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The Influence of Perceived Safety Culture and Nurses' Work Environment on Medication Error Occurrence and Reporting

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**The Influence of Perceived Safety Culture and Nurses' Work Environment on
Medication Error Occurrence and Reporting**

Joyce A. Shanty

Dissertation submitted to the
School of Nursing
at West Virginia University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Nursing

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Abstract

Influence of Perceived Safety Culture and Nurses' Work Environment on Medication Error Occurrence and Reporting

Joyce A. Shanty

Purpose: The purpose of this research study was to 1) compare differences in perceptions of the influence of organizational safety and 2) the nurses' practice environment on medication error occurrence and barriers to reporting among nurses working in Magnet, Magnet- aspiring, and non-Magnet hospitals using an Internet survey method.

Background: Over the last several years, there have been many publications that cite organizational variables that are potentially important in addressing medical errors and patient safety. Unfortunately, it is unclear which specific organizational factors contribute to errors and safety in health care organizations. Empiric support of the effects of the nurses' work environment and perceived safety culture within an organization on reasons nurses make medication errors and the barriers to report those errors would provide nursing leaders with data that would be useful in prioritizing interventions to improve patient safety.

Design and method: This descriptive correlational study used a cross sectional design. Additionally, for several of the research questions, a between- participants design was used to evaluate differences among acute care nurses in Magnet, Magnet- aspiring, and non-Magnet hospitals in perceptions of medication error occurrence and reporting, work environment, and safety culture. The study population included 447 nurses working in acute care Magnet, Magnet- aspiring, and non-Magnet designated hospitals. Data were collected online using Qualtrics web-based software. An advertisement for participation was placed on professional organizations' websites. Participants clicked on the link if interested in learning more about the study. A cover letter explaining the research was available to the potential participants.

Instruments: All of the instruments used in this study had validity and reliability demonstrated in prior studies. The Medication Administration Error (MAE) Reporting Survey contains 45 questions in 2 general content areas; (a) reasons why medication errors occur (29 items) and (b) reasons why medication errors are not reported (16 items). The instrument has five subscales for "why MAEs occur" and four subscales for "why MAEs are not reported." Internal consistency of each subscale was acceptable, with Cronbach's alpha ranging from .74-.97. Safety culture was measured using the Hospital Survey on Patient Safety Culture (HSPSC). The survey consists of 79 items measuring 12 dimensions: 2 outcome dimensions and 10 safety culture dimensions with Cronbach's alpha ranging from .72-.91. Nurses' work environment was measured using the Practice Environment Scale of the Nursing Work Index (PES-NWI) instrument. The PES-NWI consists of 31 items in five subscales that characterized professional practice in the original Magnet hospitals with Cronbach's alpha ranging from .88-.92.

Results: Differences were found among nurses working in Magnet, Magnet-aspiring, and non-Magnet hospitals regarding reasons why medication errors occur and reasons why medication errors are not reported. Safety culture variables (hospital handoffs, nonpunitive response, staffing and resources, collegial nurse-physician relations) and type of work unit were predictors of reasons medication errors occur. Safety culture variables (nonpunitive response and hospital management) and years as a nurse were predictors of reasons medication errors are not reported. Work environment variables (nursing foundation for quality of care, staffing and resources, and nurse manager ability) were predictors of reasons medication errors are not reported. The relationships between the perceived work environment and reasons medication errors are not reported and the perceived safety culture and perceived work environment were as theorized but not in the anticipated direction, most likely due to participant fatigue causing participants to not notice that the response scale options were in the opposite direction as the rest of the questionnaires.

Conclusions: This study revealed there are a number of person and system attributes that influence the reasons why medication errors occur and the reasons why medication errors are not reported, confirming the complexity of hospital systems and the influence of organizational variables on medication error occurrence and reporting and providing support for the Conceptual Model of Medication Safety. This study also revealed that reasons medication errors occur and nurses' willingness to report those errors are influenced by the key environmental attributes of Magnet hospital settings.

DEDICATION

I dedicate this work to my family. To my husband, Rick, I could not have done this without your love, support, encouragement, and hugs. To my sons, Matt, Jon, Hunter, and Logan, you gave me the inspiration needed to keep going. To my parents, Dorothy and Aldo Falsetti, you have always been there for me and words cannot express the love and gratitude I have for you and all that you have done for me and my family. To my sister, Dr. Linda Szul, for the hours of time you spent proofing my work, encouraging me, and giving me another perspective; your expertise and support was invaluable. To my sister Jeanne Casilli, for cheering me on when I needed additional support. In memory of my sister, Susie Burdett, who gave me peace of mind during this process by being a surrogate mother for my children.

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Table of Contents

CHAPTER 1: INTRODUCTION	1
Problem Statement	5
Purpose of the Study	5
Research Questions	6
Significance of the Study	7
Theoretical Framework: Reason's Human Error Model.....	9
Person Approach.....	10
System Approach.....	10
Conceptual Model of Medication Safety	14
Definitions and Indicators	16
Model of Investigation	19
Model Concepts	21
Propositions	23
Assumptions	25
Limitations	26
Organization of the Dissertation	26
CHAPTER 2: REVIEW OF THE LITERATURE	28
Overview of the Chapter	28
Empirical Support for the Conceptual Model of Medication Safety	28
Literature Review Methodology.....	28
Nurse Outcomes-Medication Error Occurrence and Reporting	52
Safety Culture	62
Instruments Used to Measure Study Concepts.....	69
Medication Error Occurrence and Barriers to Reporting Instruments	69
Nursing Work Environment Instrument	70
Safety Culture Instrument.....	72
Synthesis of the Literature.....	73
Strengths and limitations of the body of evidence	73
Summary of the Literature Gap.....	75

CHAPTER 3: METHODOLOGY	77
Research Design	77
Sample	77
Online Human Participants Research	78
Advantages to Online Data Collection	79
Measurement of Concepts	81
Medication Error Occurrence	81
Medication Error Reporting	83
Safety Culture	84
Practice Environment Scale of the Nursing Work Index	85
Personal Demographic Characteristics	86
Procedure	88
Data Analysis	89
CHAPTER 4: RESULTS	96
Introduction	96
Characteristics of the Sample	96
Description of Theoretical Variables	101
Reasons Why Medication Administration Errors Occur Subscales	101
Reasons Why Medication Errors are not Reported Subscales	109
Practice Environment Scale of the Nursing Work Index	114
Description of Safety Culture	118
Evaluation of Associations between Dependent Variables and Independent Variables	122
Evaluation of Candidate Predictors of Reasons Why Medication Errors Occur	122
Evaluation of Candidate Predictors of Reasons Why Medication Errors are not Reported	127
Evaluation of Candidate Predictors of Perceived Work Environment	131
Findings for the Research Questions	133
Summary	164
CHAPTER 5: DISCUSSION	166
Study Findings Related to Previous Research	166
Research Question 1	166
Research Question 2	169

Research Question 3:	172
Research Question 4	175
Research Question 5	178
Research Question 6	180
Research Question 7	185
Research Question 8	188
Research Question 9	191
Research Question 10	194
Recommendations for Future Research	196
Strengths and Limitations.....	197
Strengths	197
Limitations.....	198
Conclusions	199
References.....	200
Appendix A Permission to Use the Medication Administration Error Survey.....	210
Appendix B Permission to Use the Practice Environment Scale of the Nursing Work Index: Lake.....	211
Appendix C Permission to Use the Practice Environment Scale of the Nursing Work Index ..	212
Appendix D Medication Administration Error Survey.....	219
Appendix E Reason Why Medication Administration Errors Are Not Reported on Your Unit	215
Appendix F Hospital Survey on Patient Safety Culture	217
Appendix G The Practice Environment Scale of the Nursing Work Index.....	222
Appendix H Demographic Data.....	225

Table of Tables

Table 1: Forces of Magnetism	4
Table 2: Definitions and Empiric Indicators of Research Terms	17
Table 3: Inclusion and Exclusion Criteria	30
Table 4: Table of Evidence	31
Table 5: Demographic Characteristics of the Nurse Study Sample.....	97
Table 6: Type of Nursing Unit.....	100

Table 7: Descriptive Statistics for the Subscales of the Reasons Medication Errors Occur Instrument	103
Table 8: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Medication Packaging Subscale of the Reasons Why Medication Errors Occur Instrument	104
Table 9: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Physician Communication Subscale of the Reasons Why Medication Errors Occur Instrument	105
Table 10: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Transcription Related Subscale of the Reasons Why Medication Errors Occur Instrument	106
Table 11: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for Items in the Pharmacy Processes Subscale of the Reasons Why Medication Errors Occur Instrument	107
Table 12: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for Items in the Nurse Staffing Subscale of the Reasons Why Medication Errors Occur Instrument	108
Table 13: Descriptive Statistics for the Subscales of the Reasons Why Medication Errors are Not Reported Instrument.....	110
Table 14: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Disagree with Definition Subscale of the Reasons Why Medication Errors are not Reported Instrument.....	111
Table 15: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Reporting Effort Subscale of the Reasons Why Medication Errors are not Reported Instrument	112
Table 16: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Fear Subscale of the Reasons Why Medication Errors are not Reported Instrument	113
Table 17: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Administrative Response Subscale of the Reasons Why Medication Errors are Not Reported Instrument.....	114
Table 18: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Subscales of the Practice Environment Scale of the Nursing Work Index.....	116
Table 19: Subscale Means for the Practice Environment Scale of the Nursing Work Index (PES-NWI)	117
Table 20: Descriptive Statistics for Safety Culture Variables	119
Table 21: Percent Positive Responses on the Hospital Survey of Patient Safety Culture Instrument	121
Table 22: Correlations between Safety Culture Subscale Scores and Medication Error Occurrence Subscale Scores	126

