Moral Exemplars, Outpatient Medical Clinic Climate, Temporal Affect and Patient Care Errors

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Deborah Michelle Mullen, MS

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Advisor: Todd H Rockwood, Ph.D.

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Dedication

To Ethan and Colin – May your lives be filled with happiness and health.

Abstract

Objective: To evaluate the relationship between the rate of patient care errors, the clinic climate in outpatient medical practices and health care provider personality and temporal affects

Study Design: This research created and tested a new survey, the Outpatient Medical Clinic Safety Climate. The instrument was created through cognitive interviews and pilot testing between June – August 2008. Primary data was collected with surveys between February and May 2009. The surveyed population included every Nurse Practitioner and Certified Nurse Midwife holding current 2009 Minnesota licensure within all types of outpatient specialty and primary care clinics. The final instrument was administered to 2,576 advanced practice nurses resulting in a 52% response rate (AAPOR RR1). The survey data was collected through a mail, return mail process; non-respondents received a second copy of the survey four weeks after the initial mailing. Returned mail surveys were keyed as well as scanned into SAS data sets with the assistance of the HPRF Survey Center.

Survey dimensions included: reported error rates, clinic climate and culture, as well as individual respondent's temporal affect and personality traits (moral exemplarism). Error reporting frequency rates, including adverse events, near misses and accidents waiting to happen, were collected by self report for both the respondent and their clinic.

Latent variable development focused on identification of climate, culture, moral exemplarism, and temporal affect. Exploratory factor analysis allowed for the grouping of survey items into scale scores. After scale scores were created, univariate and bivariate analysis was undertaken to further test the model and variables. Generalized linear modeling was utilized for final modeling. Final models included separate models for personal and clinic errors reported.

Principal Findings: For personal errors, those made by the respondent, the presence of a safety climate and a medication reconciliation process increased the number of reported errors. For those errors made in the clinic (clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen) multiple culture scales were significant as well as the existence of a safety climate. Culture scales: formal communication about safety, error reporting process and just culture as well as safety climate all correlated with increased reported clinic error. Temporal affect – causal beliefs and moral exemplarism scales were not found to be meaningful contributors to any of the models.

Conclusions: For personal errors, relatively little of the overall model is explained by climate and culture factors; alternately clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen are strongly related to by the clinic's culture and climate. As climate and culture are shared perceptions, then it seems reasonable that for the clinic as a whole these factors would explain more of the error model.

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Chapter I – Outpatient Medical Errors

Every day in the U.S. hundreds of thousands of people interact with health care providers; many of those treatments occur as outpatient visits. The very care which we seek can, despite best intentions, cause further illness or prematurely hasten death. Health care consumers and producers want a high quality product free of defects; regardless of the product being produced. While defects are undesirable in any product, in health care specifically the consequences can be tragic. Medical errors often result in additional healthcare costs (estimated at $17-29 billion annually), strain on patients and their families as well as health care providers (Commonwealth Fund, 2006). The Institute of Medicine (IOM) Report *To Err is Human* estimated that the number of patients killed each year in hospitals is between 48,000 and 98,000 (Kohn, Corrigan and Donaldson, 1999). In any given year, more Americans die from preventable medical errors in the hospital than do from the combined effects of AIDs, breast cancer and car accidents (Kohn, Corrigan and Donaldson, 1999). While hospital errors resulting in death are tragic, these numbers represent a fraction of the people interacting with health care providers in a given year and as such understate the number of Americans who suffer from disability or protracted illness as a result of errors. As Michael Gerstein (2008) so eloquently points out people die with distressing regularity although not en mass as a result of healthcare errors; deaths due to healthcare are not as easily counted as those attributable to aviation, transportation and industrial accidents.

With 85% of all people in the United States visiting a physician at least once per year there are many more opportunities for potential errors outside of the hospital setting than within (NCHS, 2005). These outpatient medical service interactions provide exponentially more potential opportunities for errors; albeit the risk of fatal errors is thought to be lower than in hospitals. It has been estimated that in the outpatient medical setting as many as one of every 138 deaths in the U.S annually is due to medication errors (Phillips, Christenfeld, Glynn, 1998). Patients desire health care that is the error free; they want the right care at the right time to help them heal.

Hospital care tends to be complex, with high levels of patient illness severity. During inpatient admissions, patient care and treatment responses are monitored with patients stabilized prior to discharge. Outpatient care, also known as ambulatory care, may also be complex and ambiguous, dealing with multiple conditions and chronic illnesses concurrently with acute illness just as those treated in the hospital. The major difference between outpatient care and inpatient care is the brevity of outpatient care transactions. Since in the outpatient setting, treatment is performed in the clinic with the patient leaving immediately afterward or treatment is self care performed at home, there is a lack of professional monitoring of responses. Without this monitoring, health care providers are unlikely to know the true rate of medical errors and recovery delays in the outpatient setting; unlike the frequency of these events within hospitalizations which are well documented. Outpatient patient encounters do not provide opportunities for health care providers to assess the interventions or treatment effects such as patient adherence to

treatment protocols, coordination of other medical care and patient responses to care. Providers most often only know the results of patient care when the patient contacts them in the future or if they are copied on notes from other providers of care.

Recognizing that medical care is a high risk industry with severe consequences possible from errors and that outpatient care is especially problematic due to the natural limits of outpatient provider monitoring, it seems ideal to create health care systems and organizations that prevents as many potential medical care errors as possible. To this end, national groups including the Institute of Medicine (IOM), Institute for Healthcare Improvement (IHI) and National Quality Forum (NQF) cite creation of a safety climate or culture with imbedded error prevention systems as a primary objective for healthcare (IHI, 2009; NQF, 2009). The large number of outpatient medical encounters makes it a perfect environment to begin to understand the impact of organizational safety climate and individual providers on error prevention. Avoiding patient care errors requires the ability to recognize, codify and modify factors of health care settings related to safety. While outpatient errors are less often fatal than inpatient errors, they can result in protracted illness, increased patient and family distress, new injuries to patients' resulting from the medical care they received or even death. The financial costs of these errors in additional health care expenses alone represent billions of dollars, when added to the life years lost and the lost productivity due to absent workers the price increases quickly (Commonwealth Fund, 2006).

Public priorities for healthcare include affordable and effective care; these priorities are presumed in an expectation of safe care. Within the National Priorities Partnership Goals, one of the six vision statements for healthcare reform specifically addresses safe and reliable healthcare:

> "The Partners envision a healthcare system that is relentless in continually reducing the risks of injury from care, aiming for "zero" harm wherever and whenever possible – a system that can promise absolutely reliable care, guaranteeing that every patient, every time, receives the benefits of care based solidly in science. We envision healthcare leaders and healthcare professionals intolerant of defects or errors in care, and who constantly seek to improve, regardless of their current levels of safety and reliability" (National Priorities Partnership, 2008, pg. 17)

The goal of zero defects in healthcare may seem to be an impossible dream; healthcare in the United States reports more errors (lab, medication, and medical) than other developed countries at a higher cost than those countries pay for their care (Commonwealth Fund, 2006). National stakeholders state that the key to safer care is to create within health care organizations a climate that is directed at safety (NQF, 2009; IOM, 2009; IHI, 2009).

This research aims to create (aim one) and utilize (aim two) a safety climate survey for use in outpatient medical clinic settings. Aim one will be achieved through the creation of an instrument for use in this specific clinical setting. The instrument will include organizational characteristics such as climate and culture, type of work as well as personnel characteristics such as personality traits, affect and demographics. The developed survey will allow offices to quantify their climate, culture and provider characteristics which contribute to their reported patient care errors. The ultimate goal is

to develop an instrument that could be used to inform clinic interventions that help mitigate these factors.

Aim two will utilize the developed instrument within outpatient medical clinics to evaluate care errors at the personal as well as clinic levels. Combining the outcomes (error frequency) with clinic and personnel characteristics will provide a novel approach to healthcare safety work. Previous work in this field has not included both the frequency of errors reported with the correlated characteristics of both the clinic and the provider.

The final result of this research will be measurement and codification of the dimensions of the individual safety climates. With this information, managers can determine what aspects of their clinic or personnel affect can be modified or mitigated through system redesign or through programs directed at personnel. Given the results of the findings of this research, providers and staff members can better understand contributory factors to errors and help their organizations and themselves to avoid these factors. While the avoidance of all patient care errors and the creation of a perfect safety climate cannot be achieved, systems and training can help prevent many avoidable mistakes.

Chapter II - Is It Culture or Climate that Mitigate Errors?

Errors

Using the IOM (1999) *To Err is Human* definition of an error, "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim," leaves a wide range of behaviors open to classification as medical errors (Kohn, Corrigan and Donaldson, 1999). The Federal Quality Interagency Coordination Task Force (FQIC task force) added more specificity to the IOM definition with a secondary statement, "Errors can include problems in practice, products, procedures, and systems" (Avery, 2003, pg. 404). Various U.S., European and Australian studies have tried to classify patient care errors into categories or dimensions with the goal of creating a unified codification vocabulary.

Patient safety has long been a concern of health care providers; but patient safety and error prevention in medicine came to the forefront of national attention following the publication of *To Err is Human* in 1999 (Kohn, Corrigan and Donaldson, 1999). Prior to the publication of *To Err is Human* there was limited media and public attention to topic of patient safety (Kohn, Corrigan and Donaldson, 1999). While there had been local, state and regional patient safety efforts, the national call to arms came in 1999. Within the past eleven years that have been significant national efforts some in response to the IOM's 1999 publication and some preceding the publication.

The following timeline tracks some of the major patient safety work done by The Joint Commission (Joint Commission on Accreditation of Healthcare Organizations or

JCAHO), the Veteran's Administration (VA), National Quality Forum (NQF), Institute of Medicine (IOM), National Patient Safety Foundation (NPSF), Centers for Medicare and Medicaid Services (CMS) and the World Health Organization (WHO) focused on patient safety between 1998 and 2009:

1998:

- VA creates the National Center for Patient Safety, establishes an expert advisory panel on patient safety system design and initiates a patient safety improvement award program (PSRS, 2009)
- National Patient Safety Foundation holds their first national congress on safety (NPSF, 2009)
- JCAHO publishes the Sentinel Event Alert newsletter with learnings from actual sentinel events (as defined in the 1996 sentinel event policy) (JCAHO, 2009)

1999:

- IOM publication of *To Err is Human* (IOM,2009)
- Department of Veterans Affairs (VA) established the Center for Patient Safety (VACPS, 2009)
- Agency for Health Care Research and Quality (AHRQ) publication of best practices in safety (AHRQ, 2009)
- National Patient Safety Foundation calls for the creation of a national patient safety reporting system (NPSF, 2009)

2000:

- AHRQ National Summit on Patient Safety (AHRQ, 2009)
- VA implements a national VA Patient Safety Reporting System and a comprehensive *Adverse Event and Close Call Analysis Program* (PSRS, 2009)
- JCAHO publication of *Standards in Support of Patient Safety and Medical/Health Care Error Reduction* (JCAHO, 2009)

2001:

- AHRQ publication of a patient safety research agenda and the introduction of a safety grants program (AHRQ, 2009)
- IOM recommends to congress the establishment of a Center for Patient Safety (IOM, 2009)

2002:

- AHRQ creates the National Safety Awards (AHRQ, 2009)
- JCAHO creates a Patient Safety Advisory Group and publishes the National Patient Safety Goals (JCAHO, 2009)
- JCAHO and CMS publish the Speak Up™ Initiatives to encourage patients to become active in preventing patient care errors (JCAHO, 2009)
- JCAHO and NQF create the Eisenberg Award to recognize individuals and organizations making major contributions to patient safety and care quality (JCAHO, 2009)

2003:

- AHRQ publication of patient safety indicators metrics and methods, creates the Patient Safety Improvement Corps and begins the web based M&M – Morbidity and Mortality learning sessions (AHRQ, 2009)

2004:

- AHRQ publishes the ***Health Information Technology (IT) Reports*** including patient safety issues and the ***Hospital Survey on Patient Safety Culture*** (AHRQ, 2009)
- World Health Organization (WHO) creates a World Alliance for Patient Safety (WHO, 2009)

2005:

- AHRQ publishes ***A Research to Implementation Handbook*** on patient safety and creates PSNet – patient safety network to develop an online community for safety discussions (AHRQ, 2009)

2006:

- AHRQ in partnership with the Department of Defense publishes ***Team STEPPS®*** work plan and training manual for organizations focused on improving patient safety and team communication (AHRQ, 2009)
- AHRQ introduces a safety simulation grants program (AHRQ, 2009)

2007:

- Joint Commission International and World Health Organization publish a list of nine patient safety solutions (WHO, 2009)
- AHRQ publishes the ***Hospital Design Campaign*** to assist in care design which decreases patient care errors (AHRQ, 2009)

2008:

- AHRQ publishes materials on specific safety issues related to blood clot prevention and a *Healthcare Acquired Infection action plan* (AHRQ, 2009)

2009:

- AHRQ publishes patient education materials on patient safety, the *Medical Office Survey on Patient Safety Culture* and designates Patient Safety Organizations (AHRQ, 2009)

Providers (individual professionals, clinics, and health care systems) seeking to prevent errors, both at the urging of external parties such as the IOM, the FQIC task force, their own professional organizations and patient groups, have undertaken efforts to build systems and procedures as well as adoption of habituated practice routines aimed at the reduction of errors. For example, one improved system and process has been the advent of electronic medical records systems, which are meant to assist providers by providing efficient information about patients and their health. Other efforts have focused on cultural shifts as suggested by the *To Err is Human* report; in which workplace environments that support safety efforts and provide cultural reinforcement of these efforts are created and sustained (Kohn, Corrigan and Donaldson, 1999).

The efforts to improve the safety of healthcare are well intentioned and are often aimed at prevention of the events which cause the most serious consequences (adverse events and reactions). Adverse events in medicine result in patient injury due to medical intervention including both errors and adverse reactions (IOM, 2009; Leape, 1994). Adverse reactions are discussed as those that are predictable (medical errors) and those that are unpredictable (not medical errors). Predictable adverse reactions are due to

known issues such as prescribed or administered overdoses of drugs, known side/ secondary effects of drugs, inappropriate administration of drugs and drug interactions (Nebeker JR, Barach P, Samore MH, 2004). Unpredictable adverse reactions are due to unknown allergies to drugs, unknown patient physiological negative response to treatment, reactions to devices, manufacturing failures of devices and patient error in administration of self care (Nebeker JR, Barach P, Samore MH, 2004). While not all errors result in adverse events or in harm, all errors and adverse reactions hold the potential to cause patient harm. If health care's goal is to first do no harm, then creating organizations, which excel at error avoidance helps healthcare fulfill its promise to patients.

Avoidance of errors requires an understanding of the causes of error. Root cause analysis of errors is utilized in healthcare as well as other industries to track backward from the error to the casual precipitants. Many errors result from multiple seemingly small and independently good decisions that when summed created an unintended and disastrous outcome (Perrow, 1999). For this work, the specific root cause of an individual adverse event is not the focus; rather the occurrences, error types and contributory organizational factors that are related to the occurrences of error are of interest.

Per Morath and Turnbull (2005) adverse events can be classified within five types of categories:

- Procedural errors – slips, lapses, mistakes
- Proficiency errors – lack of knowledge or skill

- Communication errors – faulty or inadequate communication
- Decision errors – chosen course of action unnecessarily increases risk
- Intentional noncompliance errors – violation of procedure

These five types of adverse events are descriptive of the causal precipitating actions of an individual error. Errors in medicine could be caused by any combination of actions specified by Morath and Turnbill's (2005) five categories as well as other intervening organizational factors. For this work, the specific root cause of an individual adverse event is not the focus; rather the occurrences, error types and contributory organizational factors that are related to the occurrences of error are of interest.

Electronic systems in their ideal state have been proclaimed by some as the solution to working around these root causes of error. These systems of electronic medical and health records (EMR and EHR) can within actual clinical practice be utilized by health care providers to anticipate and warn care providers of common procedural, proficiency and communication errors. These EMR designs are however limited to the capacity of the systems programming as well as the provider's attention and heeding of the computer generated care prompts. Recent literature has cited the implementation of EMRs and EHRs as creating new sources of error in clinical settings such as incorrect selection of diagnoses, drugs and other treatments from drop down menus as well as other documentation issues causing unintended adverse consequences (Ash et. al, 2004; Briggs, 2004; Campbell et. al, 2006; Harrison et. al, 2007). Unfortunately as Perrow (1999) says making a complex system more complex (more safe guards) does not

necessarily help us avoid issues, it may cause new errors; this seems to be the case with EMRs and EHRs.

Error Terminology

For this work the following terminology will be used to discuss the types and consequences of errors occurring in outpatient medical clinics. These definitions are congruent with the IOMs (2009) terminology.

Medical error – the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim

Near miss –errors that are caught before they reach the patient

Accidents waiting to happen - potential errors that have yet to occur but have a high potential for occurring

Adverse event - errors that cause injury or harm to the patient

Harm – Prolonged illness, death or disability (long and short term)

Within health care organizations there is disagreement as to which of these types of events (near miss, adverse event or accidents waiting to happen) are appropriately identified as part of a discussion on error. In the minds of many health care providers, if the action did not cause a patient harm, then it is an issue, but not an error. From a patient perspective and from the perspective of medical torte cases, these near misses and accidents waiting to happen are important precursory warnings. They should be examined and designed around if possible prior to the occurrence of a sentinel adverse event.

The frequency of near misses, adverse events and accidents waiting to happen reported as both personal errors and clinic errors are the dependent variable examined in this study. The outcome (harm or lack of harm) of these errors is not within the scope of this research. Errors have a multitude of precipitating factors; whether intentional or unintended personal actions, faulty processes or environmental influences, all can influence the rates of health care errors. This work seeks to determine if there exists a relationship between the rates of error, individual personality traits and organizational culture or climate.

Is It Organizational Culture or Climate?

Within the national efforts to improve the safety of health care, two words are used interchangeably to discuss the construct of interest, the culture and climate of organizations (IHI, 2007; NQF, 2007; Kohn, Corrigan and Donaldson, 1999). The question of which it is, culture or climate, may be a quodlibet, the domain of philosophers and academics. To providers, the question is hermetic and of minimal importance in their daily work of health care delivery. What follows is a lengthy discussion of the two constructs; included to allow the reader to clearly understand the differences between the two and the impact of both on organizational studies such as this. Within the context of this research, the two constructs are different and require explanation as well as rationale for the use of one as opposed to the other, thus the detailed discourse.

Both constructs include shared perceptions about the people and objects within an organization and are evident within the artifacts of the organization. An organization's identity includes both its climate and culture (Ashkanasy et al., 2000; Zohar, 2003). Schein (2004) sees organizational climate as a descriptive yet less than optimal synonym for culture, while other researchers use culture and climate as similar constructs dependent upon their academic background. For this research, climate is the key construct level to be measured (A more detailed discussion of culture and climate can be found in Appendix C). Culture tells employees, "this is who we are" while climate tells employees "this is how we do what we do." (Ashkanasy et al., 2000 pg. 131; Schein, 2004).

Culture is so fundamental to the organization that it an intrinsic state; in other words "what the natives do not know that they take for granted." (Ashkanasy et al., 2000, pg.131). Schein (2004) states that an organizational culture is "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems." From his perspective, climate is a comprehensive product of culture, with levels including artifacts, exposed beliefs and values, and underlying assumptions (Schein, 2004). Culture is stable, broad and of wide breadth and is a trait of the organization which is developed out of the organization's mastery of their challenges and successes (Gerstein and Ellsberg, 2008; Schein, 2004).

Organizational climate is "…shared perceptions among members of an organization with regard to organizational policies, procedures and practices." (Zohar, 2000, pg. 587). While individuals in an organization all have unique personal experiences and perceptions of the organization, they all share commonalities of experiences within their organization's climate. Climate is a more temporal, flexible and malleable; encompassing the sense of within the organization that there are acceptable ways of "doing things" and "of acting". These standards, written and unwritten, help define the climate experienced daily by the individual members within the organization (Zohar, 2000). The continual interaction of the individual with the organization and the organization with the individual reinforces and strengthens the climate. Organizational climate is responsive to changing internal and external environments, while fundamental to the organization, is malleable enough to be changed and molded.

Why Climate and not Culture?

Examples of culture in ambulatory clinics as stated in organizations' vision, mission, values and passion statements illustrate the cohesive themes common amongst health care organizations. Themes of improving the health and well being of their communities and incorporating words such as care, compassion, respect and safety are common amongst clinic artifacts such as vision statements. These artifacts paint a picture of monolithic cultures, which are more similar than dissimilar. In examining the vision

statements of four large health care organizations in the Twin Cities, we find a homogeneous vision of patient care that is driven by a desire for excellence.

Allina Hospitals and Clinics (Allina, 2007 – cited from corporate documents)
> *"Our Vision - We will: put the patient first; make a difference in people's lives by providing exceptional care and service; create a healing environment where passionate people thrive and excel; and lead collaborative efforts that solve our community's health care challenges."*

Fairview Health Systems (Fairview, 2007 – cited from corporate documents)
> *"Vision - Our passion for excellence for our patients drives us, in partnership with the University of Minnesota, to be the best health care delivery system in America."*

HealthPartners Medical Group (HPMG, 2007 – cited from corporate documents)
> *"Our vision: Where we are headed -We will be the best and most trusted provider of health care, health promotion, health care financing and health care administration in the country. We will transform health care by delivering outstanding care and service that is: Patient/member centered, Timely, Effective, Efficient, Equitable, Safe"*

Park Nicollet Clinics (Park Nicollet, 2007 – cited from corporate documents)
> *"Vision -Everyone caring, every day, creating with the individuals we serve optimal health and greater value."*

These vision statements, serve as a guiding principle to the employees of these organizations; telling them "This is who we are" as an organization. Previous research has shown that error rates differ amongst clinics even when cohesive cultures are evident; thus we must look at other dimensions to explain the differences between clinics' error rates. For this reason, the instrument developed for this study focuses on the climate of the organization; giving us a glimpse of the culture and its actualization in the daily work of its employees while accommodating the peripheral environmental issues and influences. Neither a single employee's response nor a single survey assessment can

serve as a comprehensive measure of even the smallest and simplest organization's culture; a single survey assessment of an organization can however provide insight into the climate of an organization.

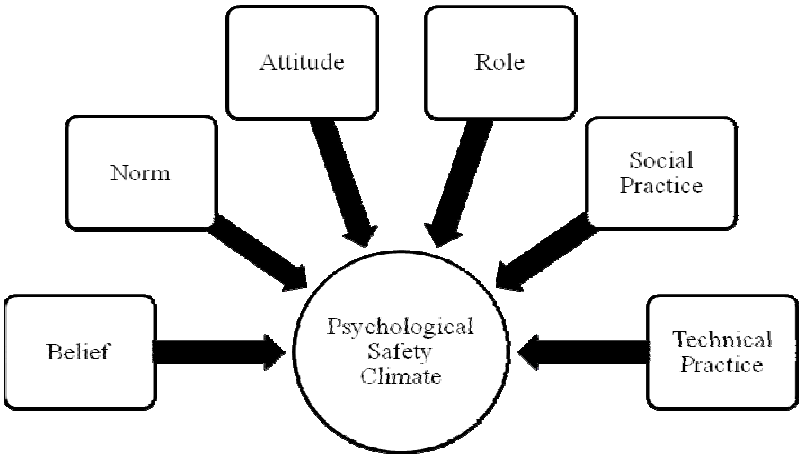
Safety Climate

In the ideal health care organization, both culture and climate would encourage effective, efficient treatment of patients with minimal errors. While organizations have both climates and cultures, a more descriptive term of the aspects that specifically influence safety and errors is the psychological safety climate. Guided by the ground work of other organizational scholars (Ashkanasy et al., 2000; Schein, 2004; Zohar, 2003) a new definition for safety climate is defined by the researcher for this work as:

> *Safety climate is the shared artifacts, espoused values and perceptions about reality, truth, space, time, human nature, activities and relationships that are concerned with minimizing the exposure of employees, customers and the public to conditions considered harmful, dangerous or injurious.*

The aforementioned definition illuminates the breadth of the constituent parts that make up a safety climate all directed at creating an environment which is focused on minimizing harm and injury. In the IHI (2009) national health care safety efforts the basic explanation of a safety climate is simply an organizational environment where people are constantly mindful about safety and feel as though they are allowed to speak up when they are concerned. Cooper (2000) further specifies the multiple contributory aspects in creating a psychological safety climate as seen in figure 2.1.

Figure 2.1 Psychological Safety Climate Components



Psychological safety climate components in health care are similar to those found in manufacturing. In high risk organizations such as health care and aviation, these aspects are more frequently discussed and actively engaged during the daily business of these organizations (Cooper, 2000; Perrow, 1999). Examples from healthcare of the six aspects of psychological safety climate:

- Belief – how individuals think things really are; e.g. employee beliefs about the causes of accidents or issues: are they caused by patients, by distracted employees, by carelessness, etc.?
- Norm – standards for action including use of safety equipment and precautions; e.g. does everyone "skip" steps to save time
- Attitude – individual employee's degree of negative or positive views about items such as people, places, things or events; e.g. does the employee feel that

they are the only ones concerned about safety; do they feel that they work in a supportive team environment?

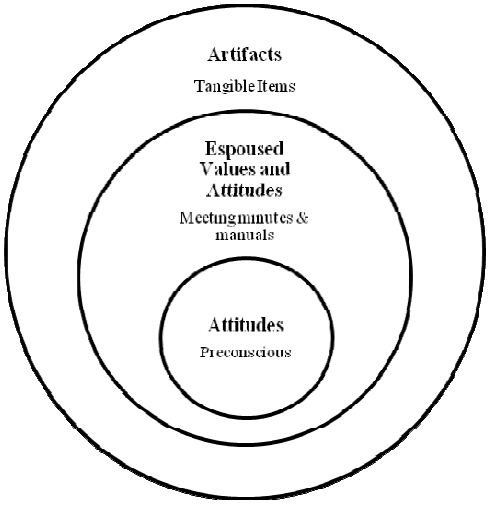
- Role – prescribed or personally ascribed duties and responsibilities in work environment including their role in safety efforts; e.g. are they expected to report near misses or only accidents, are they to step in if they see a problem even when they were not involved in the situation
- Social Practice – the work group's social interactions; e.g. co-workers do not talk about accidents or errors; all group interactions are tense
- Technical Practice – individual and group behaviors; e.g. sharps safety protocols always followed to avoid needle sticks

These psychological, behavioral and situational aspects of the individual(s) and the organization dynamically influence interactions between these actors (Cooper 2000).

Organizational safety research suggests that this complex interactive model requires study of the multiple layers of safety climates to adequately describe the concept. To address the complexity of organizational safety climates, Guldenmund (2000) offers a layered framework for examining each organization (seen in figure 2.2). The outer layers of safety climate are artifacts, tangible items such as safety equipment, which can be seen but do not tell us much about the underlying climate. The middle layer of safety climate is espoused values and attitudes. This espoused middle layer is conscious and manifested in meeting minutes and training manuals. The inner most layer, the core, is attitudes

about reality, truth, space, time, human nature, activities and relationships. The core is obvious to the members of the organization and pre-conscious in nature.

Figure 2.2 Organizational Safety Climates Layers Model



Safety climate includes as was suggested within figure 2.1 many components all working together to create the safety climate. These components (belief, norm, attitude, role, social practice and technical practice) are reinforced or degraded by other organizational factors such as communication pathways and methods, rate of innovation, types of personnel relationships, work processes, and physical environment. A safety climate in a clinic provides for the safety of both the employees and the patients. When employees feel safe, they perceive that they are valued, can trust that they will be protected from harm and feel free to discuss what they see that needs to be changed (Zohar, 2002). While hospital focused work on safety climate and patient care errors has

been increasing, few researchers have yet focused on the outpatient medical clinic. Research completed by Kralewski (2004), Kaissi (2004), and Solberg (2004) based in outpatient care settings show correlations between clinic climate and reduced number of medication errors.

Key to describing safety climates is an understanding of the dynamic interactions and organizational communications including who communicates with whom and in what manner. Communication helps employees understand the organization's norms, attitudes beliefs and helps them understand the expectations for their role, and the social and technical practices of their organization. High quality communication among managers and peer employees provides a safer environment through increased trust and understanding (Clarke, 1999). By knowing that safety is important to managers, employees perceive it as an important organizational practice; management's messages and actions tell employees that safety is important (Thompson, 1998). Zohar (2002) found that transformational leaders and contingent reward systems create a tone of concern for employees and lead to fewer injuries on the job. Organizations that focus their safety efforts on injury prevention of workers and maintain an environment of mindful prevention of injury will ultimately also prevent injuries of their customers through this same mindset (Cooper, 2002). While patient care errors are not the same as employee injuries, this research offers a beginning point for research. Leaders who encourage and model safety practices towards employees and patients create an environment of trust and understanding through their communication. Communication

also functions as a tool for knowledge management. Since it is necessary to share information and knowledge to foster shared perceptions as well as to learn from others' mistakes, how this communication occurs is important. Information passing through one person is more effective for routine tasks, but information passed through all people in an organization is more effective for complex information (Argote, 2002). Knowing who has what knowledge and where to get it (transactive memory) improves performance of organizations and increases communication (Argote, 2002; Borgatti, 2003).

Heraclitus said in 500 BC that the only constant is change; this is doubly true for health care. These changes in health care are important to the safety climate as each change can alter for the positive or negative the safety climate. One example of the importance of attitudes, norms and beliefs for the safety climate is the organizational response to innovation. Do they resist it or are they early adopters of the newest innovations? With constant development of new treatments, new devices, new drugs, health care changes on a frequent basis. All of this change and innovation leads to new unknown and unanticipated potential errors; thus it is important to understand an organization's attitudes, norms and beliefs. These attitudes, norms and beliefs and the rate of change are a part of the core of the organization's climate. Innovation brings new ideas, technologies and methods to organizations. While the level of innovation is often a function of an individual's abilities and resources, organizations provide the environmental clues to tell employees if innovation is seen in a positive light. Since

innovation requires some type of interpersonal risk, sharing of ideas, the perception of innovation acceptance is very important (Baer and Frese, 2003).

Relationships among the individuals in organizations influence an employee's perceptions; which people are networked together, which are not, and why? Young and Parker (1999) found that climate is related to the employee groups that an individual interacts with. Employees, either through physical limitations or forced communication networks, are directed toward specific groups with whom they interact; proximity to and availability of other employees increase interactions (Borgatti, 2003). Interactions focused on making sense of a situation or on information seeking made for stronger shared perceptions. Important to understanding the clinic's climate, are the individual personnel's needs strength. People with similar levels of need strength (the personal preference for being needed and needing others) will share a more homogeneous climate assessment than those who do not have a high need strength (Young, 1999).

Previous studies that have discussed the concept of a safety climate focused on the individual employee's psychological perceptions within the organization's climate. This climate is determined by the influence of many structural organizational characteristics, which, if known, could provide insight into organizational interventions, which improve patient care safety. Clarke et al. (2002) found that in hospitals with poor organizational climate (lack of management support) and heavy workloads, nurses had 50% more near misses and needle sticks. Standard precautions to avoid exposure from blood pathogens by healthcare workers has been linked to management support levels,

frequency of reminders and a strong institutional safety climate (McCoy, 2001). Guastello et al. (1999) found that job satisfaction, safety climate, environmental stressors and moderate work pace lead to fewer employee pathogen exposures.

Work processes and roles are also less formally defined within a clinic setting than a hospital. In hospitals it is common to find staff whose primary work focus is safety and quality, while in clinic settings these duties are often shared or expected of all team members. Clinics that implement structured and formalized systems directed toward a "patient-centered" focus and "collegiality" culture have fewer drug errors (Kaissi, 2004). In the clinic setting, group practices that place high value on physician autonomy have fewer drug errors (Kralewski, 2004). The type of work structures and the perceptions of responsibility and autonomy contribute to a safety climate.

Any study of an organization's climate will defacto provide insight into an organization's culture, as the climate is the temporal reflection displayed in actions and words of the underlying culture. The portions of climate that are most relevant to the research undertaken here, are the psychological safety climate of the organization as these components have direct relationships to the errors made in patient care. Within these complex, loosely coupled health care organizations the climate, employees (providers) and patients all interact influencing the patient's outcomes.

Health Care Practitioners

Health care practitioners all swear an oath to help their patients. These oaths serve as a standard for behavior, suppressing their own personal beliefs, attitudes and values for those of the professional role. While there are rare exceptions of professionals who lack empathy or personal ethos, most health care providers are genuinely interested in the well being of others.

Within organizations, reside individual roles; the actors within these job roles become pivotal to discussions about patient safety (Cooper, 2000). Clinical health care may be organized as a system, but ultimately health care is a didactic exchange. This exchange between a patient and provider occurs at a private face-to-face encounter; often physically absent during the treatment decision are other clinical practitioners, as well as the patient's network of family and friends. The absence of these other significant actors does not mean that their influence is not present in the exchange; their attitudes, beliefs and values can moderate the behavior of the actors in the dyad. The exception is patients who are unable to make medical decisions such as children, incapacitated adults and disabled, where health care decisions are agreed upon between not the patient and practitioner, but rather the practitioner and parent/guardian.

