reference for interpreting aspects of the work environment, provide clues regarding valued behaviors, attitudes, and cognitions, and also

provide insight regarding consequences and sanctions for non-conformity with group norms. Ashforth argues that pressures to conform are greatest at the workgroup level, as opposed to the organizational level, given that the majority of social and work-relevant interactions among employees happen at this level.

Theoretically, these perspectives suggest that there are multiple factors impacting employee perceptions of patient safety climate. Formal organizational policies and the actions of organizational leaders provide cues regarding the relative priority of patient safety at a macro level within the organization. The type of unit also likely impacts individual climate perceptions given differences in the degree of proceduralization and standardization among clinical areas that can be strong forces on enacted policies. Furthermore, employees who interact directly most often are more likely to engage in collective sensemaking processes and are thus likely to share similar perceptions regarding the relative priority of patient safety within their collective working environment. Thus, membership in a specific unit is also likely to affect individual climate perceptions. Therefore, it is hypothesized that:

Hypothesis 1: (a) Organizational membership, (b) specific unit membership, and (c) unit type each account for unique variance in individual-level patient safety climate elevation.

Hypothesis 1 specifically focuses on the antecedents that shape perceptions of each dimension of safety climate given that these dimensions are the components of group-level climate profiles. However, configural theory suggests that through symbolic interaction individuals may also come to share similar perceptions in terms of the patterns among the

dimensions of climate; that is, individuals may share similar climate shapes. Collective climate theory, for example, explicitly argues that individuals can be categorized into groups based on the degree to which they perceive similar patterns among the dimensions of climate using statistical clustering techniques and there is evidence that this technique meets criteria for reliability and validity (Joyce & Slocum, 1984; Smith-Jentsch et al., 2010). Given that employees who work together often on interdependent tasks have a greater opportunity to interact, and engage in collective interpretation and sensemaking of the work environment, similar patterns among dimensions are more likely to be shared among members of the same work group than among individuals from different workgroups. That is, members of the same unit are likely to perceive similar relationships among the dimensions of climate. Additionally, multi-level theory suggests that the most proximal antecedent is the one most likely to have the greatest influence on a particular outcome (Katz & Kahn, 1978). Thus, it is likely that membership in a specific unit is more likely to be related to collective climate (i.e., cluster membership based on climate shape) than unit type or organizational membership. To this end it is also hypothesized that:

Hypothesis 2: Individuals are more likely to fall into the same collective climate (i.e., cluster) with members of their same unit than with members of other units.

3.1.4 Individual Differences

Individual differences such as tenure and professional affiliation are also likely to influence individual perceptions of climate; however, they are not the focus of the current study. General

organizational climate theory argues that attraction-selection-attrition processes can influence individual perceptions of climate, especially during the socialization period when an employee first begins working in a given organization or unit (Schneider et al., 1995). This perspective suggests that individuals with longer tenure may share other deeper level characteristics that have caused them to want to stay with the organization or unit and that these deep level characteristics may color their perceptions of climate. Additionally, individuals with longer tenure have had more of a chance to be involved in collective sensemaking processes, to observe more examples of collective behavior, and have greater experience with how peers and supervisors react to safety events. In this sense, longer tenure provides a greater sample of critical events from which to draw inferences about behavior-outcome contingencies and cues regarding the relative priority of patient safety. Similarly, professional affiliation (e.g., physicians, nurses, technicians) may also affect individual perceptions of climate by influencing the frame of reference from which one perceives and interprets climate. Professional affiliation could also influence the size of the sample of critical events from which inferences about the priority of safety can be drawn. For example, in the hospital environment nurses often spend more time performing direct patient care duties than physicians. The review of existing literature suggests that there may be differences among physicians and nurses in terms of how positively they view safety climate (Singer, Gaba et al., 2009; Singer, Lin et al., 2009) given that they spend different amounts of time with patients, are responsible for different tasks, and are acculturated through differing educational processes. Given that individual differences are not a primary focus of the present study, tenure and affiliation will be accounted for during analysis to

control for their potential effects. However, they have been examined relatively extensively in the safety climate literature to date and should be an area of continued study in future research.

3.2 The Outcomes of Patient Safety Climate: Do Patient Safety Climate Profile Characteristics Predict Patient Outcomes?

This research question is dedicated to examining the relationship between group-level patient safety climate profile characteristics and two focal outcomes of interest: patient safety and patient satisfaction. While much of the work to date has examined the role of safety climate in employee outcomes (e.g., personal injuries, job satisfaction, etc.), the relationship between climate and patient outcomes is less well understood. Additionally, climate has tended to be examined from a reductionist perspective rather than from a configural perspective; that is, theories and studies of climate have tended to focus on the individual dimensions in singularity and have rarely considered the patterns among the various dimensions of climate. Given that climate is conceptualized as a holistic representation of the work environment, configural theory (Meyer, Tsui, & Hinings, 1993) suggests that the patterns among the dimensions of climate are likely to impact important outcomes. These patterns reflect the degree to which the work environment provides congruent cues regarding the priority of patient safety relative to other organizational goals. In this way the configuration of the dimensions reflects the degree to which the work environment creates strong situational forces that increase the probability of safe behaviors, which, in turn, impact patient outcomes.

In particular, the review of the literature suggests that patient safety climate is likely to impact two patient outcomes—patient safety (i.e., the degree to which care is free of harm) and patient satisfaction. While both have been discussed in Chapter Two they have often been

described using varying definitions, therefore, in subsequent sections of this chapter each outcome is defined, followed by the theoretical rationale for related hypotheses.

3.2.1 Patient Safety Climate Profile Characteristics as Predictors of Patient Safety

Patient safety is defined in terms of the presence (or absence) of patient harm caused by medical intervention (Emanuel et al., 2008; Institute of Medicine, 2001; U.S. Department of Health and Human Services Office of the Inspector General, 2008). Patient safety is often viewed as a relatively objective outcome, determined by standardized criteria that define error and harm. For example, in the U.S. there are both federal and state criteria that define an adverse event. For example, patient death, a surgical procedure performed on the wrong patient or on the wrong site, or other harm that results in long-term effects such as brain damage or spinal damage are defined as the most severe reportable events.

In line with theories of general safety climate, the current model suggests that patient safety and patient satisfaction are impacted by patient safety climate because climate affects the likelihood that employees will engage in behaviors that support safety by providing both explicit and implicit cues regarding the relative priority of patient safety and by providing information about the consequences of engaging in safe (or unsafe) behavior. In this way, a climate that provides strong, consistent cues that patient safety is a high priority helps to create strong situational forces that constrain the range of employee behaviors such that most employees engage in safe behavior most of time and thus have fewer instances of patient harm. Conversely, a climate that provides mixed signals regarding the relatively priority of patient safety creates a weak situation that is unlikely to exert much effect on behavior and thus, have limited impact on

safety outcomes. This notion is also suggested by high reliability theory (Weick & Sutcliffe, 2007) which suggests that climate is a key driver of reliable, safe outcomes because it provides both explicit and tacit information to employees that safety is a primary objective of organizational operations and supports both error mitigation and management activities.

As reviewed in previous chapters, the degree to which climate provides consistent cues regarding the relative priority of safety is reflected in the configuration of its dimensions. The patterns among the dimensions are primarily reflected by three characteristics—elevation, variation, and shape. Each characteristic is defined below.

3.2.1.1 Patient Safety Climate Profile Elevation

Profile elevation is defined as the overall positive or negative valence of climate across dimensions and is operationalized in terms of the grand mean among dimensions (Schneider, Salvaggio et al., 2002; Schulte et al., 2009). As such, elevation can be conceptualized as the overall climate “level”. Elevation conceptually reflects the degree to which patient safety climate is perceived overall as an important organizational goal. In this way, elevation is argued to reflect a higher order, summary perception of the degree to which employees perceive patient safety as an important goal worthy of a high level of effort and resource allocation (Schulte et al., 2009). Conceptually, as this overall perception becomes more positive, patient outcomes should also become more positive given that employees are motivated to engage in behaviors that support safe care because they perceive it as a valued organizational outcome. Furthermore, the degree to which the climate is perceived as being positive or negative overall is likely to uniquely impact patient outcomes because this overall perception is likely to color the way in

which employees make sense of events that happen and of supervisory or peer behaviors. Similar to a halo effect (Nisbett & Wilson, 1977), this overall gestalt summary of the valence of the climate is likely to exert unique effects on the degree to which employees engage in safe (or unsafe) behaviors. Thus, it is likely that profile elevation accounts for significant unique variance in patient outcomes.

3.2.1.2 Patient Safety Climate Profile Variation

Profile variation is defined as the degree to which there is disparity among the multiple dimensions of climate; that is, variation provides an index of the degree to which employees perceive that the climate consistently supports patient safety and the degree to which the climate sends consistent messages regarding the relative priority of patient safety (Schneider, Salvaggio et al., 2002; Schulte et al., 2009). For example, in a highly variable climate some dimensions may be perceived very positively and some dimensions may be perceived very negatively or neutrally. In this way the climate provides mixed or inconsistent cues regarding the priority of patient safety. This inconsistency may make it difficult for employees to discern when safety should be placed above other goals such as productivity or efficiency. Without clear, salient cues regarding priorities the behavior of employees is also likely to be more variable. As this situational ambiguity increases, the variability in employee behavior and, ergo, in patient outcomes is likely to increase (Barrick, Stewart, Neubert, & Mount, 1998; Schulte et al., 2009; Weick & Sutcliffe, 2007). Conversely, in a low variability climate the policies, procedures and norms regarding patient safety are more likely to be organized in a coherent, coordinated way that sends clear, salient messages regarding the relative priority of patient safety. Such a system

is also likely to provide more structure and guidance regarding how to achieve safe outcomes and thus, greater standardization in employee behavior (Weick & Sutcliffe, 2007). While elevation reflects the overall gestalt perception of climate, variability reflects the perceived consistency among the dimensions. Thus, climate profile variation is likely to also account for unique variance in patient outcomes.

3.2.1.3 Patient Safety Climate Profile Shape

The third climate profile characteristic, *profile shape*, refers specifically to the patterns of peaks and valleys among the climate dimensions. Where profile variability is concerned with the average dispersion among the climate dimensions, and profile elevation is concerned with overall positive or negative valence, profile shape reflects the notion that the relative relationships among multiple organizational goals matter when predicting outcomes. For example, organizations strive to achieve both production and safety goals simultaneously; however, employees have a limited pool of resources (e.g., energy, time, tangible resources) available to allocate to each of these goals (Pritchard & Ashwood, 2008). Thus, indicators of the relative priority of core goals help employees choose where to allocate effort. Climate shape provides information regarding the relative emphasis on each of these goals in daily work operations and the degree to which policies, procedures, and norms regarding patient safety and customer service are internally aligned.

Compared to profile elevation and variance, climate shape is based on the premise of “conceptually derived typologies and empirically derived taxonomies” (Miller, 1996, p. 505) and is thus conceptualized categorically. The climate literature to date has examined climate shape in

an exploratory fashion, mostly using empirically derived taxonomies derived from a limited theoretical basis or, in the case of many of the early studies of collective climate, little interpretation or discussion of the pattern among dimensions at all (Jackofsky & Slocum, 1988; Joyce & Slocum, 1984; Gonzales-Roma et al., 1999). For example, previous studies that have examined collective climates have displayed the pattern of means among the dimensions in each cluster, but have done little to interpret whether these patterns are theoretically meaningful or interpretable (e.g., Gonzales-Roma et al., 1999; Joyce & Slocum, 1984). Thus, most studies have examined climate shape in an exploratory fashion and have offered no specific theoretical hypotheses concerning which climate shapes are most related to outcomes (e.g., Lyons, 2009; Schulte et al., 2009). However, this is a critical component of validity (Smith-Jentsch et al., 2010).

While there is no single agreed upon climate taxonomy in the literature to date (safety related or otherwise), the synthesis of existing literature suggests a four component framework for categorizing different climate shapes according to the degree to which they emphasize production and achievement of organizational output goals relative to employee relations and well-being (Gonzales-Roma et al., 1999; Jackofsky & Slocum, 1988; Jones & Joyce, 1979; Joyce & Slocum, 1984; Smith-Jentsch et al., 2010; Young & Parker, 1999). This taxonomy was originally suggested by Schneider et al., (1998) to describe climate for service (i.e., facet-specific form of climate explicitly focused on customer satisfaction and service) and was it was later adapted and tested by Schulte et al. (2009) in the context of general organizational climate. As denoted in Table 3, this taxonomy suggests that climate shapes can be categorized according to two dimensions: Strategy and Support. Supportive climate shapes reflect a greater perceived

emphasis on employee well-being, relations among employees, supervisor-employee relationships, and psychological safety (Schneider et al., 1984). Supportive climates generally are defined by more positive perceptions of teamwork, supervisory support, and psychological safety (e.g., nonpunitive responses to error and support for continuous learning from near misses). Conversely, strategic climate shapes reflect a greater perceived emphasis on achieving organizational production and performance goals. These dimensions are hypothesized as two orthogonal dimensions, thus, as depicted in Table 3 the taxonomy suggests that climate shape can be categorized as supportive, strategic, comprehensive, or weak.

Table 3. A taxonomy of patient safety climate shapes based upon Schneider et al. (1998) and Schulte et al. (2009).

		Strategic	
		<i>High</i>	<i>Low</i>
Supportive	<i>High</i>	Comprehensive	Supportive Climate
	<i>Low</i>	Strategic Climate	Weak

Supportive climates are conceptualized as emphasizing aspects of teamwork, psychological safety, and continuous learning—all core components of highly reliable operations. In line with resource allocation models (e.g., Pritchard & Ashwood, 2008) and HRT (Weick & Sutcliffe, 2007) this suggests that a supportive climate increases the likelihood that employees direct discretionary effort toward patient safety (Neal & Griffin, 1999). Conversely, a strategic climate focused on organizational goals of productions would theoretically increase the likelihood that effort would be allocated toward achieving strategic outcomes such as patient

throughput. A weak climate may provide unclear information regarding the relative priorities of competing goals and thus more behavioral variation among group members. Therefore, a weak climate is least likely to be related to patient outcomes. Alternatively, a comprehensive climate emphasizes equal weight to multiple goals. While this may be positive in the sense that a comprehensive climate shape does provide cues that patient safety is a valued outcome, employees may not have a large enough resource pool to actually allocate adequate effort to achieve high levels of patient outcomes and simultaneously achieve high levels of strategic outcomes such as patient throughput. Thus, comprehensive climates may emphasize the patient safety as a priority, but provide limited information about the priority of patient safety relative to other goals and thus, may create ambiguity when employees must choose which goals to focus on given limited resources.

In sum, if profile variability matters in predicting patient outcomes, then which dimensions are above or below the overall mean is conceptually irrelevant for predicting patient outcomes. This perspective theoretically suggests that the individual dimensions of climate are interchangeable and that it is the consistency among the various aspects of climate that matters most. However, if profile shape is a significant predictor of patient outcomes, then the dimensions are not so interchangeable; that is, each dimension needs to fall on a certain point of the continuum to impact patient outcomes.

Overall, this suggests the following hypotheses:

Hypothesis 3: Climate (a) elevation, (b) variation, and (c) shape each account for unique variance in patient safety. Specifically, elevation will be positively related to safety,

variation will be negatively related to safety, and a supportive climate shape will be positively related to patient safety.

Hypothesis 4: Climate (a) elevation, (b) variation, and (c) shape each account for unique variance in patient satisfaction. Specifically, elevation will be positively related to satisfaction, variation will be negatively related to satisfaction, and a supportive climate shape will be positively related to patient satisfaction.

3.2.1.4 Climate Profile Shape and the Reliability of Patient Outcomes

Another important question is to what extent patient safety profile characteristics are related to the consistency of patient outcomes over time. High reliability theory (HRT; Weick & Sutcliffe, 2007) posits that the reliability of safe outcomes is a core aspect of safety that is often overlooked. HRT conceptualizes safety as a dynamic state phenomenon that requires ongoing adaptation to changing situational factors in order to maintain consistent outcomes (Cook, 1998; Weick, Sutcliffe, & Obstfeld, 1999). In this sense, safety is conceptualized as a dynamic characteristic of a given system. In the healthcare context for example, clinicians may need to adapt or add to their repertoire of behaviors over time in order to maintain safety as new threats or interventions are available. HRT argues that five processes form a critical infrastructure of collective mindfulness or shared mental model that enables employees to learn, perform adaptively, and, ergo, achieve stable outcomes. As described in Chapter One, HRT posits that climate is one mechanism for instantiating the five core processes—preoccupation with failure,

reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise—that support highly reliable outcomes. The term reliability innately suggests that time is an important aspect of performance. However, cross-sectional studies of patient safety climate have yet to investigate the degree to which climate in fact supports reliable performance over time.

In the context of the current study, it is argued that profile shape reflects the degree of consistency in management actions, enacted policies, and procedures regarding patient safety (Miller, 1996; Schulte et al., 2009; Zohar, 2003). In relation to the reliability of patient outcomes, this suggests that the more consistent the work environment as a whole is in supporting patient safety, the greater likelihood that highly reliable outcomes will be achieved over time.

Supportive climates provide clear, salient information regarding the relatively priority of patient safety by providing cues to unit members that behaviors such as speaking up when they are concerned and treating errors as opportunities for learning are valued by their peers and leaders. Supportive climates help create employees create positive behavior-outcome expectations that engaging in behaviors that support safety will lead to favorable outcomes for both their patients and themselves. Thus, in supportive climates there is likely to be less variation in employee behavior and, in turn, less variation in patient outcomes. Therefore, it is hypothesized that:

Hypothesis 5: After accounting for elevation and variability, a supportive climate profile shape in year one will be related to the reliability of unit patient safety when safety is operationalized as the variance in adverse incidents over a two year period. Specifically, when a unit's profile shape is supportive, patient safety will be more consistent over time.

Hypothesis 6: After accounting for elevation and shape, a supportive climate profile shape in year one will be related to the reliability of unit patient satisfaction when satisfaction is operationalized as the variance in patient satisfaction scores over a two year period. Specifically, when a unit's profile shape is supportive, patient satisfaction will be more consistent over time.

3.3 Does Climate Strength Moderate Patient Safety Climate—Outcome Relationships?

If there is a significant relationship between the three patient safety climate profile characteristics and patient outcomes, it is important to also consider potential boundary conditions that moderate these relationships. By examining boundary conditions we can identify the conditions under which patient safety climate has a stronger (or weaker) impact on unit outcomes. Given that unit climate is a socially derived construct, the degree to which climate perceptions are shared among unit members—the *strength of the unit climate*—is likely to impact the relationship between patient safety climate and patient outcomes.

Climate strength has only relatively recently been integrated into the study of general organizational and safety climate however. Traditional aggregation techniques based upon group means or surface level categorization (e.g., formal organizational units or teams) erroneously treat within-group variance in climate perceptions as error variance. This approach does not recognize that individuals within formally defined groups may differ in climate perceptions due to differences in attention and interpretation processes or other factors. Zohar et al. (2007) found

that the elevation of unit climate was a stronger predictor of safety outcomes when there was higher agreement among unit staff in their climate perceptions.