Table 23: Correlations between Perceived Work Environment Subscale Scores and Medication Error Occurrence Subscale Scores	127
Table 24: Correlations between Safety Culture Subscale Scores and Reasons Why Medication Errors are not Reported Subscale Scores	130
Table 25: Correlations between Perceived Work Environment and Reasons Why Medication Errors are not Reported Subscale Scores	131
Table 26: Correlations between Safety Culture and Perceived Work Environment Subscale Scores	133
Table 27: Predictors of Nurse Staffing (n = 375), Medication Packaging (n = 390), Transcription Related (n = 375), and Physician Communication (n = 374) with Unstandardized Beta Weights, Standard Error Beta and β	150
Table 28: Predictors of Transcription Related (n = 350), Physician Communication (n = 355), Medication Packaging (n = 379), Nurse Staffing (n = 357), and Pharmacy Process (n = 375) with Unstandardized Beta Weights, Standard Error Beta and β	153
Table 29: Predictors of Reporting Effort (n = 376), Administrator Response (n = 373), Disagree with Definition (n = 375), and Fear (n = 359) with Unstandardized Beta Weights, Standard Error of Beta, and β	156
Table 30: Predictors of Reporting Effort (n = 358), Administrator Response (n = 355), Disagree with Definition (n = 357), and Fear (n = 357) with Unstandardized Beta Weights, Standard Error of Beta, and β	159
Table 31: Predictors of Nurse Manager Ability (n = 354), Collegial Nurse Physician Relations (n = 362), Nursing Foundations for Quality Care (n = 351), Nurse Participation in Hospital Affairs (n = 367), and Staffing and Resource Adequacy (n = 361) with Unstandardized Beta Weights, Standard Error of Beta, and β	163

Table of Figures

Figure 1: Schematic for Reason's Model Concepts and Proposed Relationships	13
Figure 2: Conceptual Model of Medication Safety.....	15
Figure 3: Schematic Model of Investigation Depicting Concepts and Instruments	20

CHAPTER 1: INTRODUCTION

This dissertation describes a research study that examined the effects of perceived organizational safety culture and the nurses' work environment on the occurrence of medication errors and barriers to nurses' reporting those errors. The first chapter presents an overview of Reason's Human Error Model (Reason, 1990) and the conceptual model that was developed to examine these concepts. Supporting evidence for the model's concepts and antecedent conditions will be presented. Additionally, the purpose of the study and its significance is discussed.

Patient safety moved to the center of the national healthcare agenda about 12 years ago. The landmark report, *To Err is Human: Building a Safer Health System*, (Kohn, Corrigan, & Donaldson, 1999) is credited with creating the momentum for the patient safety movement. This report identified the high incidence of medical errors accounting for approximately 44,000 - 98,000 patient deaths each year, with medication errors accounting for an estimated 7,000 deaths annually (Phillips, Christenfeld, & Glynn, 1998). Today, it is unclear how much progress has been made in the patient safety efforts ("To err is human-- to delay is deadly", May 2009).

Healthcare providers can learn a great deal from the aviation industry which encourages individuals to share stories about adverse events, so all can learn from them. Organizations that have a positive safety culture typically have communications based on mutual trust, shared perceptions of the importance of safety, and confidence in the efficacy of preventive measures (Pronovost, et al., 2003).

Patient care quality and safety are influenced by organizational culture (Bates, 1996, 2007; King & Byers, 2007). Organizational culture is the value system in the organization that

guides individuals as they solve problems, adjust to change, and deal with relationships (Kramer, Schmalenberg, & Maguire, 2004b). The term “culture of excellence,” specifically a culture that values concern for the patient, is used to describe characteristics at Magnet-designated hospitals. Leadership plays a key role in the Magnet-designated safety culture initiative by establishing and nurturing structures that support safety processes. In Magnet hospitals, staff nurses have responsibility to participate in decision making involving patient care (Kramer & Schmalenberg, 2005; Kramer, Schmalenberg, & Maguire, 2004c). In non-Magnet hospitals, there may or may not be an emphasis on staff nurse involvement in decision making.

Nursing leaders not only need to be concerned with the effects of a medication error on the quality of patient care, but also with the financial ramifications on the health care system. In 2008, the Center for Medicare and Medicaid Services (Department of Health and Human Services, 2008) announced that hospitals would no longer receive reimbursement for extended patient hospital stays resulting from hospital-acquired conditions. This provides additional incentive for hospital leaders to address medication administration errors and near misses to avoid uncompensated care.

Healthcare organizations must move away from expecting perfection from providers and recognize that individuals make mistakes. A culture where reporting is encouraged and system improvements are made is needed to enhance the quality and safety of care provided to patients. This transformation requires a different approach to quality improvement; one where emphasis is placed on identification of errors and proactive identification of system problems that lead to errors. An analysis of system factors that influence medication error occurrence and enhance reporting of errors is necessary to understand the cultural aspects that enhance patient safety as it relates to medication administration.

A recent study (Capuano, Bokovoy, Hitchings, & Houser, 2005) provided evidence that more overtime hours were associated with increased medication errors in nurses working in a Magnet-designated hospital. This finding is consistent with the original qualitative study about hospitals that could attract and retain nurses even in a time of shortage. In the early 1980s, a study was conducted to identify hospitals that were able to recruit and retain nurses. These facilities were noted to provide excellent nursing and patient care (McClure M., Poulin, Sovie, & Wandelt, 1983). Forty-one hospitals were selected based on nominations by fellows of the American Academy of Nursing, as well as information regarding vacancy and turnover rates. These hospitals were given the designation of “Magnet Hospitals,” “Gold Standard Hospitals,” or, later, American Nurses Credentialing Center (ANCC) designated Magnet Hospitals (Kramer & Schmalenberg, 2005). Over the last 20 years, there have been numerous studies examining different aspects of the work environment that contribute to the “Forces of Magnetism”—a set of structural criteria that are part of the application process. Hospitals seeking Magnet recognition must meet the criteria defined as the “Forces of Magnetism” (Table 1). These fourteen forces are associated with positive nursing and patient outcomes (American Nurses Credentialing Center, 2008). An important characteristic in the original hospitals and those seeking Magnet Certification is a corporate culture that is supportive of nursing and quality patient care. The goal of quality is to be stated in the hospital mission statement, but more importantly, practiced on a daily basis in the delivery of care by all employees in the organization (McClure, 2005).

By 2010, 370 healthcare organizations had been awarded Magnet Recognition (American Nurses Credentialing Center, 2010), a designation given only to those facilities that demonstrate excellence in patient care. Not all hospitals that start on the “journey” are successful, but nursing

leaders have found, nonetheless, that the criteria are helpful in their organizational improvement efforts (McClure, 2005).

Numerous studies have examined Magnet characteristics and the effects on patient care. However, only one study located mentioned the influence of Magnet characteristics on medication administration errors (Capuano, et al., 2005). A survey conducted by the ANCC (2005-2006) reported that clinical outcomes of quality care, errors, and adverse events ranked highest in future research priorities.

Table 1: Forces of Magnetism

Force 1	Quality of Leadership
Force 2	Organizational Structure
Force 3	Management Style
Force 4	Personnel Policies and Programs
Force 5	Professional Models of Care
Force 6	Quality of Care
Force 7	Quality Improvement
Force 8	Consultation
Force 9	Autonomy
Force 10	Community and the Healthcare Organization
Force 11	Nurses as Teachers
Force 12	Image of Nursing
Force 13	Interdisciplinary Relationships
Force 14	Professional Development

Problem Statement

Over the last decade, there have been many publications that cite organizational variables that are potentially important in addressing medical errors and patient safety (Hoff, Jameson, Hannan, & Flink, 2004). Unfortunately, it is unclear which specific organizational factors contribute to errors and safety in health care organizations. Nursing and other healthcare leaders need to understand these dynamics in order to identify effective interventions to enhance quality and safety within their institutions. During these cost conscious times, it is extremely important for organizations to use their resources in the most cost effective manner. Gaps remain in the literature describing interventions that reflect a systems approach to an intervention as well as an opportunity to evaluate the effects and cost-benefit of one intervention over another. There is also a lack of knowledge of whether the reasons for medication error occurrence and the barriers to reporting medication administration errors in hospitals that meet the structural criteria for Magnet designation are the same as in non-Magnet hospitals. Empiric support for the effects of the nurses' work environment and perceived safety culture within an organization on reasons nurses make medication errors and the barriers to report those errors would provide nursing leaders with data that would be useful in prioritizing interventions to improve patient safety.