Patient safety efforts are most often directed at simplifying the complex systems and organizations, not at the intentions or individual actions of providers (Perrow, 1999). As an integral piece of these systems, the practitioners have a significant intervening effect on the patient-system interactions. Providers integrate information to avoid

potential negative outcomes. As the facilitators of care, they can stop treatment if they have concerns, can question the appropriateness of care ordered, or can simply deliver treatments. The individual provider's personality traits including risk preferences as well as the environment in which they work can influence what actions they will take or consider taking while inhabiting their professional role.

Moral Exemplars

Moral exemplars are people whose personality traits predispose them to feel a compelling need through words and actions to voice dissenting opinions or concerns, often within the context of safety issues (Walker, 1999; Walker and Hennig, 2004). Unlike whistle blowers, moral exemplars understand the personal and professional risk associated with their actions, yet are willing to risk their own self-interests for the sake and safety of others (Martin, 1999; Devine, 1997). The industrial and complex systems accidents literatures discuss the importance of the presence of individuals who are moral exemplars for prevention of errors (Perrow, 1999; Vaughan, 1996). Moral exemplars can be even more important within an organization that is "silent", where under the cultural norm no one acts or says anything in response to significant problems or in the presence of organizational bystanders (Gerstein, 2008; Henriksen and Dayton, 2006). Bystanders are individuals who fail to take action even when it is necessary to either address a threat or to take advantage of an opportunity; they are more common within rigid boundary organizations with strong hierarchical structures and may not take action due to fear of

consequences or even due to their deference to others in the organization that they see as wiser (Gerstein, 2008).

Psychological research has found that most personality traits can be described by five factors which are stable over time and heritable (Digman, 1997). An individuals' levels on these big five traits are calculated utilizing a descriptive sentence or adjective survey with continuous scales. The score is presented as a percentage, a low percentage reflecting a relative lack of the trait and a high percentage a strong exhibition of the trait (John and Srivastava, 2001). These "Big Five" include extroversion, agreeableness, conscientiousness, narcissism/emotional stability and openness to new experience (Digman, 1997). Psychologists describe the big five taxonomy using the referenced adjectives (John and Srivastava, 2001):

- Extraversion – Energy & Enthusiasm
    - Individuals who have a high level of extroversion refer to themselves as positive; "people" person's who are energized by interaction with others.
- Agreeableness – Altruism & Affection
    - Individuals who have a high level of agreeableness refer to themselves as compassionate towards others, giving them the benefit of the doubt. They are not likely to be suspicious or antagonistic with others.

- Conscientiousness - Control & Constraint
    - Individuals who have a high level of conscientiousness refer to themselves as high achievers, driven to succeed by a high level of self-disciple. They do their duty and are planners.
- Neuroticism/ emotional instability- Negative Affectivity & Nervousness
    - Individuals who have a high level of neuroticism refer to themselves as anxious and are prone to expressing unpleasant emotions easily such as anger, depression or vulnerability. These individuals may be described by others as emotionally volatile.
- Openness - Originality & Open-mindedness
    - Individuals who have a high level of openness refer to themselves as curious and adventurous. They enjoy new and varied experiences.

Early research has shown moral exemplars to be highly agreeable, conscientious, and open with relatively low levels of narcissism /emotional instability and extroversion (Walker, 1999; Walker and Hennig, 2004). This constellation of traits would describe a person who is emotionally steady, not easily stressed, angered or depressed. These moral exemplars would describe themselves as introverted. They are compassionate towards others; giving them the benefit of the doubt, most often not being suspicious or antagonistic with others. They are high achievers and planners; driven to succeed by a

high level of self-disciple. They are dutiful, curious, and adventuresome, finding enjoyment in new and varied experiences.

Under the advice of IHI (2009), health care organizations have been encouraged to create an environment where all members of the care team are comfortable voicing concerns. Creating an environment that supports individuals speaking up, helps to prevent errors. While moral exemplars will step up and interrupt processes and systems in an organization; others need the support of their environment to step up. The exemplar in health care may be any staff or provider in any setting whether hospital or clinic. They can call a stop to patient treatment. Whether or not a person feels comfortable speaking up may be more attributable to their personality than their environment.

Temporal Affect

The personality traits of individuals are foundational and immutable; like culture is for an organization. This temporal affect, so called due to its creation moment to moment, is the expression of the provider's personality within the context of their environment. As the practitioner interacts within the context of the clinic through the filter of their base traits, their conscious and unconscious thoughts and actions are influenced. The practitioner's affect is influenced by the organizational context of climate and culture, the momentary environmental influence, their workloads, interactions with patients, staff and other professionals as well as their own personal lives outside of the clinical setting. Under the changing daily pressures, the practitioner may express many

different emotional and mental states. Temporal affect is called such because by its nature the beliefs' and feelings' of providers are variable in relation to the situation at hand and thus are temporal and fleeting.

A practitioner's temporal affect may on a bad day lead a provider to be distracted and less focused, or on a good day to be particularly attentive and focused. This focus or lack of focus in combination with their degree of moral exemplarism tendencies could influence whether a practitioner catches a potential error and if they say anything about the problem. As treatments are often a solo practitioner's responsibility, their degree of attention to potential issues as well as their willingness to speak up are important to discussions of patient care error.

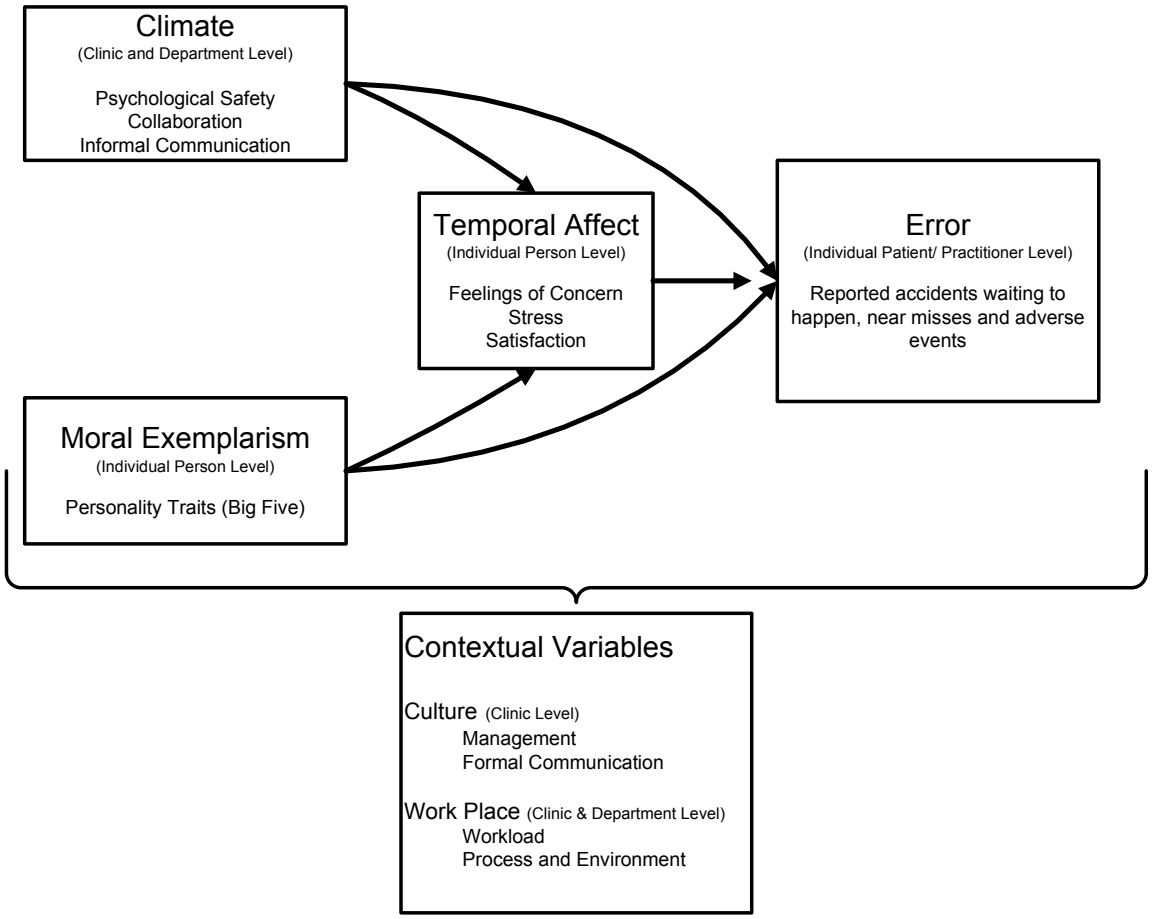
Conceptual Model

This research is based on the model shown in figure 2.3, which focuses on the effect of organizational characteristics (climate and culture) and personnel characteristics (moral exemplarism and temporal affect) patient care errors. Since a safety climate

> "*is the shared artifacts, espoused values and perceptions… and relationships… concerned with minimizing the exposure… to conditions considered harmful, dangerous or injurious…*"

and errors include problems in practice, products, procedures, and systems characteristics of the individual components of the system; it seems reasonable to infer that all of these components would also directly affect the rate of patient care errors.

Figure 2.3 Conceptual Model



A clinic's climate both directly and through the temporal affect of the provider can influence the rate of errors occurring and thus reported. For example, a tense climate that is filled with pressure and conflict influences the individual provider's affect in a different manner than one that is collaborative and collegial. Most people would find a negative/tense climate to be more difficult to work in and thus more prone to errors. A moral exemplar also influences errors both directly and through temporal affect. Moral

exemplars by their nature will speak up when they see errors or potential errors thus directly intervening and preventing errors when they are in a climate that is not reactive to errors (a low safety climate). Their presence in the clinic as well as their own personal affect can be a mitigating effect in patient care error occurrences. The actors (clinical practitioners) and the organization climate interact in the individuals' temporal affect, which influences patient care errors. Since patient care is a didactic exchange between an individual practitioner and patient, the individuals' temporal affect can directly influence the rate of patient errors independent of the climate. Underlying the model are the clinic culture and the workplace characteristics. In clinics with cultures that are safety driven as opposed to those who are profit and productivity at all cost driven, climate and personnel will be influenced. It is easy to see that the culture of a clinic will influence those individuals that are hired; the personnel and their traits will be influenced by the underlying culture of the clinic.

Specific Aims

Based on the conceptual model in figure 2.3, the specific aims for this research are:

1. Create a safety climate instrument for use in the outpatient medical clinic setting that assesses the following dimensions: outpatient medical clinics' safety climate, practitioners' moral exemplarism traits, practitioner temporal affect and error rates.

2. Determine if outpatient medical clinics' safety climates, practitioners' moral exemplarism traits and their interaction (practitioner temporal affect) are correlated with error rates (both personal errors and clinic errors).

Hypotheses

Derived from the work in this area, the following hypotheses and the specified relationships are to be tested by this work.

1. Providers reporting higher levels of clinic safety climates will report fewer patient care errors.

2. Providers identified with high levels of moral exemplarism will report more patient care errors.

3. Providers identified with low levels of temporal affect will report more patient care errors.

4. The lower the reported safety climate level the larger the positive effect of the presence of a high level moral exemplar.

These research hypotheses are to be tested with the fielding of the survey instrument. Chapter three - measurement, details the methods utilized in creating the instrument, including operationalization of the conceptual model, definitions of key

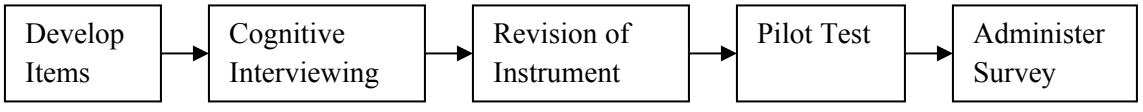
terminology, cognitive interviewing, and pilot testing. Closing chapter three is the creation of the final instrument that was utilized in the field.

Chapter III – Measurement

As stated in the specific aims, this research seeks to create a safety climate instrument for use in the outpatient medical clinic setting. The creation of an instrument is necessary within this work due to a lack of instruments that fully assess safety climates in outpatient settings. A review of other instruments considered for use is included within this chapter. Survey development began with collection of potential items, cognitive interviews of the items, revision of items, a pilot test of the moral exemplarism subscale, and then the creation of the instrument (figure 3.1).

This study utilizes two different data sources to achieve aims one and two: interviews and respondent surveys. To achieve aim one, cognitive interviews, a pilot instrument and analysis were completed prior to arrival at the finalized instrument; these steps are detailed within this chapter. The cognitive interview data was collected from subject matter experts to inform the creation of the finalized instrument (Willis, 2004). The interviews examined items within the dimensions of culture, climate, work place, temporal affect, moral exemplarism and error. Creation of the instrument followed an iterative process including evaluation of existing instruments (safety and error), potential item list creation, cognitive interviews, evaluation of items, pilot testing and psychometric testing prior to fielding of the finalized instrument (figure 3.1).

Figure 3.1 Survey Development and Fielding Stages



After instrument development is completed, this instrument was used to test if outpatient medical clinics cultures and climates, practitioners' moral exemplarism traits and temporal affect are correlated with error rates (discussion of this aim two portion of the research is contained within chapters four and five). Prior to any of the interviews, pilots, fielding or analysis, the definitions, background research, and operationalization had to be completed. Each of these four independent variables needed to be translated into real world relevant items from the theoretical conceptual model. Pivotal to translating these dimensions is the defining of key terminology and the articulation of their function within the clinic, department and for the individual practitioners and their effect on errors.

Key Definitions

Outpatient medical clinics vary greatly in size and in scope of patient care provided; within this varied context that providers practice. Within Minnesota, a majority of outpatient care occurs within group practice settings, often times multi-specialty. Clinics are defined as the physical building which may include a single specialty department or multiple specialty departments. Departments are defined as a specific unit or clinical area often times with a specific clinical specialty focus. Outpatient facilities frequently include personnel who have cross functionality, such as the receptionists and billing staff. In single specialty offices, the administrative staffs (billing staff, managers, receptionists) often have a more direct interaction with the clinical staff and may not be considered their own separate department. While they function within the specified

organizational policies, procedures, and practices (culture) yet are removed from the "back office" they do not necessarily share nor influence the climate perspectives with the clinical care staff. When utilizing a clinic safety survey instrument it is recommended that the respondents include all clinic personnel to best represent the clinic's climate. Throughout this document, providers are also referred to as employees as many are employed by the clinic organizations.

Operationalization

The five dimensions in the conceptual model to be measured with this research include climate, culture, temporal affect, moral exemplarism, temporal affect and error. Error, the dependent variable, is self reported frequencies of near misses, accidents waiting to happen and adverse events within the clinic and individual provider error frequency within the survey. Each independent variable, except moral exemplarism and temporal affect, is measured at three separate referent levels within the survey (clinic, department, individual practitioner discussed below) utilizing multiple items. Moral exemplarism is measured at the individual provider level.

Climate by contrast to culture is those structures and processes that are more malleable and subject to rapid and inconstant cycles of change. Within any working environment there are good and bad days; days where the external or internal organizational issues create a tense environment or a relaxed and collegial environment. The climate can be best articulated by examining the clinic's collaboration between

providers, their informal communications, and the psychological safety feelings of the organizational actors. Climate items developed for use in this instrument covered the following domains: (psychological) safety climate, collaboration and communication.

Culture in the outpatient medical clinic includes those structures and processes that have a level of permanency; those that are not subject to daily or weekly changes. These include management styles, formalized clinic level communication, workload expectations, clinic processes including guidelines and protocols, the physical environment of the clinic setting, as well as the clinic's usage of a "just culture" philosophy for dealing with errors. The "just culture" concept is one where an individual is held accountable for errors that are caused by their actions or inactions and not those that occur due to system issues (IHI, 2009). Culture domains included management, workload, clinic processes, non-punitive feedback around errors, and the response of management to errors; items were developed for each of these domains.

Temporal affect is the interaction of the individual person's personality with the climate/culture. Their feelings of stress, concern, causal attribution, and satisfaction are all influenced by the organization in which they work. How a person feels is a product of how they see the world and their assumptions about the world which are built upon their unique personality traits. Temporal affect domains included items to access the providers' feelings of concern, job satisfaction and stress.

Moral exemplarism is an expression of individual providers' personality traits which are measured specifically to identify those who express this trait. Moral

exemplarism is actualized by persons with high levels of conscientiousness, openness and agreeableness; but with low levels of extroversion and emotional instability. To assess moral exemplarism, items were developed to capture the positive and negative of each of the Big 5 dimensions.

To best illustrate the different interactions of the independent variables at the various levels of referent (clinic, department, individual practitioner) see table 3.1 below. Included in each intersection of the table is a brief description of the referent/variable function in the discussion of errors and patient care safety. For moral exemplarism, the referent utilized in the survey is individual practitioner. This variable is an expression of a personality trait and as such is not dependent or variable in its expression due to a level of the organization in which a person works.

Table 3.1 Interactions between Referent Level and Independent Variables in Relation to Patient Care Errors and Safety Issues

	Item Referent Level		
Independent Variable	**Clinic**	**Department**	**Individual Practitioner**
Climate	Short term goals and focus of the clinic around safety, can change on a monthly or yearly basis.	Short term goals and focus of the department around safety, can change frequently (even hourly or daily).	Each person may have a different response and interpretation of the climate. Their own perceptions of the events that they witness and how it impacts them.
Culture	Underlying attitudes and values about the causes or error, the responsible parties, the priority of error prevention efforts.	Underlying attitudes and values about the causes or error, the responsible parties, the priority of error prevention efforts; however may differ from the clinic.	Individuals bring to their work organizations differing attitudes and values about their role and responsibilities for patient safety. These may differ from the clinic and department in which they work.
Temporal Affect	Any individual's affect on a daily basis is most likely not impactful to the clinic as a whole, since the single individual is unlikely to interact with every other employee.	Any individual's affect on a daily basis does likely impact the rest of their department, since the single individual is likely to interact with every other department member.	Any individual's affect on a daily basis does likely impact their attitude and focus.
Moral Exemplarism	An individual's need to intervene in situations where other's safety is at stake, whether they are a pivot player or not, is determined by the strength of their moral exemplarism traits.		

Related Instruments

Through a literature search and examination of existing research on safety climates, potential survey items and dimensions were listed for development into measures. While these existing surveys offered a good starting place, none included all

the dimensions included in the conceptual model guiding this research. Existing instruments were too narrowly focused (uni-dimensional measure of safety climate) or had been found through psychometric testing to have issues with validity. Most previously existing safety climate scales focus primarily on management support, safety systems in place and risk of errors (Flin, 2000). Existing safety climate surveys include:

- AHRQ Safety Attitudes Questionnaire (Ambulatory Version) (Sexton et al., 2004)
- Veterans Health Administration (VHA) Patient Safety Questionnaire (Sorra and Nieva, 2004)
- IHI Safety Climate Survey (IHI, 2007)

The AHRQ Safety Attitudes Questionnaire (SAQ) (Ambulatory Version) is a seventy four-item instrument utilizing a 5-point Likert scale to assess safety attitudes in ambulatory care settings (Sexton et al., 2004). A scale consisting of 27 items from this instrument identified as safety climate specific form a second instrument (Safety Climate Questionnaire). The dimensions tested within the full SAQ instrument include "teamwork climate, safety climate, job satisfaction, stress recognition and working conditions" (Sexton et al., 2004). The basis for this questionnaire's development was previous work done to create a hospital climate instrument. While psychometrically this instrument has been found to be reliable and valid, this instrument includes many items which are incongruent with ambulatory medical settings.

Hospitals and clinics share similar personnel and professionals; however they work under different organizational structures. While the findings of these studies on

blood pathogens and management support are translatable to clinics; the hospital surveys developed are not easily translatable to the clinic setting. The management design in clinics is often “flatter”, horizontal, meaning there are fewer layers between management and staff, while the management in hospitals is “taller”, hierarchical, containing more layers and fewer face to face daily interactions between managers and the staff. The difference in management design in conjunction with fewer clinic resources focused exclusively on safety work, may lead to a less defined and less formally structured safety climate in clinics.

Sexton et al. (2006) noted that the existing SAQ while psychometrically sound could be refined to create better factor loading fits at both the clinical area level (department) and the individual person level. Items such as those focused on shift work, briefings and other hospital related concepts do not have face validity with practitioners in these settings. As previously discussed, hospitals and clinics have fundamentally different management structures, rigidity in their job roles and responsibilities, and systems. Therefore taking an instrument developed in the hospital and using it in the clinic will not result in organizationally specific results and may not include environmentally relevant factors. AHRQ due to concerns about the use of this instrument in both environments has funded creation of a new instrument for use in the clinic setting; one which is to be developed in the clinic setting and not borrowed from the hospital environment. This instrument was not at the time of the dissertation initiation available for use.

The Veterans Health Administration (VHA) Patient Safety Questionnaire focuses on safety climate in VA hospitals (Sorra and Nieva, 2004). As a hospital survey, items reflect the unique issues relevant within a hospital setting such as staffing ratios, hospital management support for patient safety, and teamwork across hospital units, hospital handoffs and transitions. Several of the dimensions of safety climate are directly applicable to the ambulatory setting: supervisor/manager expectations and actions promoting patient safety, organizational learning—continuous improvement, teamwork within units, communication openness, feedback and communication about error, as well as non-punitive organizational response to error. The safety outcomes dimensions, overall perceptions of safety and frequency of event reporting are useful in all care settings. This survey while psychometrically good lacks widespread face validity and generalizability to all types of health care settings. It was the basis for the AHRQ Safety Attitudes Questionnaire (Ambulatory Version and Hospital Version).

The IHI Safety Climate Survey focuses on the dimensions of leadership availability, leadership support of safety climates and safety priorities, reporting processes and feedback processes (IHI, 2007). This 26 item survey was created in support of the IHI 100,000 Lives campaign as a quick barometer of safety climate. Responses are measured using a 5-point Likert scale. It has not been tested psychometrically and lacks several important dimensions for understanding safety climate such as teamwork, job satisfaction and stress; all of which have been found to impact safety practices (Cooper, 2000). Since the IHI's safety efforts focus on leaders as the pivotal people in improving

safety, the instrument is not designed to illicit the responses of the staff impacts on safety or errors. As none of the existing surveys fully captured the multiple dimensions that contribute to errors within the clinic settings; creation of a new instrument was necessary.

Aim One: Creation of the Instrument – Potential Item Pool

Instrument evaluation lead to a list of potential items for testing and revision to more accurately portray the environment the instrument was to be tested within. Utilizing dimensions tested by the preceding instruments, a list of potential items was created. Additional items suggested by experts and the literature were added to the item pool (Fields, 2002). The existing and revised items list by dimension lacked items which would comprehensively evaluate the dimensions as proposed within the conceptual model. Creation of supplemental items to more robustly describe the dimensions was undertaken by the research. Additional items were gathered from subject matter expert interviews as well as from the literature; the dimensions needing items were culture, error and temporal affect. Prior to cognitive interviewing, an initial reduction of the potential items was undertaken by the researcher. The potential item pool of 249 included 176 items suggested in previous safety research, 50 items from the moral exemplarism scale research and 23 researcher originated items. The reduction of items focused on removal of duplicative items reducing the list from the primary potential item list of 199 down to a cognitive interview test pool of 123 items. Each potential item was codified into the

dimension that the researcher felt the item would best describe; these a priori dimensions would later be tested utilizing factor analysis.

Prior to cognitive interviewing a detailed review was conducted of each item to ensure that the items utilized the appropriate referents (I, we, they, team, clinic, or department). Since the survey focuses on the individual respondent's perceptions of the climate and culture, items were explicitly worded utilizing specific referents to prompt the respondents' cognitive comparisons and evaluations at the desired level of comparison. Although Klein et al. (2001) has suggested that the use of a group referent ("we" or "team" or "clinic") for evaluative items (those requesting respondents to make a subjective judgment) decreases within-group variation, for this instrument both the individual referent, "I," and the team referent will be utilized in order to adequately address the range of shared perception. The "we" referent refers to the culture aspects, while the "I" referent refers to the climate aspects and how one acts within the context of the organization.

Cognitive Interviews

The final list of 123 potential items was further refined through cognitive interviews with subject matter experts. Fifteen practitioners from various ambulatory medical care clinics with a variety of professional degrees were interviewed: 5 nurses, 5 physicians and 5 other professionals – practice administration and operations (billing,

scheduling and referrals). An initial e-mail request for volunteers was sent to the 18 members of the ICSI Ambulatory Care Patient Safety Work Group.

The initial interviewees were asked to refer others for interviewing using a referral technique to achieve the desired sample size of 15 overall and 5 within each sub classification. Initial interviews occurred with members of the ICSI Ambulatory Care Patient Safety Work Group; they were asked to refer others that they thought would be particularly insightful to the researcher. Members represent 6 different clinics systems, urban and rural with differing specialties. They have various different professional degrees and roles within the ambulatory care sites and through their work on safety, are subject matter experts.

At the beginning of the cognitive interview, the respondents were consented and the interview process was explained. Respondents were told that they would be asked to provide their personal response to the items as well as a list of conditional probes. The introduction to the interview also included a short description of the research being undertaken. The respondents were told that their input would help the researcher in the creation of a survey for use within outpatient medical clinics focused on patient care errors and clinic climate.

During the cognitive testing, the practitioners were asked to provide verbal comments on their comprehension and interpretation of the potential items for the survey instrument (Schwartz and Sudman, 1996; Sudman, Bradburn et al., 1996). The e-mail invitation briefly explained the study, the cognitive interview process and the time

commitment. Once a respondent had opted into the cognitive interview process, through contacting the researcher a pre-interview consent form and a list of the cognitive interview conditional probes was sent to the respondent. The researcher conducted these interviews either face to face or over the phone at the convenience of the respondent. Due to the interviewees' schedules and geographic spread, phone interviews supplemented face to face interviews.

Respondents were asked clarifying questions about the items and instructions as well as their thought processes about the items by the researcher utilizing a combination of discretionary and conditional probes (see questions below). The researcher looked for survey items which were ambiguous or did not translate to the respondents experiences in outpatient clinic settings for exclusion from the item pool. Items for which there were no comments were deemed adequate and not reformatted. For items with which there were comments, the range (variance) of the problem(s) was evaluated to determine a solution to the question, terminology or response categories used in the question. After the fifth, tenth and fifteenth interviews interview responses were evaluated and items were revised prior to continuing the interviews. To maintain respondent confidentiality, items that focused on individually identifying characteristics were limited. Items for which a standard wording and/or response set exist such as demographic characteristics were not tested.

As the respondent filled out the questionnaire they were asked to discuss the following questions and their thoughts. These questions were also supplemented by

probing questions dependent upon the interview responses at the discretion of the researcher. Before completion of the interview, respondents were also asked to comment on any concepts that they felt were critical to discussions of patient safety and errors that were not included within the existing instrument item pool.

Conditional Probes:

- Is this question difficult to interpret?
- Does the question seem to fully describe your work?
- Is this question relevant to your work?
- Utility – does the question assess something that is meaningful?
- Terminology – Are there phrases or words in the instrument that have multiple meanings or are open to interpretation?
- Terminology – Are there phrases and words that have distinct meanings based upon context (e.g. in exam room vs. in pharmacy)?
- Do the responses allow you to respond how you would like to?
- Are the response categories exclusive/ exhaustive?
- Relative to the moral exemplar items (only a few of the more ambiguous items will be tested, the respondent were given a list of the "Big 5" personality traits):
    - In which of the big 5 does this word fit?
    - What makes you think it fits in that category?
    - If the item is incorrectly identified in a different category, is there a better word (synonym) that would retain the item's meaning, but make it more clearly fit in the big 5 category intended?

Interesting findings from the cognitive interviews included a general lack of relative and substantive meaning of the terms “manager”, “personnel” and “resources”. As well there was a general distaste from respondents for words often seen in the business literature; they thought of the terminology as inappropriate for a health care setting (e.g. processes, structure, systems, administration and management). All respondents likewise during the interview stated an overall concern about the reading and comprehension skills of low level non-clinical and low level clinical staff. Low level staff was often cited as being absent from clinic discussions concerning clinical processes and protocols, reporting systems, and outcomes reporting particularly that pertains to medical error. Interviewees questioned the inclusion of low level staff, particularly those outside of clinical care for the aforementioned reason.

Construction of the survey instrument included item wording and item order work. Item wording and order were determined after the final items were determined from the cognitive interviewing process. Items were ordered and worded to minimize unintended effects of previous questions (Bradburn et al., 2004; Dillman, 2007; Schuman and Presser, 1996). Special attention was paid to item placement within the instrument of the error items (clinic and personal) to help ensure that the respondent was as forthcoming as possible with the dependent variable of interest. To assist in the reading comprehension ease for survey respondents, items were reworded to reflect the less complex vocabulary suggestions from the cognitive interview respondents. Item ordering included beginning the survey with non-threatening items earlier in the instrument,

leaving demographic information to the end of the survey, and grouping of items by response categories and topic (Bradburn, Sudman, Wansink, 2004).

Pilot Testing of the Moral Exemplarism Scale

The moral exemplar scale was based on a characteristic list designed to test the big five personality traits. Early research by Walker (1999) had developed the list of adjectives through the use of a free text experiment where participants were asked to "write down the characteristics and attributes of a highly moral person" utilizing a personal reference for the task. These lists of adjectives and phrases were then codified and tagged by which of the "big five" traits they responded to. These results were then utilized to compile a profile of low and high pole traits which are commonly descriptive of a moral exemplar. This list of adjectives became the list for the potential items for the moral exemplarism scale. The list included ten terms (5 negative and 5 positive) for each of the big five personality traits. This instrument operationalized their work into scales and a formal instrument.

The full 50 item version of the moral exemplar portion of the instrument was not included in the cognitive interviews due to the time required to test the full potential item list. During the cognitive interview a few items (adjectives) which were ambiguous from the moral exemplar portion of the instrument were shown to the respondent for them to suggest synonyms for substitution in the final instrument. The resulting clarifications of

several of the moral exemplarism terms such as rigid to rigid/inflexible and casual to casual/ unconcerned were included in the pilot of the full moral exemplar scale.

Fifty items were too many additional items to add to the survey, so a separate scale pilot was undertaken. The pilot included all 50 items and was administered to 87 respondents. These respondents were MBA students from a private university, master's and doctorate students in health services research at a large public research university, and employees of a not for profit health plan working in health informatics, case management, contracting, utilization review and quality improvement. Pilot test respondents were asked to opt in by anonymously and voluntarily completing the 50 item survey. For each listed adjective they were asked to respond on a 5 point Likert scale of how descriptive the adjective was of them.

Psychometric analysis was performed on the pilot data to assist in the paring down of items for the final survey instrument. Psychometric evaluation including: Cronbach's alphas, Pearson correlations and exploratory factor analysis (EFA) were run for each of the 5 adjective lists negative/positive per personality trait (Nunnally, 2004). EFA analysis with varimax rotation was also run for each personality trait (with the full block of 10 items per trait: agreeableness, conscientiousness, openness, narcissism/emotional stability and extroversion) as well as for the entire list of 50 items. Analysis allowed for the researcher to reduce the moral exemplar scale to four items (two positive and two negative) per personality trait. This reduced list of five factors reduced respondent burden by dropping 30 items from the final instrument.

Aim One - Moral Exemplarism Scale Analysis

During the pilot test of the moral exemplarism scale, an exploratory factor analysis (EFA) was conducted. The moral exemplarism scale originally included 50 adjectives as suggested by Walker and Hennig (2004) that describe the characteristics of moral exemplars. Each of the big five personality traits was represented by 5 positive adjectives and 5 negative adjectives. The inclusion of all 50 items was burdensome even when administered separate of the full Safety Climate Survey. During the EFA, each of the big five trait lists was run independently in unconstrained analysis with varimax (orthogonal rotation). The goal of the unconstrained varimax principal components analysis was to determine if the use of four items per big five scales (two positive and two negative) would be adequate for measuring moral exemplarism (ME), thus decreasing the ME scale from 50 items to 20 items and greatly reducing the respondent burden. Utilizing the big five analysis each adjective list was trimmed to the four adjectives with the strongest loadings in a two factor model one positive and one negative. Those adjectives underlined within Table 3.2 were retained in the final instrument.