Conceptually, multi-level theory (e.g., Chan, 1999; Brown & Kozlowski, 1999; Kozlowski & Klein, 2000) posits that climate is an emergent construct that develops as lower level constructs combine through the processes of social interaction. Therefore, this perspective argues that climate strength is an indicator of the “degree of emergence of a work units’ climate” (Gonzalez-Roma et al., 2002, p. 466). As such, highly shared climate perceptions (i.e., strong unit climate) theoretically create strong situational influences on behavior by providing clear cues about what behaviors are acceptable and what behaviors are not. Strong situations help individuals to form shared mental models that lead them to interpret and make sense of situations in similar ways and help shape similar behavior-outcome expectancies (Mischel, 1973; Matheiu et al., 2000). This reduces behavioral variability among unit members and, ergo, increases the predictability of behavior (Gonzales-Roma et al., 2005). Conversely, if climate strength is weak, perceptions vary among unit members and thus there is less mental model sharedness among unit members regarding enacted unit policies, procedures, and norms regarding patient safety. This ambiguity leads to greater behavioral variation among unit members given that the situational forces affecting behavior are weak and likely ambiguous. In the healthcare context, patients are cared for by multiple individuals. Thus, behavioral variation among caregivers is likely to influence patient outcomes. In this way, climate strength is likely to affect the relationship between climate and patient outcomes. Therefore, it hypothesized that:

Hypothesis 7: Climate strength moderates the relationship between (a) climate elevation,

(b) variation, and (c) shape and patient safety, such that each of these relationships becomes stronger as climate strength increases.

Hypothesis 8: Climate strength moderates the relationship between (a) climate elevation, (b) variation, and (c) shape and patient satisfaction, such that each of these relationships becomes stronger as climate strength increases.

3.4 Do Patient Outcomes Affect Subsequent Patient Safety Climate Perceptions?

Climate perceptions have been conceptualized as arguably more dynamic than static. While a certain level of climate fluidity is to be expected over time, the degree and rate of change may vary among units or organizations (Davis, Nutley, & Mannion, 2005). For example, rapid shifts may occur in response to recent errors or crises. Additionally, more gradual shifts in climate may be precipitated by influences external to the organization such as changes in federal or state regulations regarding safety that lead to changes in enacted procedures and norms.

Given that patient safety climate reflects the perceived priority of patient safety, the occurrence of adverse incidents and the responses to these events by unit and organizational members are likely to play an important role in future perceptions of climate. For example, HRT (Weick & Sutcliffe, 2007) suggests that if incidents are addressed as opportunities for learning in a context where acceptable and unacceptable behavior is clearly defined, than the unit's climate is more likely to be perceived as supportive. As described above the climate profile characteristics are indicators of the strength of the situation shaping employee behaviors,

attitudes, and thoughts relevant to patient safety. As such the characteristics are likely to shape the response of management and peers when an adverse event occurs. For example, consistent management action in response to incidents provides strong cues about the true priority of patient safety and will thus be more likely to impact future climate perceptions (Zohar, 2003). Thus, it is plausible that patient safety outcomes will meaningfully affect future patient safety climate profile elevation, shape, and variability.

For example, a supportive climate shape may have unique buffering effects. Supportive patient safety climates theoretically create a psychologically safe context which recognizes serious events as opportunities for learning and for improving systematic unit operations, rather than focusing on individual error and placing blame. A supportive climate likely allows these units to be more resilient to adverse events given that they are more likely to take a more comprehensive, just approach to addressing events and focus on addressing root causes at a system level. By fostering a supportive, learning-oriented approach to dealing with adverse events and errors, units who start out with a supportive climate shape create a foundation so that they are more likely to maintain a supportive climate shape even after adverse patient outcomes.

As such, Figure 3 depicts an input-mediator-output-input model in which patient safety outcomes also serve as direct inputs for subsequent climate perceptions. Specifically, the model suggests that patient safety outcomes impact future patient safe climate directly. For example, poor safety outcomes may lead to changes in enforced safety policies or to changes in supervisory or peer safety practices after an adverse incident—core components of patient safety climate. As such, configural theory also suggests that that over time the profile characteristics

may interact with patient safety outcomes to predict future climate perceptions (Smith-Jentsch, 2009). Accordingly is it hypothesized that:

Hypothesis 9 (elevation x safety score interaction): Climate profile elevation in year one and patient safety score in year one will interact to predict year two climate elevation. Specifically, units with higher elevation in year one will be more likely to maintain high elevation scores in year two even if patient safety scores in year one are low given that these units are theoretically more likely to engage in effective high reliability processes in response to errors and near misses.

Hypothesis 10 (variability x safety score interaction): Climate profile variability in year one and patient safety score in year one will interact to predict year two climate variability. Specifically, units with higher profile variability in year one and poor patient safety outcomes in year one will be likely to reduce the variability in year two given that these units are theoretically more likely to engage in efforts to clarify the e priority of patient safety relative to other unit goals.

Hypothesis 11 (shape x safety score interaction): A supportive climate shape in year one will interact with patient safety score in year one to predict climate shape in year two. Specifically, units with a supportive climate in year one will be likely to maintain a supportive shape in year two even if patient safety scores in year one are low given that these units are theoretically more likely to engage in effective high reliability processes

that support a psychologically safe work environment that treats events as opportunities for learning and improvement rather than opportunities for punishment.

3.5 Chapter Three Summary

A model of the antecedents and consequences of patient safety climate was presented that specifically focuses on examining the factors that influence individual-level perceptions of patient safety climate and, in turn, how these perceptions at the group-level impact patient satisfaction and patient safety. Based upon this model, the present study's hypotheses focus on investigating the following four core research questions: (1) what factors shape individual perceptions of patient safety climate, (2) what is the relationship between patient safety climate profile characteristics and patient outcomes, (3) does climate strength moderate the relationship between other climate profile characteristics and outcomes, and (4) do patient outcomes feedback to affect subsequent climate perceptions? Theories of general organizational climate and safety climate development suggest both distal and proximal influences on individual climate perceptions. Thus, organizational membership, unit type, and specific unit membership are hypothesized as inputs affecting individual climate perceptions. In terms of the effects of climate on patient outcomes multi-level theory, configural theory, and high reliability theory suggest that the configuration among the multiple dimensions of patient safety climate reflects the degree of consistency of the situational influences on employee behavior that impact patient outcomes. Thus, climate elevation, variation among the dimensions, and climate shape are hypothesized influences on patient satisfaction and patient safety. Multi-level theory also

suggests that the variation (i.e., dispersion) among group members in terms of their perceptions of climate influences the relationship between climate and outcomes. Thus, climate strength is hypothesized as a moderator of the group-level climate-outcome relationships. Finally, the model integrates aspects of temporality to suggest that patient outcomes are important antecedents of subsequent unit climate. These hypotheses will be tested using the methodology described in Chapter Four.

CHAPTER FOUR: METHODOLOGY

The current study utilizes a nested design to investigate current hypotheses. Specifically, archival data were collected from employees and patients of a multi-campus hospital system over a two year period spanning 2008 (year one) to 2009 (year two). The dataset contains individual employee perceptions regarding the patient *safety climate of their unit*, aggregated *patient satisfaction* scores for each unit, and indicators of *patient safety* for each unit that were collected by the hospital's risk management department. Before each measure is described, an overview of the study sample and results of a-priori power analyses are provided.

4.1 Sample

The data utilized in the study were originally collected by the quality improvement and risk management departments of a multi-campus hospital system located in a major U.S. metropolitan area. Specifically, archived data from a sample of 84 clinical units nested within seven hospital campuses are included in the current study. All hospital employees working at these seven campuses were invited to complete the patient safety climate survey annually as part of organizational patient safety monitoring and quality improvement planning between 2008 and 2009. Current analyses focus specifically on eight core clinical units that have direct interactions with patients as part of their daily work: (1) the intensive care unit (ICU), (2) progressive care unit (PCU), (3) the surgical unit (OR), (4) the obstetrical/perinatal (OB), (5) pediatric unit (PED), (6) the emergency department (ED), (7) med-surge (MS), and (8) radiology (RAD).

In total, 3,149 respondents nested within the 84 units nested within the seven organizations were included in analyses. Seventy-three percent (73%) of the sample was comprised of nurses (RN, LVN, LPN, NP). Units varied in size from 10 to 106 employees ($M = 37$, $SD = 21.7$). Forty-seven percent (47%) of respondents reported working in their current unit for one to five years and twenty percent (20%) reported working in their unit for six to ten years. In terms of professional tenure, thirty-two percent (32%) reported professional tenure between one and five years, while nearly eighteen percent (18.3%) reported professional tenure of 21 years or longer. Seventy-three percent (73.1%) reported working between 12 and 15 hours in a given shift. All respondents indicated that direct interaction or contact with patients was part of their daily duties.

4.2 Power Analysis

Power analysis conventions for 2-level multi-site, nested designs indicate that given an alpha level of .05 and a conservative estimated effect size of .2 (based on previously cited effect sizes ranging from .3 to .7 for the relationship between patient safety climate and outcomes) that a sample comprised of 80 units with a minimum of 8 respondents per unit would have satisfactory power (greater than .80) to detect both main effects and effects of the nested variable (Raudenbush & Bryk, 2002; Raudenbush & Liu, 2000). These were confirmed using the Optimal Design power analysis program (Raudenbush, Spybrook, Liu, & Congdon, 2005).

4.3 Measures

Measures included in this study leveraged data from multiple sources, including questionnaires completed by hospital employees, satisfaction data collected from hospital patients, and patient safety outcome data reported by the hospital risk management department. A summary of measures appears in Table 4 below.

4.3.1 Patient Safety Climate

Patient safety climate was measured using 28-items from the AHRQ Hospital Survey on Patient Safety Culture Survey (HSOPS) (Sorra & Nieva, 2004; Sorra & Dyer, 2010). These 28 questions assess seven unit-referenced dimensions of patient safety climate including: (1) unit manager expectations and actions promoting safety, (2) support for continuous learning, (3) communication openness, (4) feedback and communication about error, (5) non-punitive response to error, (6) staffing, and (7) teamwork among unit members. The HSOPS can be completed by any member of hospital staff regardless of their level of direct patient care and results can be drilled down to unit and employee type (e.g., physicians vs. nurses vs. non-clinical staff). Responses are scored on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree or 1 = Never, 5 = Always). Reverse worded items are rescaled prior to scoring and analysis.

Specific questions and the reliability estimates for each dimension can be found in the first column of APPENDIX B. Scale reliability was estimated using Chronbach's (1947) coefficient alpha, an index of internal consistency. While there is no firm guidelines regarding cutoff scores for alpha, general conventions are that values of .70 or higher may be considered

adequate (Nunnally & Bernstein, 1994). As shown in Appendix B, all dimensions, except for Staffing, demonstrated an alpha values of .70 or higher. Thus, Staffing was not included in study analyses. In total, seven unit-referenced climate dimensions are retained with alpha values ranged from .70 to .82 ($M = .77$, $SD = .04$).

Appendix B also estimates of ICC(1) and ICC(2) (also known as ICC (1,k)) based on unit membership. ICC(1) traditionally provides an estimate of the reliability of a single item. When examining within-group reliability it provides an index of the degree to which a particular individual's rating of climate is a reliable indicator of the group mean (Blies, 2000) and can be interpreted as an estimate of between-group variability (Shrout & Fleiss, 1979; Smith-Jentsch et al., 2010). Practically, ICC(1) can be interpreted as an estimate of the percentage of group-level variance. Values of ICC(1) above .10 have been suggested as meaningful, though there is no clear cutoff criteria (Bliese, 2000). While ICC(1) provides meaningful information, the primary focus of this study is on ICC(2). ICC(2) is provides an estimate of the average reliability across raters and is an indicator of the reliability of unit means. Given that it is an average measure ICC(2) values are higher than ICC(1) values, with values of .60 or higher considered meaningful (Glick, 1985). A detailed discussion of ICC(1) and ICC(2) can be found in Section 4.6.

In popular use by organizations scoring of the HSOPS has included artificial dichotomization of responses by calculating an aggregated unit "percent positive" score that counts any responses of four or higher as positive. This dichotomization, however, artificially reduces score variance and limits statistical power of analyses. Therefore, current analysis utilize raw scores (after reverse scoring) to investigate study hypotheses as originally prescribed by survey developers (Sorra & Nieva, 2004). Readers are directed to Sorra and Dyer(2010) for

comprehensive, multi-level factor analyses of this climate measure. Patient safety climate elevation, strength, and shape are operationalized as outlined by Schulte et al. (2009).

An additional question was added to the survey to capture employee willingness to recommend their hospital to family and friends. Several background questions ask employees to report how long they have worked in their current unit (unit tenure), their staff position, and how long they have worked in their current specialty or profession (professional tenure).

4.3.2 Patient Satisfaction

Patient satisfaction was measured using the Hospital Care Quality Information from the Consumer Perspective (HCAHPS) developed by the Centers for Medicare and Medicaid Services (CMS, 2010). Specifically, current analyses focus on the patient responses to the following question: “Would you recommend this hospital to your family and friends?” (1= definitely no, 4 = definitely yes). Following the required administration protocol required by the Centers for Medicare and Medicaid Services, data were collected from a random sample of adult patients staying at least overnight or longer via mail and phone. The archival data set does not contain any patient identifiers and is reported at the unit level of analysis.

It is important to note that single-item measures are often criticized for possible unreliability and the potential for measurement error (Wanous, Reichers, & Hudy, 1997).. Wanous and Hurdy (2001) have suggested methods for estimating reliability of single item measures; however, this method requires a parallel multi-item measure of the construct in question. Parallel multi-item measures for patient willingness to recommend were not available in the current archival dataset; therefore, reliability estimates were not able to be calculated.

However, single-item measures exert negative effects only in that they increase the item error variance, thus making it more difficult to achieve significance and therefore a more conservative test. Therefore, if anything, analyses may underestimate true relationships between the targeted variables.

4.3.3 Patient Safety

Patient safety was operationalized as a standardized Z-score based on the number of incidents reported within each unit. Thus, positive patient safety scores reflects a greater number of reports compared to the average across all units, while negative scores reflect that fewer reports were filed in a given unit compared to the overall mean across units. Patient safety scores were positively correlated with sentinel events, those incidents that result in serious or deadly harm for the patient, in the current data set ($r = .21-.32$). Additionally, safety scores were collected independent of both the HSOPS and HCHAPS surveys by the hospital's risk management department.

Table 4. Study measures and levels of analysis at which they were collected.

<i>Variable</i>	<i>Survey/Measurement Tool</i>
Patient Safety Climate	AHRQ Hospital Survey on Patient Safety (HSOPS)
Patient Safety	Standardize score based on incidents reported to the hospital's risk management department
Patient Satisfaction	Hospital Care Quality Information from the Consumer Perspective (HCHAPS)

4.4 Operationalizing Unit Level Patient Safety Climate Profile Characteristics

After appropriate reverse scoring a *unit climate elevation score* was computed by calculating the mean score across all seven unit-referenced dimensions of the AHRQ HSOPS. *Unit profile variability* was operationalized as the variance of the seven unit-referenced climate dimensions around their respective mean.

Climate shape was operationalized using K-means Cluster Analysis. Specifically, cluster analysis was used to group individuals (and units) into clusters based on their responses to the seven climate dimensions. K-means clustering requires that the number of clusters be determined with each run, therefore, a stopping rule is required to determine the optimal number of clusters. In the present study, the C-Index (Hubert & Levin, 1976; Milligan & Cooper, 1985) was utilized as the empirical stopping rule to determine the optimal number of clusters for both the individual level and unit level data sets. The index was calculated for multiple numbers of clusters (2, 3, 4, 5, 6, 7) and the cluster solution with the smallest C-Index value was chosen to further examination. Cluster solutions were also examined along other criteria, including ICC(1),

ICC(2), $r_{wg(i)}$, and practical interpretation of the groupings to determine the optimal grouping solution. These indices have been suggested as relevant criteria for examining the fit of cluster analysis solutions (Joyce & Slocum, 1984; Payne, 1990; Smith-Jentsch et al., 2010), given that they provide indications of whether or not adequate within cluster agreement and between cluster variability exists. In this sense these indicators are used in a similar fashion as when justifying aggregation of individual level scores to higher levels of analysis such as the unit-level.

Traditionally, cluster analysis has been used to group individual organizational members based upon the degree to which they shared similar perceptions of their work environment—regardless of whether they worked in the same unit or team (Joyce & Slocum, 1984; Smith-Jentsch et al., 2010). In a variation of this procedure developed by Shulte et al. (2009) clustering occurred at the organizational level—with organizations sharing similar climate patterns among the dimensions of climate being grouped together. Similar to traditional clustering techniques profile shape is operationalized by cluster membership. Thus, in the current study *unit climate shape* is identified by using cluster analysis to group units that share similar patterns among unit-referenced climate dimensions. Similarly, organizational climate shape is identified by using cluster analysis to group units that share similar patterns among organizational-referenced climate dimensions. *Unit climate strength* was operationalized as the standard deviation within units for each climate dimension. Standard deviation was chosen as the index of climate strength given that it aligns with theoretical dispersion models (Schneider et al., 2002) and offered value over other indices of dispersion such as the coefficient of variation, the Gini index and Theil's which require interval data with a theoretically fixed zero point (Allison, 1978).

4.5 Analysis Strategy: Individual Level Hypotheses

After data cleaning to check for data entry errors and appropriate reverse scoring of all reverse worded items, an *individual patient safety climate elevation score* was calculated for each individual respondent. This score was operationalized by calculating the mean score across all seven dimensions of patient safety climate for each individual. Descriptive statistics and correlations were calculated among core variables of interest and control variables using IBM's SPSS 18.0 (PASW). Hypothesis one was tested using multi-level modeling, specifically using the Hierarchical Linear Modeling program (HLM7, Raudenbush, Bryk, & Congdon, 2011). Multi-level modeling refers to a family of analytic techniques including multi-level regression models, hierarchical linear models, and random coefficient models—all of which aim to decompose the variance in targeted outcome variables across several hierarchical levels and explain this variance using predictor or input variables specified across these hierarchical levels (Raudenbush & Bryk, 2002). In the current study, respondents are nested within units, which are in turn nested within seven hospitals. Multi-level analyses offer an opportunity to account for variance in the criterion variable due to group membership (Raudenbush & Bryk, 2002); that is, multi-level modeling techniques account for dependence among data collected from group members. Single level analysis using ordinary least squares (OLS) assume that random error is independent. However, in nested data sets like the one used in the current study, unit level error for all units within the same hospital are dependent, thus violating this assumption of independence.

Given the small sample size at the organizational level of analysis, the models tested in hypotheses one are primarily two level models (level 1 = individual, level 2 = unit). Multi-level

analyses first model data at the lowest level of analysis and subsequently estimate a series of models at the higher level of analysis to determine whether the effects observed within units at the lower level is similar between units at the higher level.

To test hypothesis two SPSS K-Means cluster analysis (Aldenderfer & Blashfield, 1984) was first applied to individual level climate elevation scores in order to group together individuals who share similar response patterns. Chi-square analysis was then used to test hypothesis two.

4.5.1 Cluster Analysis of Individuals

To test hypothesis two, individuals were grouped into collective climates (i.e., clusters of individuals that share similar climate shapes) using cluster analysis. Cluster analysis is a method for grouping individuals together based upon the degree to which they share a particular pattern of responses across several dimensions of a given construct (Aldenderfer & Blashfield, 1984). In this way it is similar to factor analysis that is used for psychometric purposes to group test items based on the degree to which they tap the same underlying trait. Most importantly, cluster analysis creates these groupings statistically such that within group differences are minimized and between group differences are maximized (Joyce & Slocum, 1984).

At the individual level, results identified a five-cluster solution as having the smallest C-Index value (Hubert & Levin, 1976). These climate shapes are depicted in Figure 4. To determine whether there was adequate within cluster agreement and between cluster variability, within cluster ICC(1) and ICC(2) values were calculated, as were univariate analyses of variance (ANOVA) for each climate dimension. These results suggested adequate within cluster

agreement and reasonable between cluster variability. They appear in Table 5.