Purpose of the Study

The purpose of this research study was to compare differences in perceptions of the influence of organizational safety on medication error occurrence and barriers to reporting among nurses working in Magnet, Magnet- aspiring, and non-Magnet hospitals by investigating the Conceptual Model of Medication Safety using an Internet survey method. In addition, the investigator compared perceptions of the nursing practice environment in Magnet, Magnet-

aspiring, and non-Magnet-designated hospitals and the practice environment's relationship with medication error occurrence and reporting. It is important to understand the influence of nurses' work environment and the perceived safety culture on medication error occurrence and reporting so that healthcare leaders can target their safety strategies on factors with the greatest likelihood of improving patient safety.

Research Questions

The following research questions guided this study:

1. What are the explanations for medication error occurrence by acute care staff nurses working in Magnet, Magnet- aspiring, and non-Magnet-designated hospitals?
2. What are the explanations for medication errors not being reported by acute care staff nurses working in Magnet, Magnet- aspiring and non-Magnet-designated hospitals?
3. Is there a difference in the explanations for medication error occurrence in nurses working in Magnet, Magnet- aspiring, and non-Magnet acute care designated hospitals?
4. Is there a difference in the reasons why medication errors are not reported by acute care nurses working in Magnet, Magnet- aspiring, and non-Magnet-designated facilities?
5. Is there a difference in perceived work environment among acute care nurses' in Magnet, Magnet- aspiring, and non-Magnet hospitals?

6. What is the influence of perceived safety culture and demographic characteristics (hours worked per week and type of work unit) on reasons medication errors occur?
7. What is the influence of acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification) on reasons medication errors occur?
8. What is the influence of perceived safety culture and demographic characteristics (type of work unit, years of experience, and years working at the facility) on reasons why medication errors are not reported?
9. What is the influence of the acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, gender, type of nursing unit) on reasons why medication errors are not reported?
10. What is the influence of the acute care nurses' perceived organizational safety and demographic characteristics (experience level, hours worked per week, and hospital classification) on acute care nurses' perceived work environment?

Significance of the Study

Medication errors can occur at any stage of the medication administration process (ordering, transcribing, dispensing, administering) (Carlton & Blegen, 2006). Medication errors occur most frequently at the prescription and administration phases of the process. Rates of errors published varied by the method of error detection. Methods of detection include direct observation, chart review, computer screening, and voluntary reporting (Leape, 2002). Methods of detection, other than direct observation of the administration phase, found a rate of 0.3 errors

per patient per day in a study of hospital medical units (Barker, Flynn, Pepper, Bates, & Mikeal, 2002). The reported error rates for the administration phase range from 2.4 - 11.1 errors per 100 doses (Institute of Medicine of the National Academies, 2007). The Institute of Medicine (Kohn, et al., 1999) reported on the estimated incidence, severity, and costs of medication errors. Rates of errors reported in *To Err is Human* varied by the intensity and specifics of the way errors were detected. For medication error reporting to be effective, error detection is necessary. The most common and least costly method is voluntary reporting. One study (Flynn, Barker, Pepper, Bates, & Mikeal, 2002) identified that voluntary reporting resulted in an underestimation of rates of medication errors. In this study, the true error rate determined by a research pharmacist was 17.9% while direct observation and voluntary reporting error rates were 14.6% and 0.09% respectively. Under estimation of error rates may be the result of time pressures, fear of punishment, and lack of perceived benefit (Cullen, 1995; Flynn, et al., 2002). Kim (2007) revealed that 67% of Korean nurses reported medication errors that harmed patients and 17% reported medication near misses.

Healthcare systems use medication administration errors as a quality indicator of patient safety because of the rate of occurrence and potential risk to patients (Stratton, Blegen, Pepper, & Vaughn, 2004). Nurses, because they administer most medications, can directly affect medication error rates and subsequently impact patient safety in hospitals. Because nurses comprise the largest cohort of healthcare providers, ensuring patient safety and error reduction are central concerns for the profession and a responsibility of each nurse (Maddox, Wakefield, & Bull, 2001).

Nurses have a responsibility to report errors and near misses to enhance patient safety. Errors should be analyzed to identify improvements in delivery systems and increase the

likelihood of preventing their occurrence in the future. Identifying system improvements, rather than blaming individuals, is a basis for making this change. Being able to report medication errors and near misses freely will aid hospital professionals in understanding the circumstances surrounding the errors, specifically the system vulnerabilities and human factors that contribute to the errors (Berntsen, 2004). Organization leaders have an influence on the incidence of medication errors and staff willingness to report errors that do occur. The complexity of health care systems and ways organizational variables might work together to improve patient safety need to be understood.

Theoretical Framework: Reason's Human Error Model

Reason's Human Error Model was originally developed for use in high-hazard organizations such as nuclear power plants and the aviation industry as a mechanism for understanding the causes of accidents and to identify methods to prevent them (Stanhope, Vincent, Taylor-Adams, O'Connor, & Beard, 1997). Within healthcare institutions, there are a number of complex processes that lend themselves to potential errors. Reason's model can be used as a way to examine the chain of events that leads to an accident, to evaluate the actions of the individuals involved, and then to evaluate the circumstances in which the involved individuals were working and the context in which the incident occurred (Vincent, Stanhope, & Taylor-Adams, 2000).

In his Human Error Model, Reason proposed that there are two approaches to viewing causes of human errors: the person approach and the system approach (Reason, 1990, 1995). The perspective taken has implications for how errors are managed as well as implications for addressing the risk of errors occurring. For example, the philosophical perspective of the system

approach is to not blame or penalize a person for a medication error, but rather evaluate the system for failures. The person approach has been the traditional approach taken by health care organizations and will be discussed first followed by the system approach.

Person Approach

Persons in direct contact with the patient have traditionally been the focus of error reduction strategies. Under this approach, errors are attributed to faulty thinking by the health care worker, such as: forgetfulness, knowledge deficit, inattention, poor motivation, negligence, and recklessness. Efforts to prevent errors from recurring include educating the individual involved, developing new procedures, and instituting disciplinary measures (Reason, Carthey, & de Leval, 2001).

A major flaw with taking the person approach is that it does not allow identification of system problems that contributed to the error. Ninety-five percent of errors in an organization are due to system problems, and only about 5% are due to the person (Deming, 1986). For error reduction efforts to be effective, it is essential that errors be analyzed and recurrent system problems be identified.

System Approach

In contrast to the person approach, the system approach recognizes that individuals are fallible and errors are to be expected. The focus with this method is to identify how and why the defenses within the system failed.

Reason (1995) developed the Swiss cheese model of system accidents, describing systems as having defenses, barriers, and safeguards (layers of protection) in place to prevent

errors from occurring. Organizations typically have many layers of protection to prevent errors: 1) those that are engineered, such as alarms, 2) those that rely on persons, and 3) administrative controls such as policies and procedures. Ideally, the layers would always be intact; but in reality there are always weaknesses or holes, much like slices of Swiss cheese. A hole in one layer does not normally result in an error. It is only when there is a simultaneous alignment of gaps or holes in the system defenses and the holes in the layers line up that there is an opportunity for an error.

These holes in the system defenses are categorized as either active failures or latent conditions (Reason, 2000). When a person in direct contact with the patient makes an error, it may take the form of “slips, lapses, fumbles, mistakes, or procedural violations” (Reason, 2000, p. 769). These types of errors are termed active failures. Slips and lapses are failures of execution, while mistakes are failures of intention (Reason, 1995). Errors that are associated with routine tasks are usually the result of slips or lapses; they result from either a distraction or a preoccupation while performing the task (Reason, 1995). Mistakes, rule-based or knowledge-based, occur when a problem is detected and a change in the current plan is needed (Reason, 1995). When active failures occur, they usually have a short-lived effect on the system defenses.

Latent conditions are those that are a result of system issues, “resident pathogens” (Reason, 2000, p.769). They often result from decisions made by persons not directly involved in patient care, i.e. senior management staff. Latent conditions are created without the manager recognizing the potential errors that can occur as a result of their decisions. The effect of these decisions usually lasts longer than those created by active failures. For example, understaffing a nursing unit, or staffing a unit with inexperienced persons, or having inadequate equipment may contribute to medication error occurrences. Decisions at the senior management level may also create long lasting holes or weaknesses in the defenses such as unworkable procedures,

ineffective communication systems, or skill-mix staffing issues. An important characteristic of latent conditions is that they are present in the system before an error occurs and can be recognized and corrected before an error does occur. Because of this, focusing on identification and correction of latent conditions should be an integral part of an organizations' safety management program.