Table 3.2 Moral Exemplarism Adjectives by Big Five Personality Trait

Extroversion	Agreeableness	Conscientiousness	Emotional Stability	Openness to Experience
High Pole	**High Pole**	**High Pole**	**High Pole**	**High Pole**
Joyful	Loving	Faithful	Calm	*Open*
Active	*Caring*	*Moral*	*Content*	*Intelligent*
Proud	Kind	Respectful	*Balanced*	Meditative
Involved	*Thoughtful*	Trustworthy	Satisfied	Open-minded
Leader	Peaceful	*Truthful*	Mature	Reflective
Low Pole	**Low Pole**	**Low Pole**	**Low Pole**	**Low Pole**
Humble	*Stubborn*	*Impractical*	Emotional	*Rigid/ Inflexible*
Follower	Self-righteous	Casual	*Fearful*	Conservative
Quiet	*Critical*	*Flighty*	Uptight	*Narrow-minded*
Submissive	Authoritarian	Frivolous	Sad	Traditional
Introverted	Impatient	Informal	*Obsessive*	Naïve

Walker and Hennig (2004)

Chapter IV– Methods

Aim one was achieved through the completion of the instrument development. The final instrument (appendix A) included 114 items within five dimensions. Chapter four includes a discussion of the methods utilized for collection of the survey data; necessary for accomplishing aim two – determining if outpatient medical clinics' safety climates, practitioners' moral exemplarism traits and their interaction (practitioner temporal affect) are correlated with error rates (both personal errors and clinic errors).

Final Survey Instrument

Professionals responding to the instrument are over taxed by administrative and patient care responsibilities. Inclusion of items that are not appropriate in their care setting has the risk of prompting feelings of respondent resentment and potentially leading to non-response due to the seeming misunderstanding of the context of the work environment by the researcher. The goal for the finalized instrument was to limit the respondent burden while still collecting detailed enough information to adequately describe the climate of the clinic, the respondent's temporal affect and the personality traits of moral exemplarism as well as error. For the final instrument to be efficacious for ambulatory setting assessment and potential intervention strategies it must not disenfranchise practitioners by asking irrelevant questions nor leave out critical safety climate and error related factors.

The final instrument included 114 items covering the following major themes/ dimensions established a priori:

- Demographics (categorical and yes/no response sets)
    - Professional characteristics
    - Personal characteristics
- Climate (Likert scale)
    - Psychological safety climate
    - Collaboration
    - Communication both formal and informal about safety
    - Informal communication between employees about topics other than safety
- Culture (Likert scale)
    - Management including managing employee relations and training
    - Workload expectations
    - Reporting system process and medical reconciliation systems
    - Non-punitive feedback for reporting errors or safety issues
    - Response to error from management
- Temporal Affect (Likert scale)
    - Feelings of concern
    - Feelings of personal stress
    - Feelings of job satisfaction

- Moral Exemplarism (Likert scale)
    - Extroversion
    - Agreeableness
    - Conscientiousness
    - Narcissism/emotional stability
    - Openness to new experience
- Error (Count, Index and Likert)
    - Frequency of clinic error reporting (Likert)
    - Frequency of clinic error occurrences (Count)
    - Frequency personal error reporting (Likert)
    - Frequency personal error occurrences (Index)

Why Nurse Practitioners and Certified Nurse Midwives?

Advance practice nurses such as nurse practitioners, certified nurse midwives, nurse anesthetists and clinical nurse specialists were selected for a sample population for multiple reasons. As these providers are required to maintain public registry and certification, and those licensure lists are publically available for a minimal fee this sample population provides excellent coverage of this provider population. This population is central to the study of error in outpatient settings due to their roles within clinics. As practitioners who diagnose, prescribe and provide patient care these NPs and CNMs are able to speak to their clinic's processes and expectations as well as their own

personal clinical experiences. Neither nurse anesthetists nor clinical nurse specialists were included within the sample population as they are more likely to hospital or health department based respectively and as such are not working within the clinical settings desired for this study. Unique to this group and physician assistants are their place within the hierarchical structure of clinics. Although they are providers of their own right, they must also work in concert with a physician; yet unlike other nurses (registered, licensed vocational or practical) or medical assistants these providers are directing patient care, not simply delivering care ordered by others.

Population Size and Response Rate

The survey was sent to 2,576 nurse practitioners and certified nurse midwives licensed in Minnesota. In total the final instrument was returned by 1,457 people of whom 1,189 were respondents (268 ineligible) for a response rate of 52% (Table 4.1; AAPOR RR1). Ten percent of the potential respondents were deemed out of ineligible due to the reasons stated in Table 4.2. All ineligible respondents returned their surveys with notes or phone calls to the researcher explaining their ineligibility reasons. Of note is the high number of ineligible respondents working in other settings such as inpatient facilities. Cover letters clarified to the potential respondents that the desired population was those working within a clinic, regardless of the organizational setting. As the survey was specifically designed to address the unique characteristics of outpatient clinical work, it is not fully or directly applicable to inpatient care.

Table 4.1 – Population and Response Disposition

Population	2,576
Complete	1,189
Ineligible	268
AAPOR RR1	52%

Table 4.2 – Ineligible Respondents' Reasons

Ineligible Reasons	**Respondents**
Bad Address	47
Deceased	2
Dual Licensed (NP and CNM)	10
Out of the Country - Military Deployment	4
Retired	22
Working in other settings or not working	183
Total Number of Ineligible Respondents	**268**

The population consisted of 215 Certified Nurse Midwives and 2,361 Nurse Practitioners holding current licenses in the state of Minnesota. Not all potential respondents had a current household address within the state of Minnesota, or within the bordering states (Iowa, Wisconsin, South Dakota and North Dakota). Given that many medical facilities are located within miles of the Minnesota border, rather than selectively poll respondents, all were included. Due to the likelihood of these practices utilizing out of state resident providers, snowbirds or locus tenens, all licensed individuals were surveyed. As the variables of interest are not expected to vary greatly by state of home address this was not an exclusionary criteria pre surveying. Less than four percent of the final respondents were from out state locations.

Fielding of the Survey

A preliminary mailing of the survey to the full potential respondent set of 2,576 NPs and CMNs occurred between February 18th and 23rd of 2009. Preliminary mailing resulted in a response rate of 34% with an ineligible respondent count of 99 people. Second mailings to the non-respondents (1,636) occurred on March 23rd. Survey collection ended on May 1st after a total of 72 days in the field resulting in a 52% response rate. Since the survey collection was closed on May 1st, only one additional survey was received. Surveys took respondents on average 15 minutes to complete.

Surveys were mailed with a cover letter and consent letter explaining the study purpose and inviting the professionals to opt into participation by completing the survey and returning it in the business reply envelope provided. Surveys were returned to the HealthPartners Research Foundation Survey Center. The first 900 (76%) surveys were scanned by the survey center personnel using Teleform v10.4 into an excel spreadsheet. Scanned responses that were unclear were checked by staff members and verified. Due to budget constraints the remaining 289 (24%) were keyed rather than scanned. Prior to keying these surveys were hand coded with the coding double checked by a second coder. When a discrepancy was found between the two coders, both looked at the response and come to an agreement as to the intended response. To ensure accuracy all keyed surveys were keyed twice by different people. The two keyed responses were checked against each other using proc compare in SAS. Any values that did not match were listed in a verification report. Study IDs and item lists were compared against the

respondent copies of the survey. The final respondent dataset included the corrected and verified keyed data and the scanned data. A check to ensure that there were not duplicate respondent records found no duplication in the study IDs which had been imbedded within the Teleform survey response forms.

Respondents and Non-respondents

Tables 4.3 and 4.4 include the demographic characteristics of the respondents and non-respondents. Table 4.3 includes both groups including variables known for both from the provider list provided by the state licensure board. The specialty classification for the respondents is gathered from their self identified specialty reflected within the categories listed below in Table 4.3. The specialties for the non-respondents were obtained from the data file of licences from the Minnesota State Board of Nursing and as such were not identical in their mapping. The nursing board offers the following specialties (Family Medicine, Internal Medicine, Pediatrics, Nurse Midwifery, Adult Acute, Gerontology and Mental Health) which were grouped into categories matching those in the final survey instrument. Table 4.4 includes only the respondents, as these characteristics are unknown to the researcher or the state licensure board.

Table 4.3 Respondent and Non-Respondent Demographic Characteristics

	Non-respondents	Respondents	X^2	p-value
Professional Degree				
Certified Nurse Midwife	8% (85)	8 % (96)		
Nurse Practitioner	92% (1033)	91 % (1078)	0.43	0.51
Specialty				
Acute care	1.6% (22)	1.0% (12)		
Adult	15.7% (218)	13.9% (165)		
Adult Mental Health	1.2% (17)	1.4% (16)		
CNM	8% (111)	8.8% (104)		
Family Medicine	37.2% (515)	36.3% (432)		
Family Mental Health	0.2% (3)	0.5% (6)		
Gerontology	9.1% (126)	8.2% (98)		
Neonatal	5.9% (81)	5.2% (62)		
Pediatric	13.6% (188)	14.8% (176)		
Pediatric acute care	0.2% (3)	0.3% (3)		
Women's Health	7.3% (101)	9.7% (115)	11.37	0.33
Gender				
Female	95% (1322)	96% (1147)		
Male	5% (63)	4% (43)	1.43	0.23
Age Range				
30 or under	5% (74)	4% (53)		
31 - 40	22% (301)	22% (266)		
41 - 50	28% (383)	27% (318)		
51 - 60	37% (507)	35% (416)		
61 - 70	8% (113)	11% (125)		
71 or older	0% (5)	1% (11)		
No Response	0% (2)	0% (1)	8.87	0.11

Table 4.4 Respondent Demographic Characteristics

	Respondents
Race	
White	95% (1130)
Black or African American	0.5% (6)
Asian	0.5% (6)
Native Hawaiian or Other Pacific Islander	0.0% (0)
American Indian or Alaskan Native	0.6% (7)
No Response	3% (40)
Ethnicity	
Hispanic or Latino	1% (10)
Not Hispanic or Latino	97% (1150)
No Response	2% (29)
Experience at Clinic	
0 - 5 years	38% (455)
6 - 10 years	21% (253)
11 - 15 years	12% (140)
16 - 20 years	6% (68)
20 - 25 years	3% (32)
26 - 30 years	1% (16)
31 - 35 years	1% (6)
No Response	18% (219)
Experience in Specialty	
0 - 5 years	31% (373)
6 - 10 years	23% (268)
11 - 15 years	19% (222)
16 - 20 years	9% (109)
20 - 25 years	5% (62)
26 - 30 years	6% (75)
31 - 35 years	2% (29)
36 - 40 years	1% (7)
No Response	4% (44)

Chapter V – Analysis

Two different analysis processes were undertaken in order to evaluate the specific aims. To satisfy specific aim one, creation of a measurement tool for safety climate in outpatient medical clinics and variance measurement, a survey tool needed to be developed. Creation of the instrument began with scale creation and analysis with the goal of a finalized developed instrument that was reliable, free of excessive respondent burden and valid. The cognitive interviewing required a qualitative analysis, while the moral exemplarism scale creation required a quantitative analysis utilizing exemplarism factor analysis. Quantitative analysis included exploratory factor analysis, univariate and multivariate analysis, and multiple regressions. Data response rescaling, codification and scale formation were also undertaken during the analysis stages. The analysis steps necessary for completion of aim one were included within chapter three.

To satisfy aim two, determining if outpatient medical clinic safety climates, practitioners' moral exemplarism traits and their interactions (practitioner temporal affect- causal beliefs) are correlated with personally committed patient care errors or clinic observed errors, quantitative and qualitative analysis were completed. The quantitative and qualitative analyses are discussed in this chapter.

Safety Climate Clinic Survey – Aim Two

Prior to undertaking the full analysis of the collected survey data, a response non-response analysis was performed. As the full population was surveyed and the licensing

files contained basic demographics the respondents and non-respondents could be compared across several different characteristics including gender, age range, professional degree, and practicing specialty (Table 4.3). Based on the characteristics known for both groups, there is no known non-response bias for basic demographic indicators. Given this, the missing data for this study is assumed to be missing at random.

Data from both the keyed and scanned responses was combined into a single data set which was then checked for validity. This validation step was to ensure that the variables did not have values that were out of the allowable response range. At this time, open ended responses were codified and condensed into meaningful groupings for use in the final analysis (Items 1, 18, 21, 32, 34, 35 and 40). These items included demographic characteristics' of clinics and respondents, impressions of leadership and common error which were included in various analyses. Item 18 was a free form text response item which asked for the first phrase that came to mind when reading the following "My clinic's leadership is driving us to…" These free form text response were codified into major categories (positive, negative and revenue) with subcategories. The results of this item are included within Appendix D.

Latent Variable Development

Other studies have examined safety climate; finding it to be a multi-dimensional concept (Sexton et al. 2004; Sorra and Nieva, 2004; Sorra, Franklin, and Streagle, 2008). In order to confirm the multi-dimensionality of safety climate, an exploratory factor

analysis (EFA) was conducted of all the safety climate measures which are described in detail later in this chapter as well as Appendix B. Demographic and moral exemplarism scale items were removed from the EFA data set prior to testing. An unconstrained explanatory factor analysis (EFA) was performed. The first model with 19 eigenvalues greater than 1, explaining 43% of the variation was considered initially. Oblique rotation (promax) was used due to the expectation that the factors would be correlated. Factor loadings of 0.30 or greater were considered to be indicative of a factor. The factor loading were examined and individual items with multiple similar factor loadings > 0.30 or no factor loadings > 0.30 were removed prior to successive runs. During the stepped down successive EFA runs, 12 items were removed from scaling. These 12 items upon further examination were deemed to be either ambiguously defined or covering too broad of scope. The remaining 56 items loaded onto 13 factors which explained 33% of the variability in items as specified in Tables 5.1 and 5.2 (below).

Table 5.1 Exploratory Factor Analysis - Error Items

	Error	
Item	Clinic	Personal
Q9B	0.93	.
Q9C	0.89	.
Q9A	0.86	.
Q25	.	0.80
Q26	.	0.74

The final EFA showed two items (23A and 23K) that required reverse coding for the purpose of scale creation due to being negatively worded (Aday, 1996). Item 8, just culture, was included as a separate culture scale consisting of the single item. For the purpose of creating scales, all response categories for the 56 variables that were dichotomous, 5 point Likert, or 7 point Likert were converted to 4 point Likert scales through linear transformation.

Table 5.2 Exploratory Factor Analysis – Final Factor Structure, excluding Moral Exemplarism Scales

	Climate						Culture				Temporal Affect
Item	Safety	Collaboration	Team Morale	Informal Safety Comm	Workload	Informal Morale Comm	Mgmt	Formal Comm	Reporting Process	Med Rec Process	Safety Feelings
Q23H	0.83	.	.	.	.	.	.	.	.	.	.
Q23I	0.83	.	.	.	.	.	.	.	.	.	.
Q23J	0.72	.	.	.	.	.	.	.	.	.	.
Q23D	0.54	.	.	.	.	.	.	.	.	.	.
Q12D	0.42	.	.	.	.	.	.	.	.	.	.
Q12A	0.34	.	.	.	.	.	.	.	.	.	.
Q27B	0.33	.	.	.	.	.	.	.	.	.	.
Q2E	.	0.83	.	.	.	.	.	.	.	.	.
Q2D	.	0.79	.	.	.	.	.	.	.	.	.
Q2F	.	0.69	.	.	.	.	.	.	.	.	.
Q2B	.	0.55	.	.	.	.	.	.	.	.	.
Q2C	.	0.54	.	.	.	.	.	.	.	.	.
Q16	.	.	0.76	.	.	.	.	.	.	.	.
Q15	.	.	0.74	.	.	.	.	.	.	.	.
Q17A	.	.	0.73	.	.	.	.	.	.	.	.
Q17B	.	.	0.63	.	.	.	.	.	.	.	.
Q12B	.	.	.	0.80	.	.	.	.	.	.	.
Q12E	.	.	.	0.74	.	.	.	.	.	.	.
Q12C	.	.	.	0.71	.	.	.	.	.	.	.
Q13	.	.	.	0.36	.	.	.	.	.	.	.
Q19G	.	.	.	.	0.84	.	0.36	.	.	.	.
Q11	.	.	.	.	0.48	.	.	.	.	.	.
Q23A	.	.	.	.	-0.52	.	.	.	.	0.31	.
Q23K	.	.	.	.	-0.56	.	.	.	.	.	.
Q3	.	.	.	.	.	0.74	.	.	.	.	.
Q4	.	.	.	.	.	0.70	.	.	.	.	.
Q5	.	.	.	.	.	0.67	.	.	.	.	.
Q19D	.	.	.	.	.	.	0.76	.	.	.	.
Q19C	.	.	.	.	.	.	0.76	.	.	.	.
Q19F	.	.	.	.	.	.	0.71	.	.	.	.
Q19E	.	.	.	.	.	.	0.67	.	.	.	.
Q19A	.	.	.	.	.	.	0.61	.	.	.	.
Q19B	.	.	.	.	.	.	0.53	.	.	.	.
Q10B	.	.	.	.	.	.	.	0.83	.	.	.
Q10A	.	.	.	.	.	.	.	0.80	.	.	.
Q10C	.	.	.	.	.	.	.	0.70	.	.	.
Q10D	.	.	.	.	.	.	.	0.63	.	.	.
Q10E	.	.	.	.	.	.	.	0.62	.	.	.
Q10F	.	.	.	.	.	.	.	0.57	.	.	.
Q6B	.	.	.	.	.	.	.	.	0.89	.	.
Q6C	.	.	.	.	.	.	.	.	0.85	.	.
Q6A	.	.	.	.	.	.	.	.	0.82	.	.
Q7A	.	.	.	.	.	.	.	.	0.45	.	.
Q23F	.	.	.	.	.	.	.	.	.	0.81	.
Q23E	.	.	.	.	.	.	.	.	.	0.79	.
Q23C	.	.	.	.	.	.	.	.	.	0.65	.
Q14B	.	.	.	.	.	.	.	.	.	.	0.75
Q14D	.	.	.	.	.	.	.	.	.	.	0.70
Q14E	.	.	.	.	.	.	.	.	.	.	0.53
Q14C	.	.	.	.	.	.	.	.	.	.	0.50
Q14F	.	.	.	.	.	.	.	.	.	.	0.32

An exploratory factor analysis of the moral exemplarism scales (Table 5.3) was run separately from climate, culture, and temporal affect EFA. The decision to do separate EFAs was based on the a priori theory that moral exemplarism as an expression of personality traits and as a separate independent instrument of the overall instrument should be examined independently. The twenty items from the adjective list were each expected to load on two factors: "high" or "low" pole descriptors of personality. Five oblique (varimax) EFAs were run for each of the five personality trait adjectives lists.

Table 5.3 Exploratory Factor Analysis – Final Factor Structure Moral Exemplarism

Extroversion**		**Factor1**	**Factor2**
Q29C	follower	0.879	0.022
Q29D	submissive	0.876	0.053
Q29B	involved	0.007	0.876
Q29A	active	0.068	0.871
Agreeableness*		**Factor1**	**Factor2**
Q29F	thoughtful	0.883	0.049
Q29E	caring	0.873	0.109
Q29H	critical	0.073	0.857
Q29G	stubborn	0.080	0.856
Conscientious*		**Factor1**	**Factor2**
Q29L	flighty	0.892	0.083
Q29K	impractical	0.889	0.109
Q29I	moral	0.031	0.859
Q29J	truthful	0.156	0.828
Emotional Stability**		**Factor1**	**Factor2**
Q29M	content	0.869	0.018
Q29N	balanced	0.864	0.054
Q29O	fearful	-0.029	0.847
Q29P	obsessive	0.102	0.833
Openness *		**Factor1**	**Factor2**
Q29S	rigid/inflexible	0.926	0.039
Q29T	narrow-minded	0.921	0.019
Q29Q	open	-0.105	0.838
Q29R	intelligent	0.164	0.816

* High Pole **Low Pole for moral exemplars

Error Scales

The two error scales for clinic and personal error ask the respondent about the frequency of error reports and the timing of errors. Clinic error is composed of three items asking how frequently each of the three component measures occurs (adverse events, near misses and accidents waiting to happen). Clinic error is examined at the summed aggregate level (all three together) as well as each component individually (adverse events, near misses and accidents waiting to happen) and at the aggregate of medical error (adverse events and near misses). Personal error asks the respondent if they have made an error at any time during their career and if they have made an error within the last 6 months. The errors reported by the respondent rather than those measured in other methods are the standard for professionals in the medical field. While the conceptual model does not specify two distinct errors to be measured (personal and clinic), these two outcome models were theorized to have different predictors and as such were tested separately.

Reporting of errors through self report produces a viable dependent variable which is more widely accepted with the medical community than other measures of errors such as claims. While self report is inherently biased by the respondent's recall and perceptions, it is the standard within healthcare. Errors are expected to be self reported and corrected for within the medical community. Due to inconsistencies in coding of diagnoses on administrative medical claims, as well as the inability of claims to illuminate either the

causal pathway or the chronology of medical errors, claims data is a crude and unreliable measure of errors prone to more mistakes than self report.

Key to the discussion of error is the distinction between errors occurring and errors reported. Errors that occur may or may not be apparent to providers. Errors that are reported are subject to interpretation of the individual (is it or is it not a reportable event) and necessitate action by the reporter.

Climate Scales

The climate scale of 27 items divided into six scales: safety climate, collaboration, morale, informal communication about safety, workload demands, and informal communication – general; it is the lengthiest of the scales. Safety climate includes items specifying the number of times that: short cuts are utilized to save time, test results being overlooked, errors go unreported as well as the difficulty of starting safety conversations and the risk of errors due to a tense work environment. Collaboration measures the level of collaboration a respondent feels is present with different provider types. Morale scale looks at the general morale of the clinic currently and in the past 6 months, the level of team work present, and the comfort level for asking questions. Informal communication about safety asks the respondent how they feel about speaking up about safety concerns to their peers, if it is easier to speak up after others have begun the conversation, if they are encouraged to admit errors to patients and their families, and if they see reporting as their duty. Workload are explored by items include staffing levels, workload expectation

levels, effective balancing of safety with productivity, and the feeling that if they are feeling overwhelmed or fatigued that they can stop and regain focus. The final scale looks at informal communication, however this set of items specifically asks the respondent about general communication such as laughing with others, respectful atmosphere, and if others ask their advice. The climate scale focuses on the day to day interactions, the pressures that change each day and the interactions between providers. The final climate scale items reflected the proposed range of dimensions.

Culture Scales

The management, formal communication, reporting process, patient medication reconciliation, and just culture combine to create the culture scale with each factor as a scale. The culture scale includes 20 items describing the clinic and department. The management items include perceptions of management's aptitude at dealing with problems, training, supporting providers and recognizing those employees who identify errors. The formal communication items detail the extent to which a clinic's management provides a consistent messaging concerning safety in the form of error reports, safety roles and responsibilities, and open conversations of safety and errors. Reporting process asks about the reporting systems for all types of error (near miss, accidents waiting to happen and adverse events) as well as the ease of using the system. Patient medication reconciliation - the process of monitoring patient's medications, refills and use of their prescribed treatments are included in one of the scales. The just culture scale focuses on

whether a clinic in dealing with errors hold the provider responsible only when the error was within their control and not for those caused by system failures. Independently these items describe the multiple components that make up the overall clinic culture.

Temporal Affect Scale – Causal Beliefs

After the EFA, the temporal affect scale includes 5 items, all focused on the beliefs of the respondent about the causes of error. They are asked if they believe that the causes of most patient care errors are the patients themselves, system failures or resource constraints. Respondents are also asked whether they feel that the use of standardized care practices prevents errors. Respondent assessments of the unintended consequences of managements' actions on safety are also included in this scale. Temporal affect items, like the climate items, focus on the day to day interactions, pressures, and changing environment of providers. A priori this scale was intended to include items about job satisfaction as well as feelings of concern/stress. Several of the items identified prior to fielding as describing these dimensions were eliminated due to ambiguity in wording or the scope of the item referent. While conceptualized as a multidimensional construct, the final measure reflects a singular dimension/ aspect of temporal affect and not the full range; thus the scale is hereafter referred to as the "temporal affect – causal beliefs" scale.

Moral Exemplar Scale

The moral exemplar scale combines the effects of all the five moral exemplar scales. Each scale is based upon one of the "Big Five" personality traits: extroversion, agreeableness, conscientiousness, narcissism/emotional stability and openness to new experience. As the adjectives in this instrument came from previous work in this area the scale adjectives were expected to load onto two factors (high and low) describing each of the big five personality traits; high pole being positive descriptors of the trait and low pole being negative descriptors of the traits. Low pole (negative) items were reverse coded for scale creation so that all the item scales were unidirectional. Scores were calculated as the sums of the four items per trait. Additionally other moral exemplarism scale scores were also created including an overall ME score as the mean of the five trait scores as well as a mean score of the self assessed big five traits (items 28A – E).

Scale Scoring

Upon completion of the EFA, scale scores were calculated. Items needing reverse coding were recalculated. For each respondent, a scale score was calculated after missing values had been checked. Any scale with more than 75% of items without a response was not included in the calculations. All climate, culture, moral exemplarism and temporal affect – causal belief scales were calculated by the mean of the items included. Both outcomes personal and clinic errors were treated as continuous scales. Twenty one

respondents lacking the dependent variable responses (error) were dropped from the analysis.

The clinic error scale score was calculated as a mean of the item responses while the personal error score was recoded as noted below. Clinic errors were also examined independently each as their own scales: adverse events, near misses and accidents waiting to happen. Additionally the mean medical errors (adverse events and near misses) were tested.

Personal Error (I have made errors with the potential to harm patients…):

- 0 - no errors in career or past 6 months
- 1 - no recent errors only those during career
- 2 - both errors in career and the past 6 months

Clinic Error (How often do these errors occur?):

- 0 – Never
- 1 – Rarely
- 2 – Occasionally
- 3 – Frequently
- 4 – Often

Any respondent with missing dependent variables (clinic or personal) errors was excluded from the final analysis for each model. For each item in every scale, response patterns were examined to ensure that no item was subject to floor or ceiling effect and to look for skewed item response profiles. The personal error score was created utilizing a

scale created from items Q25 and Q26. The clinic error components were created utilizing a combination of items Q9A, Q9B, and Q9C:

Clinic Error = mean (Q9A, Q9B, Q9C)

Adverse Event = Q9A

Near Misses = Q9B

Accidents Waiting to Happen = Q9C

Medical Errors = mean (Q9A, Q9B)

The testing of all of these combinations of clinic level errors was to determine if there were different correlates to these different components or if they were all similar. While called clinic error throughout the document, this label is used for convenience. It would be more accurate to call accidents waiting to happen as a separate label, not subsumed under clinic error; however they are called under the title clinic errors since they are potential future errors. This is particularly true when these accidents waiting to happen are well known and are not addressed by clinics.

Scale item correlations were tested for all scales with more than 1 item and determined to be acceptable, while ideally they would all be above 0.60 none were so low as to be dropped (Table 5.4). Table 5.4 details the scale score characteristics; the ranges both reported and possible, the means and standard deviations of the reported standardized scores. The scores all ranged from a minimum of 0 to a maximum of 4. The culture scales all have a mean between 3 and 3.2, showing less variability than the climate scale scores which range from 1.8 to 3.4. The right skew of the culture scale

scores reflects high agreement/frequency of affirmative responses to the existence of the processes and cultural norms. With the means for the safety, workload, and informal communication centered on the midpoint of the score range and a right skew of collaboration, morale, and informal communication about safety scales; the climate scales exhibit more variability than the culture scales. This additional variability could be attributable to the more temporal nature of climate. Both moral exemplarism and temporal affect – causal beliefs also skew to the right. The social desirability bias possible with the moral exemplar and temporal affect – causal beliefs scales, may contribute to the skewedness of these means; respondents wanting to appear more positive. Clinic aggregations, clinic components and personal error means are in the middle of their scale ranges. Just culture, adverse events, near misses, accidents waiting to happen, medical errors, and personal errors do not have calculated Cronbach's alphas included in table 5.4 as they are either single item scales or the scale score is a count of multiple items translated into a single item score.

Table 5.4 Scale Item Correlations and Respondent Score Range

Scale	Scale Description	# of Items	Mean	Std. Dev.	Score Range	Standardized Cronbach Alpha
	Safety	7	1.9	0.4	0 - 3.2	0.727
	Collaboration	5	2.8	0.7	0 - 4	0.629
	Morale	4	2.9	0.7	0 - 4	0.845
	Informal Communication about Safety	4	3.4	0.6	0 - 4	0.691
	Workload	4	1.8	0.6	0.5 - 4	0.587
Climate	Informal Communication	3	2	0.3	0 - 3.3	0.491
	Management	6	3	0.7	0 - 4	0.836
	Formal Communication	6	3	0.7	0 - 4	0.848
	Reporting Process	4	3.2	0.7	0 - 4	0.821
	Medical Reconciliation Process	3	3.1	0.7	0 - 4	0.718
Culture	"Just culture"	1	3.1	1	0 - 4	*
Temporal Affect	Feelings about Safety - causal beliefs	5	3.2	0.6	0 - 4	0.583
Moral Exemplarism		20	2.8	0.2	0 - 3.3	*
	Personal	2	0.9	0.6	0 - 2	*
	Clinic	3	2	0.9	0 - 4	0.887
	Adverse Events	1	2.1	1.1	0 - 4	*
	Near Misses	1	2	0.9	0 - 4	*
	Accidents Waiting to Happen	1	2	0.9	0 - 4	*
Error	Medical Errors	2	2.1	1	0 - 4	*

*Alphas not reported for single item or counts as neither have a reportable alpha

Bivariate Analysis - Relating Outcomes to Demographics and Scales

Following the scale score calculation and univariate distributions, associations between demographic variables and the main outcomes of error frequency (personal, clinic, adverse events, near misses, accidents waiting to happen and medical errors) were examined through the bivariate analyses. The relationships between the outcome items and the scale scores were tested first in a simple unadjusted correlation. Correlations were

calculated for continuous variables and one-way ANOVA were used for categorical demographic variables. This analysis was to evaluate the R^2 between outcomes and basic socio-demographic characteristics (tables 5.5, 5.6, 5.7, and 5.8).