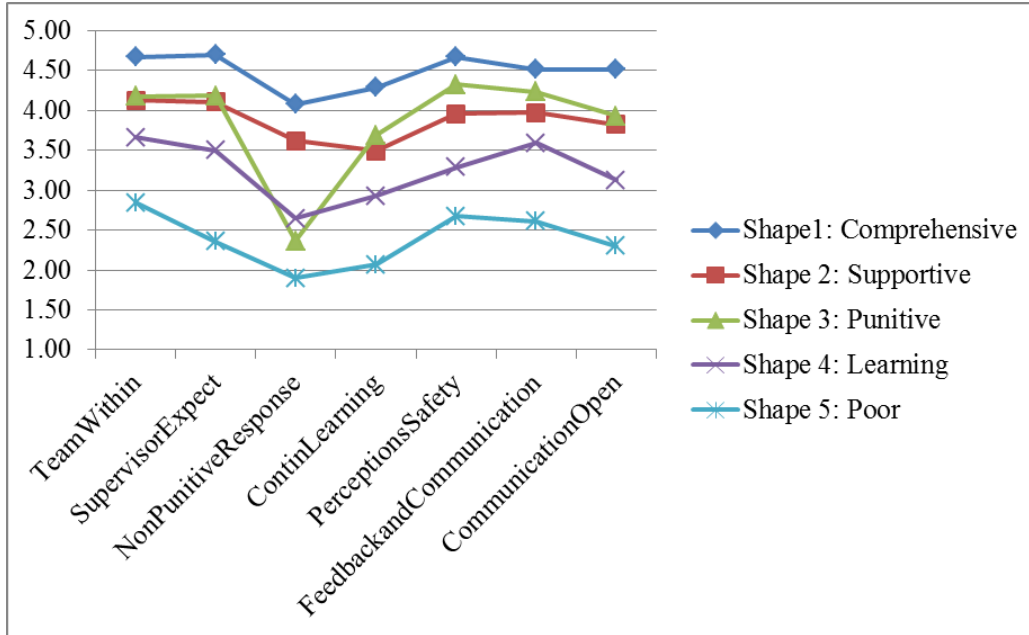


Figure 4. Five cluster solution for climate shape at the individual level of analysis.

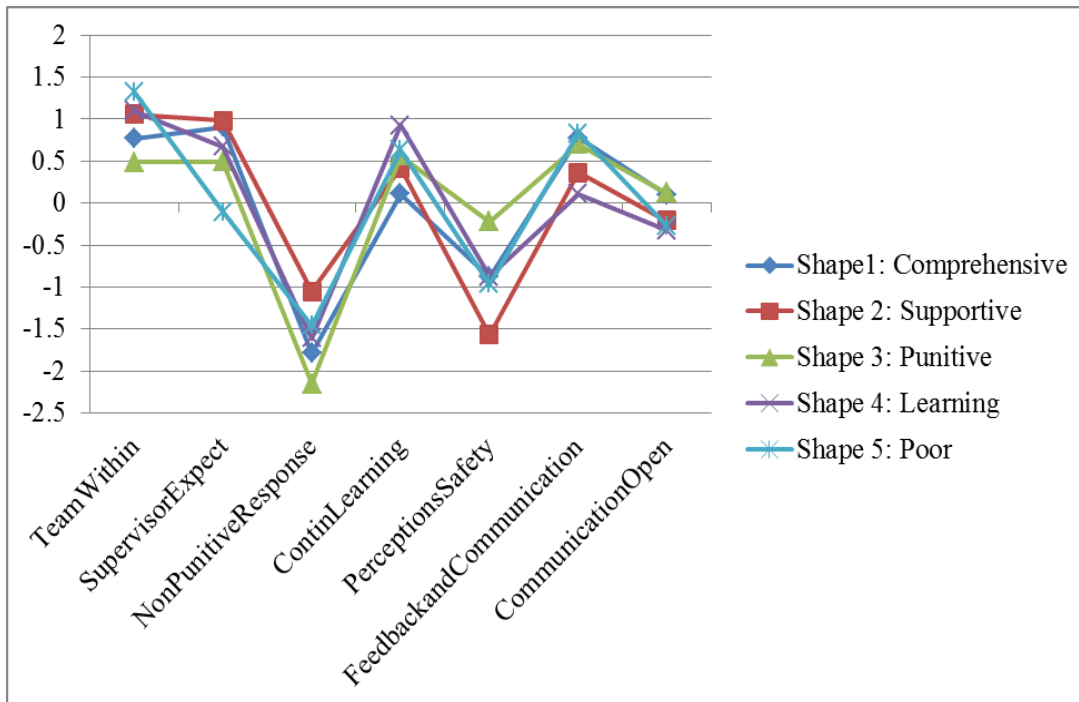


Figure 5. Five climate shapes based on standardized scores.

Table 5. Individual level climate shape descriptive statistics.

Climate Shape		Teamwork Within Unit	Supervisor Expectations	Non-punitive Response	Continuous Learning	Perceptions of Safety	Feedback & Comm About Error	Communication Openness
1	M:	4.67	4.7	4.08	4.51	4.29	4.67	4.51
	Sd:	0.37	0.36	0.59	0.42	0.53	0.4	0.45
2	M:	4.13	4.1	3.62	3.97	3.49	4	3.82
	Sd:	0.53	0.45	0.42	0.42	0.56	0.57	0.5
3	M:	4.18	4.18	2.36	4.23	3.69	4.32	3.93
	Sd:	0.61	0.52	0.52	0.45	0.58	0.53	0.59
4	M:	3.66	3.5	2.65	3.59	2.92	3.29	3.13
	Sd:	0.7	0.57	0.68	0.54	0.63	0.64	0.57
5	M:	2.84	2.36	1.9	2.61	2.07	2.68	2.3
	Sd:	0.86	0.71	0.72	0.75	0.64	0.75	0.63
F		505.25**	1127.74**	1289.55**	781.30**	837.02**	884.59**	1018.49**
ICC(1) _{avg.}		0.34	0.22	0.21	0.17	0.16	0.25	0.06
ICC(1) _{range}		(.27-.40)	(.18-.27)	(-.02-.46)	(.14-.23)	(.09-.21)	(.18-.37)	(.03-.11)
ICC(2) _{avg.}		0.67	0.53	0.34	0.38	0.42	0.49	0.16
ICC(2) _{range}		(.62-.73)	(.46-.60)	(-.06-.72)	(.32-.47)	(.28-.52)	(.39-.64)	(.07-.28)

^[1] $\underline{n} = 704$, ^[2] $\underline{n} = 880$, ^[3] $\underline{n} = 566$, ^[4] $\underline{n} = 765$, ^[5] $\underline{n} = 211$

** $p < .001$

4.6 Analysis Strategy: Unit Level Hypotheses

In line with previous examinations of climate (e.g. Smith-Jentsch et al., 2008; Sorra & Dyer, 2010) interclass correlations (ICC(1), ICC(2)) and within-unit agreement ($r_{wg(j)}$; James, Demaree, & Wolf, 1984; Lebreton & Senter, 2008) were first calculated to assess the degree to which aggregation and multi-level analyses were appropriate. ICC(1) provides an estimate of the ratio of within-group variance to between-group variance and can be interpreted as the percentage of variance in climate perceptions due to unit (or hospital) membership. ICC(2), referred to as ICC (1, k) by Shrout and Fleiss (1979), provides a measure of within group agreement and was calculated as an indicator of the reliability for unit climate elevation, variability, and shape (i.e., cluster). In the context of organizational climate measures ICC(2) values above .60 have been suggested as meaningful (Glick, 1985; Schneider et al., 1998). Additionally, the index of agreement using the $r_{wg(j)}$ statistic developed by James, Demaree, and Wolf (1984; 1993) was calculated as another indicator of agreement among unit members. The $r_{wg(j)}$ statistic is an index of within-group agreement that accounts for multi-item measures. Finally, between-unit variability on each profile characteristic was determined using one-way ANOVA analyses with unit as the independent variable. Given the small number of organizations, unit level analyses were conducted using traditional linear regression. These results are reported in Chapter 5.

4.6.1 Cluster Analysis of Units

To operationalized climate shape at the unit level of analysis, units were grouped into clusters using K-means cluster analysis and the C-index stopping rule. Results identified a three cluster solution as having one of the smallest C-index values (Hubert & Levin, 1976) that also produced reliable clusters with high levels of within-cluster agreement and between-cluster variability. These climate shapes are depicted in Figure 6 and Figure 7. As with the individual level climate shape clusters, within cluster ICC(1) and ICC(2) values were calculated, as were univariate analyses of variance (ANOVA) for each climate dimension. These results suggested adequate within cluster agreement and reasonable between cluster variability. They appear in Table 6.

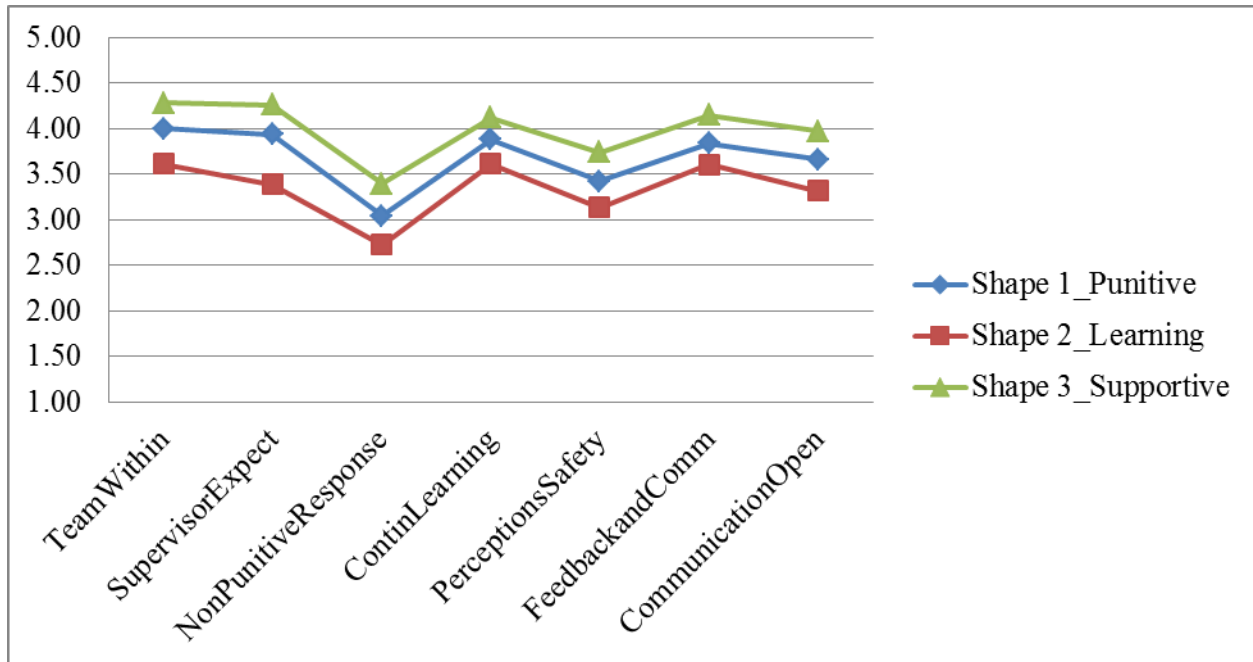


Figure 6. Three climate shapes at unit level of analysis.

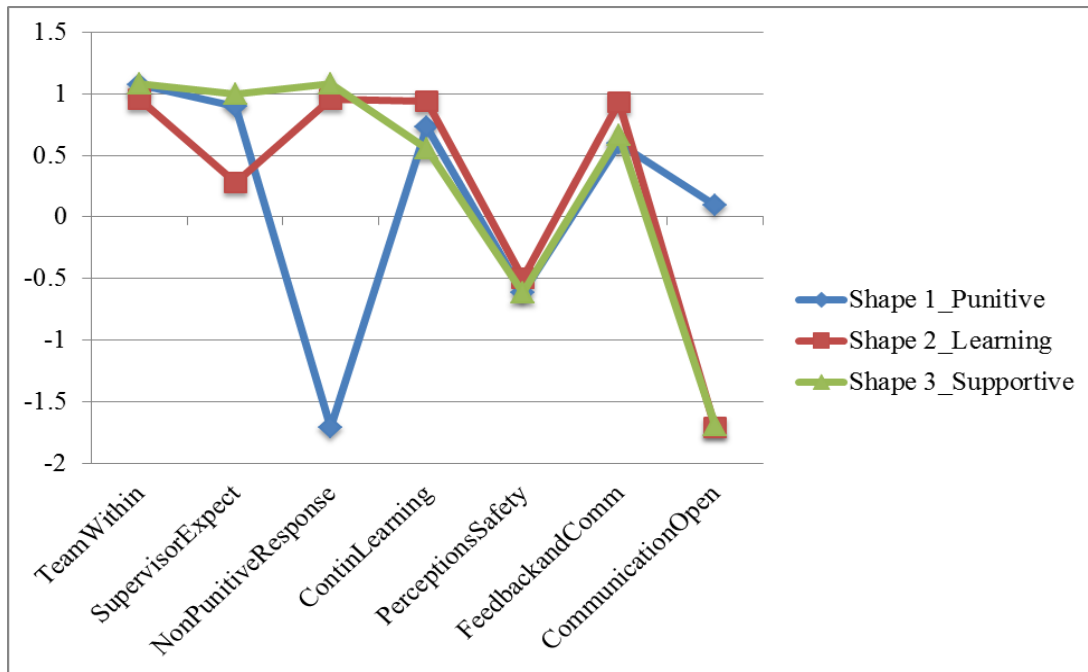


Figure 7. Three climate shapes at the unit level of analysis with standardized scores.

Table 6. Unit level climate shape descriptive statistics.

Climate Shape		Teamwork Within Unit	Supervisor Expectations	Non-punitive Response	Continuous Learning	Perceptions of Safety	Feedback & Comm About Error	Comm Openness
1	M:	3.73	3.51	2.74	3.62	3.11	3.64	3.36
	Sd:	0.27	0.37	0.23	0.2	0.2	0.2	0.21
2	M:	4.29	4.26	3.39	4.12	3.75	4.15	3.97
	Sd:	0.2	0.17	0.22	0.18	0.22	0.22	0.15
3	M:	4.00	3.95	3.08	3.91	3.46	3.86	3.69
	Sd:	0.22	0.17	0.23	0.16	0.21	0.2	0.14
F		4.12**	6.64**	4.56**	2.45**	3.79**	3.23**	4.05**
ICC(1) _{avg.}		0.24	0.35	0.3	0.36	0.35	0.36	-0.19
ICC(1) _{range}		(.12-.31)	(0.27-0.45)	(0.16-0.47)	(0.05-0.60)	(0.24-0.42)	(0.31-0.39)	(-0.26- (-0.12))
ICC(2) _{avg.}		0.53	0.78	0.53	0.33	0.67	0.63	-1.02
ICC(2) _{range}		(.34-.64)	(0.67-0.90)	(0.36-0.73)	(0.14-0.70)	(0.55-0.74)	(0.58-0.66)	(-1.67 - (-0.46))

^[1] $n = 37$ units, ^[2] $n = 11$ units, ^[3] $n = 36$ units

** $p < .001$

CHAPTER FIVE: RESULTS

Analyses were conducted in two phases. Phase one was dedicated to individual level analyses examining hypotheses one and two. Phase two was dedicated to analyses at the unit level of analysis in order to test remaining hypotheses. In phase two individual level climate scores were aggregated to the unit level. As such, descriptive statistics are reported at both the individual and unit level of analysis. Results are presented below beginning with phase one analyses and are organized according to dependent variable. Analyses were performed with the IBM SPSS Statistics version 18.0 and HLM7 (Raudenbush, Bryk, & Congdon, 2011). Unless otherwise noted, a significance level of .05 was utilized.

5.1 Individual Level Dependent Variables: Analyses and Results

Descriptive statistics and bivariate correlations among study variables at the individual level of analysis appear in Table 7. The effects of hypothesized predictors on individual level dependent variables were initially examined using three-level hierarchical linear modeling (HLM) given that individual respondents (level 1) were nested within units (level 2) that were, in turn, nested within organizations (level 3). As described by Raudenbush, Bryk, Cheong, Congdon, and du Toit (2011), HLM is a fitting analysis strategy for this data structure given that it takes into account that there are potentially three levels of random variation to consider: (1) variation among individuals within units, (2) variation among units within the same organization, and (3) variation among different organizations.

Table 7. Descriptive statistics and zero order correlations among study variables of interest at the individual level of analysis (n = 3,149).

	Mean	SD	1	2	3	4	5	6	7	8	11	12	13	14	15	16
Individual Climate Profile Characteristics																
1. Profile Elevation	3.71	0.59	--													
2. Profile Variability	0.64	0.24	-.36**	--												
3. Profile Shape 1: Comprehensive	0.22	0.42	.66**	-.30**	--											
4. Profile Shape 2: Supportive	0.28	0.45	.12**	-.24**	-.33**	--										
5. Profile Shape 3: Punitive	0.18	0.38	.05**	.39**	-.25**	-.29**	--									
6. Profile Shape 4: Learning	0.24	0.43	-.47**	.14**	-.30**	-.35**	-.27**	--								
7. Profile Shape 5: Poor	0.27	1.00	-.59**	.09**	-.14**	-.17**	-.13**	-.15**	--							
Employee Outcomes																
8. Willingness to Recommend	4.04	0.90	.52**	-.13**	.32**	.04*	.09**	-.24**	-.34**	--						
Climate Dimensions																
11. Team Within Unit	4.06	0.76	.69**	-.10**	.43**	.06**	.08**	-.30**	-.43**	.39**	--					
12. Supervisor Expectations	3.99	0.78	.80**	-.12**	.49**	.10**	.11**	-.35**	-.56**	.43**	.50**	--				
13. Continuous Learning	3.96	0.69	.74**	-.12**	.43**	.01	.19**	-.30**	-.52**	.45**	.52**	.57**	--			
14. Perceptions of Safety	3.47	0.84	.78**	-.36**	.52**	.02	.12**	-.37**	-.45**	.47**	.46**	.57**	.58**	--		
15. Feedback and	3.93	0.82	.72**	-.06**	.48**	.02	.22**	-.45**	-.41**	.37**	.40**	.56**	.55**	.47**	--	
16. Communication	3.72	0.81	.77**	-.19**	.52**	.08**	.12**	-.42**	-.47**	.37**	.48**	.60**	.49**	.51**	.58**	--
17. Non-Punitive Response to Error	3.14	0.93	.70**	-.59**	.54**	.32**	-.39**	-.30**	-.36**	.29**	.37**	.48**	.38**	.44**	.38**	.49**

*p<.05(2-tailed), **p<.01 (2-tailed)

^a Dummy coded such that 1 = Unit is member of group

5.1.1 Dependent Variable: Climate Profile Elevation

Hypotheses 1a, 1b, and 1c, predicted that organizational membership, unit membership, and unit type would account for unique variance in climate profile elevation. A three level hierarchical linear modeling analysis was utilized to test this hypothesis. First, an intercept only model (model 0) was estimated in order to partition the variance in individual climate scores into within-group variance and between-group variance.

$$\text{Lv 1: Elevation}_{ijk} = \beta_{ojk} + r_{ijk}$$

$$\text{Lv 2: } \beta_{ojk} = \pi_{ook} + u_{ojk}$$

$$\text{Lv 3: } \pi_{ook} = \gamma_{ooo} + e_{ook}$$

As shown in Table 8, organizational membership did not account for a significant amount of the total random variation in the dependent variable (0%) after accounting for unit membership and there was no significant residual variation at the organizational level ($\chi^2 = 1.80, p > .50$). Thus, organizational membership was not found to account for significant variation in individual level profile elevation (H1a not supported). Results did indicate that 14% of the variance in profile elevation was random variation due to unit membership and that there was significant residual variance at the unit level ($\chi^2 (77, N = 3,146) = 502.21, p < .001$). These results provide support for H1b and also justify examining predictors at the unit level of analysis.