A schematic depicting Reason's model is shown in Figure 1. In this schematic, errors will be prevented if the defenses, barriers, and safeguards are in place. If the defenses are broken (depicted by the lightning bolt), an active failure may occur in the form of a person slip, lapse, fumble, mistake, or procedural violation which may result in an occurrence. Additionally, if the defenses are broken, a latent condition in the form of a managerial decision or organizational process can manifest itself by combining with an active failure and triggering an error occurrence.

Healthcare systems are subject to organizational accidents where a variety of contributing factors combine to breach the many defenses established. Medication errors are a type of organizational accident that occurs in healthcare facilities. Concepts from Reason's model were used to develop a conceptual model that can serve as a basis for investigating medication errors and the factors within the system that influence the occurrence and reporting of those errors. A description of the model is presented in the following section.

Figure 1: Schematic for Reason's Model Concepts and Proposed Relationships

Conceptual Model of Medication Safety

The Conceptual Model of Medication Safety (Figure 2) (Shanty, unpublished) incorporates concepts from James Reason's Human Error Model (Reason, 1990). In his model, Reason describes explanations for error occurrence being attributable solely to persons or they can be a result of system factors contributing to individual errors. When an error is discovered, the persons responsible need to determine if they will report it. That determination is based upon person attributes as well as the attributes of the health care system. In the following paragraphs, the Conceptual Model of Medication Safety will be described followed by a discussion of the model concepts.

The Conceptual Model of Medication Safety provides a foundation for investigating the influence of the nurse's work environment and the perceived safety culture in an organization on person and system attributes that contribute to nurse outcomes (medication error occurrence and reporting) and patient outcomes (potential or actual consequences of a medication error). This model was developed using a retroductive approach. This approach is a process of deduction and induction based on empirical data and observation (Walker & Avant, 1995). The conceptual model was synthesized from professional experience as a nursing leader, concepts from Reason's Human Error Model (Reason, 1990), and available literature on medication error occurrence and reporting and the influence of an organization's safety culture. Preliminary to investigating patient consequences, the relationships among the remaining model concepts were investigated.

Figure 2: Conceptual Model of Medication Safety

Definitions and Indicators

Table 2 presents the conceptual and operational definitions of the major concepts within the research questions as well as the empiric indicator for each term. These definitions serve to clarify the concepts used in the Conceptual Model of Medication Safety.

Table 2: Definitions and Empiric Indicators of Research Terms

Term	Theoretical Definition	Operational Definition	Empiric Indicator
Medication error	Errors of omission involve the patient not receiving the medication that was ordered Errors of commission involve the medication being given but with a violation of one of the five rights: patient, drug, dose, time, or route (Wakefield, et al., 1999)	Self-Reported Reasons Why Medication Errors Occur on Your Unit instrument (Wakefield, et al., 2005)	Mean for individual item response (29 items) and subscale items response rating (5 items)
Medication error reporting	Medication error reporting involves “1) error recognition, 2) assessment of the need to report the error, 3) incident report preparation, and 4) follow-up response by the party receiving the report” (Wakefield, 2005, p. 477).	Self-Reported Reasons Why Medication Administration Errors Are Not Reported on your Unit instrument (Wakefield, et al., 2005)	Mean for individual item response and subscale items response rating (4 items)
Safety Culture	“The set of values, beliefs, and norms about what’s important, how to behave, and what attitudes are appropriate when it comes to patient safety in a work group or organization” (Comparing your results, 2006)	Self-reported Hospital Survey on Patient Safety Culture instrument (Agency for Healthcare Research and Quality, 2006)	Mean for individual item response and composite score on the 12 safety culture dimensions
Nurses Work Environment	“Organizational characteristics of a work setting that facilitate or constrain professional nursing practice” (Lake, 2002, p.178)	Self-reported Practice Environment Scale of the Nursing Work Index instrument (Lake, 2002)	Mean for nurse-specific subscale scores (5 items)
Nurse Outcomes	Medication error occurrence Decision about reporting medication error	Self-Reported Reasons Why Medication Errors Occur on Your Unit instrument (Wakefield, et al.,	Mean subscale items response rating (5 items) Mean subscale items

		2005) Self-Reported Reasons Why Medication Administration Errors Are Not Reported on your Unit instrument (Wakefield, et al., 2005)	response rating (4 items)
Patient Outcomes	Potential or actual consequences of medication errors		Not measured in this study

Model of Investigation

The Model of Investigation used to guide this study is depicted in Figure 3. The Model depicts that the safety culture in an organization influences both the person (registered nurse) and the system which contribute to nurse and patient outcomes. The nurses' work environment influences the system attributes that contribute to nurse and patient outcomes.

Figure 3: Schematic Model of Investigation Depicting Concepts and Instruments

Model Concepts

Medication Error Occurrence

Medication error can be defined in two broad categories—errors of commission and errors of omission. Errors of omission involve the patient not receiving the medication that was ordered and errors of commission involve the medication being given but with a violation of one of the five rights: patient, drug, dose, time, or route (Wakefield, Wakefield, Borders, et al., 1999). The concept of medication errors resulting from person and/or system attributes is taken from Reason's Human Error Model. In his model Reason identified that both the person and the system can lead to error occurrence (Reason, 1990). The Conceptual Model of Medication Safety includes both the person attribute (knowledge) and system attributes (policy/procedures, communication, organizational structure, and professional models of care) as contributing to medication errors. In this model, knowledge is defined as having the necessary information about the patient, and medication uses, doses, and equipment necessary to administer the medication. Policies and procedures are those documents developed by an organization to guide practice. Communication is defined as the exchange of information between and among healthcare providers. Organizational structure includes resource availability, unit design, and distractions during medication administration. Professional models of care include nursing workload, skill mix staffing, and scheduling.

Medication Error Reporting

Medication error reporting, adapted from the definition of a reporting system, is a systematic accounting of data (Nyssen, 2004) about medication errors. The concept of

medication error reporting and the attributes of person and system contributions to medication errors and barriers to nurses' reporting errors are adapted from Reason's Model (1990). The Conceptual Model of Medication Safety includes the person attributes of responsible decision making and recognizing harm and the system attributes of nursing leadership, co-worker relationships, and professional development as contributing to barriers to nurses reporting medication errors. Responsible decision making is defined as investigating areas of concern and making choices prior to administration of medication and reporting potential or actual errors. Recognizing harm is defined as the ability to identify potential medication errors and/or when a medication error occurred. In the context of this model, nursing leadership is characterized by the extent to which the leaders provide a work environment that promotes patient safety and shows it is a top priority (Sorra & Nieva, 2007). Co-worker relationships are characterized by the extent to which staff are supportive of each other, respect each other, and work together as a team (Sorra & Nieva, 2007). Professional development is the extent to which nurses are educated on the medication error reporting process and what constitutes a medication error.

Safety Culture

Safety culture is defined as a principle adhered to by healthcare providers that render patient safety a high priority (Nieva & Sorra, 2003). In the Conceptual Model of Medication Safety, a person can be solely responsible for a medication error, or attributes of the health care system can contribute to errors occurring. The approach to viewing causes of human errors is dependent on the philosophical perspective of the organization's leaders; to take the person approach or the system approach. The person

approach attributes the errors to faulty thinking by the health care worker. The system approach does not blame or penalize a person for a medication error, but rather evaluates the system for failures (Reason, 1990). The literature indicates there is a link between the organizational safety culture and actions taken by the nurse that promote patient safety. When the organization is supportive and a constructive approach is used to address medication errors, the staff feel comfortable reporting potential safety hazards (Manno, Hogan, Heberlein, Nyakiti, & Mee, 2006).

Nurses' Work Environment

Nurses' work environment is defined as "organizational characteristics of a work setting that facilitate or constrain professional nursing practice" (Lake, 2002, p.178). The concept of nurses' work environment is based on the sociology of organizations, occupations, and work. It incorporates attributes of an organization that promote professional nursing practice; nurse participation in hospital affairs, foundations for quality care, adequate staffing and resources, collegial nurse-physician relations, and nurse manager ability, leadership and support of nurses (Lake, 2002). The work environment (system attributes) influences nurse and patient outcomes. This concept is consistent with Reason's Model (1990) where he describes that human behaviors are shaped by circumstances.

Propositions

The proposed relationships of concepts in the model are:

1. System attributes (policy and procedure, communication, organizational structure,

and professional models of care) influence the person attribute of knowledge.

2. The person attribute of knowledge influences medication error occurrence.
3. System attributes (nursing leadership, co-worker relationships, and professional development) influence the person attributes of responsible decision making and recognizing harm.
4. Person attributes (responsible decision making and recognizing harm) influence medication error reporting.
5. The safety culture in an organization influences the system and person attributes that influence medication error occurrence.
6. The system attributes that influence medication error occurrence can influence the safety culture.
7. The safety culture in an organization influences the system and person attributes that influence medication error reporting.
8. The nurse outcomes of medication error occurrence and reporting influence the patient outcome of patient consequences of medication errors.