Table 5.5 Continuous Demographic Variables with Error Testing

Demographic Continuous Variables	Mean	Personal Error PCC	Clinic Error PCC	Adverse Event PCC	Near Miss PCC	Accidents Waiting to Happen PCC	Medical Errors PCC
Respondent Age	50.9	0.02	-0.03	-0.04	-0.02	-0.01	-0.04
Years of Experience	10.9	0.05	0.07*	0.06	0.06*	0.09**	0.06*
Years at Clinic	6.5	0.00	0.09**	0.08**	0.06*	0.09**	0.08**

PCC (Pearson Correlation Coefficients) values with significant p-values are denoted:
*** p-values <.001 ** p-values <.01 * p-values <.05

Table 5.6 Categorical Demographic Variables with Error Testing

Demographic Categorical Variables (>2 categories)	Personal Error F	Clinic Error F	Adverse Event F	Near Miss F	Accidents Waiting to Happen F	Medical Errors F
Management Job Role	0.3	2.64*	2.36	2.25	2.65	2.39
FT	0.06	0.06	0.33	0.23	0.57	0.01
Clinical Setting	3.09***	4.97***	5.53***	3.95***	2.89**	5.46***
Specialty	0.4	1.09	0.84	1.36	0.71	1.19
Race	1.21	3.22*	4.24**	1.83	2	3.5*
F - All categorical with dependent variables	1.44	2.93***	3.25***	2.35**	1.96**	3.13***

F values with significant p-values are denoted:
*** p-values <.001 ** p-values <.01 * p-values <.05

Table 5.7 Categorical Demographic Variables Mean Values by Dependent Variable

	Means					
	Personal Error	Clinic Error	Adverse Event	Near Miss	Accidents Waiting to Happen	Medical Errors
Q1A Clinical Setting						
Clinic Setting	0.0	0.0	0.0	0.0	0.0	0.0
Single Specialty Clinic	0.9	1.9	1.9	1.9	1.9	1.9
Multi-Specialty Clinic	0.9	2.0	2.1	2.0	2.0	2.1
Nursing Home	1.1	2.4	2.5	2.3	2.3	2.4
Retail Clinic	0.7	1.6	1.5	1.6	1.7	1.6
Worksite Clinic	1.2	2.3	2.3	2.4	2.2	2.3
Hospital	0.9	2.2	2.3	2.2	2.1	2.2
Home Health Care	0.8	1.9	1.7	2.0	2.1	1.9
School Clinic	0.7	1.8	1.8	1.8	1.9	1.8
Other	1.0	2.2	2.2	2.2	2.1	2.2
Q31 Management Job Role						
Missing	0.9	1.7	1.8	1.7	1.7	1.7
Business Office/ Administration	0.7	1.8	1.5	1.9	1.9	1.7
Care Delivery	0.9	2.1	2.2	2.1	2.1	2.1
Both business office and care delivery	0.9	2.1	2.1	2.1	2.1	2.1
Neither business office nor care delivery	0.9	2.0	2.1	2.0	1.9	2.0
Q32A Specialty						
Missing	1.0	1.8	1.9	1.8	1.8	1.8
Primary Care	0.9	2.0	2.1	2.0	2.0	2.1
Family Medicine	0.8	1.9	2.0	1.8	1.9	1.9
Internal Medicine	0.9	2.1	2.3	2.1	2.0	2.2
Pediatrics	0.9	2.1	2.1	2.0	2.1	2.1
Obstetrics and Gynecology	0.9	2.1	2.2	2.0	2.1	2.1
Specialty Care	0.9	2.1	2.1	2.0	2.0	2.1
Q36 FT						
Missing	1.0	1.9	2.0	2.1	1.8	2.0
Full Time	0.9	2.0	2.1	2.0	2.0	2.0
Part Time	0.9	2.0	2.2	2.0	2.0	2.1
PRN or On Call	0.9	2.1	2.1	2.0	2.1	2.1
Q39 Race						
Missing	0.8	1.6	1.4	1.6	1.7	1.5
White	0.9	2.1	2.1	2.0	2.0	2.1
Black or African American	0.7	2.1	2.1	2.1	2.0	2.1
Asian	0.6	2.4	2.4	2.3	2.5	2.3
Native Hawaiian or Other Pacific Islander	N/A	N/A	N/A	N/A	N/A	N/A
American Indian or Alaskan Native	0.6	1.6	1.5	1.7	1.7	1.6

Table 5.8 Dichotomous Demographic Variables Mean Values by Dependent Variable

Demographic	Personal Error		Clinic Error		Adverse Event		Near Miss		Accidents Waiting to Happen		Medical Errors	
Dichotomous Variables ***	**Mean**	**F**	**Mean**	**F**	**Mean**	**F**	**Mean**	**F**	**Mean**	**F**	**Mean**	**F**
Male	1.15		2.26		2.42		2.13		2.23		2.28	
Female	0.89	1.16	2.4	1.05	2.11	1.00	2.01	1.19	2.06	1.09	2.06	1.09
Direct Patient Care	0.86		2.04		2.04		2.00		2.01		2.05	
No Direct Patient Care	1.13	3.10	1.93	5.26**	1.38	2.34	1.90	1.66	1.90	5.26	1.95	2.14
NP	0.89		2.02		2.03		2.09		1.99		1.99	
CNM	0.98	1.15	2.19	1.29	2.20	1.16	2.27	1.06	2.14	1.28	2.15	1.30
Ethnicity - Hispanic or Latino	0.70		1.87		1.84		1.84		1.92		1.84	
Ethnicity - Not Hispanic or Latino	0.90	1.19	2.05	1.32	2.12	1.48	2.01	1.22	2.02	1.19	2.07	1.34

Due to lack of normality in responses, the Cochran variance t-test was utilized as the variances are not expected to be equal. F values with significant p-values are denoted:
*** p-values <.001
** p-values <.01
* p-values <.05

The analysis of the basic socio-demographic characteristics of the respondents along with the characteristics of the clinic were undertaken to increase the understanding of the effects of these variables with error types independent of the effects of climate, culture and temporal affect. While the instrument was developed to allow for use with a clinic's full staff including those with and without direct patient care. This data did not include enough respondents without patient care (n= 8) to include in the analysis. Furthermore, the respondents who self identified as a race other than white or an ethnicity other than non-Hispanic were so few in number that those variables were recoded to a single dichotomous variable of either white, non-Hispanic or all others. As Tables 5.5, 5.6, 5.7and 5.8 demonstrate, for the personal error model, management, clinical setting and race were significant when no scale scores were tested. For all types of clinic error models (clinic error, adverse events, near misses, accidents waiting to happen, medical

errors) without any scales included, the clinical setting and number of years a respondent had practiced within their clinic were significant. The respondent's overall years of experience within their specialty regardless of their clinic affiliation was significant for clinic error, near misses, accidents waiting to happen and medical errors. Race was significant for the clinic error, adverse events and medical errors. Having a job role that included management responsibilities was significantly correlated with clinic error.

The correlation of each of the 13 factors with the two error factors was separately examined in SAS utilizing PROC CORR. The Pearson correlation matrices were used to determine the correlation of the scales with reported errors. Table 5.9 includes the results of a subsequent correlation test of the unadjusted relationship between the climate, culture, temporal affect, moral exemplarism and each of the outcome score models (clinic and personal). Without the inclusion of the demographic variables, safety climate alone was positively correlated with personal error. Scales for culture (just culture, formal communication, management and reporting process) as well as climate – informal communication about safety were positively correlated for clinic errors without the inclusion of demographic variables.

Table 5.9 Scale with Outcomes Correlations

Latent Variable		Personal Errors	Clinic Errors	Adverse Event	Near Miss	Accidents Waiting to Happen	Medical Errors
Dimension	**Scales**	**Correlation Coefficient**					
Climate	Safety	0.18 ***	0.07 *	0.01	0.03	0.03	0.09 **
	Collaboration	0.00	0.09 **	-0.04	0.09 **	0.10 **	0.08 *
	Morale	-0.07 *	0.06 *	-0.06 *	0.07 *	0.08 **	0.05
	Informal Communication about Safety	0.00	0.13 ***	0.00	0.14 ***	0.13 ***	0.12 ***
	Workload	0.04	0.02	0.05	-0.01	-0.01	0.03
	Informal Communication	-0.01	0.02	0.09 **	0.01	0.01	0.02
Culture	Management	-0.06	0.12 ***	0.07 *	0.13 ***	0.14 ***	0.10 **
	Formal Communication	-0.07 *	0.13 ***	0.14 ***	0.23 ***	0.23 ***	0.19 ***
	Reporting Process	-0.07 *	0.23 ***	0.13 ***	0.25 ***	0.25 ***	0.20 ***
	Medical Reconciliation Process	-0.09 **	0.03	0.00	0.03	0.06 *	0.02
	"just culture"	-0.02	0.16 ***	0.11 **	0.16 ***	0.15 ***	0.15 ***
Temporal Affect	Feelings about Safety - Casual Beliefs	-0.05	0.03	-0.02	0.03	0.02	0.04
Moral Exemplarism		-0.03	-0.03	-0.02	-0.03	-0.04	-0.03

Per table 5.9 personal errors when examined independently of the socio-demographics are correlated with the safety climate, climate - morale, culture - formal communication, culture - error reporting process, and culture – medication reconciliation process. For the clinic errors, adverse events, near misses, accidents waiting to happen and medical errors, culture scales: formal communication, error reporting process and just culture are significantly correlated with these errors. Safety climate per this analysis is correlated with clinic errors and medical errors. Climate – collaboration is correlated with all types of clinic error except adverse events. Climate – morale is correlated with clinic errors, adverse events, near misses and accidents waiting to happen, but not with medical errors. Climate – informal communication about safety is significantly correlated with clinic errors, near misses, accidents waiting to happen and medical errors, but not with adverse events; interestingly adverse events are the singular type of error correlated

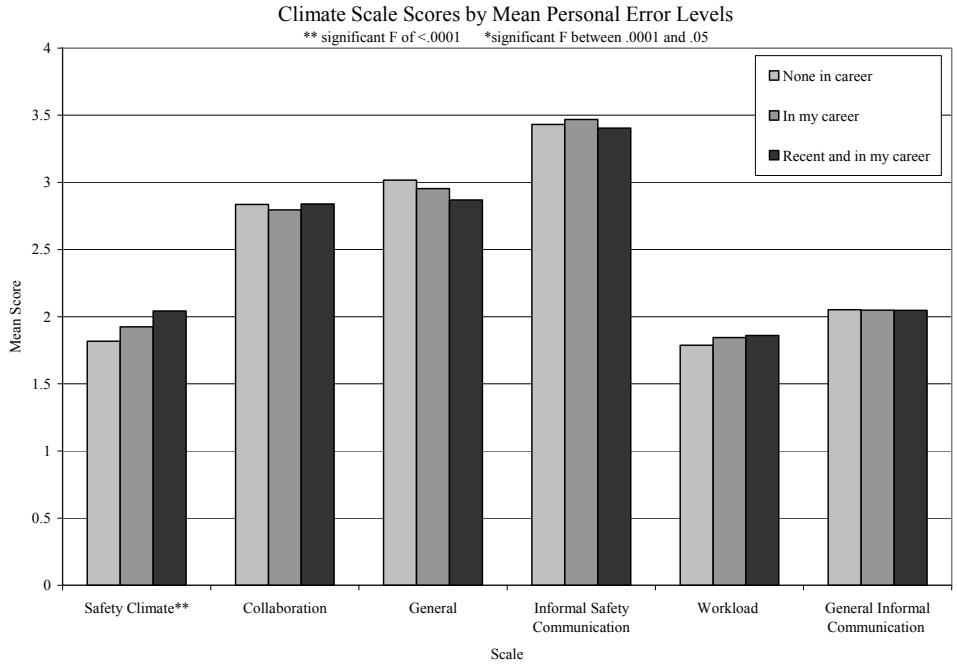
with climate – general informal communication. Besides being correlated with personal error, culture – medication reconciliation is correlated with accidents waiting to happen.

These analyses allow us to understand the simple correlations of error by types with socio-demographic characteristics and scale scores prior to delving into the complexities of the multi-variate analyses. Concurrent with the bivariate analysis presented in this chapter, was an analysis of summed scores for the multi-scaled dimensions of climate and culture. These summed scores for climate and culture were calculated from the mean values of the climate and culture scales, resulting in an overall climate and an overall culture (summed dimension) score. A decision was made to include the individual scale scores rather than the summed dimension level scores. Retention of the scale scores rather than the summed dimension level scores allowed for a more detailed explanation of the significant correlates within the final models.

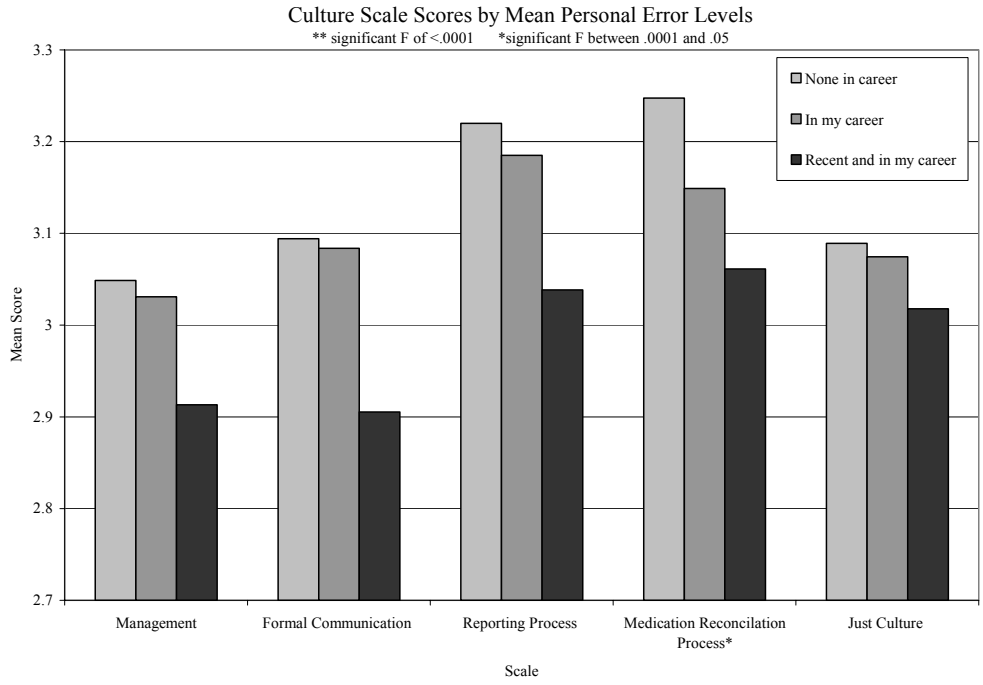
Personal Error Bivariate Analysis

Each of the scales was analyzed with the personal error levels (none in career, in my career and recent and in my career). Recent errors were those occurring in the past six months. The scale that had a significant F value between .0001 and .05 was: medication reconciliation process. The scale that had a significant F value < .0001 was: safety climate. Graphs 5.10, 5.11, and 5.12 include the results of the bivariate analysis.

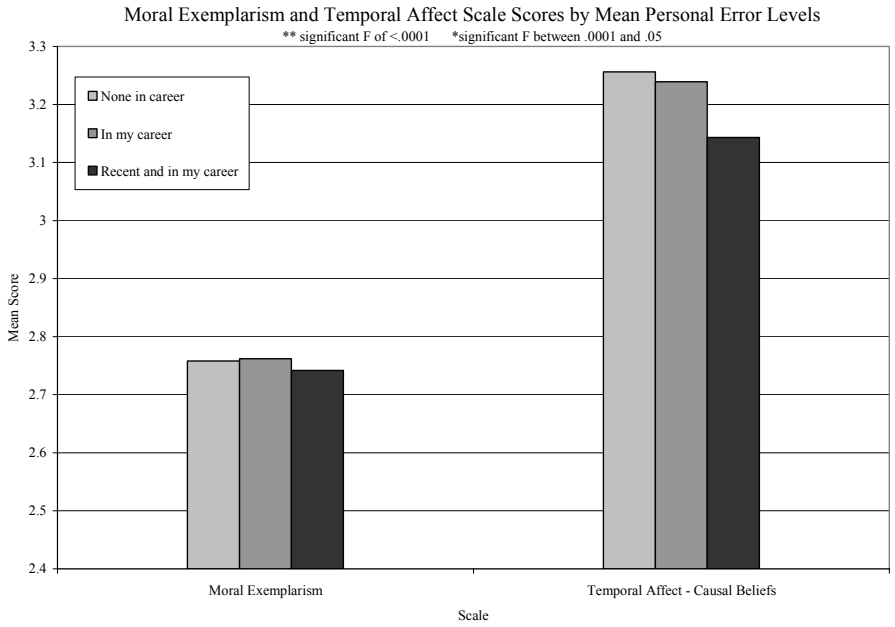
Graph 5.10 Personal Error Bivariate Analysis Climate Scales



Graph 5.11 Personal Error Bivariate Analysis Culture Scales



Graph 5.12 Personal Error Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales



Per the bivariate analysis, the scales for safety climate and medication reconciliation processes are significantly related to personal error. From the socio-demographic analysis we also know that clinical setting is significantly related to personal error when analyzed in isolation from the scales scores.

A Note to the Reader

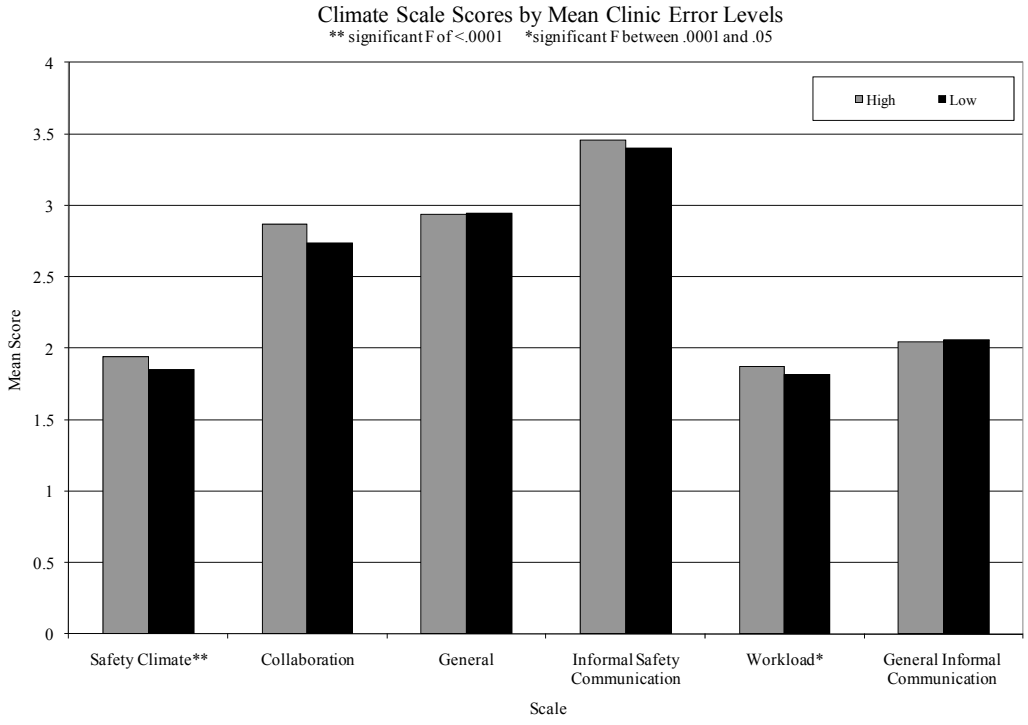
Turning from the personal error bivariate work, to the clinic error types (clinic error, adverse events, near misses, accidents waiting to happen and medical errors) we move from a three level index score to a continuous score ranging from 0 - 4 For ease of display, clinic error, adverse events, near misses, accidents waiting to happen and

medical error responses for the bivariate analysis were split into high (2 or greater) and low (less than two) in the following displays of the bivariate analysis.

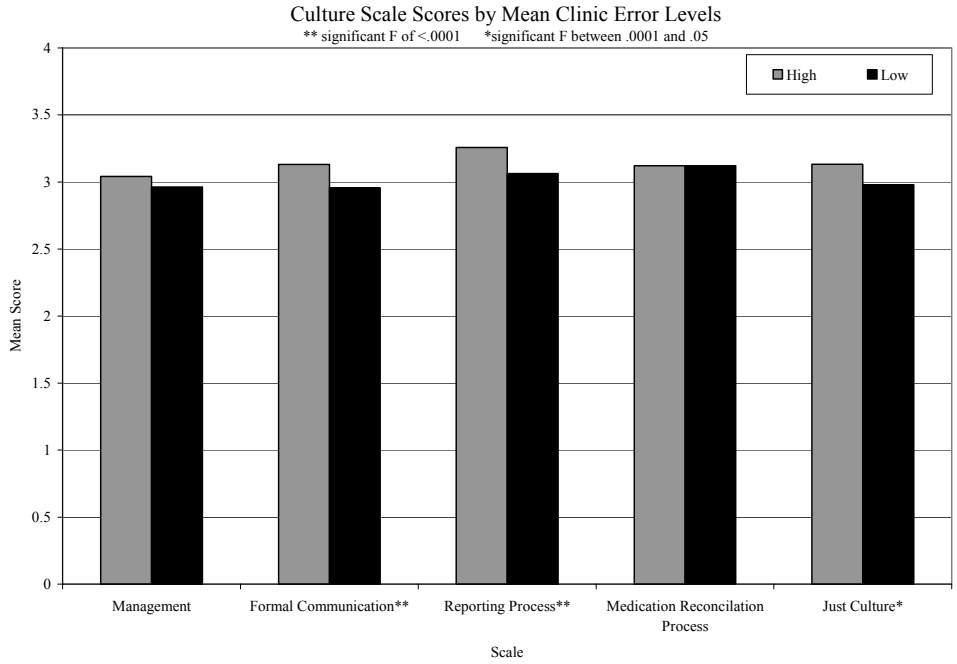
Clinic Error Bivariate Analysis

Each of the scales was analyzed with the clinic error levels. The scale that had a significant F value between .0001 and .05 were: just culture and workload. The scales that had significant F values of <.0001 were: safety climate, culture formal communication, and reporting process. Graphs 5.13, 5.14 and 5.15 include the results of the bivariate analysis.

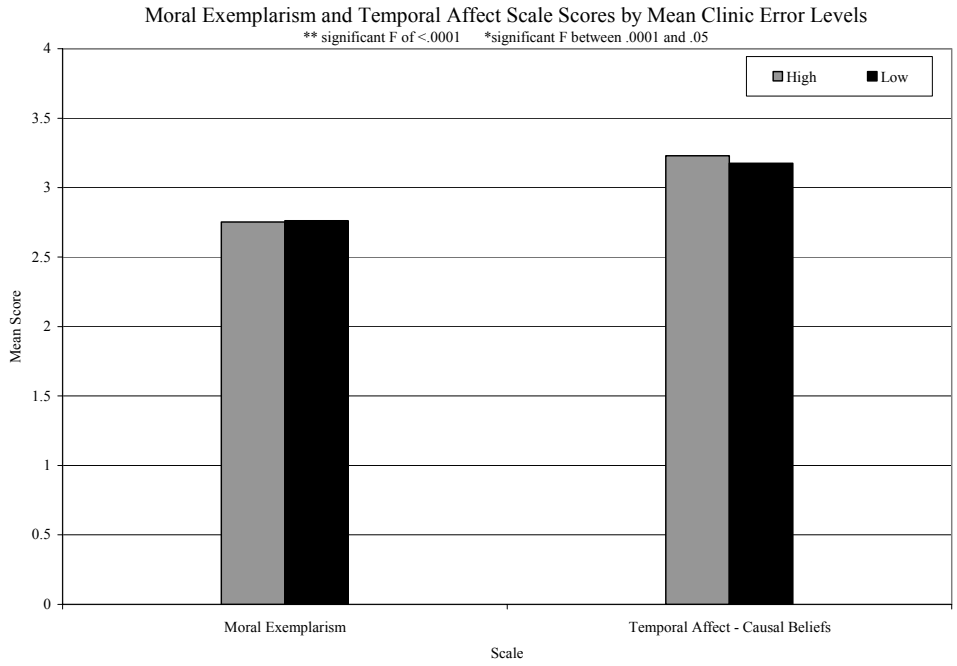
Graph 5.13 Clinic Error Bivariate Analysis Climate Scales



Graph 5.14 Clinic Error Bivariate Analysis Culture Scales



Graph 5.15 Clinic Error Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales

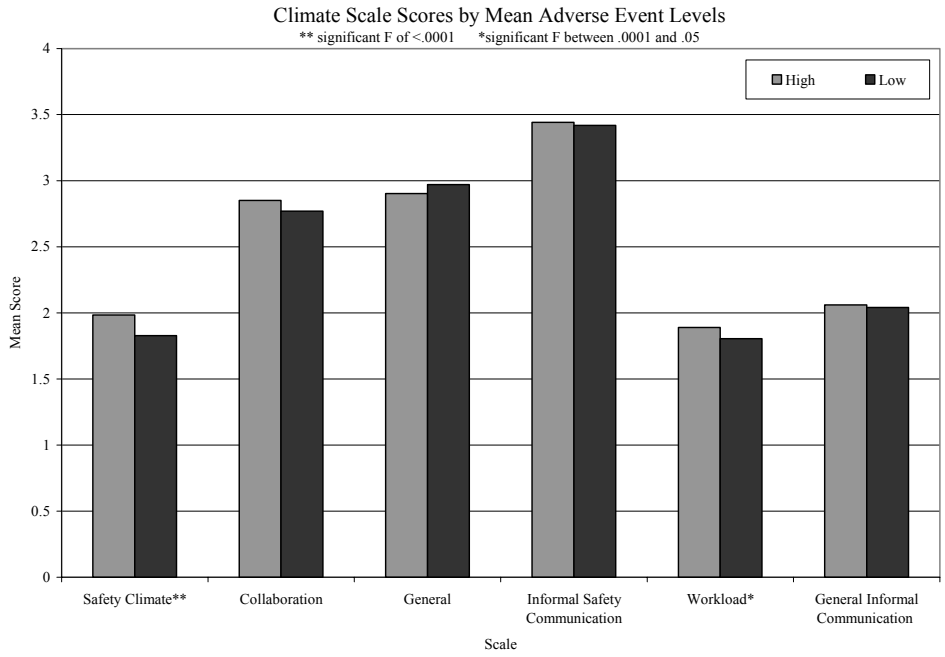


Per the bivariate analysis, the scales for safety climate, climate – workload, culture – formal communication, culture - error reporting process, and just culture are significantly related to clinic error (aggregate of adverse events, near misses and accidents waiting to happen). From the socio-demographic analysis we also know that clinic error is significantly related to having direct patient care, clinic setting, having a management role, years of experience within the clinic and within your specialty when analyzed in isolation from the scales scores. In order to better understand the individual components of clinic error, each of the individual variations of the error classification and scores is included.

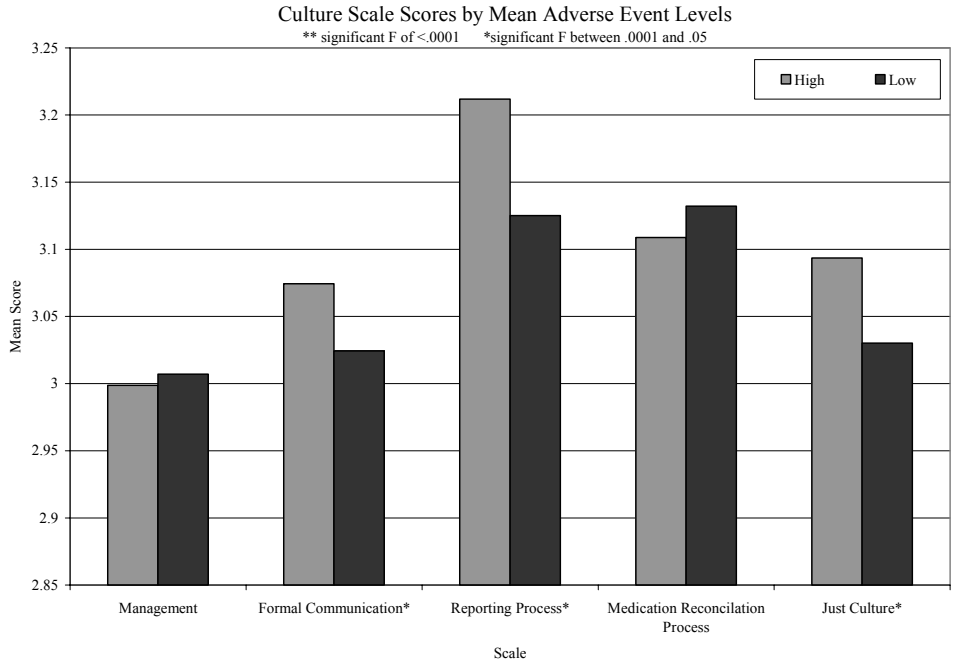
Adverse Event Bivariate Analysis

Adverse events are those errors that cause injury or harm to patients. Each of the scales was analyzed with the adverse event levels. The scales that had significant F values between .0001 and .05 were: workload, culture formal communication, reporting process, and just culture. The scale that had a significant F value < .0001 was: safety climate. Graphs 5.16, 5.17 and 5.18 include the results of the bivariate analysis.

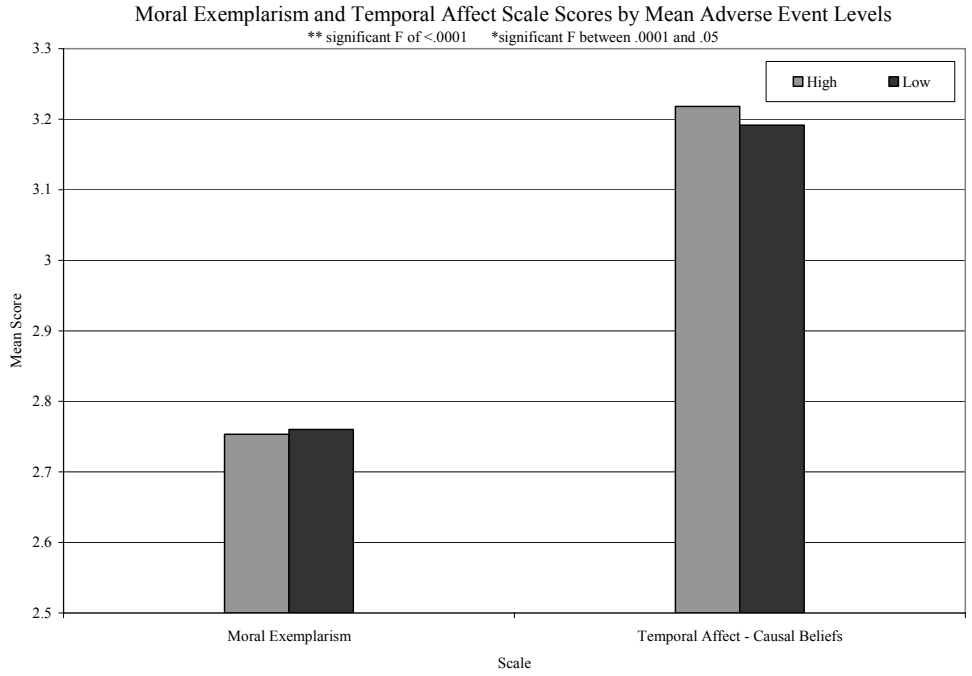
Graph 5.16 Adverse Event Bivariate Analysis Climate Scales



Graph 5.17 Adverse Event Bivariate Analysis Culture Scales



Graph 5.18 Adverse Event Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales



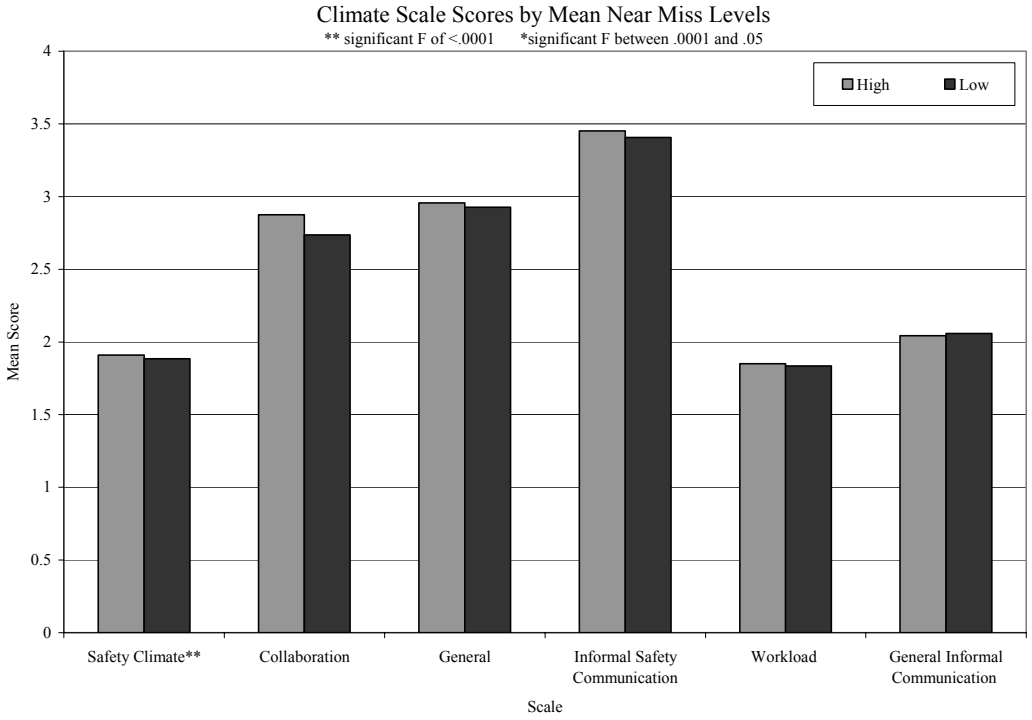
Per the bivariate analysis, the scales for safety climate, climate – workload, culture – formal communication, culture - error reporting process, and just culture are significantly related to adverse events. From the socio-demographic analysis we also know that adverse events are significantly related to having clinic setting, years of experience within the clinic and race when analyzed in isolation from the scales scores.

Near Miss Bivariate Analysis

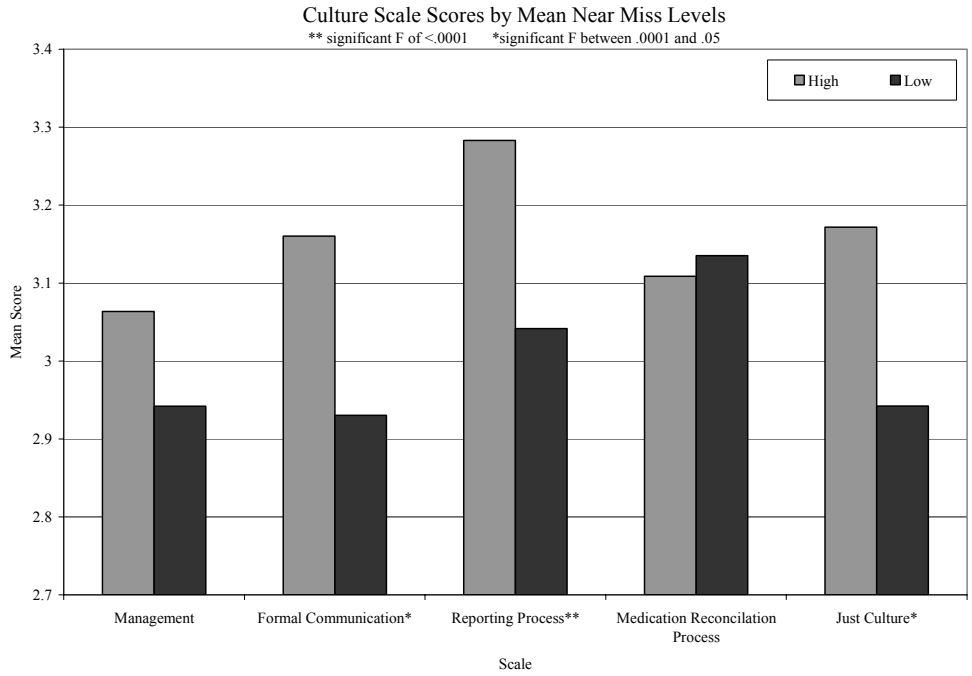
Near misses are those clinic errors that are caught before they reach the patient; thus unlike the adverse events, they do not result in patient harm or injury. Each of the

scales was analyzed with the near miss levels. The scales that had significant F values between .0001 and .05 were: culture formal communication and just culture. The scales that had significant F values of < .0001 were: safety climate and reporting process. Graphs 5.19, 5.20 and 5.21 include the results of the bivariate analysis.