Given that organizational membership was not found to account for meaningful variance in the dependent variable, this level was dropped from future models. Therefore, a two-level null model was run to determine the total model variance and to verify between-unit variance estimates.

$$\text{Lv 1: Elevation}_{ij} = \beta_{0j} + r_{ij}$$

$$\text{Lv2: } \beta_{0j} = \gamma_{00} + u_{0j}$$

Similar to the three-level model, the two-level null model revealed that 14% of the variance in individual profile elevation was attributable to unit membership and again the residual unit level variance was significant ($\chi^2(83, N = 3,146) = 538.75, p < .001$), suggesting the need to examine specific unit level predictors.

Table 8. Three level null model examining individual climate profile elevation.

		Coefficient (SE)	Standard Error	<i>t</i> -ratio				
HLM3, Model 0a: No Predictors (Null Model)								
Fixed Effects								
	Intercept1, π_0							
	Intercept2, β_{00}							
	Intercept3, γ_{000}	3.76	0.03	143.64**				% of level 3 variance to
Random Effects								
		SD	Variance Component	<i>df</i>	χ^2	Sig.	% of level 2 variance to overall variance	% of level 3 variance to overall variance
	Intercept1, r_0	0.22	0.05	77	502.21	0.000	14%	
	Level 1, e	0.57	0.32					
	Intercept1/Intercept2, u_{00}	0.00	0.00	6	1.80	>0.500		0%

* $p < .05$, ** $p < .001$

To determine if unit type helped to explain the group differences detected in the null model, a means-as-outcomes model was examined next. Unit type was operationalized as a categorical variable with three types: emergency (e.g., emergency room), proceduralized (e.g. operating room), and non-proceduralized units (e.g., intensive care units, progressive care units).

In model 1, unit type was entered as a dummy coded level two predictor with the non-proceduralized unit type as the omitted reference group.

$$\text{Lv 1: Elevation}_{ij} = \beta_{0j} + r_{ij}$$

$$\text{Lv 2: } \beta_{0j} = \gamma_{00} + \gamma_{01} * (\text{emergency}_j) + \gamma_{02} * (\text{proceduralized}_j) + u_{0j}$$

Examining the variance components shown in

Table 9, results indicated that unit type did not explain a meaningful amount of the between-unit variance in elevation scores. Thus, H1c was not supported. The significant residual variance in model 1 suggested examining both level one and other level two predictors, therefore, position type was examined as a level one predictor in Model 4. In this regression coefficients model job type was coded such that nurses (RNs, LPNs, LVNs) were the omitted dummy coded variable.

$$\text{Lv 1: Elevation}_{ij} = \beta_{0j} + \beta_{1j}*(\text{administration}_{ij}) + \beta_{2j}*(\text{physician}_{ij}) + \beta_{3j}*(\text{pt care assistant}_{ij}) + \beta_{4j}*(\text{technician}_{ij}) + r_{ij}$$

$$\begin{aligned} \text{Lv 2: } \beta_{0j} &= \gamma_{00} + \mathbf{u}_{0j} \\ \beta_{1j} &= \gamma_{10} + \mathbf{u}_{1j} \\ \beta_{2j} &= \gamma_{20} + \mathbf{u}_{2j} \\ \beta_{3j} &= \gamma_{30} + \mathbf{u}_{3j} \\ \beta_{4j} &= \gamma_{40} + \mathbf{u}_{4j} \end{aligned}$$

Results indicated that job type explained 4% of the variance in individual-level climate profile elevation. In comparison to nurses, administrators ($b = 0.50, p < .001$) and patient care assistants ($b = 0.08, p = .02$) tended to have higher profile elevations, while physicians tended to have lower profile elevations ($b = -0.41, p = .01$).

Table 9. Two level models examining individual climate profile elevation.

		Coefficient (SE)	Standard Error	<i>t</i> -ratio			
HLM2, Model 0b: No Predictors (Null Model)							
Fixed Effects							
Intercept1, β_0							
Intercept2, γ_{00}		3.76	0.03	140.7**			
Random Effects		SD	Variance Component	<i>df</i>	χ^2	Sig.	% of level 2 variance to overall variance
Intercept1, u_0			0.05	83	538.75	<0.001	14%
Level 1, r			0.32				
HLM2, Model 1: Means as outcomes model examining unit type as a level-two predictor							
		Standard					
Fixed Effects		Coefficient	Error	<i>t</i> -ratio			
Lv 2	Constant, γ_{00}	3.76	0.03	112.36**			
	Emergency, γ_{01}	-0.11	0.07	-1.44			
	Proceduralized, γ_{02}	0.04	0.06	0.62			
Random Effects		SD	Variance Component	<i>df</i>	χ^2	Sig.	% of between unit variability described by unit type
Constant, u_0		0.22	0.05	81	522.731	<0.001	0%
Level 1, r		0.57	0.32				
HLM2, Model 2: Random coefficient model examining job type as a level-one predictor							
		Standard					
Fixed Effects		Coefficient	Error	<i>t</i> -ratio			
Lv 1	Constant, γ_{00}	3.73	0.03	126.50**			
	Administration, γ_{10}	0.50	0.05	10.80**			
	Physician, γ_{20}	-0.41	0.07	-5.53**			
	Pt. Care Assistant, γ_{30}	0.08	0.03	2.44*			
	Technician, γ_{40}	-0.17	0.09	-1.86			
Random Effects		SD	Variance Component	<i>df</i>	χ^2	Sig.	% of variance in individual level profile elevation explained by job type
Constant, u_0		0.23974	0.05748	4	70.426	<0.001	4%
Administration slope, u_1		0.14281	0.02039	4	7.21607	0.124	
Physician slope, u_2		0.11449	0.01311	4	1.8761	>0.500	
u_3		0.07161	0.00513	4	4.17031	0.384	
Technician slope, u_4		0.39626	0.15702	4	13.8873	0.008	
level-1, r		0.55444	0.3074				

* $p < .05$, ** $p < .001$

5.1.2 Dependent Variable: Individual Climate Shape (Collective Climate Membership)

Hypothesis two predicted that individuals would be more likely to share the same climate shape with fellow members of their unit than with individuals from other units. A Chi-square test of independence with two categorical variables (climate shape and unit membership) indicated that there was a significant association between shape and unit membership ($\chi^2 (1, N = 3,126) = 829.36, p < .001, \text{Cramer's } V = .26$). These results supported H2 and indicated that individuals were more likely to share the same climate shape with members of their unit rather than members of other units.

5.1.3 Individual Level Exploratory Analyses

Clinical providers were also asked to report their own willingness to recommend their facility to family and friends. Therefore, exploratory analyses examined individual level predictors of this individual level outcome.

5.1.3.2 Dependent Variable: Clinician Willingness to Recommend

Hierarchical linear modeling was utilized to examine the relationship between individual willingness to recommend and individual level climate profile characteristics (level 1, individual level predictors) after accounting for unit differences (level 2, unit level variance). Model testing was completed in two phases. First a null model was calculated in order to determine if meaningful variance existed at the unit level. Second, a random coefficients model was run to examine the relationship between individual level climate profile characteristics and employee willingness to recommend while accounting for unit differences.

As show Table 10 the null model resulted in an interclass correlation coefficient of 0.07. This indicated that 7% of the variance in individual willingness to recommend was between units, while 93% was at the individual level of analysis. Individual level predictors were then examined separately in a random-coefficients model. Overall, the individual level climate profile characteristics were found to account for 29% of the variance in employee willingness to recommend. Results indicated that after accounting for unit level effects, both individual level climate profile elevation ($b = 0.08, p < .001$) and profile variability ($b = 0.18, p = .009$) accounted for significant unique variance in clinician willingness to recommend. Climate shape, however, was not significantly related.

Table 10. Random coefficient model of employee willingness to recommend.

	Coefficient	Standard Error	<i>t</i> -ratio			
HLM2, Model 0: No Predictors (Null Model)						
Fixed Effects						
Intercept1, β_0						
Intercept2, γ_{00}	4.03	0.03	130.37**			
Random Effects						
	SD	Variance Component	<i>df</i>	χ^2	Sig.	% of level 2 variance to overall variance
Intercept1, u_0	0.23	0.06	83	297.34	<0.001	7%
Level 1, <i>r</i>	0.87	0.76				
Reliability of Regression						
Coefficient Estimates						
Intercept1, β_0	0.69					
HLM2, Model 1: Random coefficient model examining individual level climate profile characteristics						
Fixed Effects						
	Coefficient	Standard Error	<i>t</i> -ratio			
Mean Willingness to Recommend, γ_{00}						
	0.9	0.12	7.21**			
Profile Elevation, γ_{10}						
	0.8	0.03	27.73**			
Profile Variability, γ_{20}						
	0.19	0.07	2.94*			
Shape1, γ_{30}						
	-0.05	0.07	-0.81			
Shape2, γ_{40}						
	-0.03	0.05	-0.6			
Shape3, γ_{50}						
	-0.00	0.06	-0.00			
Shape4, γ_{60}						
	0.01	0.06	0.14			
Random Effects						
	SD	Variance Component	<i>df</i> [†]	χ^2	Sig.	% of variance in employee willingness to recommend explained by individual level profile characteristics
Mean Willingness to Recommend, u_0						
	0.47	0.22	71	69.01	>0.500	29%
Profile Elevation, u_1						
	0.13	0.02	71	72.99	0.41	
Profile Variability, u_2						
	0.28	0.08	71	94.53	0.03	
Shape1, u_3						
	0.28	0.08	71	72.24	0.44	
Shape2, u_4						
	0.13	0.02	71	64.14	>0.500	
Shape3, u_5						
	0.22	0.05	71	61.07	>0.500	
Shape4, u_6						
	0.14	0.01	71	61.84	>0.500	
level-1, <i>r</i>						
	0.73	0.54				
Reliability of Regression						
Coefficient Estimates						
Mean Willingness to Recommend, β_0						
	0.13					
Profile Elevation, β_1						
	0.21					
Profile Variability, β_2						
	0.18					
Shape1, β_3						
	0.20					
Shape2, β_4						
	0.06					
Shape3, β_5						
	0.13					
Shape4, β_6						
	0.06					

* $p < .01$, ** $p < .001$

[†]Note: Chi-square based on 72 of 84 units

5.2 Unit level Dependent Variables: Analyses and Results

For the following analyses, individual climate scores were aggregated to the unit level. Several indicators suggested that aggregation was reasonable. ICC(1), ICC(2), and $r_{wg(j)}$ were calculated by unit for each climate dimension prior to calculating the climate profile characteristics for each unit. ICC(1) is an index of between-group variability that can be interpreted as an indicator of the percentage of variance in a given outcome that can be attributed to group member (LeBreton & Senter, 2008). ICC(2) provides an estimate of the reliability of aggregated unit means (Shrout & Fleiss, 1979) and $r_{wg(j)}$ estimates interrater agreement for multiple item indices (James, Demaree, & Wolf, 1993; LeBreton & Senter, 2008). While there are not well defined criteria for these indices, it has been suggested that ICC(1) values of 0.10 or higher, ICC(2) values above .60 higher are practically meaningful (Bliese, 2000; James, 1982). Additionally, $r_{wg(j)}$ values of 0.70 or higher have traditionally been considered meaningful, however, recent standards for interpretation suggest that values of .51 to .70 may be interpreted as an indication of moderate agreement (LeBreton, James, & Lindell, 2005; LeBreton & Senter, 2008).

The ICC(1) values based on unit membership across the seven climate scales ranged from 0.15 to 0.52 ($M = 0.40$), the ICC(2) values ranged from 0.42 to 0.81 ($M = 0.66$), and the average $r_{wg(j)}$ ranged from 0.56 to 0.76 ($M = 0.68$) (See Appendix A). Additionally, significant differences between units were suggested by univariate analyses of variance (ANOVA) analyses run for each of the seven climate dimensions. All were significant ($p < .001$), suggesting that climate scores differed among units. Thus, there was reasonable within-unit agreement and between-unit variability to operationalize climate as an emergent construct at the unit level of

analysis. Descriptive statistics and bivariate correlations among unit level variables appear in Table 11.

5.2.1 Climate Profile Characteristics and Patient Safety

Hypothesis three predicted that (a) profile elevation, (b) profile variability, and (c) profile shape would each account for unique variance in patient safety. Multiple regression was used to examine the effects of climate profile elevation, profile variability, and shape on patient safety, after controlling for unit type. As shown in Table 12, unit type accounted for approximately 33% of the variance in safety score and was thus both dummy coded unit type variables were retained in subsequent models. The full model containing the control variables and all profile characteristics was significant ($F(6,79) = 8.00, p < .001$), therefore, beta-weights were examined to test study hypotheses. Overall, results indicated that profile shape accounted for significant unique variance in patient safety ($\beta = -0.34, p = .02$), however, profile elevation ($\beta = -0.28, p = .22$) and profile variability ($\beta = 0.02, p = .83$) did not. Specifically, profile shape uniquely accounted for 6% of the variance in patient safety ($\Delta R^2 = .06, p = .04$). Units that emphasized teamwork, a non-punitive response to errors, continuous learning, and feedback and communication about error (i.e., supportive learning shape) were less likely to have incidents of patient harm compared to units that emphasized a punitive response to errors and communication about errors (i.e., strategic shape). Thus, hypothesis 3c was supported while hypothesis 3a and 3b were not.

Table 11. Descriptive statistics and correlations for the unit level of analysis.

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Unit Climate Profile Characteristics																		
1. Profile Elevation	3.77	0.25	--															
2. Profile Variability	0.37	0.09	-.23*	--														
3. Profile Shape 1: Punitive ^a	0.44	0.50	-.31**	.10	--													
4. Profile Shape 2: Learning ^a	0.13	0.34	-.68**	.04	-.34**	--												
5. Profile Shape 3: Supportive ^a	0.43	0.50	.78**	-.12	-.77**	-.34**	--											
Patient Outcomes																		
6. Willingness to Recommend	3.43	0.28	.15	-.45**	-.23	.11	.17	--										
7. Patient Safety	0.00	1.00	-.18	.06	.09	.08	-.15	-.30	--									
Control: Unit Type																		
8. Emergency ^a	0.11	0.31	-.16	-.03	.00	.21	-.14	.02	.67**	--								
9. Proceduralized ^a	0.25	0.44	.11	-.20	.10	-.06	-.06	.19	-.25*	-.02	--							
10. Non_Proceduralized ^a	0.64	0.48	.01	.20	-.09	-.08	.14	-.18	-.19	-.47**	-.78**	--						
Climate Dimensions																		
11. Team Within Unit	4.07	0.31	.72**	.06	-.21	-.58**	.61**	.04	-.22	-.18	-.03	.14	--					
12. Supervisor Expectations	4.00	0.35	.88**	-.01	-.17	-.69**	.64**	-.19	-.08	-.16	.06	.05	.56**	--				
13. Continuous Learning	3.95	0.25	.82**	-.15	-.24*	-.53**	.60**	.28	.04	-.01	.02	-.02	.47**	.66**	--			
14. Perceptions of Safety	3.52	0.32	.84**	-.31**	-.28**	-.48**	.61**	.45**	-.42**	-.24*	.26*	-.07	.58**	.60**	.71**	--		
15. Feedback and Communication about Error	3.94	0.28	.79**	-.07	-.33**	-.46**	.65**	.23	-.00	-.05	.05	-.02	.34**	.71**	.74**	.59**	--	
16. Communication Openness	3.75	0.27	.89**	-.15	-.28*	-.62**	.70**	-.01	-.22	-.16	.15	-.03	.60**	.84**	.64**	.72**	.65**	--
17. Non-Punitive Response to Error	3.15	0.33	.81**	-.66**	-.30**	-.51**	.65**	.15	-.08	-.09	.10	-.03	.53**	.65**	.58**	.61**	.57**	.68**

*p<.05(2-tailed), **p<.01 (2-tailed)

^a Dummy coded such that 1 = Unit is member of group

Table 12. Multiple regression results examining the relationships between the climate profile characteristics, willingness to recommend, and patient safety.

Variable	Patient Safety (n = 80 units)					Patient Willingness to Recommend (n = 47 units)				
	R ²	ΔR ²	B	SE	β	R ²	ΔR ²	B	SE	β
Model 1 ^a	0.33 [†]	0.33 [†]								
Emergency			1.70	0.31	0.51 [†]	--	--	--	--	--
Proceduralized			-0.41	0.21	-0.18	--	--	--	--	--
Model 2	0.37 [†]	0.00				0.02	0.02			
Profile Elevation			-0.18	0.38	-0.05			0.17	0.17	0.15
Model 3	0.37 [†]	0.00				0.20**	0.18**			
Profile Variance			0.72	1.11	0.06			-1.53	0.49	-0.45**
Model 4 ^b	0.40 [†]	0.06*				0.22*	0.02			
Shape 2_Supportive_Learning			-0.97	0.41	-0.34*			0.11	0.21	0.11
Shape 3_Supportive			0.03	0.34	0.01			0.07	0.14	0.13

^a Non-proceduralized unit type is the omitted dummy variable.

^b Shape 1_Strategic is the omitted dummy variable

* p < .05 ** p < .01, [†] p < .001

5.2.2 Climate Profile Characteristics and Patient Willingness to Recommend

Hypothesis four similarly predicted that (a) profile elevation, (b) profile variability, and (c) profile shape would account for unique variance in patient willingness to recommend the facility to family and friends. Multiple regression did not indicate the unit type was significantly related to patient willingness to recommend ($\Delta R^2 = .04, p = .43$), therefore it was removed from subsequent analyses as a control variable. Beta-weights were examined for the full model containing all three profile characteristics ($F(6,46) = 2.27, p = .03, R^2 = .22$). As shown in Table 12, after controlling for profile elevation and shape, profile variability was significantly and negatively related to patient willingness to recommend ($\beta = -.43, p = .01$); that is, patients were more likely to recommend unit's with less variable climate profiles to their family and friends. Specifically, profile variability accounted for 18% of the variance in patient willingness to recommend ($\Delta R^2 = .18, p = .003$).

5.2.3 Climate Profile Characteristics and Patient Safety over Time

Hypothesis five predicted that a supportive climate shape would be related to the reliability of patient safety over time, after accounting for profile elevation and profile variability. Examination of the archival data revealed a low overall response rate for the year one data (<60%) and that specific units were not identified. Therefore, analyses examined the relationship between climate profile shape in year two and the change in patient safety from year two to year three. Multiple regression analysis (see Table 13) revealed that overall the three climate profile characteristics did not explain significant variance in the change in patient safety between year

two and year three ($F(3,74) = .63, p = .60$). More specifically, climate shape did not uniquely predict a meaningful amount of variance in the dependent variable ($\Delta R^2 = .006, p = .50$).

Therefore, hypothesis five was not supported.

5.2.4 Climate Profile Characteristics and Patient Willingness to Recommend Over Time

Similarly, hypothesis six predicted that shape would be related to the consistency of patient satisfaction over time. Evaluation of the archival data set revealed that different survey measures were used to collect patient satisfaction collected across year one, two, and three. The measures collected in year one and year two did not contain any shared items reflecting willingness to recommend. Therefore, hypothesis six was not able to be tested.

Table 13. Multiple regression results examining the change in patient safety between year one and year two on the year one profile characteristics.

Variable	Δ Patient Safety 08-09 (n = 75 units)				
	R^2	ΔR^2	B	SE	β
Model 1	0.00	0.00			
2008 Profile Elevation			.03	.19	.02
Model 2	0.00	0.00			
2008 Profile Variance			.141	.54	.03
Model 3 ^a	0.01	0.01			
2008 Shape 2_Supportive			-.14	.16	-.18

^a Shape 1_Punitive was the omitted dummy coded variable.