Nurses are in a critical position of influence on medication error occurrence and reporting. They have a responsibility to be knowledgeable about the patients they are caring for and the medications they are administering and to report errors and near misses to enhance patient safety. Organization leaders have a responsibility to create a safety culture that encourages reporting errors and repairing conditions that contributed to the errors. Errors should be analyzed to identify improvements needed in delivery systems and to increase the likelihood of preventing error occurrence in the future. The culture in an organization needs to be supportive of error reporting rather than focusing on blaming

persons for errors. When reporting is encouraged and errors are investigated, there is an opportunity for positive patient and nurse outcomes. If the organization's safety culture is enhanced, the number of medication errors may be reduced; an increase in reporting when errors do occur will be noted; and nurses will be given an opportunity to participate in performance improvement efforts to reduce the number of errors in the future. For purposes of this research study, the influence of perceived safety culture and nurses' work environment on medication error occurrence and the barriers to nurses reporting errors was analyzed.

Assumptions

This research was structured on the following assumptions:

1. The reasons nurses make medication errors varies among nursing units within a hospital and among hospitals.
2. The reasons nurses do not report medication errors varies among nurses, nursing units, and hospitals.
3. Acute care nurses are responsible for reporting medication errors made.
4. The perceived safety culture in an organization varies among nursing units and hospitals.
5. Safety Culture is a multifaceted concept.
6. Perceived safety culture is measurable.
7. The perceived nurses' work environment varies among nursing units and hospitals.

8. Nurses working in acute care hospitals perceive the safety culture of the organization on a continuum ranging from a negative culture to a positive safety culture.
9. Factors that make-up the nurses' work environment are measurable.

Limitations

Possible limitations of this study pertain to the use of an online method of data collection with a convenience sample of acute care nurses. The sample of acute care nurses completing the questionnaires may not be representative of the population of acute care nurses. While use of online data collection allows the investigator to reach a potentially larger pool of participants (Ahern, 2005), the possibility of sampling bias exists.

The use of self-reported questionnaires is another limitation to the study. The subject of perceived medication error occurrence, reporting, and safety culture can be viewed as intrusive and threatening. Nurses may be reluctant to provide information about themselves, their peers, or hospital systems for fear of manager or peer retaliation. While assurance of anonymity was made, participants may still have been reluctant to be honest.

Organization of the Dissertation

In the remaining chapters, Chapter 2 provides a review and critical appraisal of the literature relevant to reasons medication errors occur, reasons medication errors are not reported, and the impact of safety culture and nurses' work environment on the occurrence and reporting of medication administration errors. Chapter 3 presents the

methodology used in this research including design, sampling, procedures, instruments, and statistical methods used to analyze the data. Chapter 4 provides a summary of the data and results of statistical analysis. A discussion about the research findings regarding each research question is presented in Chapter 5. Strengths and limitations of the study as well as implications for future research are included.

CHAPTER 2: REVIEW OF THE LITERATURE

Overview of the Chapter

This chapter examines the theoretical and empirical evidence to support the Conceptual Model of Medication Safety. A critical analysis of the proposed model of investigation and concepts with supporting evidence is presented first. Next, a review of the evidence about medication error occurrence, barriers to nurses' reporting medication errors and the influence of safety culture and the nurse's work environment on each of these concepts is presented. Instruments used to measure study concepts are described. Finally, a critical appraisal of the evidence is presented.

Empirical Support for the Conceptual Model of Medication Safety

Literature Review Methodology

An integrative review methodology was selected for this review because it allows for the evidence to be supported by diverse methodologies. This approach also allows for the consideration of a broader selection of the literature which potentially results in a more comprehensive review of important issues to health care providers (Whittemore & Knafl, 2005).

Search Methods

To assess the current information available on the reasons medication errors occur, barriers to medication error reporting, and the influence of a safety culture and nurses' work environment on medication error reporting, interdisciplinary databases were selected. Databases searched included Academic Search Complete, E-Journals, Health

Source: Nursing/Academic Edition, MEDLINE, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and Psych INFO (Psychology Information). The search was limited to peer-reviewed research articles written in English between 1995 and 2009. Keywords used were medication errors, nursing, patient, hospital, work environment, medication, patient safety, and safety culture.

Search Outcomes

The number of hits on the databases identified for the search was: CINAHL (56), Medline (137), Health Source: Nursing/Academic (146), E-Journals (72), Academic Search Complete (184), and Psych Info (31) resulting in a total of 554 citations. Duplications were identified and abstracts were scanned for relevance to the study. Reference lists of articles were reviewed and additional pertinent articles retrieved.

Inclusion criteria were primary research, either qualitative, mixed methods, or quantitative, that focused on acute care nurses as participants, characteristics of organizations that may influence medication error occurrence or the reporting of medication errors, and evidence related to a paper driven system as opposed to an electronic system. Strict inclusion and exclusion criteria were applied to maintain the focus of the study (Table 3). This resulted in 39 relevant studies.

Data Abstraction

Papers meeting the inclusion criteria were organized by type of evidence and analyzed sequentially (Whittemore & Knafl, 2005). Sources were described based on: author/year/country, purpose and design, sample and setting, method, and findings (Table 4).

Table 3: Inclusion and Exclusion Criteria

Inclusion	Exclusion
<p>A sample of nurses in acute care hospitals</p> <p>Qualitative studies that explored nurses' perceptions of why medication errors occurred and perceived barriers to reporting</p> <p>Quantitative research exploring nurses perceived reasons medication errors occur and perceived barriers to reporting</p> <p>Quantitative research that correlates medication error occurrence or reporting with cultural factors and nursing work environment</p> <p>Mixed methods studies exploring nurses' perceived risk factors for medication errors and perceived organization factors that contribute to error occurrence</p> <p>Quantitative research that explored the relationship between nurse characteristics (experience and education) and medication error occurrence</p>	<p>A sample of non-nurses or other health care providers</p> <p>Studies that focused on specific medications</p> <p>Studies that explored relationships of variables in nurses' work environment and perceived safety culture excluding medication errors</p> <p>Quantitative research exploring the effects of specific interventions on safety climate attitudes or medication error occurrence incident reporting</p> <p>Research that explored causes of errors not including medication errors</p> <p>Quantitative research that explored effects of specific technology on the incidence of medication errors</p>

Table 4: Table of Evidence

Author/Year/ Country	Purpose and design	Sample and Setting	Method	Findings
<i>Qualitative studies</i>				
Arndt (1994) (Germany and Scotland)	Qualitative study to explore nurses' experiences with medication errors	Nurses in Germany and Scotland	Group discussions with nurses in Germany and Scotland Unstructured interviews with nurses in Scotland Written self-reports from German, English, and Scottish nurses Documentation from the Professional Conduct Committee of the United Kingdom	Nurses identified with their role as being responsible for the welfare of patients and accountable for their actions. They demonstrated their willingness to take responsibility for their mistakes, even if it resulted in disciplinary action. Some nurses, after having negative experiences, began covering up errors, but only about minor mistakes. If there was no harm to the patient and providing the type of error was not an ongoing thing, they would not report the error
Gladstone (1995) (England)	Mixed method study to explore reasons why medication errors occur	Incident reports over 12 month period Convenience sample informal interviews (14 nurses) Self-administered	Semi-structured interviews with nurses who made medication errors and questionnaires about reasons medication errors occur and managers' views	Top reasons drug errors occur: Failure of the RN to check patient name band Doctor's writing on chart difficult to read or illegible Nurses distracted by other patients/events on ward Nurse miscalculates the dose Additional information provided by nurses: Poor reaction of management to drug errors

		questionnaire to Stratified random sample of trained nurses (N = 102) and self-administered questionnaire to nonrandom sample of nurse managers (N = 12)	about drug errors.	<p>Nurses' accountability</p> <p>Role of the doctor in safe drug administration</p> <p>Fear and uncertainty in reporting errors</p> <p>Problems with definition of drug errors</p> <p>Perceived risk factors relation to drug errors</p> <p>Themes from interviews:</p> <p>Management reaction to nurses who make errors</p> <p>Nurse's feelings about the incident</p> <p>Factors that the nurse thought contributed to the error</p>
Cheek (1997) (Australia)	Qualitative interviews using critical incident technique to identify perceptions of factors affecting the quality of administration of medication	Convenience sample 29 RNs employed at a large publicly funded acute-care hospital (5 clinical nurse consultants, 6 clinical nurses, 8 RNs with 1 or more years of experience and 10 RNs in the graduate nurse program)	Qualitative analysis of the transcripts of responses to factors which affect the quality of medication administration	<p>Themes that emerged:</p> <p>Contextual/structural</p> <p>Human resources not available</p> <p>Mix of nursing staff (amount of experience)</p> <p>Lack of access to medication information</p> <p>Procedural</p> <p>Ambivalence about usefulness and effectiveness of policies</p> <p>Communication of procedures between members</p> <p>Professional themes</p> <p>Lack of nurses knowledge</p> <p>Personal attributes</p> <p>Unrealistic expectations</p> <p>Nurses taking on responsibility for others</p> <p>Client</p> <p>Active participation needed</p>
Walker and Lowe (1998) (Australia)	Exploratory mixed methods study to identify nurses'	Convenience sample of 43 nurses from 6	Questionnaire with 20 examples of medication incidents	Nurses more likely to report a medication incident when they believe patient safety may have been compromised (reported as a percentage)