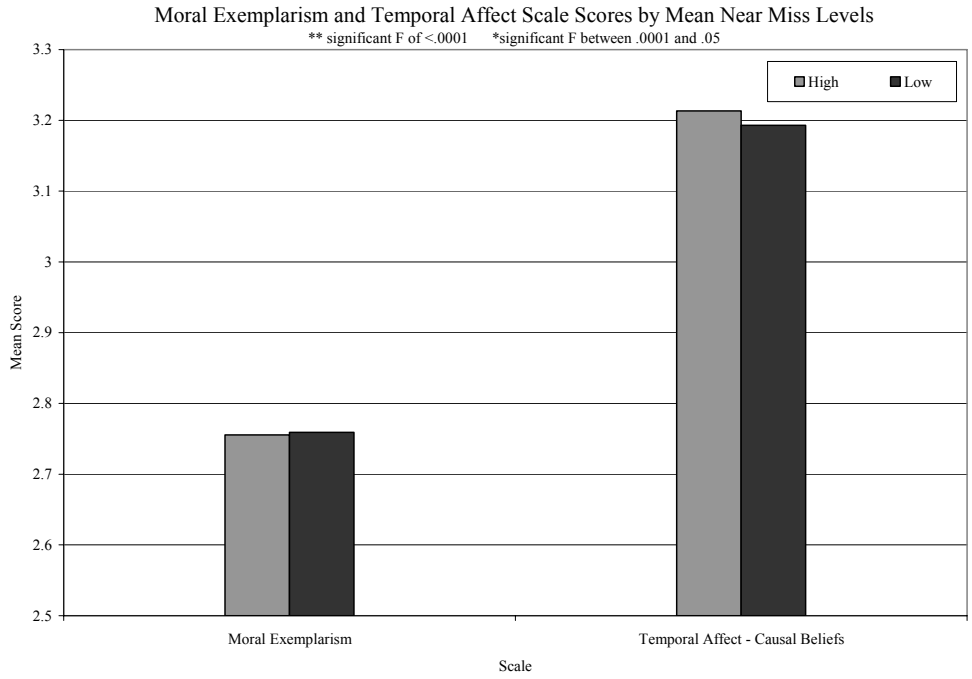
Graph 5.19 Near Miss Bivariate Analysis Climate Scales



Graph 5.20 Near Miss Bivariate Analysis Culture Scales



Graph 5.21 Near Miss Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales

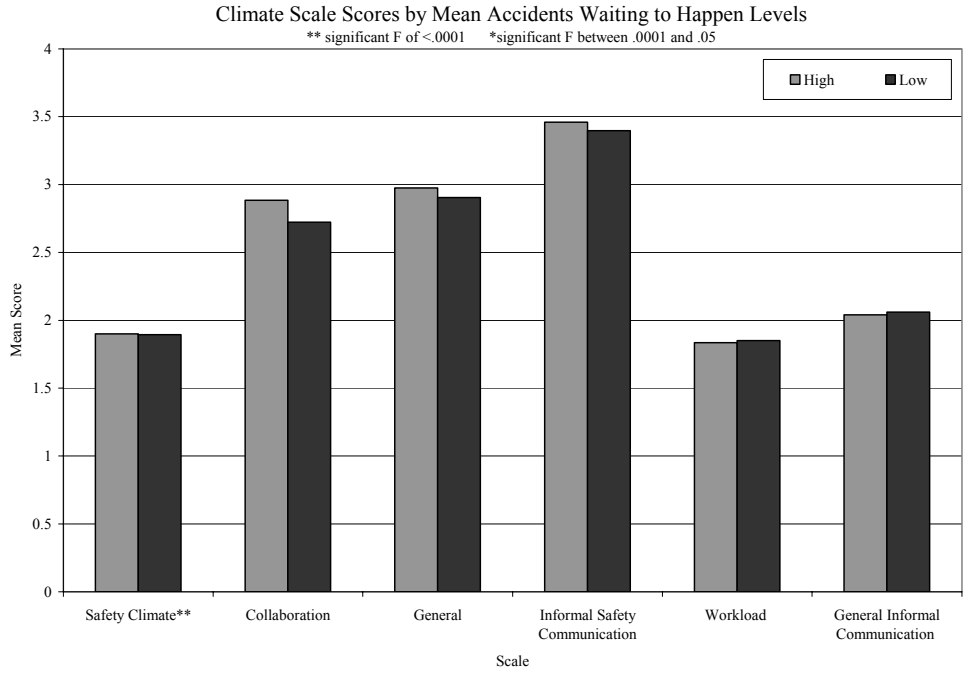


Per the bivariate analysis, the scales for safety climate, culture – formal communication, culture - error reporting process, and just culture are significantly related to near misses. From the socio-demographic analysis we also know that near misses are significantly related to having clinic setting, years of experience within the clinic and within your specialty when analyzed in isolation from the scales scores.

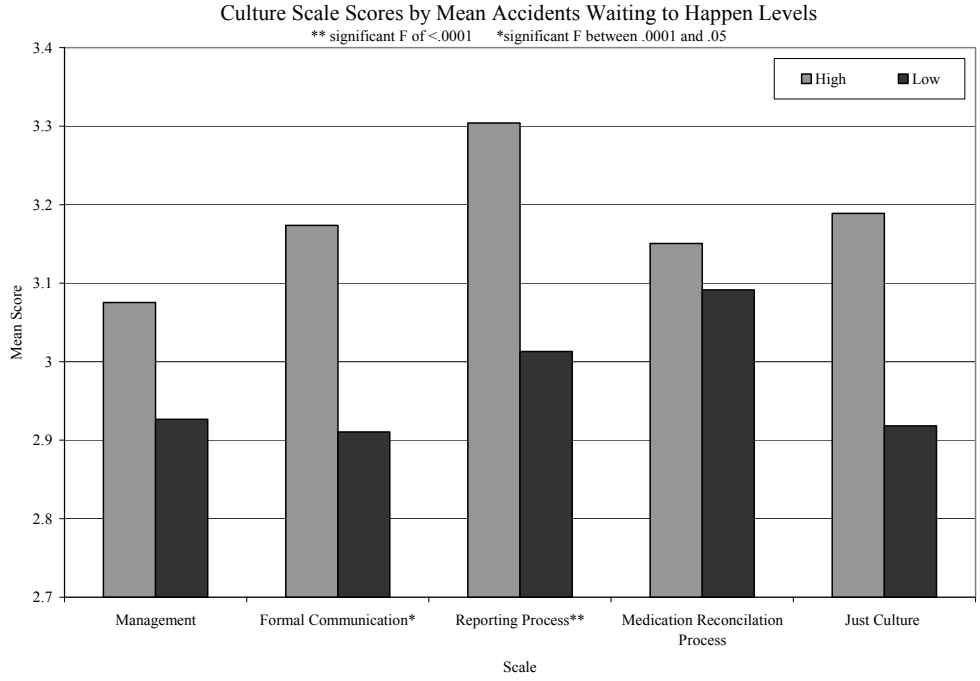
Accidents Waiting to Happen Bivariate Analysis

Accidents waiting to happen are potential errors that have yet to occur, but have a high potential for occurring. Each of the scales was analyzed with the accidents waiting to happen levels. The scale that had a significant F value between .0001 and .05 was: culture formal communication. The scales that had significant F values of <.0001 were: safety climate and reporting process. Graphs 5.22, 5.23 and 5.24 include the results of the bivariate analysis.

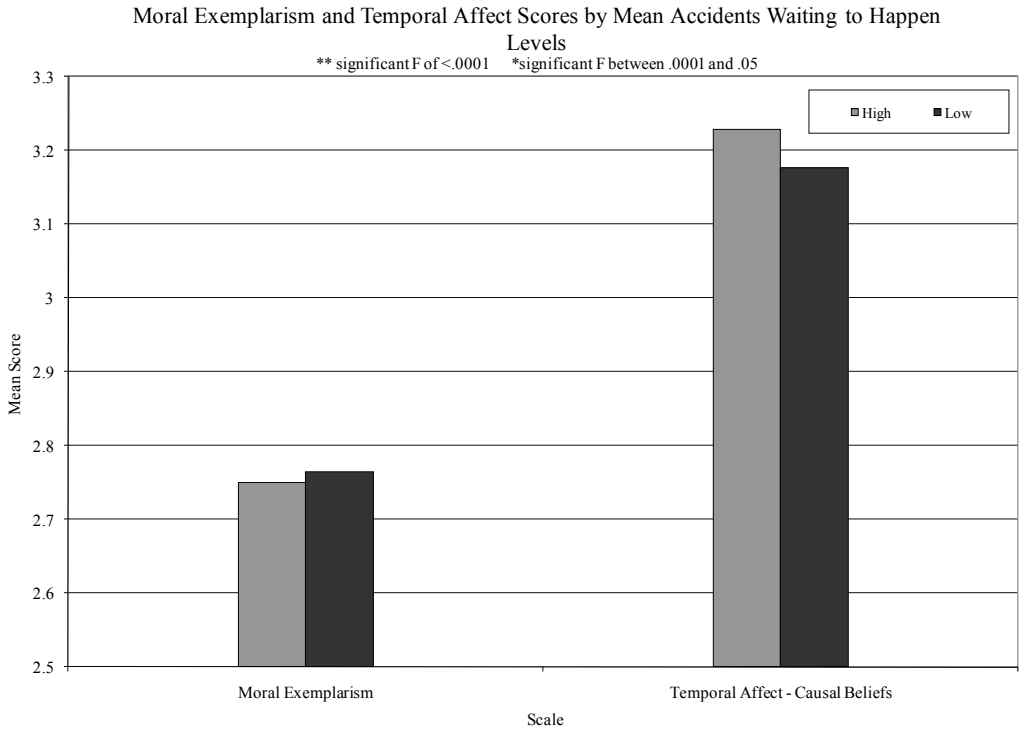
Graph 5.22 Accidents Waiting to Happen Bivariate Analysis Climate Scales



Graph 5.23 Accidents Waiting to Happen Bivariate Analysis Culture Scales



Graph 5.24 Accidents Waiting to Happen Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales

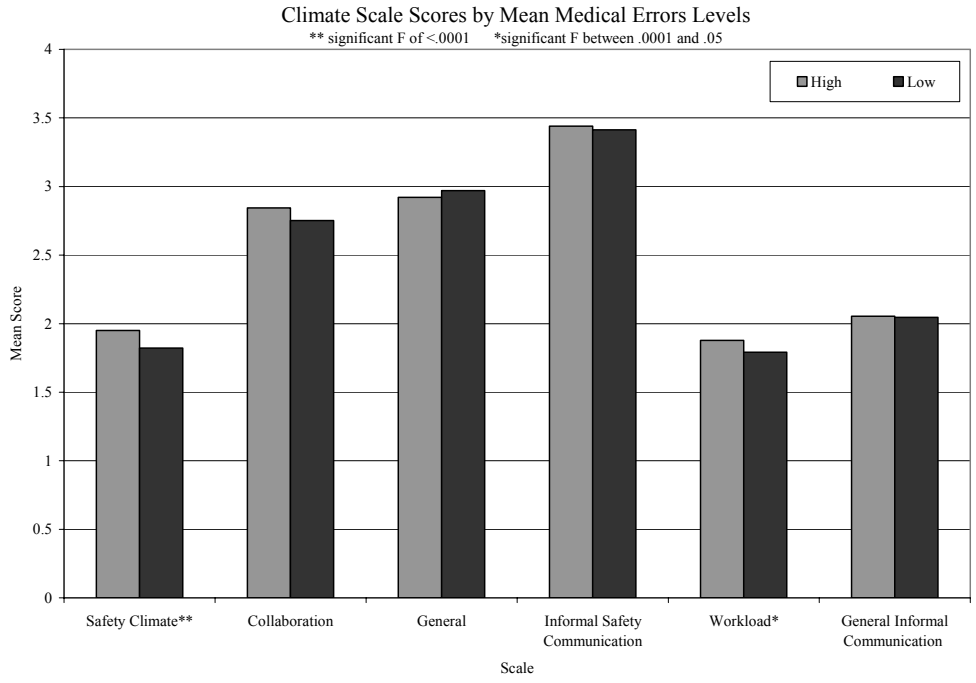


Per the bivariate analysis, the scales for safety climate, culture – formal communication and culture - error reporting process are significantly related to accidents waiting to happen. From the socio-demographic analysis we also know that accidents waiting to happen are significantly related to clinic setting, years of experience within the clinic and within your specialty when analyzed in isolation from the scales scores.

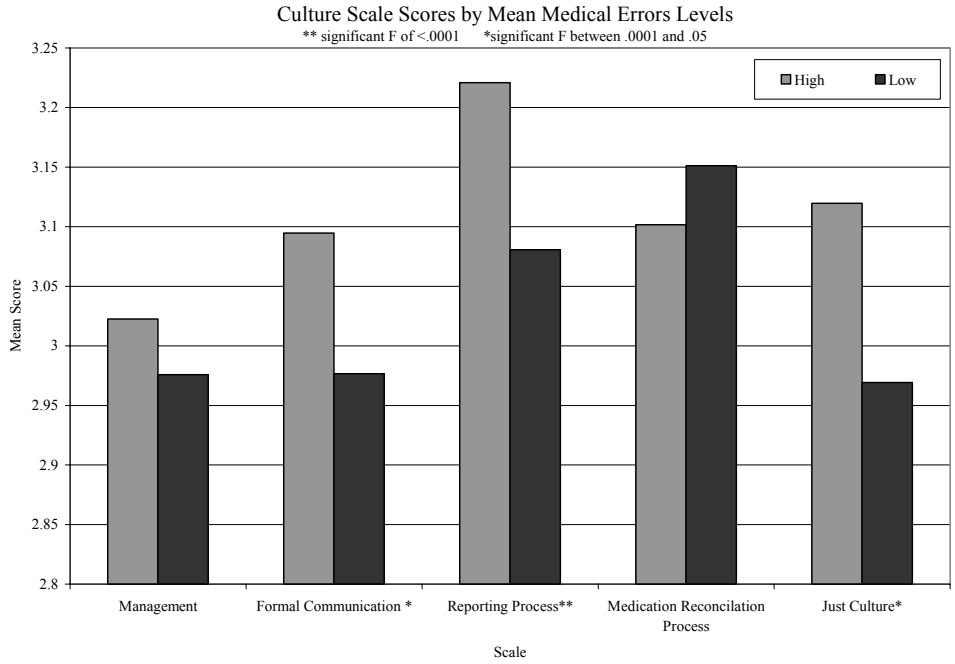
Medical Error Bivariate Analysis

Medical error combines the frequency of adverse events and near misses within the clinic. Removal of accidents waiting to happen from the clinic scale score to arrive at this score, removes the protest of providers saying that accidents waiting to happen are not errors. Each of the scales was analyzed with the medical error levels. The scales that had significant F values between .0001 and .05 were: workload, culture formal communication, and just culture. The scale that had significant F values of < .0001 were: safety climate and reporting process. Graphs 5.25, 5.26 and 5.27 include the results of the bivariate analysis.

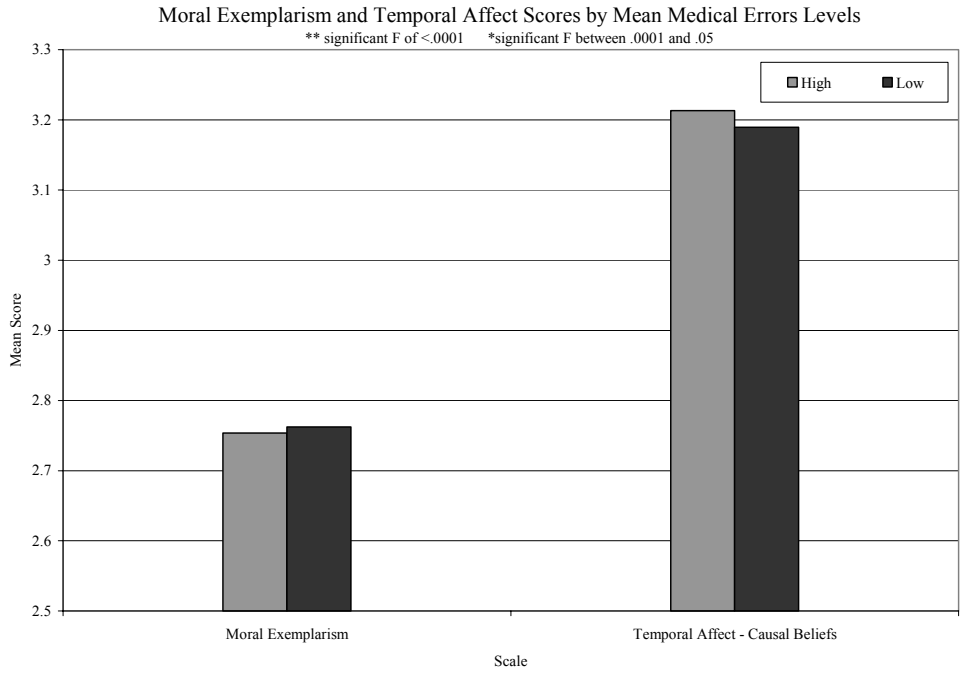
Graph 5.25 Medical Error Bivariate Analysis Climate Scales



Graph 5.26 Medical Error Bivariate Analysis Culture Scales



Graph 5.27 Medical Error Bivariate Analysis Moral Exemplarism and Temporal Affect – Causal Beliefs Scales



Per the bivariate analysis, the scales for safety climate, climate – workload, culture – formal communication, culture - error reporting process, and just culture are significantly related to medical error (aggregate of adverse events and near misses). From the socio-demographic analysis we also know that medical error is significantly related to clinic setting, years of experience within the clinic and within your specialty when analyzed in isolation from the scales scores.

Just as the univariate analysis assisted in understanding the independent variable relationships with the dependent variable; the bivariate analysis deepens the understanding of the relationships between the dependent and independent variables. While the bivariate analyses are a helpful step prior to the multivariate analysis; highlighting the scales which may be significant within the full models once the demographic and scale independent variables are combined, further analysis is necessary.

For none of the error types (personal error, clinic error, adverse events, near misses, accidents waiting to happen, and medical errors) were the socio-demographic characteristics of full time employment, respondent age, respondent specialty, gender, NP/CNM or ethnicity significant. None of the following scales climate – general, climate – general informal communication, culture – management, temporal affect- casual beliefs or moral exemplar were significant for any type of error in the bivariate analysis.

Chapter VI – Results

Following the univariate and bivariate analysis (chapter 5), the multivariate analysis was undertaken to achieve research aim two – determining the effects of clinic climate, temporal affect and moral exemplarism on patient care errors. All levels of analysis detailed within chapters five and six include aggregations of errors as well as single scales for specific patient care errors. As has been previously discussed, there remains heated conversation amongst health care providers and researchers as to what truly constitutes and error. To allow for a greater understanding of the nature of error as defined by the study population, item 21 was added. This item assumes that the providers had the knowledge and the rights to self define error, regardless of the specification by researchers.

Item 21 - Most common types of error in their clinic

Item 21 requested that the provider choose either a listed error or fill in their own text answer to the question: What is the most common type of patient care error in your clinic? Table 6.1 includes the responses of the most common errors. The top three most common errors relate to missed communication of results (lab, radiology, etc.) to providers as well as to patients (44%) and medication errors (20%). Medication errors cited specifically by providers included wrong dosage, wrong medication, missed interactions, missed medication reconciliation and missed refills.

Table 6.1 Most Common Clinic Error

Reported Error Categories	# of Responses	% of Total
Test results not communicated to patient	**317**	**27%**
Medication errors (dosage & wrong medication)	**240**	**20%**
Lab results not returned to ordering provider or shared with patients	**197**	**17%**
Missing	100	8%
Don't know	67	6%
Missed Diagnoses	**66**	**6%**
Radiology reports not returned to ordering provider	**56**	**5%**
Communication (between providers and patients)	30	3%
Incorrect Diagnosis	**27**	**2%**
Paperwork/ EMR (incorrect, misplaced)	22	2%
Appointment failure - not scheduled or incorrect timing	20	2%
Missed Care Protocols	14	1%
Patient errors with medications	9	1%
Incorrect/ Missed Treatment	7	1%
None	7	1%
All Above	4	0.3%
Needle sticks	2	0.2%
Resources not available	2	0.2%
Other	2	0.2%

Bolded Errors were those available with check boxes, all others were free form text

The responses to this item vary in how they would be categorized within the dependent variables utilized in this research. Missed communication of results to patients or providers could reasonably be termed as adverse events or accidents waiting to happen. Irregardless of the consequences to the patient (harm or not) and the terminology attached to describe the event, these missed communications are seen by providers as errors. Medication errors are commonly discussed within the patient safety literature and are less controversial for the most part; most providers and researchers do not balk at the

term medical error when medications issues arise such as wrong dosage, wrong medication, and drug interactions. The controversy arises with the specific case of medication reconciliation and missed refills, some providers feel that (per the cognitive interviews) that they are not at fault for these patient driven issues.

Model Comparisons

Following the bivariate analysis, multivariate analysis was undertaken for all the dependent variable error models: personal error, clinic error, adverse events, near misses, accidents waiting to happen and medical error. Complete detail for the individual models including explanations of both the full models including all independent variables, as well as the reduced models including only those independent variables with a significance level between <.0001 and <.05 follows the condensed results table 6.2 on pages 103 -128, figures 6.3 – 6.21.

For ease of comparisons of the full and reduced models across the various aggregations of errors table 6.2 was created. Upon examination of the table several trends are noted. The full models all show significant correlations between the clinic setting and error of all types, while none of the reduced models included setting. For all variations of the clinic error models cultural scales (formal communication about safety, reporting process, and just culture) as well as safety climate were significant. Gender was significant with all types of error with the exception of near misses.

Table 6.2 Model Comparisons

			Statistically Significant Values													
			Personal Error		Clinic Error		Adverse Event		Near Miss		Accidents Waiting to Happen		Medical Errors	
Scale	Parameter	Item	Full Model	Fit Model	Full Model	Fit Model	Full Model	Fit Model	Full Model	Fit Model	Full Model	Fit Model	Full Model	Fit Model
	Intercept			1.15 ***										
Setting	Hospital clinic	1A▲	0.01		0.17		0.25		0.12		0.13		0.19	
	Multi spec clinic	1A▲	0.01		0.09		0.15		0.06		0.06		0.11	
	Nursing home	1A▲	0.23		0.46		0.59		0.37		0.42		0.48	
	Other	1A▲	0.15 **		0.19 **		0.22 **		0.21 *		0.14 *		0.21 **	
	Retail clinic	1A▲	-0.19		-0.22		-0.30		-0.21		-0.14		-0.26	
	School clinic	1A▲	-0.21		-0.15		-0.19		-0.16		-0.10		-0.18	
	Single spec clinic	1A▲	0.00		0.00		0.00		0.00		0.00		0.00	
Mgmt. Role	Business Office/ Administration	31▲												
	Care Delivery	31▲												
	Both Bus. Office & Care Delivery	31▲												
	Neither Bus. Office nor Care Del.	31▲												
Specialty	Primary Care	32A▲												-0.05
	Family Medicine	32A▲												-0.23
	Internal Medicine	32A▲												0.13 *
	Pediatrics	32A▲												-0.01
	Obstetrics and Gynecology	32A▲												0.04
	Specialty Care	32A▲												0.00
Demographics	Full Time	36▲												
	Part Time	36▲												
	PRN or On Call	36▲												
	Years in current clinic position	34A				0.01 *		0.01 **				0.01 *		0.01 *
	Years in current specialty	35		0.01 *										
	Years of age	age												
	License (NP)	30D												
	Gender (Female)	37	-0.32 **	-0.32 **	-0.35 *	-0.31 *	-0.47 *				-0.33 *	-0.31 *	-0.36 *	-0.32 *
	Race/ethnicity (white non-Hispanic)	DRACE	-0.26 *	-0.24 *	-0.27 *		-0.42 *	-0.41 *					-0.30 *	
Culture	Management	sc1												
	Formal Comm. about Safety	sc2			0.19 **	0.19 ***	0.21 **	0.20 **	0.19 **	0.22 ***	0.17 **	0.19 ***	0.20 **	0.19 ***
	Reporting Process	sc4			0.22 ***	0.22 ***	0.15 *	0.16 **	0.26 ***	0.25 ***	0.26 ***	0.26 ***	0.20 ***	0.21 ***
	Medical Reconciliation Process	sc9	-0.07 *	-0.07 *										
	"Just culture"	sc14			0.07 *	0.07 *	0.04 *	0.07 *	0.07 *	0.07 *	0.07 *	0.06 *	0.08 *	0.07 *
Climate	Safety	sc3	0.29 ***	0.28 ***	0.38 ***	0.39 ***	0.09 ***	0.53 ***	0.32 ***	0.32 ***	0.32 ***	0.33 ***	0.42 ***	0.43 ***
	Collaboration	sc5												
	General Climate	sc6												
	Informal Comm. about Safety	sc7												
	Workload	sc11												
	Informal Communication	sc12												
Temporal Affect		sc10	-0.07 *											
Moral Exemplarism		me												

▲ Items marked with a triangle are not uniquely estimable; therefore the significance for the betas comes from the Type III F value significance tests.

Significant p-values are denoted:

*** p-values <.001
** p-values <.01
* p-values <.05

Personal Error Models – Full Model

The dependent variable within this model is the index score for items 25 and 26, "I have made errors that had the potential to harm patients…" - none in my career, in my career but not in the last six months, or in my career as well as in the past six months. The full model (n = 1,077; F value 2.83; p <.0001; $R^2 = 0.09$) with all scales and demographics are below in Table 6.3. Of particular note, for personal error, a full 25% of respondents said that they had not made any patient care errors in their career that had the potential to harm patients. Utilizing multiple regression the significant variables were found to be the clinic setting, gender, race/ethnicity, culture – medical reconciliation, safety climate, and temporal affect – causal beliefs. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. The demographic variables gender (female = 1) and race/ethnicity (white, non-Hispanic = 1) both have a negative effect on reported personal error of $\beta = -0.32$ and $\beta = -0.26$ respectively. The culture scale: medication reconciliation process also has a negative effect on personal error reporting ($\beta = -0.07$). The single positive effect seen in the overall model is the safety climate scale ($\beta = 0.29$). Three scale/ demographic factors that were borderline significant with a p-value less than 0.10 were licensure as a NP ($\beta = 0.15$), the number of years experience the respondent had in their specialty ($\beta = 0.01$) and temporal affect – causal beliefs ($\beta = -0.07$).

As the categorical variables resulted in estimates which were not uniquely estimable, a Type III test was performed for all categorical variables with two or more

response categories. Table 6.3 includes the results of the Type III test for the categorical variables which were significant. For the personal error full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of personal errors by the different settings in order to determine which of the specific response categories was significant.

Table 6.3 Full Model Personal Error

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		-0.18	B	2.81	-0.07	0.95	DF	F Value	Pr > F
Setting	Hospital clinic	Q1A	0.01	B	0.06	0.23	0.82	6	3.12	0.01
	Multi spec clinic	Q1A	0.01	B	0.05	0.15	0.88			
	Nursing home	Q1A	0.23	B	0.08	2.90	0.00			
	Other	Q1A	0.15	B	0.08	1.82	0.07			
	Retail clinic	Q1A	-0.19	B	0.12	-1.69	0.09			
	School clinic	Q1A	-0.21	B	0.14	-1.53	0.13			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt Role	Business Office/ Administration	Q31	-0.29	B	0.19	-1.52	0.13	3	0.88	0.45
	Care Delivery	Q31	-0.02	B	0.04	-0.38	0.70			
	Both Bus. Office & Care Delivery	Q31	0.02	B	0.07	0.30	0.77			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	0.02	B	0.06	0.27	0.79	5	0.35	0.88
	Family Medicine	Q32A	0.01	B	0.06	0.10	0.92			
	Internal Medicine	Q32A	-0.10	B	0.09	-1.11	0.27			
	Pediatrics	Q32A	0.01	B	0.06	0.20	0.84			
	Obstetrics and Gynecology	Q32A	-0.03	B	0.07	-0.40	0.69			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	-0.04	B	0.12	-0.33	0.74	2	0.08	0.92
	Part Time	Q36	-0.03	B	0.12	-0.22	0.82			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	-0.01		0.00	-1.43	0.15	1	2.05	0.15
	Years in current specialty	Q35	0.01		0.00	1.91	0.06	1	3.66	0.06
	Years of age	age	0.00		0.00	0.66	0.51	1	0.43	0.51
	License (NP)	Q30D	0.15		0.09	1.74	0.08	1	3.02	0.08
	Gender (Female)	Q37	-0.32		0.10	-3.14	0.00	1	9.83	0.00
	Race/ethnicity (white non-Hispanic)	DRACE	-0.26		0.09	-2.80	0.01	1	7.85	0.01
Culture	Management	sc1	0.02		0.04	0.41	0.68	1	0.17	0.68
	Formal Comm. about Safety	sc2	-0.02		0.04	-0.50	0.62	1	0.25	0.62
	Reporting Process	sc4	-0.01		0.03	-0.26	0.80	1	0.07	0.80
	Medical Reconciliation Process	sc9	-0.07		0.03	-2.36	0.02	1	5.57	0.02
	"Just culture"	sc14	0.03		0.02	1.41	0.16	1	2.00	0.16
Climate	Safety	sc3	0.29		0.05	5.34	<.0001	1	28.49	<.0001
	Collaboration	sc5	0.03		0.03	0.78	0.44	1	0.61	0.44
	General Climate	sc6	-0.01		0.04	-0.28	0.78	1	0.08	0.78
	Informal Comm. about Safety	sc7	0.02		0.04	0.55	0.58	1	0.30	0.58
	Workload	sc11	-0.04		0.04	-1.00	0.32	1	0.99	0.32
	Informal Communication	sc12	-0.04		0.07	-0.50	0.62	1	0.25	0.62
	Temporal Affect - causal beliefs	sc10	-0.07		0.03	-2.05	0.04	1	4.20	0.04
	Moral Exemplarism	me	-0.08		0.12	-0.67	0.50	1	0.45	0.50

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of personal errors by the different settings are shown in Table 6.4 and find that the respondents from nursing home settings report significantly higher personal errors means than respondents from all settings (hospital, multispecialty, single specialty, retail and school clinics) except the respondents answering "other" as their clinic's specialty. The respondents answering "other" (mostly public health clinics, prison or unclassifiable clinic specialties) also reported significantly higher mean personal errors than those with a clinic specialty of retail or school. As the management roles and clinic specialty were not significant the regression adjusted mean values of personal errors for these categorical variables are not included.

Table 6.4 LSMEANS Item Q1A Personal Error

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: scaleEP							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	Q1A	i/j	1	2	3	4	5	6	7
0.83	Hospital	1	-	0.91	0.01	0.13	0.09	0.12	0.82
0.82	Multi-Specialty	2		-	0.01	0.09	0.08	0.11	0.88
1.04	Nursing Home	3			-	0.42	0.00	0.00	0.00
0.96	Other Clinic	4				-	0.01	0.02	0.07
0.62	Retail	5					-	0.93	0.09
0.60	School	6						-	0.13
0.81	Single Specialty	7							-

Personal Error Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression (n = 1,089; F value 7.06; $p < .0001$; $R^2 = 0.07$) resulting in a model with 3 demographic variables and 2 scales (Table 6.5). The demographic variables were gender, race/ethnicity and the number of years of experience the respondent had in their specialty. Years of specialty experience was significant in the reduced model ($\beta = 0.01$). The demographic variables gender (female = 1) and race/ethnicity (white, non-Hispanic = 1) both have a negative effect on reported personal error of $\beta = -0.32$ and $\beta = -0.24$ respectively. The scales in the reduced model were: culture medication reconciliation process and safety climate. The medication reconciliation process has a negative effect on personal error reporting ($\beta = -.07$). The single positive effect seen in the overall model is the safety climate scale ($\beta = 0.28$) was significant at $p < .0001$.