* $p < .05$ ** $p < .01$, [†] $p < .001$

5.2.5 Examining Climate Strength as a Moderator

Multiple regression was used to test whether climate strength moderated the relationship between profile elevation and patient safety, after controlling for unit type, profile variability, and shape (hypothesis 7a). As shown in Table 14 control variables (unit type, variability, shape) entered in step one accounted for 38% of the variance in patient safety scores ($F(5, 74) = 9.21, p < .001$). Profile elevation and climate strength were entered in step two (main effects model). The total variance explained by model 2 was 42% ($F(7, 79) = 7.33, p < .001$), however the change in the amount of variance explained compared to the control model was not significant ($\Delta R^2 = .03, F(2, 72) = 2.02, p = .14$). The centered elevation*climate strength interaction term was entered in step three. Overall, model three was significant ($F(8, 79) = 6.33, p < .001, R^2 = .42$), however, the interaction term did not significantly improve the amount of variance explained in patient safety ($\Delta R^2 = .00, p = .87$), thus, the moderation effect hypothesized (7a) was not supported.

Similar analyses were run to test hypotheses 7b and 7c (see Table 15 and Table 16). Results indicated that neither the profile variability*climate strength interaction ($\Delta R^2 = .001, p = .76$) nor the shape*climate strength interaction ($\Delta R^2 = .00, p = .98$) were significantly related to patient safety. Thus, hypothesis 7b and 7c were also not supported.

Hypothesis 8 predicted that climate strength would moderate the relationships between the profile characteristics and patient willingness to recommend. Again, however, there was no support for moderation effects on the relationships between any of the profile characteristics and willingness to recommend (see Table 14, Table 15, and Table 16). While the moderation

hypotheses 8a, 8b, and 8c were not supported, main effects models continued to demonstrate a significant main effect for profile variability. That is, regardless of climate strength, variability among the dimensions of climate remained a significant predictor of patient willingness to recommend.

Table 14. Multiple regression analysis testing climate strength as a potential moderator of the profile elevation—patient outcome relationships.

Variable	Patient Safety (n = 80 units)					Patient Willingness to Recommend (n = 47 units)				
	R ²	ΔR ²	B	SE	β	R ²	ΔR ²	B	SE	β
Model 1 ^{a,b}	0.38 [†]	0.38 [†]				0.25*	0.25*			
Emergency			1.80	0.32	0.54			-0.05	0.20	-0.04
Proceduralized			-0.43	0.22	-0.19			0.14	0.10	0.18
Profile Variance			0.58	1.07	0.05			-0.31	0.49	-0.39
Shape 2_Learning			-0.61	0.29	-0.21*			0.17	0.15	0.18
Shape 3_Supportive			-0.32	0.20	-0.16			0.08	0.09	0.14
Model 2	0.42 [†]	0.03				0.27	0.01			
Profile Elevation			-1.78	0.98	-0.44			-0.31	0.47	-0.27
Climate Strength			-1.86	1.18	-0.20			-0.40	0.53	-0.15
Model 3	0.42 [†]	0.00				0.27	0.01			
Elevation*Strength			-0.59	3.76	-0.02			0.21	2.20	0.02

^a Non-proceduralized unit type is the omitted dummy variable.

^b Shape 1_Strategic is the omitted dummy variable

* p < .05 ** p < .01, [†] p < .001

Table 15. Multiple regression analysis testing climate strength as a potential moderator of the profile variability—patient outcome relationships.

Variable	Patient Safety (n = 80 units)					Patient Willingness to Recommend (n = 47 units)				
	R ²	ΔR ²	B	SE	β	R ²	ΔR ²	B	SE	β
Model 1 ^{a,b}	0.40 [†]	0.40 [†]				0.13	0.13			
Emergency			1.82	0.32	0.55			--	--	--
Proceduralized			-0.37	0.22	-0.16			--	--	--
Profile Elevation			-1.15	0.86	-0.27			--	--	--
Shape 2_Learning			-0.99	0.40	-0.34*			--	--	--
Shape 3_Supportive			0.03	0.34	0.02			--	--	--
Model 2	0.42 [†]	0.02				0.20**	0.20**			
Profile Variability			0.07	1.10	0.01			-1.24	0.50	-0.37*
Climate Strength			-1.86	1.18	-0.20			-0.19	0.35	-0.07
Model 3	0.42 [†]	0.00				0.22*	0.02			
Variability*Strength			3.20	10.32	0.03			-5.19	4.55	-0.17

^a Non-proceduralized unit type is the omitted dummy variable.

^b Shape 1_Strategic is the omitted dummy variable

"--" Removed from analysis as control variables given non-significance of overall model

* p < .05 ** p < .01, [†] p < .001

Table 16. Multiple regression analysis testing climate strength as a potential moderator of the profile shape—patient outcome relationships.

Variable	Patient Safety (n = 80 units)					Patient Willingness to Recommend (n = 47 units)				
	R ²	ΔR ²	B	SE	β	R ²	ΔR ²	B	SE	β
Model 1 ^{a,b}	0.34 [†]	0.34 [†]				0.22*	0.22*			
Emergency			1.70	0.32	0.51			-0.3	0.19	-0.02
Proceduralized			-0.37	0.22	-0.16			0.10	0.10	0.14
Profile Elevation			-0.13	0.39	-0.03			-0.04	0.17	-0.03
Profile Variability			0.72	1.11	0.06			-1.50	0.51	-0.45**
Model 2	0.42 [†]	0.08*				0.27	0.05			
Shape 2_Learning			-0.99	0.41	-0.34*			0.11	0.23	0.11
Shape 3_Supportive			0.09	0.34	0.05			0.14	0.16	0.25
Climate Strength			-1.86	1.18	-0.20			-0.40	0.53	-0.15
Model 3	0.42 [†]	0.00				0.30	0.03			
Shape2_Learning*Strength			-0.70	3.84	-0.04			3.77	8.47	0.68
Shape3_Supportive*Strength			-0.25	2.35	-0.02			1.33	1.08	0.33

^a Non-proceduralized unit type is the omitted dummy variable.

^b Shape 1_Strategic is the omitted dummy variable

* p < .05 ** p < .01, [†] p < .001

5.2.6 Patient Outcomes and Subsequent Patient Safety Climate Profile Characteristics

Hypothesis 9 predicted that patient safety in year one would moderate the relationship between profile elevation in year one and profile elevation in year two. Initially, unit type was included as a control variable, however, results indicated it was not significantly related to year two profile characteristics and it was dropped from analyses. Thus, year two profile elevation was regressed onto the year one profile characteristics, the year one patient safety score, and the interaction between year one elevation and year one safety score. As shown in Table 17, the overall model containing the test of the interaction term was significant ($F(5, 74) = 6.76, p < .001$), however, the interaction term did not explain significant variance above and beyond the main effects model ($\Delta R^2 = .00, p = .93$). Thus, hypothesis nine was not supported. However, significant main effects for year one elevation ($\beta = 0.54, p = .004$) and year one profile variability were detected ($\beta = 0.24, p = .03$). This suggests that both profile elevation and profile variability are useful in predicting future profile elevation.

Hypothesis 10 predicted that patient safety in year one would moderate the relationship between profile variability in year one and profile variability in year two. Therefore, year two profile variability was regressed onto year one elevation, variability, shape, patient safety score and the interaction between year one profile variability and year one safety score. Results are summarized in Table 18. The overall model testing the interaction term accounted for approximately 17% of the variance in year two profile variability ($F(5, 74) = 2.80, p = .02$), however, addition of the interaction term was not found to significantly improve the amount of variance explained ($\Delta R^2 = .01, p = .30$). Thus, hypothesis 10 was not supported. Overall, results

suggest that year one profile variability was significantly related to year two variability ($\beta = .35$, $p < .001$) and that this relationship did not change based on the year one patient safety score.

Hypothesis 11 (H11) predicted that patient safety score in year one would moderate the relationship between a supportive climate shape in year one and a supportive shape in year two. To test H11 a hierarchical binomial logistical regression analysis was conducted to determine if the year one climate profile characteristics (Y1 elevation, Y1 variability, Y1shape), year one patient safety score, and the interaction between Y1shape and Y1safety score predicted what units would show a supportive shape in year two. Supportive shape in year two was coded as a dichotomous dependent variable (1 = Y2 supportive shape, 0 = Y2 any other shape). As shown in Table 19 model one included all three Y1 profile characteristics. In model two Y1 safety score was entered. Finally, in model three the Y1shape*Y1safety score interaction term was added to test H11.

Results indicated that, overall, the combination of all control variables, main effects, and the interaction term significantly predicted whether a unit would have a supportive climate shape in year two ($\chi^2(5, N = 84) = 22.44, p < .001$). However, addition of the interaction term did not significantly increase the degree of prediction ($\chi^2(1, N = 84) = 1.85, p = .17$). Thus, H11 was not supported. Given that the neither the addition of the interaction term nor the addition of the main effect for Y1 safety score significantly increased the prediction of Y2 profile shape the model containing only the Y1 climate profile characteristics was examined. Overall, results indicated that when all three Y1 profile characteristics were considered simultaneously, Y1 profile elevation significantly predicted Y2 profile shape ($\beta = 4.46, p = .04$). Specifically, as Y1 profile elevation increased, the probability of a unit also having a supportive profile shape increased significantly (Odds ratio = 86.03).

Table 19. Logistic regression analysis for variables predicting supportive climate shape in year two (n = 36) compared to other climate shapes (n = 48).

Variable	Supportive Climate Profile Shape: Year Two								
	Model 1			Model 2			Model 3		
	$\hat{\beta}$	SE($\hat{\beta}$)	Odds Ratio	$\hat{\beta}$	SE($\hat{\beta}$)	Odds Ratio	$\hat{\beta}$	SE($\hat{\beta}$)	Odds Ratio
Yr 1 Profile Elevation	4.46*	2.21	86.03	4.29 ^b	2.23	72.61	4.39*	2.24	80.55
Yr1 Profile Variability	4.31	3.06	74.68	3.96	3.10	52.44	3.11	3.18	22.48
Yr1 Shape_Supportive ^a	0.38	0.90	1.46	0.36	0.90	1.43	0.49	0.91	1.63
Yr1 Pt. Safety Score				-0.19	0.31	0.83	-0.55	0.47	0.58
Yr1 Variability * Yr1 Pt. Safety							0.96	0.74	2.62
Constant									
	χ^2_{model}	20.21 [†]		20.59 [†]			22.41 [†]		
	df^{model}	3		4			5		
	χ^2_{step}	20.21 [†]		0.38			1.85		
	df^{step}	3		1			1		
% with supportive shape in Y2 correctly predicted		67%		67%			70%		

^a Y1Shape2_Strategic shape is the omitted dummy coded variable

^b p = 0.054

* p < .05 ** p < .01, [†] p < .001

CHAPTER SIX: DISCUSSION

Overall, these results provide fresh insight into the antecedents of individual patient safety climate perceptions and the degree to which these perceptions are related to patient outcomes when considered as a collective emergent phenomenon. Specifically, individual profile elevation was found to be associated with unit membership, but not with organizational membership or unit type. Individuals were also more likely to share the same climate shape with members of their immediate work unit as opposed to members of other units. These findings align with the interactionist perspective of climate development, suggesting that individual patient safety climate perceptions are likely the product of social interaction (Louis, 1980; Miller & Jablin, 1990). This mirrors findings in the general organizational climate and team climate literatures that climate arises from complex social processes rather than structural aspects of the organization such as formal policies or workforce homogeneity based on attraction-selection-attrition processes (e.g., González-Romá, Periró, & Tordera, 2002; Smith-Jentsch et al., 2010). More specifically, these findings support the theoretical conceptualization of individual perceptions of patient safety climate as being most directly influenced by enacted policies and procedures (i.e., what happens and is reinforced in day-to-day work), rather than by formal organizational or unit policy.

As an emergent, unit level construct, results indicate that the profile characteristics are differentially related to patient willingness to recommend a facility to others and patient safety. Unit profile variability was negatively related to patient willingness to recommend, but was not

related to patient safety. As noted in Chapter Three, variability provides an index of the degree to which employees perceive that consistent messages from the social and structural aspects of their work environment regarding patient safety. Configural theory argues that highly variable climates provide inconsistent cues to employees regarding the priority of safety relative to other unit goals. This ambiguity likely leads to greater variation in employee behavior, which in turn, likely impacts patient perceptions of the services they receive. For example, previous studies have found that the degree to which care is effectively coordinated among multiple providers is related to patient satisfaction and loyalty (Gittell, 2002). Overall, there remains a definite need to investigate the consistency of employee behavior as a mediator of the climate—patient satisfaction relationship.

It is also important to note that patient satisfaction and intentions to recommend are colored by a multitude of factors above and beyond safety (Jha, Orav, Zheng, & Epstein, 2008; Smith, Terry, Manstead, Louis, Kotterman, & Wolfs, 2008). In fact, it is possible that staff behaviors that support safety (e.g., asking a patient multiple times about allergies) may lower patient satisfaction if it is not clear that these behaviors are done in the name of protecting the patient's safety and to ensure an optimal care experience. Theories of customer attitudes draw on traditional expectancy theory to argue that consumer attitudes are influenced by the degree to which their experience meets, exceeds, or falls short of their expected value of a given service or product (Ajzen & Fishbein, 1980). Additionally, attribution theory argues that consumer attitudes are further impacted by the explanations consumers make regarding why particular events occur during their service experience (Weiner, 1992). These attitudes, in turn, impact behavioral intentions, such as willingness to recommend a given organization to family or friends (Smith,

Terry, Manstead, Louis, Kotterman, & Wolfs, 2008). Thus, climate variability is likely to negatively impact patient willingness to recommend when patients do not perceive a consistent dedication to safety among the care providers they are exposed to or do not consistently attribute provider behaviors to supporting safety. More work is needed, however, to further understand the relationship between patient safety climate and affective patient outcomes, such as satisfaction and willingness to recommend.

In terms of actual safety, unit profile shape was related to patient safety in the present study, while profile elevation and variability were not. In line with configural theory, these findings suggest that the overall degree to which climate is positive or negative (i.e., profile elevation) or the degree to which it is consistent (i.e., profile variability) are deficient predictors of safety. Rather, these findings support the hypothesis that the relative relationships among multiple organizational goals matter when predicting such objective outcomes. Shape specifically provides information to employees regarding the emphasis to place on patient safety relative to other unit goals such as efficiency and it also reflects the degree to which policies, procedures, and norms regarding patient safety are internally aligned. Given that shape was related to safety, but variability was not also suggests that the individual dimensions of climate are not interchangeable. These results support the tenants of configural theory which argue that the individual dimensions take their meaning from the whole and contribute to outcomes through complex interactions with other dimensions.

Results specifically indicated that units with a supportive, learning climate shape provided safer care for their patients. These units were characterized as being high on teamwork within the unit, feedback and communication regarding error, non-punitive response to error, and

support for continuous learning. Theoretically, these are important factors underlying psychological safety (Edmondson, 2004) and all are considered core components of high reliability operations (Weick & Sutcliffe, 2007). Theoretically, a supportive, learning climate likely motivates employees to allocate discretionary effort toward patient safety. While data on employee behavior was not available in the present study, future work should examine employee behavior as a mediator of the climate—patient outcome relationships.

While profile elevation was not found to be related to either patient outcome in this study, exploratory analyses indicated that it was significantly related to employee willingness to recommend their facility to their family and friends for care. This aligns with work design theories of employee attitudes (e.g., Humphrey, Nahrang, & Morgeson, 2007) and general organizational climate theory (e.g., Schulte, 2009) which suggest that job satisfaction and other affective employee outcomes, such as willingness to recommend, are impacted by the degree to which employees interpret their work environment as holistically beneficial or detrimental to them (Schleicher, Hansen, & Fox, 2011). While both climate and employee willingness to recommend originate as employee perceptions, they differ in that willingness to recommend includes an evaluative component, and climate does not (Schneider, Ehrhart, & Macey, 2011). Thus, these theories suggest that the work environment likely impacts employee attitudes through motivational mechanisms; that is, by influencing the degree to which employees experience their work as personally meaningful, feel a sense of responsibility for their work and its outcomes, and have knowledge of the results of their work (Humphrey, Nahrang, & Morgeson, 2011). In the healthcare environment, patient safety is an important component of the degree to which clinical care providers perceive and interpret their own work as meaningful. Additionally, providers may

have previous personal experiences related to patient safety (either positive or negative) that may give it greater importance or weight in their willingness to recommend their facility to family or friends (Smith-Jentsch et al., 1996). These findings also align with previous literature that has found that climate profile elevation is associated with internal outcomes such as employee satisfaction and perceptions of service quality, while profile variability and shape, on the other hand, have been related to external outcomes such as objective indicators of team performance, organizational financial performance, and customer satisfaction (Schulte et al., 2009; Smith-Jentsch et al., 2010).

Finally, results did not indicate that the relationships between unit level patient safety climate and patient outcomes were dependent upon climate strength. Theoretically, these results would suggest that once the baseline level of agreement necessary to aggregate individual climate perceptions to the group or unit level is reached, remaining variability among unit members does not meaningfully impact the climate-patient outcome relationships. As underscored by Schneider, Ehrhart, and Macey (2011), however, detecting moderation effects often suffers from issues of range restriction, given that a baseline level of strength is required to investigate climate as a collective construct. Thus, climate strength often does not have the range of scores necessary to adequately detect smaller moderation effects. In the present study climate strength was operationalized as the average standard deviation across dimensions and ranged from 0.54 to 1.03. Given that the range was relatively small, it is possible that true moderation effects could not be detected. As discussed below, these results suggest that climate strength may need to be operationalized differently in the context of climate profiles.

6.1 Summary of Theoretical Implications

In sum, results suggest several theoretical and conceptual implications regarding the patient safety climate construct. First, study findings collectively suggest that the reductionist perspective (i.e., examining individual dimensions of climate only) provides an incomplete understanding of how climate perceptions form and how climate relates to outcomes. These results support the conceptualization of patient safety climate as a gestalt construct. Specifically, this study is one of the first to empirically suggest that gestalt perceptions of patient safety climate are the product of complex, reciprocal interactions among the various dimensions. Thus, thinking in terms of climate profiles may provide a more robust mechanism for understanding outcome relationships and lead to the development of more comprehensive models of patient safety climate.

Concerning the etiology of the patient safety construct, this study supports symbolic interaction theories of climate formation. In one of the few theoretical discussions of the patient safety climate construct to date Reiman, Pietikäinen, and Oedewald (2010) suggested that organizational, social, and individual psychological processes contribute to individual perceptions of patient safety climate. While the impact of these factors has been well established in the general organizational climate literature, this study is one of the first to provide empirical support for the role that social interaction processes play in formation of individual-level perceptions of patient-safety climate. In this way, this study uniquely expands the conceptual understanding of facet-specific climates and supports theories suggesting that these more specific forms of climate form in similar ways as broader, more general climate perceptions.

The study also contributes to the understanding of potential boundary conditions affecting the relationships between the three climate profile characteristics and outcome at the unit level of analysis. Similar to previous studies of climate strength that have only examined the dimensions of climate in singularity (e.g., Schneider, Salvaggio, & Subirats, 2002), climate strength was not found to exert main effects on patient outcomes in the present study. Furthermore, climate strength was not found to be a significant boundary condition of these relationships in the present study. This raises interesting theoretical questions regarding the way climate strength operates in the context of climate profile characteristics. Previous studies of general organizational climate have found mixed evidence regarding whether climate strength moderates the relationship between individual dimensions of climate and outcomes. Several studies have found support for climate strength as a boundary condition (e.g., González-Romá, Davis, & West, 2008; Schneider, Salvaggio, & Subirats, 2002), while others have not (e.g., Bliese & Halverson, 1998; Lindell & Brandt, 2000). It is important to note that all of these studies have examined climate from a reductionist perspective, looking at each dimension of climate in singularity. Thus, the present study offers initial insight into how climate strength functions in the context of climate profile characteristics. It is possible that, over a certain threshold, climate strength becomes less important in the context of climate profiles since profiles capture the full gestalt constellation of perceptions comprising patient safety climate. This aligns with the tenants of dispersion theory (Brown & Kozlowski, 1999) suggesting that within-unit dispersion can be conceptualized in terms of uniformity as well as strength. While strength focuses on the degree of within-unit agreement, uniformity is defined according to the

patterns of the individual-level construct at the unit level. The present study suggests that uniformity may be more critical than strength for examining the effects of profile characteristics.