	beliefs about medication incident reporting	clinical units	and focus group discussions	<p>Nurses less likely to complete a medication incident form for errors of documentation and minor variations from the prescriptions (reported as a percentage)</p> <p>Themes that emerged: ‘self-preservation’ ‘it depends’ Time taken to fill in the incident report form Inadequate understanding of what constituted an error Positive influences on reporting: Reporting system had capacity to improve the situation Any failure of the five rights Harm to the patient</p>
Balas, Scott, and Rogers (2004) (USA)	Qualitative method using spiral bound log books over a 2 week period to describe the nature and prevalence of errors and near errors	Random sample of 393 nurses accessed through the ANA working at urban (56%), suburban (19%), and rural (25%) hospitals	Content analysis conducted to group all reported errors and near errors into categories	<p>Recurrent factors may precipitate or contribute to errors</p> <p>Variation from standards of practice and protocols</p> <p>Interruptions and distractions</p> <p>Preoccupation and attention slips</p> <p>Human/technology interface</p> <p>Inadequate staffing</p> <p>Ineffective health care provider communication</p>
Kingston et. al (2004) (Australia)	Qualitative focus group interviews to examine attitudes of medical and	Purposive sample of 5 focus groups (14 medical staff and 19 nursing staff) from 3	Semi-structured open ended questions Data entered under thematic categories using Triandis’	<p>Theory components:</p> <p>Habit</p> <p>Intention</p> <p>Social factors</p> <p>Affect</p>

	nursing staff towards reporting adverse incidents and to identify measures to facilitate incident reporting.	metropolitan public hospitals.	Behavior Modeling Theory	Perceived consequences Motivation Facilitating Conditions
Rassin, Kanti, & Silner (2005) (Israel)	Phenomenological study examining the influence of medication errors on the mental and social state of the erring caregiver	Twenty nurses from a medical center in Israel. Participants included only those that made an error for the first time.	Semi-structured in-depth interview analyzed using content analysis	Responsibility was a theme identified by participants. Nurses described reporting stress-related symptoms after making an error, but did not flee. They described coping with the situation in a way that did minimize the imminent danger to the patient.
Stetina, Groves, and Pafford (2005) (USA)	Qualitative using Heideggerian phenomenological method to explore how nurses experience making or being involved in medication errors, what process is used to decide what constitutes a medication error, and what action to take when an error	6 female RNs working in clinical settings; experience range 6 months- 34 years	One-on-one interviews; Benner's interpretive methodology used for data analysis	Themes: Time is on our side Context counts Reliance on systems

	occurs			
McBride-Henry and Foureur (2007) (New Zealand)	Qualitative to explore how nurses in a secondary care environment understand medication administration safety and the factors that contribute to or undermine safe practice during the process	Convenience sample of 3 focus groups each with 6-10 participants Groups 1 and 2 staff nurses Group 3 clinical nurse specialists	Narrative approach to analyze responses to focus group discussions	Themes: Staff understanding of the medication culture 'Teams mean safety' Communication within the multi-disciplinary team Knowledge of medication procedures Working with dysfunctional organizational systems Strategies for improving them
Tang, et al. (2007) (Taiwan)	Mixed method study to explore nurses' views on factors that contribute to medication errors	Focus group of 9 RNs with at least 3 years of experience Snowball sampling method used; 72 female nurses who had made a medication error completed self-administered survey	Focus groups used to develop semi-structured questionnaire Narrative statements analyzed by 2 researchers and coded independently	Three most common contributing factors: Personal neglect (n = 62) Heavy workload (n = 27) New staff (n = 27) Three most common conditions: Need to solve other problems while administering drugs (n = 34) Advanced drug preparation without rechecking (n = 31) New graduates (n = 23)

Ulanimo, et al (2007) (USA)	Mixed method study to explore causes of medication errors and barriers and empowerments to reporting	Convenience sample of 25 RNs and LVNs ; 96% female; 72% Asian; 52% 40-49years old; 68% had a BSN	Qualitative analysis of responses to barriers and empowerments to reporting not covered in self-reported questionnaire	Reasons medication errors occur: Failure to check patient's ID band with the patient's medication administration record (45.8%) Nurse tired and exhausted (33%) Barriers to reporting: Fear of nurse manager reaction (60%) Fear of peer reaction (64%) Fear of disciplinary reaction (16%) Empowerments to reporting: Supportive and understanding physicians and supervisors Active involvement of nurse in determining medication errors and promptly reporting Enough time to report Nurse managers who consistently follow through
<i>Quantitative descriptive studies</i>				
Walters (1992) (USA)	Descriptive study to examine perceptions of major causes of medication errors	Convenience sample of 238 RNs; 71.4% < 35 years old; 90% > 1year experience	33 item questionnaire	Reasons medication errors occur: Medications late from the pharmacy (43.3%) Frequent interruptions (41.6%) RN too busy (39.1%) RN forgetfulness/oversight (35.3%) Unclear MARs (35.3%) System problems (21.8%) Own disorganization (12.6%)
Hackel, Butt, and Banister (1996) (USA)	Focused survey to determine what constituted a	Convenience sample of 146 RNs and LPNs; 78%	48 questions and 3 vignettes to describe actual situations (stat	Errors attributed to: Slow pharmacy delivery Transcription errors

	medication error and if nurses were satisfied with the medication support system	Fulltime, 10% part-time; 12% per diem; experience < 1 yr 6%; 1-3yrs 38%. 4-6 yrs 20%, 7-10 yrs 12%, > 11 yrs 25%	medication, QD medication, self-disclosed number of medication errors with incident forms)	Failing to double check medications Heavy patient loads Stress Misabeled medications Look-alike containers and medication
Wakefield, et al. (1996) (USA)	Descriptive design to explore reasons medication errors are not reported	Nonrandom selected convenience sample of 1384 nurses (N = 107 LPNs; N = 935 ADN or diploma; N = 259 BSN; N = 14 Advanced degrees); Staff nurses (78%), management position (8.9%)	Self-report questionnaire assessing nurses level of agreement with 16 different statements of reasons medication administration are not reported	Reasons why medication administration errors are not reported (range: 1 strongly disagree—6 strongly agree): Fear of blame being placed on individuals M = 4.0 No positive response or rewards for correct medication administration M = 4.2 Fear of being labeled incompetent by peers M = 3.64 Fear adverse consequences form reporting M = 3.59
Wakefield, et al (1998) (USA)	Descriptive design to explore perceptions of why medication errors occur	Convenience sample of 1384 nurses (N = 107 LPNs; N = 935 ADN or diploma; N = 259 BSN; N = 14 Advanced degrees);	Questionnaire requiring participants to rank level of agreement with 18 statements reflective of different reasons medication administration errors	Reasons medication errors occur (range: 1 strongly agree-6 strongly disagree) included: Physician issues Doctor's orders not legible Orders not clear Orders change frequently Systems issues Interruption while giving medication

		Staff nurses (78%), management position (8.9%)	occur	<p>Floated to other areas All medications for patients cannot be passed in 1 hour Knowledge Medications are similar Patients on same medications Limited knowledge about adverse effects No easy way to look up medications</p>
Wakefield, et al (2001) (USA)	Cross sectional descriptive study to explore the relationship between organizational variables (i.e. organizational culture and extent of continuous quality improvement implementation) and perceived rates of medication administration error reporting by nurses	Convenience sample of 292 nurses (LPNs 6 %, Diploma 21%, ADN 57%, BSN 15%, Advanced degree 1%; Staff nurse 88%, manager 7%) in 6 Midwest hospitals who responded to a medication administration error reporting survey in spring 1996	Self-administered questionnaires on culture (group, developmental, hierarchical, and rational) and CQI implementation (leadership, information and analysis, human resources management, quality management, and strategic quality planning)	<p>Significant differences: Among hospitals for 3 of 4 cultures; Group ($p < .0001$), developmental ($p > .05$), hierarchical ($p < .002$), and rational ($p < .0001$) Perceived percentage of errors reported ($p < .002$) Perceived extent of CQI implementation ($p < .0001$) Correlations between CQI implementation and 4 culture types significantly correlated; Individual—group ($r = .56$, $p < .0001$), developmental ($r = .29$, $p < .0001$), hierarchical ($r = -.56$, $p < .0001$), and rational ($r = -.26$, $p < .0001$) Unit—group ($r = .67$, $p < .0002$), rational ($r = -.46$, $p < .0002$), hierarchical ($r = -.50$, $p < .02$) Hospital—group ($r = .82$, $p < .04$), developmental ($r = -.88$, $p < .02$) Developmental culture at the unit level and hierarchical and rational culture type at the hospital level were not significant Correlations at Individual, Unit, and Hospital</p>