Table 6.5 Reduced Model Personal Error

	Parameter		Estimate	SE	t value	Pr > |t|
	Intercept		1.15	0.24	4.76	<.0001
Demographics	Years in current specialty	Q35	0.01	0.00	2.55	0.01
	Gender (Female)	Q37	-0.32	0.10	-3.20	0.00
	Race/ethnicity (white non-Hispanic)	DRACE	-0.24	0.09	-2.65	0.01
Culture	Medical Reconciliation Process	sc9	-0.07	0.03	-2.24	0.03
Climate	Safety	sc3	0.28	0.05	5.86	<.0001

Clinic Error Models – Full Model

The dependent variable within this model is the scale score including items 9A, 9B, and 9C ("For each of the following please indicate how often they occur – adverse events, near misses, accidents waiting to happen"). The full model (n = 1,095; F value 5.39; p <.0001; $R^2 = 0.15$) with all scales and demographics are below in Table 6.6. Utilizing multiple regression the significant variables were found to be the clinic setting, gender, race/ethnicity, culture – formal communication about safety, culture – reporting process, just culture and safety climate. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. The demographic variables gender (female = 1) and race/ethnicity (white, non-Hispanic = 1) both have a negative effect on reported personal error of $\beta = -0.35$ and $\beta = -0.27$ respectively. All three culture scales had a positive effect on clinic error reporting; formal communication about safety ($\beta = 0.19$), error reporting process ($\beta = 0.22$; p-value <.0001), just culture ($\beta = 0.07$). The single climate scale (safety climate) also had a positive effect in the overall model ($\beta = 0.38$) which was significant at p-value <.0001.

Table 6.6 also includes results of the Type III test for the categorical variables with two or more response categories. For the clinic error full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of clinic errors by the different settings in order to determine which of the specific response categories was significant.

Table 6.6 Full Model Clinic Error

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		-0.51	B	3.86	-0.13	0.89	DF	F Value	Pr > F
Setting	Hospital clinic	Q1A	0.17	B	0.08	2.02	0.04	6	4.26	0.00
	Multi spec clinic	Q1A	0.09	B	0.07	1.39	0.17			
	Nursing home	Q1A	0.46	B	0.11	4.28	<.0001			
	Other	Q1A	0.19	B	0.11	1.72	0.09			
	Retail clinic	Q1A	-0.22	B	0.16	-1.38	0.17			
	School clinic	Q1A	-0.15	B	0.18	-0.83	0.41			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt. Role	Business Office/ Administration	Q31	-0.21	B	0.26	-0.80	0.43	3	1.35	0.26
	Care Delivery	Q31	0.05	B	0.06	0.90	0.37			
	Both Bus. Office & Care Delivery	Q31	0.16	B	0.10	1.71	0.09			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	-0.02	B	0.09	-0.22	0.83	5	0.91	0.48
	Family Medicine	Q32A	-0.11	B	0.08	-1.29	0.20			
	Internal Medicine	Q32A	0.09	B	0.12	0.74	0.46			
	Pediatrics	Q32A	0.07	B	0.09	0.77	0.44			
	Obstetrics and Gynecology	Q32A	0.06	B	0.10	0.64	0.53			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	-0.03	B	0.06	-0.51	0.61	2	0.30	0.74
	Part Time	Q36	0.08	B	0.17	0.45	0.66			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	0.00		0.00	0.72	0.47	1	0.52	0.47
	Years in current specialty	Q35	0.00		0.00	0.24	0.81	1	0.06	0.81
	Years of age	age	0.00		0.00	0.13	0.90	1	0.02	0.90
	License (NP)	Q30D	0.13		0.12	1.07	0.29	1	1.14	0.29
	Gender (Female)	Q37	-0.35		0.14	-2.50	0.01	1	6.23	0.01
	Race/ethnicity (white non-Hispanic)	DRACE	-0.27		0.13	-2.10	0.04	1	4.40	0.04
Culture	Management	sc1	0.03		0.06	0.44	0.66	1	0.20	0.66
	Formal Comm. about Safety	sc2	0.19		0.05	3.61	0.00	1	13.05	0.00
	Reporting Process	sc4	0.22		0.04	4.95	<.0001	1	24.54	<.0001
	Medical Reconciliation Process	sc9	0.00		0.04	0.05	0.96	1	0.00	0.96
	"Just culture"	sc14	0.07		0.03	2.57	0.01	1	6.58	0.01
Climate	Safety	sc3	0.38		0.07	5.26	<.0001	1	27.71	<.0001
	Collaboration	sc5	0.02		0.04	0.52	0.61	1	0.27	0.61
	General Climate	sc6	0.02		0.05	0.39	0.70	1	0.15	0.70
	Informal Comm. about Safety	sc7	0.07		0.06	1.24	0.22	1	1.53	0.22
	Workload	sc11	0.07		0.05	1.40	0.16	1	1.96	0.16
	Informal Communication	sc12	0.08		0.10	0.76	0.45	1	0.58	0.45
	Temporal Affect	sc10	-0.07		0.05	-1.51	0.13	1	2.29	0.13
	Moral Exemplarism	me	-0.05		0.17	-0.28	0.78	1	0.08	0.78

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of clinic errors by the different settings are shown in Table 6.7 and find that respondents from nursing home settings report significantly higher clinic errors means than respondents from all other settings including: hospital, multispecialty, single specialty ($p < .0001$), retail, school, and "other". The respondents answering retail clinic reported significantly lower mean clinic errors than those with a clinic specialty of hospital, multispecialty, nursing homes or "other". Hospital clinic respondent clinic error means were significantly higher than those of single specialty clinics.

Table 6.7 LSMEANS Item Q1A Clinic Error

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: scaleEC							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	**Q1A**	**i/j**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.16	**Hospital**	**1**	-	0.37	0.01	0.86	0.02	0.10	0.04
2.08	**Multi-Specialty**	**2**		-	0.00	0.38	0.05	0.18	0.17
2.45	**Nursing Home**	**3**			-	0.05	0.00	0.00	<.0001
2.18	**Other Clinic**	**4**				-	0.02	0.09	0.09
1.77	**Retail**	**5**					-	0.77	0.17
1.84	**School**	**6**						-	0.41
1.99	**Single Specialty**	**7**							-

Clinic Error Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression (n = 1,110; F value 23.17; p <.0001; R^2 = 0.11) resulting in a model with 2 demographic variables and 4 scales (Table 6.8). The demographic variables were gender and the number of years experience the respondent had in their current position in the clinic. In the full model, the years of experience in current position (full model β = 0.004) was not significant; yet in the reduced model it was a significant demographic variable (fit model β = 0.01). The demographic variables gender (female = 1) had a negative effect on reported personal error of β = -0.31. All three culture scales had a positive effect on clinic error reporting; formal communication about safety (β = 0.19; p-value <.0001), error reporting process (β = 0.22; p-value <.0001), just culture (β = 0.07). The single climate scale (safety climate) also had a positive effect in the overall model (β = 0.39) which was significant at p-value <.0001.

Table 6.8 Reduced Model Clinic Error

	Parameter		Estimate	SE	t value	Pr > |t|
	Intercept		0.35	0.34	1.03	0.30
Demographics	Years in current clinic position	Q34A	0.01	0.00	2.53	0.01
	Gender (Female)	Q37	-0.31	0.14	-2.31	0.02
Culture	Formal Comm. about Safety	sc2	0.19	0.04	4.40	<.0001
	Reporting Process	sc4	0.22	0.04	5.20	<.0001
	"Just culture"	sc14	0.07	0.03	2.39	0.02
Climate	Safety	sc3	0.39	0.06	6.08	<.0001

Medical Error Models – Full Model

The dependent variable within this model is the scale score including items 9A and 9B ("For each of the following please indicate how often they occur – adverse events and near misses"). The full model (n = 1,095; F value 4.9; p <.0001; R^2 = 0.14) with all scales and demographics are below in Table 6.9. Utilizing multiple regression the significant variables were found to be the clinic setting, gender, race/ethnicity, culture – formal communication about safety, culture – reporting process, just culture and safety climate. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. The demographic variables gender (female = 1) and race/ethnicity (white, non-Hispanic = 1) both have a negative effect on reported personal error of β = -0.36 and β = -0.30 respectively. All three culture scales had a positive effect on clinic medical error reporting; formal communication about safety (β = 0.20), error reporting process (β = 0.20; p-value <.0001), just culture (β = 0.08). The single climate scale (safety climate) also had a positive effect in the overall model (β =0.42) which was significant at p-value <.0001.

Table 6.9 also includes results of the Type III test for the categorical variables with two or more response categories. For the clinic medical error full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of clinic medical errors by the different settings in order to determine which of the specific response categories was significant.

Table 6.9 Full Model Medical Error

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		-0.14	B	4.11	-0.03	0.97	DF	F Value	Pr > F
Setting	Hospital clinic	Q1A	0.19	B	0.09	2.11	0.03	6	4.38	0.00
	Multi spec clinic	Q1A	0.11	B	0.07	1.50	0.13			
	Nursing home	Q1A	0.48	B	0.11	4.20	<.0001			
	Other	Q1A	0.21	B	0.12	1.82	0.07			
	Retail clinic	Q1A	-0.26	B	0.17	-1.54	0.12			
	School clinic	Q1A	-0.18	B	0.19	-0.91	0.36			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt Role	Business Office/ Administration	Q31	-0.29	B	0.28	-1.04	0.30	3	1.41	0.24
	Care Delivery	Q31	0.04	B	0.06	0.69	0.49			
	Both Bus. Office & Care Delivery	Q31	0.17	B	0.10	1.65	0.10			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	-0.03	B	0.09	-0.30	0.77	5	0.84	0.52
	Family Medicine	Q32A	-0.12	B	0.09	-1.37	0.17			
	Internal Medicine	Q32A	0.09	B	0.13	0.71	0.48			
	Pediatrics	Q32A	0.05	B	0.09	0.50	0.61			
	Obstetrics and Gynecology	Q32A	0.06	B	0.11	0.57	0.57			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	-0.05	B	0.06	-0.85	0.40	2	0.40	0.67
	Part Time	Q36	0.02	B	0.18	0.09	0.93			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	0.00		0.01	0.73	0.46	1	0.54	0.46
	Years in current specialty	Q35	0.00		0.00	0.02	0.98	1	0.00	0.98
	Years of age	age	0.00		0.00	-0.01	0.99	1	0.00	0.99
	License (NP)	Q30D	0.12		0.13	0.98	0.33	1	0.96	0.33
	Gender (Female)	Q37	-0.36		0.15	-2.40	0.02	1	5.77	0.02
	Race/ethnicity (white non-Hispanic)	DRACE	-0.30		0.14	-2.20	0.03	1	4.82	0.03
Culture	Management	sc1	0.02		0.06	0.33	0.74	1	0.11	0.74
	Formal Comm. about Safety	sc2	0.20		0.06	3.55	0.00	1	12.57	0.00
	Reporting Process	sc4	0.20		0.05	4.28	<.0001	1	18.35	<.0001
	Medical Reconciliation Process	sc9	-0.01		0.04	-0.29	0.77	1	0.08	0.77
	"Just culture"	sc14	0.08		0.03	2.53	0.01	1	6.39	0.01
Climate	Safety	sc3	0.42		0.08	5.37	<.0001	1	28.88	<.0001
	Collaboration	sc5	0.02		0.05	0.45	0.65	1	0.20	0.65
	General Climate	sc6	0.03		0.06	0.55	0.58	1	0.30	0.58
	Informal Comm. about Safety	sc7	0.06		0.06	1.07	0.28	1	1.15	0.28
	Workload	sc11	0.07		0.05	1.36	0.17	1	1.85	0.17
	Informal Communication	sc12	0.10		0.11	0.92	0.36	1	0.85	0.36
	Temporal Affect	sc10	-0.06		0.05	-1.21	0.23	1	1.46	0.23
	Moral Exemplarism	me	0.00		0.18	0.03	0.98	1	0.00	0.98

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of medical errors by the different settings are shown in Table 6.10 and find that respondents from nursing home settings report significantly higher medical errors means than respondents from all other settings with the exception of "other" clinics including: hospital, multispecialty, single specialty ($p < .0001$), retail, and school. The respondents answering retail clinic reported significantly lower mean medical errors than those with a clinic specialty of hospital, nursing home or multispecialty. Hospital clinic respondent medical error means were significantly higher than those of single specialty clinics.

Table 6.10 LSMEANS Item Q1A Medical Error

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: Medical Errors							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	Q1A	i/j	1	2	3	4	5	6	7
2.16	Hospital	1	-	0.372	0.018	0.839	0.013	0.074	0.035
2.08	Multi-Specialty	2		-	0.001	0.367	0.031	0.146	0.133
2.45	Nursing Home	3			-	0.068	0.000	0.002	<.0001
2.18	Other Clinic	4				-	0.012	0.067	0.070
1.72	Retail	5					-	0.735	0.125
1.80	School	6						-	0.363
1.97	Single Specialty	7							-

Medical Error Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression (n = 1,110; F value 12.18; p <.0001; R^2 = 0.11) resulting in a model with 3 demographic variables and 4 scales (Table 6.11). The demographic variables were clinical specialty, gender and the number of years experience the respondent had in their current position in the clinic. Clinical specialty, while significant in the full model of medical error was significant in the fit model with estimates of the individual categories in table 6.11. Family medicine reported a mean level of medical errors that was significantly lower than all other specialties of providers. In the full model, the years of experience in current position (full model β = 0.004) was not significant; yet in the reduced model it was a significant demographic variable (fit model β = 0.009). The demographic variables gender (female = 1) had a negative effect on reported personal error of β = -0.32. All three culture scales had a positive effect on clinic error reporting; formal communication about safety (β = 0.20; p-value <.0001), error reporting process (β = 0.21; p-value <.0001), just culture (β = 0.07). The single climate scale (safety climate) also had a positive effect in the reduced model (β = 0.43) which was significant at p-value <.0001.

Table 6.11 Reduced Model Clinic Medical Error

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		0.377	B	0.363	1.040	0.299	DF	F Value	Pr > F
	Primary Care	Q32A	-0.047	B	0.088	-0.530	0.593			
	Family Medicine	Q32A	-0.234	B	0.079	-2.970	0.003			
	Internal Medicine	Q32A	0.126	B	0.128	0.990	0.323	5	2.56	0.03
	Pediatrics	Q32A	-0.013	B	0.090	-0.140	0.888			
	Obstetrics and Gynecology	Q32A	0.037	B	0.084	0.440	0.657			
Specialty	Specialty Care	Q32A	0.000	B	.	.	.			
	Years in current clinic position	Q34A	0.009		0.004	2.100	0.036			
Demographics	Gender (Female)	Q37	-0.322		0.145	-2.230	0.026			
	Formal Comm. about Safety	sc2	0.195		0.047	4.150	<.0001			
	Reporting Process	sc4	0.212		0.046	4.660	<.0001			
Culture	"Just culture"	sc14	0.074		0.030	2.460	0.014			
Climate	Safety	sc3	0.426		0.069	6.170	<.0001			

The regression adjusted mean values of medical errors by the different specialties are shown in Table 6.12. The respondents with a specialty of family medicine report significantly lower medical errors means than respondents from all other specialties with the exception of primary care.

Table 6.12 LSMEANS Item Q32A Medical Error

		Least Squares Means for effect Q32A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: Medical Errors					
			Family Medicine	Internal Medicine	OB/GYN	Pediatrics	Primary Care	Specialty Care
LSMEAN	**Q32A**	**i/j**	**1**	**2**	**3**	**4**	**5**	**6**
1.88	**Family Medicine**	**1**	-	0.01	0.01	0.03	0.06	0.00
2.24	**Internal Medicine**	**2**		-	0.52	0.33	0.22	0.32
2.15	**OB/GYN**	**3**			-	0.63	0.42	0.66
2.10	**Pediatrics**	**4**				-	0.75	0.89
2.06	**Primary Care**	**5**					-	0.59
2.11	**Specialty Care**	**6**						-

Adverse Events Models – Full Model

The dependent variable within this model is the scale score of item 9A ("For each of the following please indicate how often they occur – adverse events"). The full model (n = 1,095; F value 4.66; p <.0001; R^2 = 0.12) with all scales and demographics are below in Table 6.13. Utilizing multiple regression the significant variables were found to be the clinic setting, gender, race/ethnicity, culture – formal communication about safety, culture – reporting process, just culture and safety climate. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. The demographic variables gender (female = 1) and race/ethnicity (white, non-Hispanic = 1) both have a negative effect on reported personal error of β = -0.47 and β = -0.42 respectively. All three culture scales had a positive effect on clinic medical error reporting; formal communication about safety (β = 0.21), error reporting process (β = 0.15), just culture (β = 0.08). The single climate scale (safety climate) also had a positive effect in the overall model (β =0.52) which was significant at p-value <.0001.

Table 6.13 also includes results of the Type III test for the categorical variables with two or more response categories. For the clinic adverse events full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of clinic adverse events by the different settings in order to determine which of the specific response categories was significant.

Table 6.13 Full Model Adverse Events

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		0.35	B	4.92	0.07	0.94	**DF**	**F Value**	**Pr > F**
Setting	Hospital clinic	Q1A	0.25	B	0.11	2.35	0.02	6	4.52	0.00
	Multi spec clinic	Q1A	0.15	B	0.08	1.83	0.07			
	Nursing home	Q1A	0.59	B	0.14	4.31	<.0001			
	Other	Q1A	0.22	B	0.14	1.54	0.12			
	Retail clinic	Q1A	-0.30	B	0.20	-1.50	0.14			
	School clinic	Q1A	-0.19	B	0.23	-0.84	0.40			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt Role	Business Office/ Administration	Q31	-0.58	B	0.33	-1.74	0.08	3	1.84	0.14
	Care Delivery	Q31	0.05	B	0.07	0.77	0.44			
	Both Bus. Office & Care Delivery	Q31	0.16	B	0.12	1.33	0.18			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	-0.05	B	0.11	-0.42	0.68	5	0.41	0.84
	Family Medicine	Q32A	-0.08	B	0.10	-0.75	0.46			
	Internal Medicine	Q32A	0.09	B	0.15	0.58	0.56			
	Pediatrics	Q32A	0.01	B	0.11	0.08	0.94			
	Obstetrics and Gynecology	Q32A	0.09	B	0.13	0.69	0.49			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	-0.12	B	0.08	-1.57	0.12	2	1.24	0.29
	Part Time	Q36	-0.04	B	0.22	-0.20	0.84			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	0.01		0.01	1.24	0.22	1	1.54	0.22
	Years in current specialty	Q35	0.00		0.00	-0.18	0.86	1	0.03	0.86
	Years of age	age	0.00		0.00	-0.14	0.89	1	0.02	0.89
	License (NP)	Q30D	0.10		0.15	0.68	0.50	1	0.46	0.50
	Gender (Female)	Q37	-0.47		0.18	-2.66	0.01	1	7.06	0.01
	Race/ethnicity (white non-Hispanic)	DRACE	-0.42		0.16	-2.56	0.01	1	6.56	0.01
Culture	Management	sc1	0.02		0.08	0.30	0.76	1	0.09	0.76
	Formal Comm. about Safety	sc2	0.21		0.07	3.09	0.00	1	9.56	0.00
	Reporting Process	sc4	0.15		0.06	2.67	0.01	1	7.15	0.01
	Medical Reconciliation Process	sc9	-0.01		0.05	-0.23	0.82	1	0.05	0.82
	"Just culture"	sc14	0.08		0.04	2.28	0.02	1	5.21	0.02
Climate	Safety	sc3	0.52		0.09	5.58	<.0001	1	31.12	<.0001
	Collaboration	sc5	0.03		0.06	0.62	0.54	1	0.38	0.54
	General Climate	sc6	0.05		0.07	0.68	0.50	1	0.46	0.50
	Informal Comm. about Safety	sc7	0.04		0.07	0.54	0.59	1	0.29	0.59
	Workload	sc11	0.10		0.07	1.58	0.11	1	2.5	0.11
	Informal Communication	sc12	0.16		0.13	1.21	0.23	1	1.47	0.23
	Temporal Affect	sc10	-0.05		0.06	-0.77	0.44	1	0.59	0.44
	Moral Exemplarism	me	0.06		0.22	0.26	0.79	1	0.07	0.79

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of adverse events by the different settings are shown in Table 6.14 and find that respondents from nursing home settings report significantly higher adverse event means than respondents from all other settings including: hospital, multispecialty, single specialty ($p < .0001$), retail ($p < .0001$), school and "other" clinics. The respondents answering retail clinic reported significantly lower mean adverse events than those with a clinic specialty of hospital, multispecialty, nursing home or "other". Hospital clinic respondent adverse event means were significantly higher than those of single specialty clinics.

Table 6.14 LSMEANS Item Q1A Adverse Events

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: Adverse Events							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	Q1A	i/j	1	2	3	4	5	6	7
2.17	Hospital	1	-	0.38	0.02	0.83	0.01	0.07	0.02
2.08	Multi-Specialty	2		-	0.00	0.67	0.02	0.13	0.07
2.52	Nursing Home	3			-	0.03	<.0001	0.00	<.0001
2.14	Other Clinic	4				-	0.02	0.11	0.12
1.63	Retail	5					-	0.71	0.14
1.73	School	6						-	0.40
1.92	Single Specialty	7							-

Adverse Events Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression ($n = 1,110$; F value 14.93; $p <.0001$; $R^2 = 0.08$) resulting in a model with 3

demographic variables and 4 scales (Table 6.15). The demographic variables were gender and the number of years experience the respondent had in their current position in the clinic. In the full model, the years of experience in current position (full model β = 0.01) was not significant; yet in the reduced model it was a significant demographic variable (fit model β = 0.01). The demographic variable gender (female = 1) had a negative effect on reported adverse events of β = -0.41. All three culture scales had a positive effect on clinic error reporting; formal communication about safety (β = 0.20), error reporting process (β = 0.16), just culture (β = 0.07). The single climate scale (safety climate) also had a positive effect in the reduced model (β = 0.53) which was significant at p-value <.0001.

Table 6.15 Reduced Model Adverse Events

	Parameter			Estimate	SE	t value	Pr > |t|
	Intercept			0.48	0.43	1.11	0.27
	Years in current clinic position	Q34A		0.01	0.00	2.81	0.01
Demographics	Gender (Female)	Q37		-0.41	0.17	-2.37	0.02
	Formal Comm. about Safety	sc2		0.20	0.06	3.49	0.00
	Reporting Process	sc4		0.16	0.05	2.96	0.00
Culture	"Just culture"	sc14		0.07	0.04	2.09	0.04
Climate	Safety	sc3		0.53	0.08	6.46	<.0001

Near Misses Models – Full Model

The dependent variable within this model is the scale score for item 9B ("For each of the following please indicate how often they occur –near misses"). The full model (n = 1,095; F value 4.81; p <.0001; R^2 = 0.14) with all scales and demographics are below in Table 6.16. Utilizing multiple regression the significant variables were found to be the clinic setting, culture – formal communication about safety, culture – reporting process, just culture and safety climate. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. All three culture scales had a positive effect on clinic medical error reporting; formal communication about safety (β = 0.19), error reporting process (β = 0.26; p-value <.0001), just culture (β = 0.07). The single climate scale (safety climate) also had a positive effect in the overall model (β =0.32) which was significant at p-value <.0001.

Table 6.16 also includes results of the Type III test for the categorical variables with two or more response categories. For the clinic near misses full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of clinic adverse events by the different settings in order to determine which of the specific response categories was significant.

Table 6.16 Full Model Near Misses

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		-0.63	B	4.04	-0.16	0.88	DF	F Value	Pr > F
Setting	Hospital clinic	Q1A	0.12	B	0.09	1.44	0.15	6	2.9	0.01
	Multi spec clinic	Q1A	0.06	B	0.07	0.83	0.41			
	Nursing home	Q1A	0.37	B	0.11	3.29	0.00			
	Other	Q1A	0.21	B	0.12	1.82	0.07			
	Retail clinic	Q1A	-0.21	B	0.16	-1.30	0.19			
	School clinic	Q1A	-0.16	B	0.19	-0.83	0.41			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt Role	Business Office/ Administration	Q31	0.00	B	0.27	0.00	1.00	3	1.02	0.38
	Care Delivery	Q31	0.03	B	0.06	0.47	0.64			
	Both Bus. Office & Care Delivery	Q31	0.17	B	0.10	1.74	0.08			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	-0.01	B	0.09	-0.09	0.92	5	1.43	0.21
	Family Medicine	Q32A	-0.16	B	0.09	-1.87	0.06			
	Internal Medicine	Q32A	0.09	B	0.13	0.74	0.46			
	Pediatrics	Q32A	0.09	B	0.09	0.93	0.35			
	Obstetrics and Gynecology	Q32A	0.03	B	0.10	0.31	0.75			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	0.01	B	0.06	0.18	0.86	2	0.09	0.91
	Part Time	Q36	0.08	B	0.18	0.42	0.67			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	0.00		0.01	-0.02	0.98	1	0	0.98
	Years in current specialty	Q35	0.00		0.00	0.26	0.79	1	0.07	0.79
	Years of age	age	0.00		0.00	0.15	0.88	1	0.02	0.88
	License (NP)	Q30D	0.15		0.12	1.17	0.24	1	1.38	0.24
	Gender (Female)	Q37	-0.24		0.15	-1.65	0.10	1	2.73	0.10
	Race/ethnicity (white non-Hispanic)	DRACE	-0.18		0.14	-1.35	0.18	1	1.82	0.18
Culture	Management	sc1	0.02		0.06	0.31	0.76	1	0.1	0.76
	Formal Comm. about Safety	sc2	0.19		0.05	3.45	0.00	1	11.89	0.00
	Reporting Process	sc4	0.26		0.05	5.46	<.0001	1	29.81	<.0001
	Medical Reconciliation Process	sc9	-0.01		0.04	-0.31	0.76	1	0.1	0.76
	"Just culture"	sc14	0.07		0.03	2.37	0.02	1	5.6	0.02
Climate	Safety	sc3	0.32		0.08	4.14	<.0001	1	17.15	<.0001
	Collaboration	sc5	0.01		0.05	0.17	0.87	1	0.03	0.87
	General Climate	sc6	0.02		0.06	0.29	0.77	1	0.08	0.77
	Informal Comm. about Safety	sc7	0.09		0.06	1.52	0.13	1	2.31	0.13
	Workload	sc11	0.05		0.05	0.84	0.40	1	0.71	0.40
	Informal Communication	sc12	0.04		0.11	0.39	0.69	1	0.15	0.69
	Temporal Affect	sc10	-0.07		0.05	-1.52	0.13	1	2.32	0.13
	Moral Exemplarism	me	-0.05		0.18	-0.27	0.79	1	0.07	0.79

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of near misses by the different settings are shown in Table 6.17 and find that respondents from nursing home settings report significantly higher near misses means than respondents from all other settings except "other" clinics including: hospital, multispecialty, single specialty, retail, and school. The respondents answering "other" clinic reported significantly higher mean near misses than those with a clinic specialty of retail clinics.

Table 6.17 LSMEANS Item Q1A Near Misses

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: Near Misses							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	Q1A	i/j	1	2	3	4	5	6	7
2.14	Hospital	1	-	0.45	0.04	0.50	0.05	0.16	0.15
2.07	Multi-Specialty	2		-	0.01	0.19	0.10	0.26	0.41
2.39	Nursing Home	3			-	0.27	0.00	0.01	0.00
2.23	Other Clinic	4				-	0.02	0.08	0.07
1.80	Retail	5					-	0.81	0.19
1.86	School	6						-	0.41
2.02	Single Specialty	7							-

Near Misses Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression (n = 1,127; F value 35.15; p <.0001; $R^2 = 0.11$) resulting in a model with 4 scales (Table 6.18). All three culture scales had a significant positive effect on clinic near miss reporting at p-value <.0001; formal communication about safety (β = 0.22), error

reporting process (β = 0.25), just culture (β = 0.07). The single climate scale (safety climate) also had a positive effect in the reduced model (β = 0.32) which was significant at p-value <.0001.

Table 6.18 Reduced Model Near Misses

	Parameter			Estimate	SE	t value	Pr > |t|
	Intercept			-0.29	0.22	-1.29	0.20
	Formal Comm. about Safety	sc2		0.22	0.05	4.81	<.0001
	Reporting Process	sc4		0.25	0.04	5.70	<.0001
Culture	"Just culture"	sc14		0.07	0.03	2.45	0.01
Climate	Safety	sc3		0.32	0.07	4.86	<.0001

Accidents Waiting to Happen Models – Full Model

The dependent variable within this model is the scale score for item 9C ("For each of the following please indicate how often they occur –accidents waiting to happen"). The full model (n = 1,095; F value 4.85; p <.0001; $R^2 = 0.14$) with all scales and demographics are below in Table 6.19. Utilizing multiple regression the significant variables were found to be the clinic setting, gender, culture – formal communication about safety, culture – reporting process, just culture and safety climate. Unless otherwise noted, p-values <.05 was used as a cutoff for statistical significance. The demographic variable gender (female = 1) has a negative effect on reported personal error of $\beta = -0.33$. All three culture scales had a positive effect on clinic medical error reporting; formal communication about safety ($\beta = 0.17$), error reporting process ($\beta = 0.26$; p-value <.0001), just culture ($\beta = 0.07$). The single climate scale (safety climate) also had a positive effect in the overall model ($\beta = 0.32$) which was significant at p-value <.0001.

Table 6.19 also includes results of the Type III test for the categorical variables with two or more response categories. For the clinic adverse events full model only clinical setting was significant. These results led to the running of a regression adjusted mean values of clinic adverse events by the different settings in order to determine which of the specific response categories was significant.

Table 6.19 Full Model Accidents Waiting to Happen

	Parameter		Estimate		SE	t value	Pr > |t|			
	Intercept		-1.26	B	4.07	-0.31	0.76	DF	F Value	Pr > F
Setting	Hospital clinic	Q1A	0.13	B	0.09	1.48	0.14	6	2.78	0.01
	Multi spec clinic	Q1A	0.06	B	0.07	0.91	0.36			
	Nursing home	Q1A	0.42	B	0.11	3.69	0.00			
	Other	Q1A	0.14	B	0.12	1.22	0.22			
	Retail clinic	Q1A	-0.14	B	0.16	-0.83	0.41			
	School clinic	Q1A	-0.10	B	0.19	-0.52	0.60			
	Single spec clinic	Q1A	0.00	B	.	.	.			
Mgmt. Role	Business Office/ Administration	Q31	-0.04	B	0.27	-0.16	0.88	3	1.02	0.38
	Care Delivery	Q31	0.07	B	0.06	1.17	0.24			
	Both Bus. Office & Care Delivery	Q31	0.15	B	0.10	1.53	0.13			
	Neither Bus. Office nor Care Del.	Q31	0.00	B	.	.	.			
Specialty	Primary Care	Q32A	0.00	B	0.09	-0.02	0.98	5	0.81	0.54
	Family Medicine	Q32A	-0.08	B	0.09	-0.91	0.36			
	Internal Medicine	Q32A	0.09	B	0.13	0.67	0.50			
	Pediatrics	Q32A	0.11	B	0.09	1.18	0.24			
	Obstetrics and Gynecology	Q32A	0.07	B	0.10	0.67	0.51			
	Specialty Care	Q32A	0.00	B	.	.	.			
Demographics	Full Time	Q36	0.02	B	0.06	0.25	0.80	2	0.60	0.55
	Part Time	Q36	0.20	B	0.18	1.09	0.27			
	PRN or On Call	Q36	0.00	B	.	.	.			
	Years in current clinic position	Q34A	0.00		0.01	0.57	0.57	1	0.33	0.57
	Years in current specialty	Q35	0.00		0.00	0.62	0.53	1	0.39	0.53
	Years of age	age	0.00		0.00	0.39	0.70	1	0.15	0.70
	License (NP)	Q30D	0.13		0.13	1.06	0.29	1	1.12	0.29
	Gender (Female)	Q37	-0.33		0.15	-2.25	0.02	1	5.05	0.02
	Race/ethnicity (white non-Hispanic)	DRACE	-0.21		0.14	-1.54	0.12	1	2.36	0.12
Culture	Management	sc1	0.04		0.06	0.58	0.56	1	0.34	0.56
	Formal Comm. about Safety	sc2	0.17		0.06	3.12	0.00	1	9.72	0.00
	Reporting Process	sc4	0.26		0.05	5.44	<.0001	1	29.63	<.0001
	Medical Reconciliation Process	sc9	0.03		0.04	0.73	0.47	1	0.53	0.47
	"Just culture"	sc14	0.07		0.03	2.19	0.03	1	4.80	0.03
Climate	Safety	sc3	0.32		0.08	4.12	<.0001	1	17.01	<.0001
	Collaboration	sc5	0.03		0.05	0.56	0.58	1	0.31	0.58
	General Climate	sc6	0.00		0.06	0.00	1.00	1	0.00	1.00
	Informal Comm. about Safety	sc7	0.08		0.06	1.35	0.18	1	1.83	0.18
	Workload	sc11	0.07		0.05	1.23	0.22	1	1.52	0.22
	Informal Communication	sc12	0.03		0.11	0.32	0.75	1	0.10	0.75
	Temporal Affect	sc10	-0.09		0.05	-1.87	0.06	1	3.50	0.06
	Moral Exemplarism	me	-0.15		0.18	-0.84	0.40	1	0.71	0.40

Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The regression adjusted mean values of accidents waiting to happen by the different settings are shown in Table 6.20 and find that respondents from nursing home settings report significantly higher accidents waiting to happen means than respondents from all other settings including: hospital, multispecialty, single specialty, retail, school and "other" clinics.