Range restriction is also a statistical issue needing to be dealt with in greater detail in the context of climate strength; given that thresholds for aggregation require that a certain level of within-group agreement be obtained before constructs such as climate can be examined as collective, emergent phenomena. Therefore, conceptual questions of interest remain: at what point and to what degree do within-group differences matter for the climate profile characteristics, and how is climate strength of these profile characteristics most meaningfully operationalized? Echoing Schneider, Ehrhart, and Macey (2011), the issue of within-group variability in the context of emergent group-level constructs is an area ripe for theoretical development.

Finally, results also provide initial insight into how patient safety climate profile characteristics are interrelated over time. Profile elevation in year two was uniquely predicted by both elevation and variability from the previous year. Conversely, profile shape in year two was only predicted by profile elevation in year one. While these results have to be tempered with the potential for mono-method bias, they conceptually suggest that the profile characteristics are meaningfully related over time at the unit level of analysis.

6.2 Practical Implications

From a practical perspective, these findings are meaningful in that they provide insight into (1) how employees form their perceptions of patient safety climate and (2) how patient safety climate is related to two important patient outcomes. For hospital administrators and unit

leaders, these findings provide insight for the development and planning of initiatives designed to enhance patient satisfaction and safety. When targeting patient willingness to recommend, these results suggest that organizations consider the degree of alignment among the various aspects of climate. However, to predict patient outcomes, organizations need to consider the relationships among the multiple dimensions of patient safety climate.

Specifically, findings suggest that patient safety can be enhanced by creating a learning patient safety climate shape. This means optimizing collective perceptions of teamwork within a given unit, ensuring that employees perceive that they receive and can participate in feedback regarding error, that time and resources are dedicated to continuous learning from near misses and actual errors, and that both supervisors and peers actively support the priority of patient safety as a priority over competing goals such as efficiency.

Additionally, results suggest that the patient safety climate dimensions contribute differentially (i.e., are not necessarily all equally important) for patient safety. Practically, this is meaningful because it provides evidence that not all climate dimensions need to be high in order to achieve safety. Specifically, results suggest that units with climates characterized by high teamwork within the unit, high feedback and communication about error, a high degree of support for continuous learning, and a non-punitive response to error also tend to be the safest. This suggests that these four dimensions be prioritized in intervention planning and development.

This does not mean that the other dimensions can be ignored, however. Patient willingness to recommend was negatively related to profile variability. Thus, to simultaneously support optimal patient safety and patient satisfaction, the current results suggest interventions that prioritize the four core dimensions of a supportive learning climate (teamwork within units,

feedback and communication, continuous learning, and non-punitive response), but that the other dimensions of climate must also be considered and none can be extremely low. Overall, results suggest that patient outcomes can be achieved by creating learning climates around patient safety and by using improvement approaches that target multiple dimensions of climate simultaneously, such as patient safety bundles.

6.3 Limitations & Avenues for Future Research

Though the present study includes a number of important findings, it is important to consider them along with several limitations. First, the generalizability of results may be attenuated given that data was collected from multiple organizations operating within the same overarching healthcare system. While each hospital functioned under its own executive leadership and local patient safety practices, there are likely some unaccounted-for similarities among organizations. For example, all organizations were united under the same corporate mission and values statement. Future studies would benefit from samples collected across multiple healthcare systems to account for the potential impact of corporate culture or climate. The sample size at the organizational level was also small; therefore, results regarding organizational influences on individual-level climate characteristics may have been attenuated by reduced statistical power. The current study also focused on high acuity hospital units. It remains unclear if similar results would emerge in ambulatory care units or in other healthcare environments (e.g., primary care, nursing home care facilities).

Second, it is possible that the specific profile shapes found in this study may not emerge in other samples or that different climate shapes may emerge in other healthcare environments.

In comparison to more recent model-based classification techniques, the K-means clustering method used to derive climate shape in the present study has been faulted as relatively sample-specific, given that it lacks statistically consistent classification criteria (Vermunt & Magidson, 2002; Wang & Hanges, 2011). Modeling methods such as latent profile analysis (Muthen, 2002) or latent class analysis (Carter, Dalal, Lake, Lin, & Zickar, 2011; Vermunt & Magidson, 2003) offer more model estimation and comparison criteria and may offer a mechanism for identifying profile shapes that are more robust across samples.

Third, causality cannot be inferred directly even though outcomes were collected from a separate source at different points in time. Longitudinal data collected over a longer time span would strengthen inferences regarding the direction of the patient safety climate-outcome relationships and the stability of patient safety climate over time. Additionally, such longitudinal designs would enhance the ability to examine potential interactions between patient safety climate and other facet-specific climates such as the unit's climate for justice or general organizational climate (Dekker, 2008; Zohar, Livne et al., 2007). For example, Zohar, Livne and colleagues (2007) have found some evidence that unit level climate interacts with organizational-level climate to predict medication safety and emergency preparedness. However, it remains unclear how the unit-referenced climate profile characterizes may interact with organization-referenced climate profile characteristics.

Fourth, while climate strength was not found to moderate climate-outcomes in the present study, this could be due in part due to the way in which strength was operationalized. In the present study, the average standard deviation across climate dimensions was utilized to operationalize strength. While assumptions regarding normality and variance were met, it is

possible that strength needs to be considered differently in the context of climate profile characteristics. Given that profiles are comprised of multiple dimensions, rather than individual items, aggregation bias may confound results if strength is operationalized as an aggregate across dimensions. Additionally, it remains unclear whether the strength of particular dimensions contributes differentially to overall profile strength. Future research should examine other indicators of dispersion from the theoretical lens of dispersion models (Chan, 1998) to determine if there are more optimal ways of operationalizing climate strength for climate profiles.

Finally, only two patient outcomes were examined in the present study. While patient safety was operationalized in terms of incident reporting, for example, there are multiple ways to operationalize this construct. Evidence to date clearly suggests that underreporting of patient harm is widespread; therefore, current results may actually underestimate the relationships between patient safety profile characteristics and patient safety. Different results may have been found if safety was operationalized in terms of only the most severe cases of patient harm such as sentinel events. Recent methods for measuring patient harm that do not rely on clinician reporting, such as the Global Trigger Tool methodology (Ashcraft, Dorrill, & Adler, 2010; U.S. Department of Health and Human Services Office of the Inspector General, 2010), may find more robust relationships between the climate profile characteristics and patient harm given that they do not rely on clinician reporting. Additionally, given the relationship between climate and employee willingness to recommend in the present study, the climate profile characteristics may also be related to other employee level outcomes, such as organizational commitment and ; turnover intentions (Lok, Westwood, Crawford, 2005; Patterson et al., 2005; Pritchard & Karasick, 1973). Future research should strive to not only uncover these relationships, but to also

determine how group-level factors may impact the relationships between the three climate profile characteristics and other internal, employee outcomes.

There are also positively valenced indicators of patient safety that could be examined. For example, several dimensions of patient safety climate have been found to be significantly correlated with indicators of care quality, such as the AHRQ Patient Safety Indicators and Hospital Quality Alliance Core Measures (Mardon, 2008). These measures provide a positive indicator of the degree to which patients are receiving standards of care.

6.4 Closing Summary

In summary, this study contributes to the body of evidence regarding both individual-level perceptions of patient safety climate and the relationship between patient safety climate as a collective group-level construct and patient outcomes. Specifically, this work provides empirical evidence that individual perceptions of patient safety climate are likely the product of social interaction processes rather than simply organizational structure or workforce homogeneity based on attraction-selection-attrition processes. Additionally, this study has further expanded the understanding of the patient safety climate construct from a configurative perspective. Results indicate that the three climate profile characteristics of elevation, variability, and shape are differentially related to clinician and patient outcomes. While profile elevation and variability were related to clinician willingness to recommend their facility to others, only profile variability was found to be related to patient willingness to recommend at the group level of analysis. Furthermore, profile shape was the only characteristic found to be related to patient safety.

Overall, these results uniquely contribute to the theoretical and empirical body of work regarding the patient safety climate construct. Theoretically, this study supports conceptualizing patient safety climate from a configural perspective, as a gestalt construct. In line with configural theory, results suggest that the individual dimensions of climate take their meaning from the whole and that this meaning can be lost when they are considered in isolation. Additionally, results indicate that individual-level climate perceptions are formed primarily through social interaction processes. The practical implications of these findings suggest that multi-pronged approaches to improving patient safety climate that target multiple dimensions simultaneously have the greatest potential to positively impact both internal and external outcomes. Additionally, this study offers a much needed point of departure for future research dedicated to expanding the understanding of patient safety climate as a gestalt construct reflective of the complex patterns among its underlying dimensions.

APPENDIX A: STUDY HYPOTHESES

Research Question	Hypotheses
What Factors Shape Individual Perceptions of Patient Safety Climate?	<p><i>Hypothesis 1:</i> (a) Organizational membership, (b) specific unit membership, and (c) unit type each account for unique variance in individual-level patient safety climate elevation.</p> <p><i>Hypothesis 2:</i> Individuals are more likely to fall into the same collective climate (i.e., cluster) with members of their same unit than with members of other units.</p>
Do patient safety climate profile characteristics predict patient outcomes?	<p><i>Hypothesis 3:</i> Climate (a) elevation, (b) variation, and (c) shape each account for unique variance in patient safety. Specifically, elevation will be positively related to safety, variation will be negatively related to safety, and a supportive climate shape will be positively related to patient safety.</p> <p><i>Hypothesis 4:</i> Climate (a) elevation, (b) variation, and (c) shape each account for unique variance in patient satisfaction. Specifically, elevation will be positively related to satisfaction, variation will be negatively related to satisfaction, and a supportive climate shape will be positively related to patient satisfaction.</p> <p><i>Hypothesis 5:</i> After accounting for elevation and variability, a supportive climate profile shape in year one will be related to the reliability of unit patient safety when safety is operationalized as the changed in adverse incidents from year one to year two. Specifically, when a unit's profile shape is supportive, patient safety will be more consistent over time.</p> <p><i>Hypothesis 6:</i> After accounting for elevation and shape, a supportive climate profile shape in year one will be related to the reliability of unit patient satisfaction when satisfaction is operationalized as the changed in satisfaction from year one to year two. Specifically, when a unit's profile shape is supportive, patient satisfaction will be more consistent over time.</p>
Does climate strength moderate patient safety climate-outcome relationships?	<p><i>Hypothesis 7:</i> Climate strength moderates the relationship between (a) climate elevation, (b) variation, and (c) shape and patient safety, such that each of these relationships becomes stronger as climate strength increases.</p>

Hypothesis 8: Climate strength moderates the relationship between (a) climate elevation, (b) variation, and (c) shape and patient satisfaction, such that each of these relationships becomes stronger as climate strength increases.

**Do Patient Outcomes
Affect Subsequent Patient
Safety Climate
Perceptions?**

Hypothesis 9 (elevation x safety outcomes interaction): Climate profile elevation in year one and patient safety score in year one will interact to predict year two climate elevation. Specifically, units with higher elevation in year one will be more likely to maintain high elevation scores in year two even if patient safety scores in year one are low given that these units are theoretically more likely to engage in effective high reliability processes in response to errors and near misses.

Hypothesis 10 (variability x safety score interaction): Climate profile variability in year one and patient safety score in year two will interact to predict year two climate variability. Specifically, units with higher profile variability in year one and poor patient safety outcomes in year one will be likely to reduce the variability in year two given that these units are theoretically more likely to engage in efforts to clarify the priority of patient safety relative to other unit goals.

Hypothesis 11 (shape x safety score interaction): A supportive climate shape in year one will interact with patient safety score in year one to predict climate shape in year two. Specifically, units with a supportive climate in year one will be likely to maintain a supportive shape in year two even if patient safety scores in year one are low given that these units are theoretically more likely to engage in effective high reliability processes that support a psychologically safe work environment that treats events as opportunities for learning and improvement rather than opportunities for punishment.

APPENDIX B: HSOPS DIMENSIONS, CORRESPONDING QUESTIONS,
SCALE RELIABILITIES, & ICCS

Dimension	Questions	Current Study		
		α	ICC(1)	ICC(2)*
<i>Background</i>	1. How long have you worked in your current hospital work area/unit? 2. What is your staff position in this hospital? 3. In your staff position, do you typically have direct interaction or contact with Patients? 4. How long have you worked in your current specialty or profession?	N/A	N/A	N/A
Unit-Referenced Climate Scales				
<i>Supervisor expectations & actions promoting patient safety</i>	B1. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures. B2. My supervisor/manager seriously considers staff suggestions for improving patient safety. B3r. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts. (reverse worded) B4r. My supervisor/manager overlooks patient safety problems that happen over and over. (reverse worded)	.82	.52	.81
<i>Continuous Learning</i>	A6. We are actively doing things to improve patient safety. A9. Mistakes have led to positive changes here. A13. After we make changes to improve patient safety, we evaluate their effectiveness.	.73	.43	.70
<i>Teamwork within Unit</i>	A1. People support one another in this unit. A3. When a lot of work needs to be done quickly, we work together as a team to get the work done. A4. In this unit, people treat each other with respect. A11. When one area in this unit gets really busy, others help out.	.82	.49	.80
<i>Communication Openness</i>	C2. Staff will freely speak up if they see something that may negatively affect patient care.	.70	.36	.63

	C4. Staff feel free to question the decisions or actions of those with more authority. C6r. Staff are afraid to ask questions when something does not seem right. (reverse worded)			
<i>Feedback & Communication About Error</i>	C1. We are given feedback about changes put into place based on event reports. C3. We are informed about errors that happen in this unit. C5. In this unit, we discuss ways to prevent errors from happening again.	.76	.52	.76
<i>Non-punitive Response to Error</i>	A8r. Staff feel like their mistakes are held against them. (reverse worded) A12r. When an event is reported, it feels like the person is being written up, not the problem. (reverse worded) A16r. Staff worry that mistakes they make are kept in their personnel file. (reverse worded)	.80	.54	.78
<i>Overall Perceptions of Safety</i>	A10r. It is just by chance that more serious mistakes don't happen around here. A15. Patient safety is never sacrificed to get more work done. A17r. We have patient safety problems in this unit. A18. Our procedure and systems are good at preventing errors from happening.	.75	.40	.73
Organization Referenced Climate Scales				
<i>Hospital Management Support for Patient Safety</i>	F1. Hospital management provides a work climate that promotes patient safety. F8. The actions of hospital management show that patient safety is a top priority. F9r. Hospital management seems interested in patient safety only after an adverse event happens. (reverse worded)	.79	.48	.73
<i>Teamwork Across Hospital Units</i>	F2r. Hospital units do not coordinate well with each other. (reverse worded) F4. There is good cooperation among hospital units that need to work together. F6r. It is often unpleasant to work with staff from other hospital units. (reverse worded) F10. Hospital units work well together to provide the best care for patients.	.80	.45	.77
<i>Hospital</i>	F3r. Things "fall between the cracks" when transferring patients from one unit to	.81	.50	.80

<i>Handoffs and Transitions</i>	another. (reverse worded) F5r. Important patient care information is often lost during shift changes. (reverse worded) F7r. Problems often occur in the exchange of information across hospital units. (reverse worded) F11r. Shift changes are problematic for patients in this hospital. (reverse worded)			
<i>Outcomes</i>				
<i>Willingness to Recommend</i>	F12. I would recommend my organization to friends and family members who need care.	NA	NA	NA

Note: *Also known as ICC(1,k)

REFERENCES

- Adler, P. S., & Borys, B., (1996). Two types of bureaucracy: Enabling and coercive. *Administrative Science Quarterly*, 41, 61-89.
- Aguinis, H. (2004). *Regression analysis for categorical moderators*. New York, NY: Guilford Press.
- Agency for Healthcare Research and Quality. (2009, September). *Hospital survey on patient safety culture: Background and information for translators*. Retrieved August 20, 2010 from: <http://www.ahrq.gov/qual/patientsafetyculture/infotransHSOPS.pdf>
- Agency for Healthcare Research and Quality. (2006, February). *Patient Safety Indicators Overview, AHRQ Quality Indicators*. Retrieved August 1, 2010 from: http://www.qualityindicators.ahrq.gov/psi_overview.htm
- Agency for Healthcare Research and Quality. (2001). *Making health care safer: a critical analysis of patient safety practices* (AHRQ Publication No. 01-E058). Rockville, MD.
- Aiken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J., & Silber, J. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association*, 288(16), 1987-2954.
- Aiken, L. H., Clarke, S. P., & Sloane, D. M. (2002). Hospital staffing, organization, and quality of care: Cross-national findings. *International Journal for Quality in Health Care*, 50(5), 5-13.
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Process*, 50, 179-211.
- Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behaviors. *Journal of Personality and Social Psychology*, 27, 41-57. doi:10.1037/h0034440.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Aldenderfer, M.S., & Blashfield, R. K. (1984). *Cluster analysis*. Newbury Park, CA: Sage.
- Allison, P. D. (1978). Measures of inequality. *American Sociological Review*, 43, 865-880.

- Alvesson, M. (2002). *Understanding organizational culture*. Thousand Oaks, CA: Sage.
- Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, 19(3), 235-258. doi: 10.1002/(SICI)1099-1379(199805)19:3<235::AID-JOB837>3.0.CO;2-C.
- Armstrong, K., Laschinger, H., & Wong, C. (2009). Workplace empowerment and magnet hospital characteristics as predictors of patient safety climate. *Journal of Nursing Care Quality*, 24(1), 55-62.
- Ashcraft, A., Dorrill, R. A., & Adler, L. (2010, May). *Office of Inspector General (OIG) national incidence of adverse events among medicare beneficiaries*. Presentation at the Annual Congress of the National Patient Safety Foundation: Orlando, FL.
- Ashforth, B. E. (1985). Climate formation: Issues and extensions. *The Academy of Management Review*, 10(4), 837-847.
- Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.
- Barrick, M.R., Stewart, G.L., Neubert, M., & Mount, M.K. (1998). Relating member ability and personality to work team processes and team effectiveness. *Journal of Applied Psychology*, 83, 377-391.
- Bellou, V. (2007). Achieving long-term customer satisfaction through organizational culture: Evidence from the health care sector. *Managing Service Quality*, 17(5), 510-522. doi: 10.1108/09604520710817334.
- Beus, J. M., Payne, S. C., Bergman, M. E., & Arthur, W. (2010). Safety climate and injuries: An examination of theoretical and empirical relationships. *Journal of Applied Psychology*, 95(4), 713-727.
- Bierly, P.E. & Spender, J.C. (1995). Culture and high-reliability organizations – The case of the nuclear submarine. *Journal of Management*, 21, 639-656.
- Bliese, P.D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation. In K. Klein & S.W.J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 349-381). San Francisco: Jossey-Bass.
- Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Englewood Cliffs, NJ: Prentice Hall.