				<p>levels between error reporting barriers and estimated error reporting rates significant only at the individual level for all barriers:</p> <p>Fear ($r = -.24, p < .0001$)</p> <p>Disagreement over definition of error ($r = -.23, p < .0001$)</p> <p>Administration response ($r = -.25, p < .0001$)</p> <p>Reporting effort ($r = -.22, p < .0001$)</p> <p>No significant differences for the unit and hospital levels</p> <p>No significant relationships were found between the 4 culture types/extent of CQI implementation and the reasons why errors are not reported</p>
Cohen, et al. (2003) (Poll in <i>Nursing 2002</i>)	Exploratory study designed to assess nurses' attitudes and experiences regarding medication administration and error reporting	775 self-selected nurses (no further description of sample)	Self-report survey	<p>Top 5 reasons or factors that increase the risk of medication errors:</p> <p>Distractions and interruptions during medication administration</p> <p>Inadequate staffing and high nurse/patient ratios</p> <p>Illegible written medication orders</p> <p>Incorrect dosage calculations</p> <p>Similar drug names and packaging</p> <p>Reasons for not reporting:</p> <p>Fear of personal or professional repercussions</p>
Blegen, et al. (2004) (USA)	Descriptive correlational study describing nurses' perceptions of a medication error that should be	Convenience sample of 1105 RNs nationwide; mean age 40; 13.3 years work experience, 36 hrs	Survey questionnaires on: patient safety—which of 10 types of medication errors should be reported,	<p>Reasons for not reporting:</p> <p>Administrative response reasons (Mean = 3.17, SD = .87) and personal fear reasons (patient or colleagues will have a poor opinion of me; Mean = 3.41, SD .81)</p> <p>Nurse respondents agreed more strongly with</p>

	reported, the proportion of medication errors and patient falls that are reported, reasons for not reporting medication errors, and work environment and nurse factors associated with reporting	w/week; Female 93%; Caucasian 70%; BSN 54%	estimate the proportion of MAEs actually occurring in the unit that were reported, estimate of the overall proportion reported and indicate agreement with each of 11 reasons medication errors might not be reported	personal fear reasons than administrative response reasons for not reporting Proportion of medication errors reported was negatively related to both administrative response ($r = -.214, p < .05$) and personal fear reasons ($r = -.184, p < .05$) for not reporting. Quality management process in unit was positively related to reporting medication errors ($r = .216, p < .05$) and negatively related to the reasons for not reporting ($r = -.124, p < .05$ for personal reasons, $r = -.387, p < .05$ for administrative response reasons)
Hall, et al. (2004) (Canada)	Descriptive correlational design to evaluate the effect of different nurse staffing models on costs and the patient outcomes of patient falls, medication errors, wound infections, and urinary tract infections	77 adult medical, surgical, and obstetric patient care units	Questionnaire of staffing models to nurse managers Outcome data acquired through administrative records	On units that employed a lower proportion of professional nursing staff (RNs/RPNs) there were higher numbers of medication errors ($r = -.325, p < .05$)
Mayo and Duncan (2004) (USA)	Descriptive correlational study designed to obtain information about: Perceptions of	Random sample of 5000 RNs represented by United Nurses Association of	Self-report questionnaire	Top 3 ranked reasons medication errors occur (Ranked 1-10 with 1 most frequent cause): Physician handwriting $M = 3.92$ $SD = 2.6$ RNs are distracted $M = 4.15$ $SD = 2.98$ Tired and exhausted $M = 4.30$ $SD = 2.82$

	medication errors, what constitutes a medication error, what is reportable and barriers to reporting	California Union of Health Care Professionals N = 983		Reasons medication errors are not reported: Afraid of manager reaction (76.9%) Afraid of co-worker's reaction (61.4%) Not thinking error was serious enough (52.9%) Did not fear disciplinary action (losing job) because of error (80.4%) Correlations between type of unit and percentage of perceived reported errors was weak ($r = 0.21$; $P = .01$) and percentage of errors perceived reported and years of RN practice ($r = 0.15$; $P < .001$) was weak
Stratton, et al. (2004) (USA)	Descriptive correlational pilot study conducted as part of a nationwide study. Questionnaire asking nurses to estimate the percentage of medication errors actually reported, obtain nurses' reasons why medication administration errors occur, and reasons for not reporting	Convenience sample of 284 RNs (227 adult nurses and 57 pediatric nurses) in 11 hospitals in 2 states	Questionnaire containing 3 sections related to medication administration errors and 1 section asking for demographics	Reasons errors occur: Distractions and interruptions 46.9% Inadequate RN to patient ratios 37.2% Volume of medications administered 31.4% Not double checking doses 28% Reasons not reported (scale 1-5 with 5 highest level of agreement): Management related ($M = 3.14$, $SD 0.84$); No feedback for passing correctly Focus on person rather than system Too much emphasis on medication errors as quality of care Responses by administrators don't match severity Individual/personal related ($M = 3.31$, $SD 0.86$); Blamed if something happens to patient Peers think incompetent Fear of adverse consequences Patient may develop negative attitude Fear reprimand from physician

				<p>Nurses fear losing their license</p> <p>Nurses want to avoid potential publicity of medication errors in the media</p> <p>The more strongly nurses on pediatric and adult units agreed with management related and individual/personal reasons for not reporting med errors, the lower the estimates of errors reported.</p> <p>Correlations with management-related reasons for not reporting -.439 ($p < .05$) for pediatrics and -.210 ($p < .05$) for adults</p> <p>Correlations with individual/personal fears reasons -.423 ($p < .05$) for pediatrics and -.206 ($p < .05$) for adults</p>
Walsh (2004) (USA)	Prospective study to examine the relationship between organizational culture and leadership and the degree of safety in healthcare institutions	Convenience sample of RNs working in ICUs in the state of Texas Respondents N = 386; 226 from study hospitals and 149 from non-study hospitals	Self-administered questionnaire Interviews with key leaders in 13 institutions to assess compliance with Institute of Medicine's Selected Strategies to Improve Medication Safety	<p>No statistically significant difference between leadership practice at unit or hospital level and the degree of sophistication of the medication safety program</p> <p>Significant directional relationship between academic affiliation and safety performance</p> <p>All teaching hospitals had high or very high levels of safety scores</p> <p>Non-teaching hospitals scored low, med or high safety scores</p> <p>Magnet- aspiring hospitals had higher safety performance and the leaders demonstrated stronger practice toward safety</p>
Chiang and Pepper (2006) (Taiwan)	Cross-sectional descriptive correlational	579 nurses; age range 20-43; BSN (73.7%); reported	Self-administered questionnaire	<p>Barriers to reporting:</p> <p>Individual/personal barriers</p> <p>Fear</p>

	design to describe nurses' perceptions of barriers to reporting medication administration errors and to examine the relationship between the barriers to reporting and cultural factors and nursing work environment	making an medication error 75.2%		Adverse consequences from reporting Being blamed for error Administrative barriers No positive feedback for giving medication correctly Too much emphasis on medication errors as a quality indicator Power hierarchy and face-saving concern were positively correlated with barriers to reporting, ($r = .55, p < .01$ and $r = .64, p < .01$) respectively
Fogarty and McKeon (2006) (Australia)	Structural equation modeling to measure organizational climate and test hypothesized links between climate and unsafe medication administration behaviors	176 nurses in 11 public sector hospitals; RNs 77.3%; female 92%, male 6.8%; fulltime 36.4%, part time 48.3%; > 40 years old 58%; years of experience in area 59.1%	Self-administered questionnaire	Quality of working life, morale and organizational climate were negatively correlated with violations and distress showed a positive relationship Weak support for the proposition that morale and stress are directly linked with errors Indirect links; when the climate is positive, nurses are less likely to feel stressed, less likely to violate procedures and less likely to make errors
Hofmann and Mark (2006) (USA)	Exploratory study investigating the correlates of safety	127 nurses working in 81 general	Data collected over 6 month period; safety climate survey	Overall safety climate of the unit significantly predicted medication errors ($r = -1.51, p < .05$) Safety climate had a strong negative relationship

	climate with organizational outcomes	medical/surgical nursing units in 42 randomly selected acute care hospitals with > 150 beds.	completed at beginning, 3 months later, data collected on medication errors	with the incident rate of medication errors and weaker relationship when patient conditions were less complex
Laschinger, et al. (2006) (Canada)	Exploratory study investigating the relationships between hospital work environment characteristics, nurse staffing, and nurse and patient outcomes	Stratified random sample of nurses working in 292 acute care hospitals were randomly selected	Self-administered questionnaire	Patient safety outcome of medication errors are related to the quality of the nursing practice work environment and nursing leadership's role in changing the work environment (M = 1.89. SD = 0.76)
McKeon, Fogarty, and Hegney (2006) (Australia)	Mixed method study investigating organizational factors contributing to procedural violations by nurses during medication administration	Non-proportional stratified sample of 627 nurses (BSN 76.7%, acute care 61.7%; fulltime 45.8% part time 38.4%); 297 contained written responses for qualitative analysis	Self-administered questionnaires	Violations were statistically significantly related ($p < .01$) to all four predictor variables (level of knowledge, access to reference materials, workload, expectation by doctor) Two main predictors of violations are level of knowledge (better knowledge associated with fewer violations) and expectation by doctor (violations more likely if it was believed that the doctors endorse behavior) Qualitative data supported the findings from quantitative analysis
Moody (2006) (USA)	Descriptive correlational study	Purposive sample of 158 RNs (83%)	Self-administered questionnaire	The more positively nurses perceived nursing unit managements actions and expectations promoting