Table 6.20 LSMEANS Item Q1A Accidents Waiting to Happen

		Least Squares Means for effect Q1A Pr > |t| for H0: LSMean(i)=LSMean(j) Dependent Variable: Accidents Waiting to Happen							
			Hospital	Multi-Specialty	Nursing Home	Other Clinic	Retail	School	Single Specialty
LSMEAN	Q1A	i/j	1	2	3	4	5	6	7
2.16	Hospital	1	-	0.46	0.02	0.93	0.13	0.25	0.14
2.09	Multi-Specialty	2		-	0.00	0.51	0.23	0.39	0.36
2.45	Nursing Home	3			-	0.06	0.00	0.02	0.00
2.17	Other Clinic	4				-	0.13	0.25	0.22
1.89	Retail	5					-	0.87	0.41
1.93	School	6						-	0.60
2.03	Single Specialty	7							-

Accidents Waiting to Happen Models – Reduced Model

Following analysis of the full model, the model was reduced using a stepwise regression (n = 1,110; F value 22.37; p <.0001; $R^2 = 0.11$) resulting in a model with 2 demographic variables and 4 scales (Table 6.21). The demographic variables were gender and the number of years experience the respondent had in their current position in the clinic. In the full model, the years of experience in current position (full model $\beta = 0.003$)

was not significant; yet in the reduced model it was a significant demographic variable (fit model β = 0.01). The demographic variables gender (female = 1) had a negative effect on reported adverse events of β = -0.31. All three culture scales had a positive effect on clinic error reporting; formal communication about safety (β = 0.19; p-value <.0001), error reporting process (β = 0.26; p-value <.0001), just culture (β = 0.06). The single climate scale (safety climate) also had a positive effect in the reduced model (β = 0.33) which was significant at p-value <.0001.

Table 6.21 Reduced Model Accidents Waiting to Happen

	Parameter			Estimate	SE	t value	Pr > |t|
	Intercept			0.37	0.35	1.04	0.30
	Years in current clinic position	Q34A		0.01	0.00	2.44	0.01
Demographics	Gender (Female)	Q37		-0.31	0.14	-2.20	0.03
	Formal Comm. about Safety	sc2		0.19	0.05	4.13	<.0001
	Reporting Process	sc4		0.26	0.04	5.70	<.0001
Culture	"Just culture"	sc14		0.06	0.03	2.05	0.04
Climate	Safety	sc3		0.33	0.07	4.82	<.0001

Interactions Tested

Because it was of interest in hypothesis four, to examine if temporal effect moderated the relationship between moral exemplarism, climate and errors, models including interactions were tested. The interactions specifically tested were temporal affect – causal beliefs with moral exemplarism and temporal affect - causal beliefs with

climate scales. Neither interaction was significant for either of the error models (personal or clinic). Further analysis of interaction effects will occur in future research.

Hypotheses Findings Comparisons

Table 6.22 compares the findings by each error aggregation level and the acceptance or rejection of the research hypotheses. The hypotheses as originally stated and included within this project were originally proposed when the dependent variable was to include both self reported errors along with clinic reporting system errors and claims extracted errors. While the utilization of only self reported error frequencies are not the ideal measurement and are prone to measurement noise, self reported error is the professional standard within healthcare and as such is a valid measure of error. Each hypothesis is independently examined in the Hypotheses Testing section, immediately following table 6.22.

Table 6.22 Comparison of Research Hypotheses Findings

	Hypotheses	Personal Error	Clinic Error	Adverse Event	Near Miss	Accidents Waiting to Happen	Medical Errors
1	Safety climate high, errors lower	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
2	High levels of moral exemplarism, higher errors	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted
3	Low temporal affect, higher errors	Rejected	Accepted	Accepted	Accepted	Accepted	Accepted
4	Lower safety climate, greater effect of moral exemplar	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted

Hypotheses Testing

Utilizing the full models and fit models for each of the types of dependent variables (personal error, clinic error, medical error, adverse events, near misses, accidents waiting to happen) articulated within the previous sections of chapter six, each hypothesis is tested. Hypotheses were tested and remain unaltered from the initial proposed research which was designed as a full clinic survey.

Hypothesis 1

1. Providers reporting higher levels of clinic safety climates will report fewer patient care errors.

- Personal Error

In both the reduced ($\beta = 0.29$; sig. <.0001) and full ($\beta = 0.28$; sig. <.0001) models, the frequency of personal errors reported was associated with the existence of a safety climate. In the personal error models null hypothesis 1 is rejected.

- Clinic Error

In both the reduced ($\beta = 0.38$; sig. <.0001) and full ($\beta = 0.39$; sig. <.0001) models, the frequency of clinic errors reported was higher due to the existence of a safety climate. In the clinic error models null hypothesis 1 is rejected.

- Medical Error

In both the reduced ($\beta = 0.07$; sig. <.05) and full ($\beta = 0.42$; sig. <.0001) models, the frequency of medical errors reported was higher due to the existence of a safety climate. In the medical error models null hypothesis 1 is rejected.

- Adverse Event

In both the reduced (β = 0.54; sig. <.0001) and full (β = 0.52; sig. <.0001) models, the frequency of adverse event reported was higher due to the existence of a safety climate. In the adverse event models null hypothesis 1 is rejected.

- Near Miss

In both the reduced (β = 0.32; sig. <.0001) and full (β = 0.32; sig. <.0001) models, the frequency of near miss reported was higher due to the existence of a safety climate. In the near miss models null hypothesis 1 is rejected.

- Accidents Waiting to Happen

In both the reduced (β = 0.33; sig. <.0001) and full (β = 0.32; sig. <.0001) models, the frequency of accidents waiting to happen reported was higher due to the existence of a safety climate. In the accidents waiting to happen models null hypothesis 1 is rejected.

Hypothesis 2

1. *Providers identified with high levels of moral exemplarism will report more patient care errors.*

Hypothesis 2 was to be tested utilizing the moral exemplarism scale. The moral exemplarism scale was not significant in any of the models for personal or clinic errors.

Hypothesis 3

2. *Providers identified with low levels of temporal affect will report more patient care errors.*

- Personal Error

In the full model, the frequency of personal errors reported was slightly lower due to a provider's temporal affect – causal beliefs (β = -0.07; p-value = 0.04) but it was not significant in the reduced model. Due to the direction of the effect, negative, in the personal error models null hypothesis 3 is rejected.

- Clinic Error

In the full model for clinic error, the frequency of clinic errors was not impacted by temporal affect – causal beliefs (β = -0.07; p-value = 0.13). Due to the lack of effects of temporal affect on clinic error, the null hypothesis 3 is accepted.

- Medical Error

In the full model (β = -0.06; p-value = .23), the frequency of medical errors reported was not impacted by temporal affect – causal beliefs. In the medical error models null hypothesis 3 is accepted.

- Adverse Event

In the full model (β = -0.05; p-value = .44), the frequency of adverse event reported was not impacted by temporal affect – causal beliefs. In the adverse event models null hypothesis 3 is accepted.

- Near Miss

In the full model (β = -0.07; p-value = .13), the frequency of near miss reported was not impacted by temporal affect – causal beliefs. In the near miss models null hypothesis 3 is accepted.

- Accidents Waiting to Happen

In the full model (β = -0.09; p-value = .06), the frequency of accidents waiting to happen reported was not impacted by temporal affect – causal beliefs. In the accidents waiting to happen models null hypothesis 3 is accepted.

Hypothesis 4

3. *The lower the reported safety climate level the larger the positive effect of the presence of a high level moral exemplar. For example: A low safety climate and a low moral exemplar level will have higher rates of patient care errors than a high safety climate or high level of moral exemplarism.*

Hypothesis 4 was also to be tested utilizing the moral exemplarism scale. As the moral exemplarism scale was not significant in any of the full models (personal or clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen) this null hypothesis is not supported. This null hypothesis (4) is accepted due to the lack of significance of the interactions tested.

Chapter VII – Discussion

Chapter seven includes discussions of findings related to both aims one and two. The discussion of the scale content as driven by the factor analyses pertains to the completion of aim one, creation of an instrument. The aim two discussions include alternative explanations for the hypotheses, personal error model and clinic error model results followed by other interesting findings. Concluding this chapter is a discussion of the limitations of this work.

Aim one

Aim one was to create a safety climate survey for use in outpatient medical clinics; to do so items had to be written for the scales. The final item lists for these scores was determined thorough factor analysis, but the factor analysis alone is not sufficient interpret the appropriateness of scales. To ensure that the scores reflect cohesive constructs, a factor loading must be examined along with substantive knowledge. To this end, the EFA factors were compared to the a priori dimensions items within each scale. Each scale had been designed to cover aspects of the conceptualized domains. When the comparison of the a priori dimensions with the actual factors was complete and confirmed the aspects defined, the scores were accepted as cohesive. Each cohesive factor was examined asking do these items make sense together? Are they all asking about the same topic?

The temporal affect – causal beliefs scale items, with their central theme of beliefs about causes and contributory factors to errors, ask the respondents about their own thoughts on why errors happen. These beliefs can change over time; they may be influenced by proximal events or others with whom they work. The respondent's own personal beliefs moderated by the environment in which they work are of interest in this scale. This scale and the items included did match the expectations of the researcher.

The climate scales (safety climate, workload demands, morale, collaboration, informal communication about safety and informal communication – general) cover a broad range of topics. The safety climate scale items cover the actions that the literature suggest specifically contribute to errors such as short cuts, lack of discussions and work tension; these items were all expected to load together. The workload demands items were as expected a single factor. The morale scale items were as expected with the exception of the "comfort level for asking questions" item; seemingly this item could have also logically fit with the communication scales. The factor loading firmly places it in morale; this item does speak to the respondent's feelings of collegiality and therefore also can be reasoned to belong within the morale scale.

Three separate climate scales detail the respondent's feelings about their clinic communication and collaboration levels. The collaboration scale is not surprising in that all the items specifying the level of collaboration a respondent has with other specified categories of professional groups were a single factor. As was mentioned in table 5.2 the collaboration with providers item was dropped due to the breadth of providers included

(physician, resident, interns, fellows, nurse practitioner, physician assistants, certified nurse midwife); this item in the future would be rewritten to separate out the different providers as the interactions. Informal communication was divided into those items specifically focused on safety and other general co-worker conversations. Both the safety related and general communication items loaded as expected. The climate scales were expected to be subject to day-to-day interactions and pressures. As such variation in responses would be expected if the instrument were administered to the same personnel at different times when they faced different influences and pressures.

The management, formal communication, reporting process, patient medication reconciliation, and just culture scales describe the clinic culture. Items within the management scale were expected as were those within the formal communication scale. The process scales (reporting process for errors and the medication reconciliation) both loaded separately in the EFA as would be expected as they are very different processes within the clinic. The just culture scale was the unexpected item within this set of items. A priori this item was expected to load with the other formal communication items as they all were concerned with safety. Just culture was not by factor loading the same construct. The scale difference may be explained by the difference between the items within formal communication focusing on the role and responsibility of the respondents in safety and the just culture specifically speaks to what they can expect the clinic to do in response to errors.

Moral Exemplarism

The moral exemplar scale based upon the "Big Five" personality traits - extroversion, agreeableness, conscientiousness, narcissism/emotional stability and openness to new experience - was not a significant variable in the personal or clinic error models. Moral exemplarism and other individual personality traits, as factors in individuals' reporting or errors is an interesting new area of research within healthcare, however the adjective scale as utilized in this study did not work.

Recent research by Walker and Frimer (2007) suggest that the best way to measure exemplarism is not with an adjective list as was used here, but rather by a life story narrative. Their findings suggest that a life story narrative may be best for exemplars acting in a heroic life risking type manner, not for those moral exemplars acting in a health care setting where their own life is not in jeopardy. Collection and analysis of narrative life stories are not practical within the clinical setting and for this type of research.

Life narratives, besides being burdensome to the respondent and the researcher, are hardly ideal in that they are reactive interviews taking place after specific respondent actions. The recall bias as well as the problems of researcher prompting based upon inductive reasoning during the interviews, does not offer a reliable and repeatable measure. It seems unlikely that just because a portion of the population has experienced similar childhood/ early life experiences that they would become moral exemplars. Seemingly there are more factors at work in acts of moral exemplarism than a childhood

experience; factors such as the person having the traits and being present in an opportunistic moment where their traits are actualized in action.

The limited research on moral exemplarism has yet to develop a reliable measurement technique. While stories of moral exemplarism exist in the literature of psychology and industrial safety as well as anecdotally in health care, these stories are retrospective in nature. We know a moral exemplar by their actions after they have interjected into a safety situation, not prior. Identification of moral exemplars prior to their exemplary actions is key to understanding their day-to-day influence within their organizations; identification will require more research of new methods capable of identifying moral exemplars through repeatable and reasonable testing mechanisms. Given the findings of this study and the recent work of Walker and Frimer (2007), this researcher would recommend for future moral exemplarism work in health care to utilize case scenarios for assessments of exemplarism. Utilizing cases that ask respondents to consider their own course of actions if the scenario occurred within their clinic setting, would allow the researcher to understand the respondent's likelihood of acting as a moral exemplar. As moral exemplarism research is still within its infancy perhaps over time measurement of this construct will become more reasonable in terms of the resources needed and more standardized.

Temporal Affect – Causal Beliefs

As previously stated in chapter 5, upon completion of the EFA items which had been utilized in the final instrument during fielding were found to be unidimensional. The items were all about the respondents' causal beliefs of errors. While this information is important to understanding their perspectives of error causes, the other suggested temporal affect dimensions were missing (feelings of concern/stress and job satisfaction specifically). For future research it would be suggested that items which more fully explore these missing dimensions of concern and stress feelings should be added to the instrument. The items which had been developed to measure stress, job satisfaction and concern during the factor analysis loaded either on two factors or loaded as single items. The temporal affect items may have been subject to a dimensionally issue. Temporal affect was developed to measure affect across a large spectrum of feelings (stress, job satisfaction and concern) in a survey which included many dimensions of climate. Since the combination/ interaction of personality and climate result in temporal affect perhaps these feeling items are too diffuse to be finitely measured. Temporal affect – causal beliefs in comparison seem to be uniquely measurable and separately identifiable from the climate items. Overall temporal affect may be difficult to isolate due to its unique place where the negotiation between the person, their occupational role and the organizational climate/culture play out.

Alternative Explanation for Hypotheses Findings

While this work did not support hypotheses 2 or 4 for any of the models/ aggregations of error (personal error, clinic error, medical error, adverse events, near misses, or accidents waiting to happen) there are alternative, plausible rival explanations for these findings. Also not supported were any of the clinic errors or components for hypothesis 3, but again there are alternate plausible rival explanations.

In the case of hypothesis one, the existence of a safety climate would reasonably lead to more reporting of errors and once work arounds were in place, one could expect for fewer errors to occur. This work demonstrated that existence of a safety climate correlated with more error (personal error, clinic error, medical error, adverse events, near misses, or accidents waiting to happen) being reported. When people feel personally and professionally safe talking about their patient safety concerns within their clinic, people may report more errors; the clinic can take steps to prevent errors, thus leading to fewer errors. The existence of the safety climate can help reduce the occurrence of both personal and clinic wide errors. With hypotheses 2 and 4, it is reasonable to think that moral exemplars if they could be identified would more frequently report patient care errors than their peers if they were aware of them regardless of the climate in which they practiced.

Hypothesis 3 was not supported for clinic errors (clinic error, medical error, adverse events, near misses, or accidents waiting to happen). Low temporal affect – causal beliefs equates to a lack of attribution by the providers to the causal precipitants of

error in general; meaning that these individuals did not respond in the affirmative to items that generalized that most errors are caused by patients, resource constraints or systems failures. Perhaps within the error rates an individual does not report occurrences when they do not know the cause of the error. They may not believe there is anything the clinic could do to prevent it even if it was reported; or believe that if the patient is the case and not the clinic that they should not report the error.

Personal Error Results

The overall error rate for personal error was a mean of one, indicating that on average respondents reported a career error, but not a recent error or a lack of errors during their career. Personal errors reported are influenced by a multitude of factors, some changeable and some not. For both the full and reduced models, gender and race/ethnicity were significantly correlated with the frequency of personal errors reported. In the fit model, provider's years of experience significantly correlated with the frequency of personal errors reported; with more experience they report a greater frequency of errors. In the full model, clinic setting was significant. For managers of clinics knowing that providers report varying frequency of personal errors by gender, race/ethnicity, experience and setting can help them understand the differences of reporting.

While the personal socio-demographic characteristics (gender, race/ethnicity, years of experience and age) are non-mutable, understanding the general trends of

personnel based on these characteristics can help us understand their role in error reporting. Since years of experience slightly increase the reported frequency of error, it is reasonable to hypothesize why this occurs. Greater experience is likely to result in more knowledge and more keen awareness of errors and potential errors, thus with experience these individuals recognize more errors. It is also possible that with experience, they feel more comfortable reporting errors and more secure in their professional roles, so that they do not fear the loss of their job for reporting a personal error. It is not likely that increased experience leads to greater numbers of errors committed as experience is generally thought to decrease negative outcomes in health care (Luft et al., 1987). As to the effects of being female or white, non-Hispanic on error reporting, it is hard to say why these slightly decrease the reporting of personal error or clinic error.

Three of the scales had a significant correlation with personal error: medication reconciliation process, temporal affect-causal beliefs (full model only) and safety climate. These three scales are influenceable by the clinic and management: medication reconciliation by a process implementation, temporal affect – causal beliefs by sharing the root cause analysis of reporting investigations and the safety climate through changing the interactions within the clinic. There has been some questioning of the validity and usefulness of medication reconciliation programs, but these results support the use of these processes (Orrico, 2008; Bayoumi et al., 2009).

Medication reconciliation process, which includes the process of monitoring patient's medications, refills and use of their prescribed treatments, is related to reporting

of fewer errors. The impact of a medication reconciliation process is per this work apparently helpful in decreasing the errors providers report making. The adoption of medical reconciliation processes has been recommended by both the IOM (2009) and IHI (2009) as a way to decrease medication errors by reducing the discrepancies between the known medication list and the actual medications taken by patients. Questions have been raised by the provider community about the efficacy of such programs given that the there is an underlying assumption of serious mismatch between medication lists maintained by clinics and those medications actually taken by patients as well as the process and quantity of medication taken (Orrico, 2008; Bayoumi et al., 2009). Research has found that while there are multiple barriers to accurate medication lists such as patients not knowing their dosage, forgetting medication names, forgetting to bring medications with them even when prompted or lack of ability to bring with due to patients arriving to appointments from work or medications needing refrigeration (Riley-Lawless, 2009). The IHI and IOM suggestions are based on the idea that imperfect information is better than no information at all. A recent Meta analysis of the effects of medical reconciliation programs found that there has been a lack of research in ambulatory care settings; too little research (Bayoumi et al., 2009). Bayoumi et al. (2009) found two studies in the past twenty years; one that demonstrated reductions in discrepancies between medications on record and those gathered during medication reconciliation and one that found no effect. A concurrent study (not reviewed in the meta analysis) by Stock, Scott and Gurtel (2009) demonstrated in a large multi-specialty

medical group an improvement in medication lists when a care process including an EMR and medication reconciliation during patient visits was utilized. A lack of research and mixed findings about the efficacy of medication reconciliation does not imply that there is no need for these activities during patient visits; rather when looking at the results of this study and the research available, medical reconciliation is recommended due to its effect on personal error (Bradley, Malone, and Fleming, 2009). Even when imperfect information is gathered, providers reported fewer personal errors when a medication reconciliation process was utilized. Perhaps this effect is due to provider mindfulness during outpatient clinic visits as primed by the medication reconciliation or perhaps the patients become more accurate at reporting when they are habituated to reporting medications at every visit.

The single positive effect seen in the overall models with all types of errors is the safety climate scale. The safety climate scale includes items specifying the number of times that: short cuts are utilized to save time, test results being overlooked, errors go unreported as well as the difficulty of starting safety conversations and the risk of errors due to a tense work environment. As would be expected the more often a respondent sees these types of behaviors, the more often errors are reported. Short cuts that do not follow protocols, overlooked results, not talking about safety and tense environments lead the provider to report that they have personally made more frequent errors. The industrial safety climate literature confirms the findings here that the overall atmosphere in which

the person works informs them as to the acceptable behavior; telling them subtly if safety is a priority or not.

Clinic Error Results

As was found in the personal error reporting, demographics do influence the reported clinic errors. For clinic errors, medical errors, adverse events, and accidents waiting to happen, gender of the respondent was correlated with a decrease in the mean error frequency reported; not so however for near misses. For the full models (clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen), clinic setting was significant; however in the reduced model clinic setting was not significant. For the reduced models of clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen, years of respondent experience in their current clinic position was correlated with a decrease in the mean error frequency reported; not so however for near misses or within the full models. Respondent specialty was significant and correlated with lower reported medical errors in the reduced model. Licensure as an NP was correlated with more reported adverse events. Race/ethnicity of white, non-Hispanic was correlated with fewer reports of clinic errors, adverse events, and medical errors in the full models and adverse events in the fit model.

The absence of significant effects of personal respondent demographic factors in the near miss models, when they are found within all other clinic error aggregations (medical errors, adverse events and accidents waiting to happen) is an interesting finding.

Personal and clinic demographics, while immutable are important indicators of expected error reporting. While these demographics cannot be changed, they can inform clinic management.

Three culture scales had a positive effect on reporting of clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen reporting; formal communication about safety, error reporting process, and just culture. The formal communication items focused on the clinic's management providing a consistent messaging concerning safety in the form of error reports, safety roles and responsibilities, and open conversations of safety and errors. The error reporting process items inquired about the presence of a reporting system for all types of error (near miss, accidents waiting to happen and adverse events) as well as the ease of using the system. Clinics with a just culture which ensures providers that when reporting errors, they will be held responsible for only those errors that were within their control as opposed to those caused by system failures were significantly different. The presence of a reporting system paired with formal communications about safety and a just culture, all correlated with increased clinic error reporting frequency.

The single climate scale with an effect within the clinic error aggregations was safety climate; just as was found within the personal error models. For clinic errors ($\beta = 0.39$), medical errors ($\beta = 0.32$), adverse events ($\beta = 0.52$), near misses ($\beta = 0.32$), and accidents waiting to happen ($\beta = 0.32$) the positive effect was larger than the effect for personal error ($\beta = 0.28$). The influence of working in an environment in which others

often utilize short cuts to save time, overlook test results, do not initiate safety conversations and feel tense in the work environment, results in errors are being more frequently seen.

Limitations

The main limitations of this study include self reporting of errors/lack of actual errors reported and single provider assessment of group level constructs. As has been previously mentioned, self report of errors is prone to bias. While the influence of social desirability on the reporting of personal errors is likely, the standard for all types of medical professionals is self report. They are to report and correct their own errors. Counts of actual errors is also prone to reporting biases, as they require a provider to recognize the event as an error and then to report the event. Error reporting for outpatient care requires that the event is actually known by the provider. For outpatient providers, they may not be aware as the patient may seek follow up care elsewhere or may not even attribute their symptoms to the care received. A better count of errors might be administrative counts of events such as drug toxicity or missed treatments per protocol, but these counts were out of scope for this work and not available. Even administrative counts are prone to errors as they rely on diagnostic coding and do not include those "good catches".

Clinic culture and climate are by their nature group level constructs and as such would ideally be studied through clinic level analysis with responses gathered from all

clinic staff. Preliminary plans to study entire clinics fell through due to clinics experiencing economic hardships and potential clinical staff strikes. The hypotheses posited by the researcher came from the original study design which utilized full clinic surveys and administrative reported errors.

The population of NPs and CNMs, while informative, are by their training very similar. As both groups during their undergraduate experiences face similar socialization in their Bachelors in Science of Nursing (BSN) programs, they are likely to report similarly on error frequency and types. As advanced nursing practitioners, these NPs and CNMs diagnose and prescribe patient care which differentiates their role within the clinic from other nursing professionals who also provide patient care, but do not share the diagnosis and prescription duties. It would be preferable to include providers of different types and professionals from all clinic roles to compare with the population studied. The similar roles may have limited the generalizability of these findings across all personnel within the clinic settings.

Chapter VIII – Conclusions

The findings from this research have implications for both future research as well as management and practice applications. Translation of this research into daily clinical practice can increase safe patient care. Continued research in this area is important for outpatient medical clinic safety.

Implications for Practice

For personal errors managers can put into place a medical reconciliation process and can influence providers' temporal affects- causal beliefs. While providers' basic beliefs cannot be readily changed, open and frequent discussions about error and the findings of root cause analyses may influence their beliefs and change their future attribution error causes. For personal errors, clinic errors, medical errors, adverse events, near misses, and accidents waiting to happen safety climate is impactful on reporting. Consistent communication also may help here. Talking about the importance of not taking shortcuts, providing more time to providers, and building processes that ensure test results are seen by patients in conjunction with building a collegial and collaborative environment can increase reporting of errors while potentially decreasing the occurrence of patient care errors.

With full 25% of respondents reporting that they had never in their careers made a patient care error that had the potential to harm patients, the question must be asked how to change perceptions of error and personal definitions of errors. As their professional

oaths and licensure require compliance with self monitoring and policing, these item responses are expected to be accurate to the extent of the respondent's knowledge and are not expected to be prone to social desirability bias as much as they are prone to respondent assessment of their experiences. When providers are not identifying the possibility of patient care errors how do managers and administrators have a true understanding of errors occurring? While there may be a portion of the 25% of respondents who answered in this manner to avoid looking "bad" to the researcher, a portion of the 269 respondents certainly must truly believe that they have never committed an error that had the potential to harm patients within their careers'. The question for researchers, administrators and providers is are we being honest with ourselves when we declare that the work we have done is perfect? If we are either unwilling or unable to face our own human condition as fallible and potentially injurious, how can we work to improve our systems and processes to help ensure patients get our best care, free of defects?

For clinic errors, managers can both formally and informally communicate to providers the importance of safety. They can build systems error reporting processes that are easy to use and that allow providers to report not just adverse events for which there are legal ramifications, but also accidents waiting to happen and near misses. As one Twin Cities clinic calls them "good catches"; those events that could cause harm in the future. The addition of good catches within the reporting systems ensures that provider's safety concerns are documented and reported.

The creation and use of just culture is also recommended. Providers need to know that reporting errors will result in appropriate placement of responsibility, not blame. Open discussions and feedback about reported errors was often cited by providers during the cognitive interviews as a critical lacking piece to the prevention of patient care errors. They felt that without open dialogs about the frequency and type of errors as well as the causal events, they could not learn from others nor assist in prevention. A feedback loop is critical for the systems improvement. Reports of errors and the findings may be personally and professionally embarrassing or threatening, but if they are not shared no one knows what the real impact or frequency of errors is within the clinic. To compliment a just culture, it is suggested that clinics also adopt a standard approach for helping providers as well as patients deal with the psychosocial impacts of medical errors and complications, such as those endorsed by the Medically Induced Trauma Support Services (MITSS, 2009).

Broader Implications

Patient safety does matter to providers as well as patients. Although not reported in findings, providers involved in this research parenthetically commented on the need for safety research in the outpatient clinic setting as well as feedback on the rates of errors within their clinics. Both the findings from this study as well as opinions from experts and the IOM (2009) believe that it is reasonable to expect that a "healthier" safety climate will assist providers in avoiding errors as well as increase the reporting of errors.

A major step in fixing clinical errors is understanding with accuracy the frequency and type of errors occurring. Measurement using this or other instruments such as the newly released AHRQ Medical Office Survey on Patient Safety Culture is costly and reliant upon respondent honesty and knowledge. Regardless of the psychometric soundness of these survey instruments, it is not clear that they provide any insight not available from key informant interviews. Perhaps the best tool for researchers may not be the best tool for an individual clinic for improving their safety. As suggested in the implications for practice section, open conversations about safety and errors may be the most impactful step clinics can take in preventing patient care errors.

Clinics seem to be years behind the efforts of hospitals in preventing errors. Hospitals have learning sessions through Mortality and Morbidity (M&M) and grand rounds, where all physicians can learn from each other's experiences. With national efforts to increase safety reporting, hospitals now are reporting never events (negative events and medical errors that are uniformly decreed as those that should never happen to patients) (NQF, 2009). To date there is no list of "never events" for use within the clinic setting. The increased utilization of highly toxic pharmaceuticals and the outpatient management of more severely ill patients require the clinic setting to increase their safety efforts. Just because a patient suffers a protracted illness or death outside of the clinic does not mean that a clinic should not investigate their role in the patient's condition/ outcomes. Unfortunately the efforts at the national level have focused on hospitals and there seem to be few national or regional organizations assisting the clinics or leading the

call to action. Implementation of the TeamSTEPPS®, other Agency for Healthcare Research and Quality (AHRQ) safety efforts including the Patient Safety Organization plans and the Medical Office Survey on Patient Safety can assist clinics in creating better safety communication and action plans, although minor adaptation of some of these programs such as TeamSTEPPS® may be necessary in order to fit them to clinic settings (AHRQ, 2009). Additional efforts were initiated in 2009 by the collective work of The Health Research and Educational Trust (HRET), the Institute for Safe Medication Practices (ISMP) and the Medical Group Management Association (MGMA) who have created a new *Pathways for Patient Safety Tool* kit for use in medical clinics (MGMA, 2009). This tool kit utilizes the SAQ (reviewed on page 42) which is reliable and valid, but the instrument includes many items which are incongruent with ambulatory medical settings (Sexton et al., 2006). Unlike the AHRQ Medical Survey the Pathways for Patient Safety Tools survey cost providers per survey instrument analysis.

AHRQ Medical Office Survey on Patient Safety Culture

The recently released Medical Office Survey on Patient Safety Culture is a 51 item survey measuring 12 dimensions using both 5 and 6 point Likert Scales including:

- Communication about error (4 items)
- Information exchange with other settings (4 items)
- Office processes and standardization (4 items)
- Organizational learning (3 items)
- Overall perceptions of patient safety and quality (4 items)
- Owner/managing partner/leadership support for patient safety (4 items)
- Patient care tracking/followup (4 items)
- Patient safety and quality issues (9 items)

- Staff training (3 items)
- Teamwork (4 items)
- Work pressure and pace (4 items)

This survey was developed specifically to address unique organizational setting issues related to safety climates. One disadvantage of this instrument is the use of a respondent recall period of the preceding 12 months; this is problematic as it introduces bias with the provider likely to recall either sentinel events or respond based upon recent occurrences not actual frequency. One of the advances that this instrument has made is the accompanying comprehensive "how to" handbook for clinics (Sorra, Franklin, Streagle, 2008) including survey administration, analysis and interpretation. To date, the psychometrics of this survey have not been published; though benchmark data has been published for clinic comparison to the piloted clinics.

The AHRQ Medical Office Survey on Patient Safety Culture is very similar in its items and dimensions chosen to survey during this project (Sorra, Franklin, Streagle, 2008). Both surveys were developed in parallel paths: utilizing a review of existing measures, interviewing experts and cognitively interviewing potential respondents. The similarity in scope of items from two separate projects strengthens the argument that both surveys are measuring the factors important to safety and error. Both independently arrived at similar lists of items. Conversations between the lead researchers, Sorra and Mullen, confirmed that other surveys lacked face validity in clinics. Similar findings by both projects also determined that for staff members in clinics, traditional organizational terms such as manager, leader and organization did not have meaning.

Future Research

Utilizing the data gathered from this study, further analysis is planned to examine geographic influences in responses and interactions between the independent variables. A question of interest given the respondent's dispersion across the state of Minnesota is what influence does geographic location (rural and urban clinics) have on the reported personal and clinic error frequencies? Is temporal affect – casual beliefs an outcome?

Path analyses are planned to answer the following questions: Is temporal affect – causal beliefs a mediator as suggested within the conceptual model? Do beliefs as to the causes of events correlated with clinic climate and culture? Does the negative or positive response to the item "Leadership is driving us to…" correlate with personal error, clinic error, medical errors, adverse events, near misses, or accidents waiting to happen? Do providers not report errors when they believe that the casual precedent is the patient's behavior, thus why report when the clinic cannot control the precedents? Are temporal affect questions about stress, concern, and job satisfaction too tightly entangled within the respondent's climate to be measured separately, however measurement of causal beliefs are unique and measurable? Do specific root cause beliefs correlate with error reporting at the personal and the clinic aggregations?