- Braithwaite, J., Westbrook, M. T., Travaglia, J. F., & Hughes, C. (2008). Cultural and associated enablers of, and barriers to, adverse incident reporting. *Quality and safety in healthcare, 19*, 229-233.
- Brown, K. G., & Kozlowski, S. W. J. (1999). *Dispersion theory: moving beyond a dichotomous conceptualization of emergent organizational phenomena*. Paper presented at the Fourteenth Annual Meeting of the Society of Industrial and Organizational Psychology, Atlanta, GA.
- Campbell, E. G., Singer, S., Kitch, B. T., Iessoni, L. I., Meyer, G. S. (2010). Patient safety climate in hospitals: Act locally on variation across units. *Joint Commission Journal on Quality and Patient Safety, 26*(7), 319-326.
- Campbell, J. J., Dunnette, M. D., Lawler, E. E., & Weick, K. E. (1970). *Managerial behavior, performance, and effectiveness*. New York: McGraw-Hill.
- Cannon-Bowers, J. A., Salas, E., & Converse, S. A. (1993). Shared mental models in expert team decision making. In N. J. Castellan, Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221-246). Hillsdale, NJ: Erlbaum.
- Carr, J. Z., Schmidt, A. M., Ford, K., & DeShon, R. P. (2003). Climate perceptions matter: A meta-analytic path analysis relating molar climate, cognitive and affective states, and individual level work outcomes. *Journal of Applied Psychology, 88*(4), 605-619.
- Carter, N. T., Dalal, D. K., Lake, C. J., Lin, B. C., Zickar, M. J. (2011). Using mixed-model item response theory to analyze organizational survey response: An illustration using the job descriptive index. *Organizational Research Methods, 14*(1), 116-146. doi: 0.1177/1094428110363309.
- Centers for Medicare and Medicaid Services. (2010). *Hospital Care Quality Information from the Consumer Perspective*. Retrieved June 1, 2010 from: <http://www.hcahpsonline.org>.
- Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology, 83*, 234-246.
- Chen, C., & Huang, J. (2007). How organizational climate and structure affect knowledge management: The social interaction perspective. *International Journal of Information Management, 27*, 104-118.
- Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology, 94*, 1103-1127.

- Choudhry, R. M., Fang, D., & Mohamed, S. (2007). The nature of safety culture: A survey of the state-of-the art. *Safety Science*, *45*, 993-1012. doi:10.1016/j.ssci.2006.09.003.
- Clarke, S. (2006). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology*, *11*(4), 315-327.
- Colla, J. B., Bracken, A. C., Kinney, L. M., & Weeks, W. B. (2005). Measuring patient safety climate: A review of surveys. *Quality and Safety in Healthcare*, *14*, 364-366. doi:10.1136/qshc.2005.014217.
- Colquitt, J. A., Noe, R. A., & Jackson, C. L. (2002). Justice in teams: Antecedents and consequences of procedural justice climate. *Personnel Psychology*, *55*, 83–109. doi: 10.1111/j.1744-6570.2002.tb00104.x.
- Cook, R. I. (1998.) *How complex systems fail*. Chicago, IL: University of Chicago, Cognitive Technologies Laboratory.
- Cooper, M. D. (2000). Towards a model of safety culture. *Safety Science*, *36*, 111-136. doi:10.1016/S0925-7535(00)00035-7.
- Cooper, J. B., Blum, R. H., Carroll, J. S., Dershwitz, D. M. et al. (2008). Differences in safety climate among hospital anesthesia departments and the effect of a realistic simulation-based training program. *Anesthesia and Analgesia*, *106*, 574-584.
- Daniel, K., & Darby, D. N. (1997). A dual perspective of customer orientation: a modification, extension and application of the SOCO scale. *International Journal of Service Industry Management*, *8*(2), 131-147. doi: 10.1108/09564239710166254.
- Davies, H. T. O., Nutley, S. M., & Mannion, R. (2000). Organisational culture and quality of healthcare. *Quality in Health Care*, *9*, 111-119.
- Davis, K., Schoen, C., & Stremikis, K. (2010, June). *Mirror, mirror on the wall: How the performance of the US healthcare system compares internationally*. Retrieved June 4, 2010 from the Commonwealth Fund website: <http://www.commonwealthfund.org/Content/Publications/Fund-Reports/2007/May/Mirror--Mirror-on-the-Wall--An-International-Update-on-the-Comparative-Performance-of-American-Health.aspx>
- Davenport, D. L., Henderson, W. G., Mosca, C. L., Khuri, S. F. & Mentzer, R. M. (2007). Risk-adjusted morbidity in teaching hospitals correlates with reported levels of communication and collaboration on surgical teams but not with scale measures of teamwork climate, safety climate, or working conditions. *Journal of the American College of Surgeons*, *205*(6), 778-784.

- Dawson, J. F., Gonzalez-Roma, V., Davis, A., & West, M. A. (2008). Organizational climate and climate strength in UK hospitals. *European Journal of Work and Organizational Psychology, 17*(1), 89-111.
- Dekker, S. (2008). *Just culture: Balancing safety and accountability*. Surrey, UK: Ashgate.
- Denison, D. R. (1996). What is the different between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars. *Academy of Management Review, 21*(3), 619-54.
- Dickson, M. W., Smith, D. B., Grojean, M. W., & Ehrhart, M. (2001). An organizational climate regarding ethics: The outcome of leader values and practices that reflect them. *The Leadership Quarterly, 12*(2), 197-217.
- Dickson, M. W., Resick, C. J., & Hanges, P. J. (2006). When organizational climate is unambiguous, it is also strong. *Journal of Applied Psychology, 91*(2), 351-364. doi: 10.1037/0021-9010.91.2.351.
- Edmondson, A. C. (2004). Learning from failure in health care: Frequent opportunities, pervasive barriers. *Quality and Safety in Health Care, 13*(6), 3-9.
- Ekvall, G. (1996). Organizational climate for creativity and innovation. *European Journal of work and Organizational Psychology, 5*(1), 105-123.
- Emanuel, L., Berwick, D., Conway, J., Combes, J., Hatlie, M., Leape, L., Reason, J., Schyve, P., Vincent, C., & Walton, M. (2008). What exactly is patient safety? K. Henriksen, J. B. Battles, M. A. Keyes & M. L. Grady (Eds.), *Advances in Patient Safety, Vol. 1: Assessment*. Retrieved October 10, 2010 from: http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=aps2v1&part=advances-emanuel-berwick_110
- Estabrocks, C. A., Tourangeau, A. E., Humphrey, C. K., Hesketh, K. L., Giovannetti, P., & Thomson, D. (2002). Measuring the hospital practice environment: A Canadian context. *Research in Nursing and Health, 25*(4), 256-268.
- Fletcher, B. C., & Jones, F. (1992). Measuring organizational culture: The cultural audit. *Managerial Auditing Journal, 7*(6), 30-36. doi: 10.1108/eb017606.
- Flin, R. (2007). Measuring culture in healthcare: A case for accurate diagnosis. *Safety Science, 45*, 653-667.
- Flin, R., Burns, C., Mearns, K., Yule, S., & Robertson, E. M. (2006). Measuring safety climate in healthcare. *Quality and Safety in Healthcare, 15*(2), 109-115. doi: 10.1136/qshc.2005.014761.

- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- France, D. J., Greevy, R. A., Liu, X., Burgess, H., Dittus, R. S. et al. (2009). Measuring and comparing safety climate in intensive care units. *Medical Care, 48*(3), 279-284.
- Frederiksen, N. (1968). Administrative performance in relations to organizational climate. Paper presented at the Annual Convention of the American Psychological Association: San Francisco, CA.
- Gershon, R. M., Karkashian, C. D., Grosch, J. W., Murphy, L. R., Escamillia-Cejudo, A. et al. (2000). Hospital safety climate and its relationship with safe work practices and workplace exposure incidents. *American Journal of Infection Control, 28*(3), 211-221.
- Gershon, R. M., Stone, P. W., Bakken, S., & Larson, E. (2004). Measurement of organizational culture and climate. *Journal of Nursing Administration, 34*(1), 33-40.
- Gifford, B. D., Zammuto, R. F., & Goodman, E. A. (2002). The relationship between hospital unit culture and nurses' quality of work life. *Journal of Healthcare Management, 47*(1), 13-26.
- Gillespie, M. A., Denison, D.R., Haaland, S., Smerek, R., & Neale, W. S. (2008). Linking organizational culture and customer satisfaction: Results from two companies in different industries. *European Journal of Work and Organizational Psychology, 17*(1), 112-132. doi: 10.1080/13594320701560820
- Gitell, J. H. (2002). Relationships between service providers and their impact on customers. *Journal of Service Research, 4*(4), 299-311.
- Glick, W.H. (1985). Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. *Academy of Management Review, 10*, 601-616
- Griffin, M. A., & Mathieu, J. E. (1997). Modeling organizational processes across hierarchical levels: climate, leadership, and group process in work groups. *Journal of Organizational Behavior, 18*(6), 731-744. doi: 10.1002/(SICI)1099-1379.
- González-Romá, V., Peiró, J. M., & Zornoza, A. (1999). The validity of collective climates, *Journal of Occupational and Organizational Psychology, 72*, 25-40.
- González-Romá, V., Peiró, J. M., & Tordera, N. (2002). An examination of the antecedents and moderator influences of climate strength. *Journal of Applied Psychology, 87*(3), 465-473.

- González-Romá, V., Fortes-Ferreira, L., & Peiró, J. M. (2009). Team climate, climate strength and team performance: A longitudinal study. *Journal of Occupational and Organizational Psychology*, 82(3), 511-536.
- González-Romá, V., & West, M. A. (2005). *Agreeing to disagree: Team climate, climate strength and innovation in work teams*. Unpublished manuscript, University of Valencia, Spain.
- Guion, R. (1973). A note on organizational climate. *Organizational Behavior and Human Performance*, 9, 120-125. doi: 10.1016/0030-5073(73)90041-x.
- Guldenmund FW. (2000). The nature of safety culture: A review of theory and research. *Safety Science*, 34(1), 215-257. doi: S0925-7535(00)00014-X.
- Halbeslben, J. R. B., Wakefield, B. J., Wakefield, D. S., & Cooper, L. B. (2008). Nurse burnout and patient safety outcomes: Nurse safety perceptions versus reporting behavior. *Western Journal of Nursing Research*, 30(5), 560-577. doi: 10.1177/0193945907311322.
- Hellriegel, D., & Slocum, J.W. (1974). Organizational climate: Measures, research, and contingencies. *Academy of Managerial Journal*, 17, 255-279.
- Hoffman, D. A., & Mark, B. (2006). An investigation of the relationship between safety climate and medication errors as well as other nurse and patient outcomes. *Personnel Psychology*, 59, 847-869. doi: 10.1111/j.1744-6570.2006.00056.x.
- Holden, L. M., Watts, D. D., & Walker, P. H. (2010). Patient safety climate in primary care: Age matters. *Journal of Patient Safety*, 5(1), 23-28.
- Hubert, L. J., & Levin, J. R. (1976). A general statistical framework for assessing categorical cluster recall. *Psychological Bulletin*, 83, 106-125.
- Huang, D. T., Clermont, G., Sexton, J. B., Karlo, C. A., Miller, R. G. et al. (2007). Perceptions of safety culture vary across the intensive care units of a single institution. *Critical Care Medicine*, 35(1), 165-176.
- Huang, D.T., Clermont, G., Kong, L., Weissfeld, L.A., Sexton, J.B., Rowan, K.M., & Angus, D.C. (2010). Intensive care unit safety culture and outcomes: a US multicenter study. *International Journal of Quality in Health Care*, 22(3), 151-161.
- Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Team in organizations: From input-process-output models to IMO models. *Annual Review of Psychology*, 56, 517-543.

- Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, D.C.: National Academies Press.
- Jackofsky, E. F., & Slocum, J. W., (1988). A longitudinal study of climates. *Journal of Organizational Behavior*, 9(4), 319-334.
- James, R. L., Choi, C. C., Ko, E., McNeil, P. K., Minton, M. K. et al. (2008). Organizational and psychological climate: A review of theory and research. *European Journal of Work and Organizational Psychology*, 17(1), 5-32.
- James, L.R. (1982). Aggregation bias in estimates of perceptual agreement. *Journal of Applied Psychology*, 67, 219-229.
- James, R. L., Demaree, R. G., & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*, 69, 85-98.
- James, R. L., Demaree, R. G., & Wolf, G. (1993). rwg: An assessment of within-group interrater agreement. *Journal of Applied Psychology*, 78, 306-309.
- James, L. R., & Jones, A. P. (1974) Organizational climate: A review of theory and research. *Psychological Bulletin*, 81, 1096-1112.
- Jasti, H., Sheth, H., Verricao, M., Perera, S., Bump, G. et al. (2009). Assessing patient safety culture of internal medicine house staff in an academic teaching hospital. *Journal of Graduate Medical Education*, 1(1), 139-145.doi: 10.4300/01.01.0023.
- Jewell, K., & McGiffert, L. (2009, May). To err is human-to delay is deadly: Ten years later, a million lives lost, billions of dollars wasted. Retrieved July 5, 2010 from from the Consumer's Union website:
<http://www.safepatientproject.org/safepatientproject.org/pdf/safepatientproject.org-ToDelayIsDeadly.pdf>.
- Jha, A. K., Orav, E. J., Zheng, J., & Epstein, A. M. (2008). Patients' perceptions of hospital care in the United States. *New England Journal of Medicine*, 359, 1921-1931.
- Joint Commission. (2010a, September). *Specifications manual for Joint Commission National Quality Core Measures* (version 2010B2). Retrieved September 22, 2010 from:
<https://manual.jointcommission.org/bin/view/Manual/WebHome>.
- Joint Commission. (2010b, October). Joint commission requirements. Retrieved October 30, 2010 from: <http://www.jointcommission.org/Standards/Requirements/>

- Jones, A. P. & James, L. R. (1979). Psychological climate: Dimensions and relationships of individual and aggregated work environment perceptions. *Organizational Behavior and Human Performance*, 23, 201-250.
- Joyce, W. F., & Solcum, J. W. (1984). Collective climate: Agreement as a basis for defining aggregate climates in organizations. *Academy of Management Journal*, 27(4), 721-742.
- Katz, D., & Khan, R. (1978). *The social psychology of organizations* (2nd ed.). New York, NY.: Wiley.
- Kohn, L.T., Corrigan, J.M., & Donaldson, M.S. (Eds.). (2000). *To err is human: Building a safer health system*. Washington, DC: National Academy Press.
- Kho, M. E., Perri, D., McDonald, E., Waugh, L., Orlicki, C., et al. (2009). The climate of patient safety in a Canadian intensive care unit. *Journal of Critical Care*, 24, 469.e7-469.e13.
- Kohler, W. (1947). *Gestalt Psychology*. New York: Liveright.
- Kivimaki, M., Vanhala, A., Pentti, J., Lansisalmi, H., Virtanen, M., Elovianio, M., & Vahtera, J. (2007). Team climate, intention to leave and turnover among hospital employees: Prospective cohort study. *BMC Health Services Research*, 7, 170. doi:10.1186/1472-6963-7-170.
- Klein, K. J., Conn, A. B., Smith, D. B., & Sorra, J. S. (2001). Is everyone in agreement? An exploration of within-group agreement in employee perceptions of the work environment. *Journal of Applied Psychology*, 86, 3-16.
- Klein, K.J., & Knight, A.P. (2005). Innovation implementation: Overcoming the challenge. *Current Directions in Psychological Science*, 14, 243-246.
- Klein, K. J., & Kozlowski, S. W. J. (2000). *Multilevel theory, research and methods in organizations*. San Francisco, CA: Jossey-Bass.
- Kopelman RE, Brief AP, & Guzzo RA. (1990). The role of climate and culture in productivity. In Schneider B. (Ed.). *Organizational Climate and Culture* (pp. 282–318). San Francisco, CA: Jossey-Bass.
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3-90). San Francisco, CA: Jossey-Bass.
- Lawler, E. E., Hall, D. T., & Oldham, G. R. (1974). Organizational climate: Relationship to organizational, structure, process, and performance. *Organizational Behavior and Human Performance*, 11(1), 139-155.

- Leape, L.L., Bates, D.W., Cullen, D.J., Cooper, J., Demonaco, H. J., et al. (1995). Systems analysis of adverse drug events. ADE Prevention Study Group. *Journal of the American Medical Association*, 274, 35-43.
- LeBreton, J. M., James, L. R., & Lindell, M. K. (2005). Recent issues regarding r_{WG} , r^*_{WG} , $r_{WG(j)}$, and $r^*_{WG(j)}$. *Organizational Research Methods*, 8(1), 128-139.
- LeBreton, J. M., & Senter, J. L. (2008). Answers to 20 questions about interrater reliability and interrater agreement. *Organizational research methods*, 11(4), 815-852. Doi: 10.1177/1094428106296642.
- Lievens, F., Chasteen, C., Day, A., & Christiansen, N. (2006) Large-scale investigation of the role of trait activation theory for understanding assessment center convergent and discriminant validity. *Journal of Applied Psychology*, 91, 247-258.
- Litwin, G. H., & Stringer, R. A. (1968). *Motivation and organizational climate*. Cambridge, MA: Harvard University Press.
- Lewin, K. (1951). *Field theory in social science; selected theoretical papers*. New York: Harper & Row.
- Lewin, K., Lippit, R., & White, R.K. (1939). Patterns of aggressive behavior in experimentally created social climates. *Journal of Social Psychology*, 10, 271-301.
- Liao, H., & Rupp, D. E. (2005). The impact of justice climate and justice orientation on work outcomes: A cross-level multifoci framework. *Journal of Applied Psychology*, 90(2), 242-256.
- Lindell, M. K., & Brandt, C. J. (2000). Climate quality and climate consensus as mediators of the relationship between organizational antecedents and outcomes. *Journal of Applied Psychology*, 85, 331-348.
- Lok, P., Westwood, R., & Crawford, J. (2005). Perceptions of organizational subculture and their significance for organizational commitment. *Applied Psychology: An International Review*, 54(4), 490-514.
- Louis, M. R. (1980) Surprise and sense making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Science Quarterly*, 25, 226-251.
- Lyons, J. S. (2009). The missing link: An examination of safety climate and patient clinical outcomes in a national sample of hospitals. Ph.D. dissertation—University of Maryland, College Park, MD. Retrieved December 14, 2010, from Dissertations & Theses: A&I. (Publication No. AAT 3260406).

- Mardon, R. (2008, September). *Survey of patient safety culture in US Hospitals: External validity analyses*. Paper presented at the 2008 AHRQ Annual Conference, Bethesda, MD.
- MacDavitt, K., Chou, S. S., & Stone, P.W. (2007). Organizational climate and health care outcomes. *Joint Commission Journal on Quality and Patient Safety*, 33(11 Suppl), 45-56.
- MacDavitt, K., Chou, S., & Stone, P. (2007). Organizational climate and health care outcomes. *The Joint Commission Journal on Quality and Patient Safety*, 33(11) supplement, 45-56.
- Mann, S., Marcus, R., & Sachs, B. (2006) Lessons from the cockpit: How team training can reduce errors in L&D. *Contemporary OB/GYN*, 51(1), 34-41.
- Mardon, R. (2008). *Survey of patient safety culture in U.S. Hospitals: External validity analyses*. Presentation at the 2008 AHRQ Annual Conference, Rockville, MD. Retrieved June 3, 2010 from: http://www.cahps.ahrq.gov/content/community/events/files/F-3-P_Mardon-Final_fwp.pdf
- Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team processes and performance. *Journal of Applied Psychology*, 85(2), 273-283.
- Mearns, K., Whitaker, S., Flin, R. (2003). Safety climate, safety management practices and safety performance in offshore environments. *Safety Science*, 41 (8), 641–680.
- Meyer, A. D., Tsui, A. S., & Hinings, C.R. (1993). Configurational approaches to organizational analysis. *Academy of Management Journal*, 36(6), 1175-1195.
- Miller, D. (1996). Configurations revisited. *Strategic Management Journal*, 17, 505-512.
- Miller, V.D., & Jablin, F. M. (1990). Information seeking during organizational entry: Influences, tactics, and a model of process. *The Academy of Management Review*, 16(1), 92-120.
- Milligan, G. W., & Cooper, M.C. (1985). An examination of procedures for determining the number of clusters in a data set. *Psychometrika*, 50(2), 159-179.
- Mischel, W. (1973). Toward a cognitive social learning conceptualization of personality. *Psychological Review*, 80, 252-283.
- Mohammed, S., Klimoski, R., & Rentsch, J. R. (2000). The measurement of team mental models: We have no shared schema. *Organizational Research Methods*, 3, 123–165.
- Muthén , B.O. (2002). Beyond SEM: General latent variable modeling, *Behviormetrika*, 29, 81-117.

- Naveh, E., Katz-Navon, T., & Stern, Z. (2005). Treatment errors in healthcare: A safety climate approach. *Safety Science*, *51*(6), 948-960.
- Neil, A., Griffin, M.A., & Hart, P. M. (2000). The impact of organizational climate on safety climate and individual behavior. *Safety Science*, *34*, 99-109.
- Nightingale, D., & Toulouse, J. M. (1977). Towards a multi-level congruence theory of organization. *Administrative Science Quarterly*, *22*, 264-280.
- Nisbett, R., & Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*, 231-259.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- O'Brien, R. (2009). *Keeping patients safe: The relationship between patient safety climate and patient outcomes*. Ph.D. dissertation, University of California, San Francisco, CA. Retrieved December 14, 2010, from Dissertations & Theses: A&I. (Publication No. AAT 3378501).
- Offerman, L. R., & Malamut, A. B. (2002). When leaders harass: The impact of target perceptions of organizational leadership and climate on harassment reporting and outcomes. *Journal of Applied Psychology*, *87*(5), 885-893.
- Ostroff, C., & Schmitt, N. (1993). Configurations of organizational effectiveness and efficiency. *Academy of Management Journal*, *36*(6), 1345-1361.
- Ostroff, C., Kinicki, A. J. & Tamkins, M. M. (2003). Organizational culture and climate. In W. C. Borman, D. R. Ilgen & R. J. Klimoski (Eds.), *Handbook of Psychology: Industrial and Organizational Psychology* (Volume 12) (pp. 565-593). Hoboken, NJ: John Wiley and Sons, Inc.
- Patterson, M. G., West, J. F., Shackleton, V. J., Dawson, J. F., Lawthom, R., et al. (2005). Validating the organizational climate measure: links to managerial practices, productivity and innovation. *Journal of Organizational Behavior*, *26*(4), 379-408. doi: 10.1002/job.312.
- Payne, R. L., & Mansfield, R. (1973). Relationships of perceptions of organizational climate to organizational structure, context, and hierarchical position. *Administrative Science Quarterly*, *18*(4), 515-526.

- Payne, R. L., & Pugh, S. S. (1976). Organizational structure and organizational climate. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp.1125-1172) . Chicago, Rand McNally.
- PASW Statistics 18.0 [Computer software]. Chicago, IL: SPSS, Inc.
- Porter, L.W., & Lawler, E.E. (1965). Properties of organizational structure in relation to job attitudes and job behavior. *Psychological Bulletin*, *64*, 23-51.
- Pritchard, R. D. (1990). *Measuring and improving organizational productivity: A practical guide*. New York: Praeger.
- Pritchard, R. D., & Ashwood, E. L. (2008). *Managing motivation: A manager's guide to diagnosing and improving motivation*. New York: Routledge, Taylor & Francis Group.
- Pritchard, R. D., & Karasick, B. W. (1973). The effects of organizational climate on managerial job performance and job satisfaction. *Organizational Behavior and Human Performance*, *9*(1), 126-146. doi: 10.1016/0030-5073(73)90042-1.
- Probst, T. M., Brubaker, T. L., & Barsotti, A. (2008). Organizational injury rate underreporting: The moderating effect of organizational safety climate. *Journal of Applied Psychology*, *93*(5), 1147-1154.
- Pronovost, P.J., Berenholtz, S.M., Goeschel, C., Thom, I., Watson, S.R., et al. (2008). Improving patient safety in intensive care units in Michigan. *Journal of Critical Care*, *23*(2), 207-221.
- Raudenbush, S.W., & Bryk, A.S., (2002) *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.
- Raudenbush, S. W., Bryk, A.S., Cheong, Y., Congdon, R., & du Toit, M. (2011). HLM7: Hierarchical linear and nonlinear modeling [Computer software]. Lincolnwood, IL: SSI
- Raudenbush, S. W., & Liu, X. (2000). Statistical power and optimal design for multisite randomized trials. *Psychological Methods*, *5*(2), 199-213.
- Raudenbush, S. W., Spybrook, J., Liu, X., & Congdon, R. (2005). *Optimal Design for longitudinal and multilevel research: Documentation for the "Optimal Design" software, version 1.55*. Retrieved August 15, 2010 from: <http://www.wtgrantfoundation.org>.
- Reason, J. R. (2000). Human error: Models and management. *British Medical Journal*, *320*, 768-770.

- Reiman, T., Pietikainen, E., & Oedewald, P. (2010). Multilayer approach to patient safety culture. *Quality and safety in healthcare*, E-pub ahead of print.
- Rochlin, G. I. (1989). Informal organizational networking as a crisis-avoidance strategy: US naval flight operations as a case study. *Organization & Environment*, 3(2), 159-176. doi: 10.1177/108602668900300205.
- Rochlin, G. I. (1999). Safe operation as a social construct. *Ergonomics*, 42(11), 1549-1560. doi: 10.1080/001401399184884.
- Rouse, W. B., Cannon-Bowers, J. A., & Salas, E. (1992). The role of mental models in team performance in complex systems. *IEEE Transactions on Systems, Man, and Cybernetics*, 22(6), 1296-1308.
- Rousseau, D. M. (1988). The construction of climate in organization research. In C. L. Cooper & I. T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology*, Vol. 3(pp. 139-159). Chichester, UK: Wiley.
- Rousseau, D. M., & Fried, Y. (2001). Location, location, location: Contextualizing organizational research. *Journal of Organizational Behavior*, 22, 1-13.
- Sammer, C. (2009). *Culture of safety in hospitals: A three-part analysis of safety culture, evidence-based practice guidelines, and patient outcomes*. Dr.P.H. dissertation, University of North Texas Health Science Center at Fort Worth, United States -- Texas. Retrieved December 14, 2010, from Dissertations & Theses: A&I.(Publication No. AAT 3396587).
- Schein, E. H. (1990). Organizational culture. *American Psychologist*, 45, 109-119.
- Schein, E. H. (2000). Sense and nonsense about culture and climate. In N. M. Ashkanasy, C. P. M. Wilderom, & M. F. Peterson (Eds.), *Handbook of organizational culture and climate* (pp. xxiii-xxx). Thousand Oaks, CA: Sage Publications.
- Schneider, B. (1975). Organizational climates: An essay. *Personnel Psychology*, 28, 447-479.
- Schneider, B. (1983). Work climates: An interactionist perspective. In N. W. Feimer & E. S. Geller (Eds.), *Environmental Psychology* (pp. 106-128). Thousand Oaks, CA: Praiger.
- Schneider, B. (1987). The people make the place. *Personnel Psychology*, 40, 437-454.
- Schneider, B., Ehrhart, M.G., & Macey, W. H. (2011). Perspectives on organizational climate and culture (pp. 373-414). In S. Zedeck (Ed.), *APA Handbook of Industrial and*

Organizational Psychology, Vol. II. Washington, DC: American Psychological Association.

- Schneider, B., Goldstein, H. W., & Smith, D. B. (1995). The ASA framework: An update. *Personnel Psychology, 48*(4), 747-773.
- Schneider, B., & Reichers, A.E. (1983). On the etiology of climates. *Personnel Psychology, 36*(1), 19-39.
- Schneider, B., Salvaggio, A. N., & Subirats, M. (2002). Climate strength: A new direction for climate research. *Journal of Applied Psychology, 87*(2), 220-229.
- Schneider, B., White, S. S., & Paul, M. C. (1998). Linking service climate and customer perceptions of service quality: Test of a causal model. *Journal of Applied Psychology, 83*, 150-163.
- Shortell, S. M., Zimmerman, J. E., Rousseau, D. M., Gillies, R. R., Wagner, D. P. et al. (1994). The performance of intensive care units: Does good management make a difference?. *Medical Care, 32*(5), 508-525.
- Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428.
- Schulte, M., Ostroff, C., Shmulyian, S., & Kinicki, A. (2009). Organizational culture configurations: Relationships to collective attitudes, customer satisfaction, and financial performance. *Journal of Applied Psychology, 94*(3), 618-634.
- Schulte, M., Ostroff, C., & Kinicki, A. J., (2006). Organizational climate systems and psychological climate perceptions: A cross-level study of climate-satisfaction relationships. *Journal of Occupational and Organizational Psychology, 79*, 645-671. doi: 10.1348/096317905X72119.
- Sexton, J. B. (2002). A matter of life or death: Social, psychological, and organizational factors related to patient outcomes in the intensive care unit. Dissertation. University of Texas, Austin.
- Sexton, J. B., Helmreich, R. L., Neilands, T. B., Rowan, K., Vella, K. et al. (2006). The safety attitudes questionnaire: Psychometric properties, benchmarking data, and emerging research. *BMC Health Services Research, 6*, 44-54. doi:10.1186/1472-6963-6-44.
- Sexton, J. B., Holzmueller, C. G., Pronovost, P. J., Thomas, E. J., McFerran, S., et al. (2006). Variation in caregiver perceptions of teamwork climate in labor and delivery units. *Journal of Perinatology, 26*, 463-470.

- Shortell, S. M., Zimmerman, J. E., Rousseau, D. M., Gillies, R. R., Wagner, D. P., et al. (1994). The performance of intensive care units: does good management make a difference? *Medical Care*, 32(5), 508-525.
- Sine, D. M., & Northcutt, N. (2008). Interactive quality assessment of patient safety culture survey scores. *Journal of Patient Safety*, 4(2), 78-83.
- Singer, S.J., Gaba, D. M., Geppert, J. J., Sinaiko, A.D., Howard, S. K., & Park, K. C. (2003). Culture of safety: Results of an organization-wide survey in 15 California hospitals. *Quality and Safety in Health Care*, 12(2), 112-118.
- Singer, S., Lin, S., Falwell, A., Gaba, D., & Baker, L. (2009). Relationship of safety climate and safety performance in hospitals. *Health Services Research*, 44, 399-421.
- Singh, H., Thomas, E., Petersen, L., & Studdert, D.M. (2007). Medical errors involving trainees. *Archives of Internal Medicine*, 167(19), 2030-2036.
- Sleutel, M. R. (2000). Climate, culture, context, or work environment?: Organizational factors that influence nursing practice. *Journal of Nursing Administration*, 30(2), 53-58.
- Smetzer, J.L., Vaida, A.J., Cohen, M.R., et al. (2003). Findings from the ISMP Medication Safety Self-Assessment® for Hospitals. *Joint Commission Journal on Quality and Patient Safety*, 29, 586-597.
- Smith, D.R., Mihashi, M., Adachi, Y., Shouyama, Y., Mouri, F. et al. (2007). Organizational climate and its relationship with needlestick and sharps injuries among Japanese nurses. *American Journal of Infection Control*, 37(7). 545-550.
- Smith, D.R., Muto, T., Sairenchi, T., Ishikawa, Y., Sayama, S., et al. (2010). Hospital safety climate, psychosocial risk factors and needlestick injuries in Japan. *Industrial Health*, 48(1), 85-95.
- Smith, J., Terry, D., Manstead, A., Louis, W., Kotterman, D., & Wolfs, J. (2008). The attitude-behavior relationship in consumer conduct: The role of norms, past behavior, and self-identity. *The Journal of Social Psychology*, 148(3), 311-33.
- Smith-Jentsch, K. A. (2009). Measuring team-related cognition: The devil is in the details. In E. Salas, G.F. Goodwin, & C.S. Burke (Eds.), *Team effectiveness in complex organizations: Cross-disciplinary perspectives and approaches* (pp. 491-509). New York: NY: Psychology Press.

- Smith-Jentsch, K. A., Jentsch, F. G., Payne, S. C., & Salas, E. (1996). Can pretraining experiences explain individual differences in learning?. *Journal of Applied Psychology*, *81*(1), 110-116.
- Smith-Jentsch, K. A., Mathieu, J. E., & Kraiger, K. (2005). Investigating linear and interactive effects of shared mental models on safety and efficiency in a field setting. *Journal of Applied Psychology*, *90*(3), 523-535.
- Smith-Jentsch, K. A., Weaver, S.J., Wiese, C. & Kraiger, K. (2010, July). *Evidence of the reliability and validity of collective climates in work teams*. Paper presented at the 5th Annual INGRoup Conference, Washington, DC. July 22-24, 2010.
- Sorra, J. S., & Dyer, N. (2010). Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Services Research*, *10*, 199-212.
- Sorra, J.S., & Nieva, V.F. (2004). *Hospital Survey on Patient Safety Culture*. (2004). (AHRQ Publication No. 04-0041). Rockville, MD: Agency for Healthcare Research and Quality.
- Stone, P.W., Du, Y., & Gershon, R. R. M. (2007). Organizational climate and occupational health outcomes in hospital nurses. *Journal of Occupational and Environmental Medicine*, *49*, 50-58. doi: 10.1097/01.jom.0000251622.05429.0c.
- Sutcliffe, K.M., Lewton, E., Rosenthal, M.M. (2004). Communication failures: An insidious contributor to medical mishaps. *Academic Medicine*, *79*(2), 186-194.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn & Bacon.
- Thomas, E. J., Sexton, J. B., & Helmreich, R. L. (2003). Discrepant attitudes about teamwork among critical care nurses and physicians. *Critical Care Medicine*, *31*(3), 992-993.
- Travaline, J., Ruchinkas, R. & D'Alonzo, G. (2005). Patient-physician communication: Why and how. *Journal of the American Osteopathic Association*. 105, 13-18.
- Tregunno, D. (2004). Organizational climate and culture. In L. McGillis Hall (Ed.). *Quality work environments for nurse and patient safety* (pp. 67-91). Boston, MA: Jones and Bartlett.
- Tzeng, H., & Ketefian, S. (2002). The relationship between nurses' job satisfaction and inpatient satisfaction: an exploratory study in a Taiwan teaching hospital. *Journal of Nursing Care Quality*, *16*(2), 39-49.

- U.S. Department of Health and Human Services Office of the Inspector General. (2009). Semi-annual report to Congress. Retrieved July 5, 2010 from: http://oig.hhs.gov/publications/docs/semiannual/2009/semiannual_spring2009.pdf
- U.S. Department of Health and Human Services Office of the Inspector General. (2008). Adverse events in hospitals: State reporting systems (OEI-05-07-00471). Retrieved July 3, 2010 from: <http://oig.hhs.gov/oei/reports/oei-06-07-00471.pdf>
- U.S. Department of Health and Human Services Office of the Inspector General. (2010). Adverse events in hospitals: Methods for identifying events (OEI-06-08-00221). Retrieved June 27, 2011 from: <http://www.oig.hhs.gov/oei/reports/oei-06-08-00221.pdf>
- U.S. Food and Drug Administration. (2009, June). What is a serious adverse event. Retrieved August 19, 2010 from: <http://www.fda.gov/safety/medwatch/howtoreport/ucm053087.htm>
- Uttal, B. (1983, October). The corporate culture vultures. *Fortune Magazine*, 108(8), 66-72.
- Vermunt, J.K., & Magidson, J. (2003). Latent class models for classification. *Computational Statistics and Data Analysis*, 41, 531-537.
- Vogus, T. J. & Sutcliffe, K. M. (2007). The Safety Organizing Scale: Development and validation of a behavioral measure of safety culture in hospital nursing units. *Medical Care*, 45(1), 46-54.
- Wakefield, J. G., McLaws, M., Whitby, M., & Patton, L. (2010). Patient safety culture: Factors that influence clinician involvement in patient safety behaviours. *Quality and Safety in Health Care*, 19(6), doi: 10.1136/qshc.2008.030700.
- Walston, S. L., Al-Omar, B. A., & Al-Mutari, F. A. (2008). Factors affecting the climate of hospital patient safety: A study of hospitals in Saudi Arabia. *International Journal of Health Care Quality Assurance*, 23(1), 35-50.
- Wang, M., & Hanges, P. J. (2011). Latent class procedures: Applications to organizational research. *Organizational Research Methods*, 14(1), 24-31. DOI: 10.1177/1094428110383988.
- Wanous, J. P., & Hurdy, M. J. (2001). Single-item reliability: A replication and extension. *Organizational Research Methods*, 4(4), 361-375.
- Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology*, 82, 247-252.

- Warren, N., Hodgson, M., Craig, T., Dyrenforth, S., Perlin, J., & Murphy, F. (2007). Employee working conditions and healthcare system performance: The Veterans Health Administration experience. *Journal of Occupational and Environmental Medicine*, 49, 417-429.
- Wolosin, R. J. (2008, May/June). Safety and satisfaction: Where are the connections?. *Patient Safety and Quality Healthcare E-Newsletter*. Retrieved August 12, 2008 from: <http://www.psqh.com/mayjun08/satisfaction.html>
- Weick, K.E., & Sutcliffe, K.M. (2001). *Managing the unexpected: Assuring high performance in an age of complexity*. University of Michigan Pressing Problem Series. San Francisco: Jossey-Bass.
- Weick, K. E., & Sutcliffe, K. M. (2007). *Managing the unexpected: Resilient performance in an age of uncertainty, 2nd edition*. San Francisco, CA: Jossey-Bass.
- Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. In B. Staw & R. Sutton (Eds.). *Research in organizational behavior* (pp. 81-117). Sanford, CT: JAI Press.
- Weigmann, D. A., Zhang, H., von Thaden, T., Sharma, G., & Mitchell, A. (2002, June). A synthesis of safety culture and safety climate research (Technical report #ARL-02-3/FAA-02-2). Federal Aviation Administration: Atlantic City International Airport, NJ.
- Weingart, S. N., Farberstein, K., Davis, R. B., & Phillips, R. S. (2004). Using a multihospital survey to examine the safety culture. *Joint Commission Journal on Quality and Patient Safety*, 30(3), 125-132.
- Weingart, S. N., Pagovich, O., Sands, D. Z., Li, J. M., Aronson, M. D. et al. (2006). Patient-reported service quality on a medicine unit. *International Journal for Quality in Health Care*, 18(2), 95-101. doi: 10.1093/intqhc/mzi087.
- Wilson, K. A. (2007). *Does safety culture predict clinical outcomes?*. Unpublished doctoral dissertation. University of Central Florida.
- Wilson, K. A., Burke, C. S., Priest, H. A., & Salas, E. (2005). Promoting healthcare safety through training high reliability teams. *Quality and Safety in Healthcare*, 14, 303-309.
- Young, S. A., & Parker, C. P. (1999). Predicting collective climates: Assessing the role of shared work values, needs, and employee interaction and work group membership. *Journal of Organizational Behavior*, 20(7), 119-1218.

- Zohar, D. (2000). A group-level model of safety climate: Testing the effect of group climate on microaccidents in manufacturing jobs. *Journal of Applied Psychology*, 85(4), 587-596. doi: 10.1037//0021-9010.85.4.587.
- Zohar, D. (2003). Safety climate: Conceptual and measurement issues. In J. Quick & L. Tetrick (Eds.), *Handbook of Organizational Health Psychology* (pp. 123-142). Washington, DC: American Psychological Association.
- Zohar, D. (2008). Safety climate and beyond: A multi-level multi-climate framework. *Safety Science*, 46, 376-387. doi:10.1016/j.ssci.2007.03.006.
- Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention*, 42(5), 1517-1522.
- Zohar, D., Livne, Y., Tenne-Gazit, O., Admi, H., & Donchin, Y. (2007). Healthcare climate: A framework for measuring and improving patient safety. *Critical Care Medicine*, 35(5), 1312-1317.
- Zohar, D., & Luria, G. (2005). A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. *Journal of Applied Psychology*, 90(4), 616-628.