Ideally, the original proposal of testing the instrument within full clinics surveying all staff members and utilizing administrative and clinic error reports as well as self reported errors will be possible at some point in the future. To date, conversations with the clinic contacts that were to be surveyed have been supportive of future research.

At current, while they still feel it is important and would provide helpful and actionable information, clinics report feeling overwhelmed by continued economic hardships and are unable to dedicate the resources to such a project.

I am hopeful that with the increased interest in safe and affordable health care for all Americans as called for by the national debate on health reform, coupled with the national health priorities and efforts by organizations such as IHI and NQF more efforts will be made to increase the quality of outpatient medical care. This research is a beginning of codifying and thus preventing errors in outpatient care. This work is a useful baseline for understanding the opinions of nurse practitioners and certified nurse midwives in Minnesota.

I would recommend that future research adopt the AHRQ Medical Office Survey on Patient Safety Culture as it is a nationally developed survey with baseline data available as well as instructions for use of the instrument. As both the AHRQ developed instrument and the instrument developed through this work were similar in the dimensions covered and the items developed, this work was helpful in reaffirming the important constructs and dimensions influencing safety climates in outpatient medical clinics. For research in moral exemplarism, this study provided a real world test of one method of identifying these traits and found it lacking. As suggested I would continue research in this arena utilizing case studies.

New Models

As is common with the process of science and experimentation, the results of this work have created data explaining part of this problem and resulted in the formation of many novel questions. Safety climate was unilaterally significant; confirming the importance of the call for development of safety climates in health care as a national priority. This work has illustrated that the presence of a reporting system and it's categorizations for errors and good catches vary as do the assessed frequencies of patient care error. The variation amongst systems, error reporting frequencies, as well as the interpretation of what an error is have been the sources of many of the new research questions; some of which may be answered through further analysis of this data, others which shall require the collection of new data.

These new questions include: What effect does the clinic culture and climate have on the scope of the reporting system implemented? What are the effects of the presence of the reporting system on the provider's causal beliefs? What are the effects of the presence of the reporting system on the provider's temporal affect?

As was stated in chapter two, there is a great deal of academic specification of the concepts of climate and culture. While I remain resolute in my preliminary thinking that there is a difference between the two, I also see the hubris in taking such as absolute stance. The providers were correct, call it what we may, but remember that the importance lies not in the name but in its presence. While theoretically interesting and definitionally distinct to both academics and lay persons, the two constructs prove to be

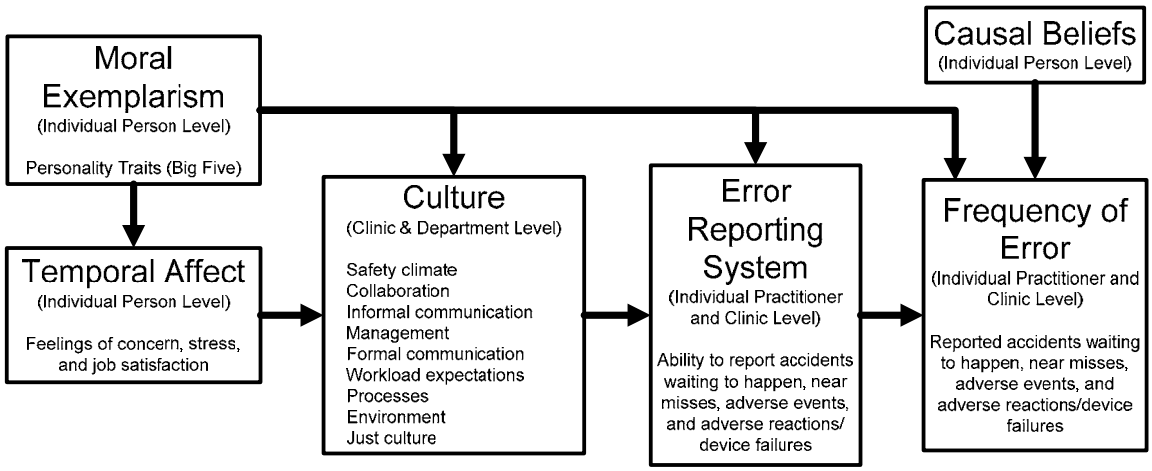
too tightly coupled to empirically disentangle. Whether a measurement could ever be developed that would adequately differentiate the two, I am not sure. But for future work I would refer to it as culture since climate is the immediate snapshot of the culture and as such is formed upon the basis of the culture. When asking respondents to consider their organization's culture or climate it is likely that they are calling upon their entire experience with the organization. Absent specific time period referents such as in the past six months, past month or past two weeks, it is likely that the respondents are instead of thinking about the current issues, thinking instead about their overall and general assessments of their organization. As this survey specifically omitted time period words in the organizational items, including them only within personal items, the responses about the organization are most likely about the overall impression of the employees. The new definition of safety culture would read as the originally proposed safety climate definition read:

> *Safety culture is the shared artifacts, espoused values and perceptions about reality, truth, space, time, human nature, activities and relationships that are concerned with minimizing the exposure of employees, customers and the public to conditions considered harmful, dangerous or injurious.*

The original conceptual model with the separation of the climate and culture, the inclusion of temporal affect (which ended up as only the causal beliefs) and moral exemplarism worked well to direct the research, but did not stand up to the applied findings and have lead to a re-examination of how the world of outpatient clinics really works. The absence of a separation of the reporting system and the frequency of errors in

the original model was problematic in the end. The reporting of errors is directly effected by what the system will allow providers to report. When there is no place to report the concerns that the employees see how can there be any counts of the occurrences and thus a codified capture of those good catches? Given the learnings from the current research, a new revised model is proposed for future research (figure 7.1).

Figure 7.1 New Conceptual Model



New Conceptual Model

The new conceptual model differentiates the reporting system from the frequency of errors, combines the culture/climate items into culture, separates the temporal affect and the casual beliefs from one another and restates the relationships between them. Culture within the new model includes all the scales that were proposed within the

original climate and culture (safety climate, collaboration, informal communication (about safety and in general), management, formal communication about safety, workload expectations, process, environment and just culture). The separation of reporting systems and the frequency of errors was previously explained.

Moral exemplarism in this model would follow the recommended revisions, measurement with the usage of case study examples; moral exemplarism influences the temporal affect of the provider as well as the culture, reporting system and frequency of errors committed. Through their presence, moral exemplars, change the dialog about error and therefore would influence these other factors. It is reasonable to expect that a person's moral exemplarism traits would influence their levels of stress, concern and job satisfaction.

The separation of casual beliefs and the other aspects of temporal affect reflect the relationship of the culture and reporting system upon the providers. A provider/ employee may feel stressed, concerned or dissatisfaction with their organization's culture; these feeling can interact with the organization and over time influence the culture of the organization. Temporal affect also may influence the reporting system, if there is widespread dissatisfaction with the system, the organization may change the system based on employee feedback. Casual beliefs are separated from other aspects of temporal affect within this model to illustrate the difference between the two within the model. Employees all come to work with preconceived ideas about the causes of error as well as what is or is not an error. The reporting system interacts with the casual beliefs in that the

reports from the system tell an employee what the culture sees as an error. As previously discussed the problem with a reporting system is that what it collects informs employees about what the organization feels has value. Reports such as root cause analysis when shared out of the reporting system may influence the causal thing of providers. These thoughts as well as their previously held beliefs help influence what the providers' will report and if they even evaluate actions that they see as errors.

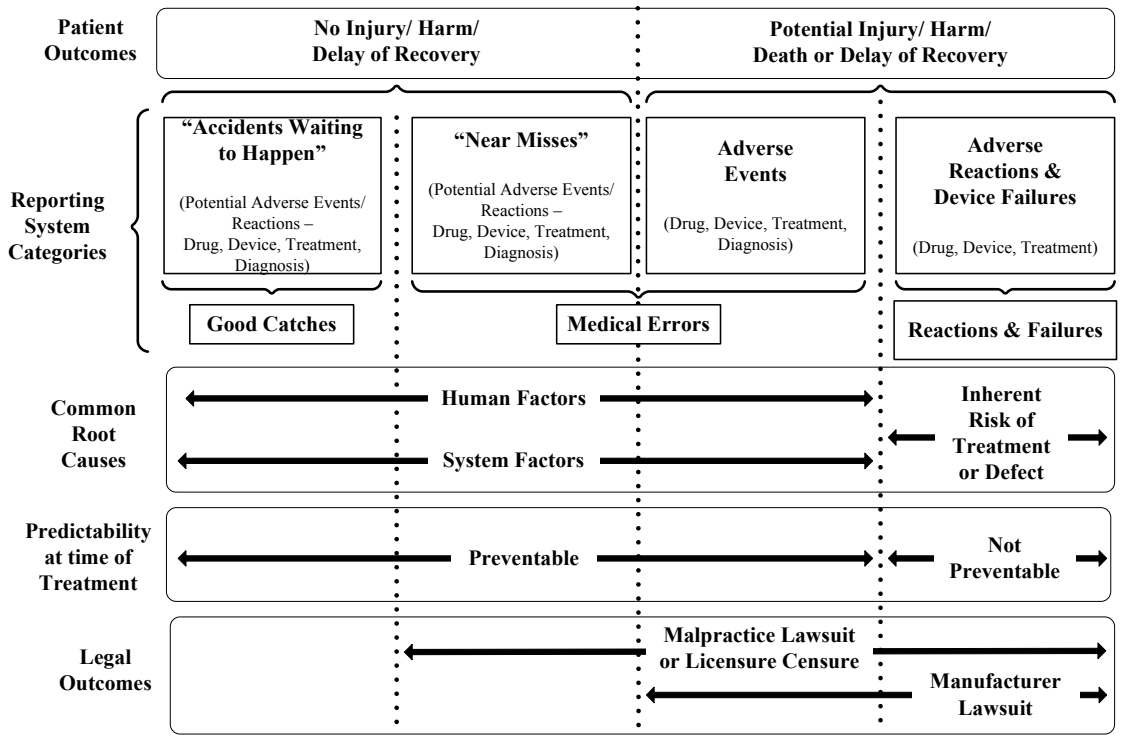
The frequency of reported errors can influence the culture as well as the temporal affect of providers and the ultimately the reporting system. Often times the reporting system is altered and influenced by exogenous sources such as regulatory requirements for reporting or by legal concerns in the form of malpractice issues.

Conceiving of Medical Errors

The discussion about medical errors and good catches with providers has lead to a search for a conceptual model which offers clarity to guide future research. It has been proposed that errors can be described as near misses and adverse events, but that adverse events also can be caused by adverse reactions (Riley et. al, 2008). This makes an accurate assessment of the impact of adverse reactions, but does not completely explain errors, good catches, and a third category of events (anaphylaxis to pharmaceutical agents that were previously unknown and failures of medical devices) called "reactions & failures". The model in figure 7.2 proposes a new conceptualization of medical errors, good catches and reactions & failures. The model includes the patient outcomes,

reporting system categories, the common root causes of error, the predictability of errors and the legal ramifications of each situation from the perspective of the patient and healthcare organization.

Figure 7.2 Error in Medical Practice Model



The new model for medical error begins as health care does first with the patient. The patient may be helped or harmed by their interactions with healthcare providers. This new model illustrates the places where we would conceptually draw the line between

safety issues that potentially cause patient harm, injury, and death or delay their recovery. Accidents waiting to happen and near misses have not potential harm to the patients since they are caught at a time before the patient is treated. Adverse events, adverse reactions and device failures can result in any number of patient outcomes from the annoying (delayed recovery) to the severe; these are costly to the patient, the patient's family and the providers who are involved.

Directly below the patient outcomes are the reporting system categories. While not all systems include all of these types of categories, it is suggested that they broaden their scope to include all four types of issues. Accidents waiting to happen are not thought of as errors, I proposed that we should think of them as potential errors and as such should have a formal collection place for these items of concern. Often times we think of these as physical plant issues: the door mat that always flips up and becomes a trip hazard, the ice in the parking lot, and the stairs in the clinic next to the eye department where patients who have had eye exams may not be able to safely walk down the stairs, but they also may include the two drugs with similar names on the drag down menu of the EMR system. These are termed good catches. Next come the medical errors; the near misses that thankfully were caught before the patient was treated and the adverse events were the treatment, device, diagnosis, or drug were given and they were wrong. These need little explanation to providers.

The final category however is a new category called reactions & failures. While individually these have long been talked about within healthcare, they have not

traditionally been included in the models of medical error. In this new conceptualization they are included since from a patient's perspective, these events are medical errors. These errors are ones the provider was not in control of, nor aware of, due to a lack knowledge. These are adverse reactions and device failures where the data was not there to prevent a problem. Reactions & failures include the adverse drug reaction to a drug that the patient had never before been exposed to and there was no way that the provider or patient would have known to avoid the drug. These are the device failures or drug manufacturing failures, which the patient and provider do not have knowledge about prior to treatment. The failures and defects of manufacturing health care products, while all instances are reported to the Food and Drug Administration (FDA) and Center for Disease Control and Prevention (CDC), require a critical mass for a warning to be issued to providers (CDC, 2009; FDA, 2009). Prior to the discovery of their failures these cannot be avoided by providers – the data is simply non-existent at the time of treatment. Within the context of a just culture the provider would not be held responsible for these events. For example, in an emergent case, a patient who is unconscious and with no identification on them presents a perfect example case of these types of errors. Since there is no data available and care must be given, adverse reactions are possible in this case. In the case of the patient whom we can identify, where the data was present within the medical chart and the provider could know that data if they had looked, yet it was done anyway, that would be an adverse event. Another rare type of these reactions &

failures is the case of a technically perfect surgery that results in adverse reactions from the patient due to their unique physiological make up.

Next in the model is the common root causes found after examination of the patient care error. Here all categories except reaction & failures events are prone to either singularly or in combination human factors or system factors. The reaction & failures are more commonly due to the inherent risk of treatment. They can be due to manufacturing failures that were exogenous to the organization that made the patient care error, these system and human factor root causes are at the manufacturer not the health care provider organization. The root causes lead directly into the discussion of the predicability of these errors. At the time of treatment for accidents waiting to happen, near misses and adverse events, these are all predictable if there was enough time and attention to these patient interventions. In the case of the reaction & failures events, these by their very nature are unpredictable (unknown allergies, device and drug manufacturing issues, unknown physiological responses) due to the lack of existent data. Until the data exists, these cannot move into the other categories and as such be preventable and predictable.

The final part of the new model is the legal outcome of category. In the case of accidents waiting to happen, since nothing has yet happened there is not legal issue. Near misses while hard for a patient to discover and are therefore not likely to be part of a malpractice lawsuit, they are likely to if committed on a frequent basis to land the provider in trouble with their licensure board when reported by colleagues; resulting in censure or licensure revocation. The adverse events are likely to result in the potential

malpractice suits as well as potentially in manufacturer lawsuits. One example that comes readily to mind is radiation overdoses. In these adverse events, often times the radiologist, their organization, as well as the radiation machine manufacturer and even maintenance servicer may be named in lawsuits. As in the case of near misses, repeated adverse events may result in the provider ending up with a censure, probation or revoked license from their professional governing board. The final category, reactions & failures, most likely results in a manufacturer lawsuit and possibly albeit rarely a malpractice lawsuit. In these cases of adverse reactions and device failures, providers are not able to predict these events and as such are less likely to be blamed for them.

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Appendix A: Safety Climate Clinic Survey

Safety Climate Clinic Survey

1. In which setting do you primarily work?

   ⬭ Single Specialty Clinic
   ⬭ Multi-specialty Clinic
   ⬭ Nursing Home
   ⬭ Retail Clinic
   ⬭ Worksite Clinic
   ⬭ Hospital
   ⬭ Home Health Care
   ⬭ School Clinic
   ⬭ Other, please specify: _____

2. Based on your experiences in your **clinic***, rate the quality of your collaborations with the following professionals:

   *Through out the survey, **clinic** refers to the setting in which you work.

	Very Low	Low	Adequate	High	Very High	N/A
a. Providers (Physician, Resident, Intern, Fellow, Nurse Practitioner, Physician Assistant, Certified Nurse Midwife)	⬭	⬭	⬭	⬭	⬭	⬭
b. Nursing Staff (RN, LVN, LPN, MOA)	⬭	⬭	⬭	⬭	⬭	⬭
c. Management/Administration (Nursing, Physician, Office Administrator, Business Office Manager)	⬭	⬭	⬭	⬭	⬭	⬭
d. Pharmacy (Pharmacists and Pharmacy Techs)	⬭	⬭	⬭	⬭	⬭	⬭
e. Ancillary Services (Technicians - Lab, Radiology, EKG, others)	⬭	⬭	⬭	⬭	⬭	⬭
f. Patient Services (Receptionists, Scheduler, Referral Coordinator, Billing, Medical Records)	⬭	⬭	⬭	⬭	⬭	⬭

3. I can laugh with others in my department / clinic.

⬭ Yes

⬭ No

4. I am one of the people other staff in my clinic turn to for advice and assistance if they have problems.

⬭ Yes

⬭ No

5. The overall atmosphere in my clinic is respectful.

⬭ Yes

⬭ No

6. My clinic, *all departments within the physical building "brick and mortar" which may include multiple or single departments & practitioners,* has a system for reporting each of the following safety issues:

Error - an error is the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim

	Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**
a. Adverse Events - Errors that cause injury or harm to the patient	⬭	⬭	⬭	⬭
b. Near Misses - Errors that are caught before they reach the patient	⬭	⬭	⬭	⬭
c. Accidents waiting to happen - potential errors that have yet to occur, but have a high potential for occurring	⬭	⬭	⬭	⬭

7. The following questions ask about the process in your clinic for reporting errors.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
a. The reporting process is easy to use.	⬭	⬭	⬭	⬭
b. The reporting process protects the confidentiality of reporters.	⬭	⬭	⬭	⬭

8. Errors in this clinic are discussed within a "just culture" environment. In a "just culture" individuals are not held responsible for errors caused by system failures, which they have no control of. But individuals are held responsible for gross misconduct or reckless behaviors that show conscious disregard for the safety of patients.

⬭ Strongly Disagree

⬭ Somewhat Disagree

⬭ Somewhat Agree

⬭ Strongly Agree

9. For each of the following please indicate how often they occur.

	Never	Rarely	Occasionally	Frequently	Often
a. Adverse Events - Errors that cause injury or harm to the patient, how often is it reported?	⬭	⬭	⬭	⬭	⬭
b. Near Misses - Errors that are caught before they reach the patient, how often is it reported?	⬭	⬭	⬭	⬭	⬭
c. Accidents waiting to happen - potential errors that have yet to occur, but have a high potential for occurring, how often is it reported?	⬭	⬭	⬭	⬭	⬭

10. Thinking about patient safety, please indicate the extent to which you agree with each statement.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
a. Patient safety considerations underlie all discussions at staff meetings.	⬭	⬭	⬭	⬭
b. In my clinic written materials (e.g. posted materials, memos, documents, etc.) emphasize safety as a priority.	⬭	⬭	⬭	⬭
c. Information obtained from reported errors are used to improve patient safety.	⬭	⬭	⬭	⬭
d. Everyone in my clinic takes responsibility for patient safety.	⬭	⬭	⬭	⬭
e. Staff receives information on the number and type of errors that occur in our clinic.	⬭	⬭	⬭	⬭
f. I feel comfortable expressing my concerns about patient safety with my administrator or supervisor.	⬭	⬭	⬭	⬭

11. My clinic effectively balances the need for patient safety and the need for productivity.

⬭ Yes
⬭ No

12. For each statement please indicate the extent to which you disagree or agree with it.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
a. In my clinic, we have trouble initiating discussions about errors that have occurred.	⬭	⬭	⬭	⬭
b. If I see someone engaging in unsafe care practices, I will immediately talk to them about it.	⬭	⬭	⬭	⬭
c. I feel like it is easier to speak up about safety concerns when they are out in the open.	⬭	⬭	⬭	⬭
d. I believe many health care errors often go unreported.	⬭	⬭	⬭	⬭
e. It is my duty to speak up about safety concerns.	⬭	⬭	⬭	⬭

13. When errors occur providers are encouraged to acknowledge the error to the patient (or the patient's family).

⬭ Strongly Disagree

⬭ Somewhat Disagree

⬭ Somewhat Agree

⬭ Strongly Agree

14. For each statement please indicate if you disagree or agree with it.

	Yes	No
a. Is there a story (morality tale) about a particular clinic incident or error and how it was handled?	⬭	⬭
b. I believe that most errors occur as a result of system failures, and are not due to any one individual's actions.	⬭	⬭
c. I believe that most medical errors are due to patient behaviors, such as non-adherence to medications or not following medical advice.	⬭	⬭
d. Most errors occur because of resource constraints (e.g. lack of proper tools, equipment, scheduling, etc.).	⬭	⬭
e. Standardized care routines, such as annual exams and well child check ups, prevent patient care errors.	⬭	⬭
f. I feel that the management of my clinic unknowingly compromises patient safety.	⬭	⬭

15. Rate your clinic's morale over the past 6 months...

⬭	⬭	⬭	⬭	⬭	⬭	⬭
1	2	3	4	5	6	7
Low						**High**

16. Rate your clinic's morale over the past month...

⬭	⬭	⬭	⬭	⬭	⬭	⬭
1	2	3	4	5	6	7
Low						**High**

17. For each please indicate the extent to which you disagree or agree with each statement. The following questions are about your ***department****, that is the specific unit or clinical area in which you work, e.g. in a multi-specialty clinic pediatrics and family medicine are different departments.*

	Never	**Rarely**	**Occasionally**	**Often**	**Always**
a. My department works as a team.	⬭	⬭	⬭	⬭	⬭
b. It is easy for department staff to ask questions when there is something that they do not understand.	⬭	⬭	⬭	⬭	⬭
c. I am unable to express disagreement with coworkers in this department.	⬭	⬭	⬭	⬭	⬭

18. Please complete the following sentence with the first phrase that comes to mind:

My clinic's leadership is driving us to...

_____

_____

19. For each of the following please indicate the extent to which you disagree or agree with each of them.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
a. My clinic does a good job of training new personnel.	⬭	⬭	⬭	⬭
b. I have the support I need from other staff to care for patients.	⬭	⬭	⬭	⬭
c. My office deals effectively with problem personnel.	⬭	⬭	⬭	⬭
d. Staff are recognized for taking quick action to identify errors.	⬭	⬭	⬭	⬭
e. If I have a question about patient safety I know who to ask what should be done to resolve the question/issue.	⬭	⬭	⬭	⬭
f. Disagreements in my clinic that can affect patient care are resolved in the patient's best interest.	⬭	⬭	⬭	⬭
g. My clinic has excessive workload expectations.	⬭	⬭	⬭	⬭

20. Telling others about my mistakes is embarrassing.

⬭ Yes

⬭ No

21. What is the most common type of patient care error in your clinic?

⬭ Lab results not returned to ordering provider

⬭ Radiology reports not returned to ordering provider

⬭ Incorrect Diagnoses

⬭ Missed Diagnoses

⬭ Test results not communicated to patient

⬭ Medication Errors (incorrect dosage or wrong medication)

⬭ Other, please specify: _____

22. Has there been a patient care error in the past month in this department/clinic?

⬭ Yes

⬭ No

23. For each of the following please indicate how frequently you would agree with these statements.

	Never	Rarely	Sometimes	Usually	Always
a. The levels of staffing in my clinic are sufficient to handle the number of patients.	⬭	⬭	⬭	⬭	⬭
b. I like my job.	⬭	⬭	⬭	⬭	⬭
c. Requests for medication refills are filled correctly and in a timely manner.	⬭	⬭	⬭	⬭	⬭
d. Test results are frequently lost or overlooked.	⬭	⬭	⬭	⬭	⬭
e. During patient visits, medication names and dosages are checked.	⬭	⬭	⬭	⬭	⬭
f. Patient compliance with medication directions are discussed at each visit.	⬭	⬭	⬭	⬭	⬭
g. If there is little or no risk to patient safety, I will take a shortcut to save time.	⬭	⬭	⬭	⬭	⬭
h. Staff frequently disregard treatment protocols/clinical pathways that are established for our clinic.	⬭	⬭	⬭	⬭	⬭
i. Staff frequently disregard rules or guidelines (e.g., hand washing, sterile fields, etc) that are established for our clinic.	⬭	⬭	⬭	⬭	⬭
j. In the last year, I have witnessed a co-worker do something that appeared to me to be unsafe for the patient in order to save time.	⬭	⬭	⬭	⬭	⬭
k. My clinic allows me to stop what I am doing until I regain my focus when I feel overwhelmed or fatigued.	⬭	⬭	⬭	⬭	⬭

24. Reporting errors is part of my job.

⬭ Yes

⬭ No

25. I have made errors that had the potential to harm patients during my career.

⬭ Yes

⬭ No

26. I have made errors that had the potential to harm patients in the past 6 months.

⬭ Yes

⬭ No

27. For each of the following, please indicate the extent to which you disagree or agree with each of them.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
a. Professionals leave their personal problems at home and do not take them to work with them.	⬭	⬭	⬭	⬭
b. I am more likely to make errors in tense situations.	⬭	⬭	⬭	⬭
c. At times personal problems have affected my work performance.	⬭	⬭	⬭	⬭
d. I feel fatigued when I have to get up in the morning and face another day on the job.	⬭	⬭	⬭	⬭

28. For this portion of the survey please indicate how descriptive each of the following phrases are of you:

	Very	Somewhat	Not Very	Not At All
a. Open to new experiences	⬭	⬭	⬭	⬭
b. Conscientious	⬭	⬭	⬭	⬭
c. Extroverted	⬭	⬭	⬭	⬭
d. Agreeable	⬭	⬭	⬭	⬭
e. Emotionally Stable	⬭	⬭	⬭	⬭

29. As part of this work, the dynamic relationship between individual characteristics and organizations are being examined. How descriptive each of the following words is of you?

	Very	Somewhat	Not Very	Not At All
Active	⬭	⬭	⬭	⬭
Involved	⬭	⬭	⬭	⬭
Follower	⬭	⬭	⬭	⬭
Submissive	⬭	⬭	⬭	⬭
Caring	⬭	⬭	⬭	⬭
Thoughtful	⬭	⬭	⬭	⬭
Stubborn	⬭	⬭	⬭	⬭
Critical	⬭	⬭	⬭	⬭
Moral	⬭	⬭	⬭	⬭
Truthful	⬭	⬭	⬭	⬭
Impractical	⬭	⬭	⬭	⬭
Flighty	⬭	⬭	⬭	⬭
Content	⬭	⬭	⬭	⬭
Balanced	⬭	⬭	⬭	⬭
Fearful	⬭	⬭	⬭	⬭
Obsessive	⬭	⬭	⬭	⬭
Open	⬭	⬭	⬭	⬭
Intelligent	⬭	⬭	⬭	⬭
Rigid/Inflexible	⬭	⬭	⬭	⬭
Narrow-Minded	⬭	⬭	⬭	⬭

30. Which of the following best describes your position?

⬭ Nurse Practioner

⬭ Certified Nurse Midwife

31. Does your position include management responsibilities in any of these areas?

⬭ Business Office / Administration

⬭ Care Delivery

⬭ Both business office and care delivery

⬭ Neither business office nor care delivery

32. Which of the following best describes your specialty?

⬭ Primary Care

⬭ Family Medicine

⬭ Internal Medicine

⬭ Pediatrics

⬭ Obstetrics and Gynecology

⬭ Specialty Care; please write in your department: _____

33. Do you have direct patient contact in your position?

⬭ Yes

⬭ No

34. How long have you worked in your current position at your clinic?

_____ Years **or** _____ Months

35. How many years of experience have you had in your current position (specialty)? _____ Years

36. Is your position at your clinic...

⬭ Full time

⬭ Part time

⬭ PRN or On Call

37. Are you...

⬭ Male

⬭ Female

38. Are you of Hispanic or Latino origin?

⬭ Yes

⬭ No

39. Which of the following best describes your racial or ethnic background?

⬭ White

⬭ Black or African American

⬭ Asian

⬭ Native Hawaiian or Other Pacific Islander

⬭ American Indian or Alaskan Native

40. In what year were you born? 19 _____

Thank you for your time and assistance.

Appendix B: Item List by Latent Variable

Culture – Management Items 19 A - F

Culture – Formal Communication Items 10 A - F

Culture – Reporting Process Items 6 A – C, 7 A

Culture – Medical Reconciliation Process Items 23 C, 23 E, 23 F

Culture – Just Culture Item 8

Climate – Safety Climate Items 12 A, 12 D, 23 D, 23 H, 23 I, 23 J, 27 B

Climate– Collaboration Items 2 B – F

Climate– Morale Items 15, 16, 17 A, 17 B

Climate– Informal Communication about Safety Items 12 B, 12 C, 12 E, 13

Climate– Informal Communication Items 3, 4, 5

Climate– Workload Items 11, 19 G, 23 A, 23 K

Temporal Affect Items 14 B – F

Moral Exemplarism Items 29 A - T

Personal Error Items 25, 26

Clinic Error Items 9 A - C

Miscellaneous Clinic Items 1, 18, 21,

Demographic – Respondent Items 24, 28 A – E, 30 - 40

Appendix C: Culture or Climate Discussion

As discussed in chapter 2, the argument between culture and climate is within the domain of academics for most health care providers. For those readers seeking a more detailed discussion of the differences a further argument is presented here.

Culture

Culture is so fundamental to the organization that it an intrinsic state; in other words "what the natives do not know that they take for granted." (Ashkanasy et. al., 2000, pg. 131). Schein (2004, pg. 17) states that an organizational culture is "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems." From his perspective, climate is a comprehensive product of culture, with levels including artifacts, exposed beliefs and values, and underlying assumptions (Schein, 2004). Culture is stable, broad and of wide breadth and is a trait of the organization which is developed out of the organization's mastery of their challenges and successes (Gerstein and Ellsberg, 2008; Schein, 2004).

In organizations culture is evident in organizations' mission and vision statements. Organizational cultures with their shared perceptions create a large number of generalized expectations for action; this is how our organization works. A person in our organization acts in this manner, not because of future sanctions, but because this is who we are and this is our legacy. In organizations these traditions are constant and

foundational; as such they are not impacted by changes in personnel, short-term business interruptions or temporary environmental pressures.

Shifts in culture can be precipitated by transformational leaders, business disruptions such as major innovation or technology shifts, or by environmental events of a global nature. Franchised organizations have illustrated that culture can be replicated in a reasonable facsimile in different geographic regions.

Climate

Organizational climate is "…shared perceptions among members of an organization with regard to organizational policies, procedures and practices." Zohar (2000, pg. 587). While individuals in an organization all have unique personal experiences and perceptions of the organization, they all share commonalities of experiences within their organization's climate. Climate is inclusive of many different characteristics related to communication, collaboration, management, relationships, work process, and physical environment as well as individual expectation levels, methods of innovation and expectations of dynamic response to changing environmental influences (Thompson, 1998; Zohar, 2000).

Climate is a more temporal state, more flexible and malleable. Climate shifts can occur due to changes in personnel, short-term business interruptions, temporary environmental pressures, innovation, technology shifts and leadership changes. Climate is evident in the business plan for today and the next couple of years; it can also change hour by hour as people's attitudes and feelings change and their social interactions vary.

Climate is a state of organization as temporal affect is a state for a person. Climate's similar perception between employees is due to their "common work context" as well as the similar experiences formed by the employees by a shared experience of leadership, social interactions and "attraction-selection-attrition processes" (Schulte et. al. 2009).

Climate, while unique to each organization, is universal in the sense that within every organization there are acceptable ways of "doing things" and "of acting". These standards, written and unwritten, help define the climate experienced daily by the individual members within the organization (Zohar, 2000). With the variety of organizational settings and climates, come a variety of acceptable ways of "doing" and "acting". What is deviant in one organization may be exemplary behavior in another organization. Given that as a society we entrust health and wellness preservation to the medical community, we have a vested interest in their norms of behavior. The cost and potential for harm or death due to maladaptive or deviant climates is large and of appropriate interest to patients and society. The continual interaction of the individual with the organization and the organization with the individual reinforces and strengthens the climate. Organizational climates responsive to changing internal and external environments, while fundamental to the organization, are malleable enough to be changed and molded.

Appendix D: Leadership is driving us to…

An open ended question (Leadership is driving us to…) was placed midway through the survey asking the respondents to complete the sentence with their first thoughts. Respondents were direct and honest in their answers. These free form text answers were categorized by the researcher into three general categories: profitability, patient centered activities and negative reactions. Fifty-four percent of clinicians report that their clinic leadership has a primary focus of profitability. They feel that they are being driven to increase productivity; using fewer resources while cutting costs. Many of these clinicians made comments along with profitability saying that they are stressed by the economic hardships their clinics are facing as well as the greater non-patient care demands (learning EMRs, documentation and frequent process changes). Nineteen percent of clinicians reported that their clinic leadership's primary focus is on patient centered activities such as continuous quality improvement and coordination of care. Fourteen percent reported that their clinic leadership is driving them towards distraction, chaos or personal despair; including looking for a new job.