	to examine relationships among nurses' behavioral motivation, cognitive decision-making style, safety culture perceptions, and nursing care hours per patient day, in relation to nurses' frequency of error reporting, and the incidence of nurses' reported medication administration errors	and LPNs (17.1%)		<p>safety on the units, the greater the frequency of error reporting ($r = .233$, $\alpha = .01$)</p> <p>Open communication on the nursing unit is positively associated with increased willingness to report errors ($r = .270$, $\alpha = .01$)</p> <p>Fewer numbers of direct care hours worked by nurses was associated with significantly higher rates of nurses' reported medication administration errors ($r = -.348$, $\alpha = .05$)</p>
Fry and Dacey (2007) (England)	Cross-sectional design to assess nurses' views of contributing factors to medication errors, if type of work area influenced the factors that contribute to medication	Purposive sample of 224 RNs in 15 wards N = 139	Self-administered questionnaire	<p>Contributing factors to medication errors:</p> <p>Distractions in the environment (94%)</p> <p>Medication products and packaging were misleading (57%)</p> <p>Medications that looked and sounded alike were misleading (69%)</p> <p>Illegible medication charts (96%)</p>

	incidents, if years of experience or grade was associated with medication errors, and the effect of an error on practice			
Kim, et al. (2007) (Korea)	Descriptive correlational study exploring nurses' perceptions of frequency of error reporting and patient safety culture and to identify relationships between the nurses' perception and work-related factors	Convenience sample of 886 nurses (female, 99.8%; staff nurse 84.4%; age 20-29, 69.6%; 40 to 50 hours worked per week , 58.6%	Self-administered questionnaire	Sixty-seven percent of nurses said they always report errors that are harmful to patients. Only 5% said staff were not afraid to report errors while 31% said they worried mistakes were kept in their files
Manojlovich & DeCicco (2007) (USA)	Descriptive study to examine the relationships between nurses' perceptions of their practice environment (workplace	Convenience sample of 462 critical care nurses working in southeast Michigan (female 84%; white 78%; mean age 39.3	Questionnaires measuring 1) characteristics of magnet hospitals and workplace empowerment, 2) nurse-physician communication, 3)	Medication errors had a significant inverse relationship with the practice environment scale and the communication scale Nurse assessed rates of VAP, catheter-associated sepsis, and medication errors were significantly related to the communication scale, but not to both environment scales Years of nurse experience was positively

	empowerment and magnet hospital characteristics), nurse-physician communication and selected patient outcomes	years; 36-40 hours worked per week, 72%)	perceptions of ventilator acquired pneumonia (VAP), catheter-related sepsis, and medication errors	associated with medication errors—the more years of experience, the more likely to report
Mrayyan, et al (2007) (Jordan)	Descriptive correlational design to assess rate of medication errors reported, causes of medication errors as perceived by nurses, nurses' views about reporting medication errors, and what are the predictors of medication errors	Convenience sample of 799 Jordanian nurses; male 54%, female 46%; mean age 29.5 years; BSN 74%; full-time 75.1%	Questionnaire measuring 1) rate of medication errors, 2) nurses' perceived causes of medication errors, 3) nurses' views about reporting medication errors	Perceived causes of errors: Medication labels/packaging poor quality Confusion by different types and function of infusion devices Occur when distracted by other patients, coworkers, or events on the unit Failure to Report; Afraid of disciplinary action or even loss of job Did not think errors were serious to warrant reporting Afraid of the reaction they will receive from coworkers Afraid of reaction from Head Nurse Total score of medication errors and sample characteristics, no significant correlations Stepwise regression between total score of medication errors and sample characteristics; gender only predictor with female reporting higher than males
Vogus and Sutcliffe (2007) (USA)	Cross sectional study to explore the benefits of	Convenience sample of 1033 RNs, and 78 nurse	Self-administered questionnaire and analysis of	Interaction effects between safety organizing and trusted leadership ($p < .001$) and safety organizing and care pathways ($p = .001$) had significant

	bundling safety organizing with leadership (trust in leadership) and design factors (use of care pathways) on reported medication errors	managers in 10 acute care hospitals	medication errors reported to the hospital incident reporting system for a 6 month period	negative relationships with reported medication errors Benefits of increased safety organizing are more pronounced when coupled with high levels of trust in one's manager and extensive use of care pathways High levels of trust in manager coupled with high levels of safety organizing results in 1 fewer reported medication error/unit than those with lower levels of trust Extensive use of care pathways and high levels of safety organizing results in approximately 3 fewer reported medication errors/unit than those with extensive pathways
Vogus and Sutcliffe (2007) (USA)	Cross sectional assessment of a self-report measure of safety culture	Convenience sample of 1685 RNs working in 13 hospitals Multiple t tests to determine if sample was biased; none revealed statistical significance	Self-reported questionnaire	Safety Organizing Scale is negatively related to reported medication errors ($p < .001$) High numbers of reported medication errors were associated with low ratings of quality of care by nurse managers
Armutlu, et al. (2008) (Canada)	Cross sectional survey to explore current medication administration practices,	Purposive sample of 205 RNs with complete data on 144 questionnaires. No	Questionnaire consisting of 8 questions on current practice, 1 question on reporting	Top 3 perceived sources of errors: Transcribing Legibility Distractions No significant differences for results of

	perceptions of sources of errors, and error reporting practices of nurses	further breakdown of sample provided	practices, and selection of 6 most common sources of errors with an opportunity to add 3 additional items.	administration between patient care units Years of nursing experience not associated with perceived sources of errors
Kagan and Barnoy (2008) (Israel)	Exploratory study examining the medication self-error reporting, estimate of the perceived incidence of medication errors and reporting, and nurses' personal views on reporting. The study also examined the relationship between nurses views and self-reporting of errors and the impact of safety culture on error reporting	Convenience sample of 201 RNs (work experience M = 9.06 years, SD = 8.34)	Self-reported questionnaire	Frequency of reporting errors correlated negatively with self-reporting of errors ($r = -.32$; $p < .01$) Positive correlations found between self-reporting medication errors and respondent's personal views on how the ward and hospital deal with errors ($r = .43$; $P < .01$) and the perception of the way error reporting was handled ($r = .41$; $p < .01$) Negative correlations between error self-reporting and the practice of nurse managers ($r = -.026$; $p < .01$) and staff nurses' tendency to correct errors without reporting them to a higher authority ($r = -.033$; $P < .01$)
Wilkins and Shields (2008) (Canada)	Exploratory study examining the association	Random sample from membership lists provided to	Survey administered by phone	Medication errors significantly related to more overtime hours worked ($p < .05$) and shift length less than 12 hours more errors than 12 hour shifts

	between medication error and selected factors in the workplace; work organization and environment	Statistics Canada; 18,676 nurses were contacted by phone and 4,379 were RNs providing care to hospital patients		($p < .05$) No relationships found between working > 40 hours/week, fulltime/part time and shift other than days and medication errors Medication errors related to perceived “role overload” and perceived staffing and resource adequacy
Chang and Mark (2009) (USA)	Longitudinal study examining nursing unit characteristics contributing to medication errors at acute care hospitals and explore whether medication errors of different levels of severity have different antecedents	Data collection from 146 randomly selected JCAHO accredited acute care facilities; 279 nursing units (2 med/surg units/hospital)	Questionnaires distributed during the 1 st , 3 rd , and 5 th month of data collection Monthly for 6 months data on unit level RN hours, patient days, and both severe and non-severe medication errors	Average number of severe medication errors 0.61 and non-severe 3.86 per month Team factors— Nursing expertise statistically significant negative association with non-severe medication errors ($p < 0.01$) Severe medication errors and communication with physicians was not statistically significant Person factors— Education level had a significant nonlinear relationship with severe medication errors only ($p < 0.01$); as % of BSN prepared nurses on the unit increased (up to 54%), severe medication errors decreased Nursing units with more experienced RNs reported more non-severe medication errors The more medication related support services available, the more non-severe medication errors were reported
Mark and Belyea (2009) (USA)	Exploratory study to examine the relationship	284 nursing units in 145 hospitals; 4911 RNs	American Hospital Association data on bed size and teaching	Hospitals with a higher case mix index had smaller increases in medication errors over time. Teaching hospitals had larger increases in medication errors

	<p>between change in acute care unit nurse staffing and change in medication errors and to describe the trajectory of change over a 6 month time period</p>		<p>status Surveys of RNs collected once during 6 month period Data on unit size, occupancy rate, case mix index, and medication errors (documented by incident reports)</p>	<p>over time Unit characteristics—average occupancy, uncertainty of work and system to support medication administration had no effect on initial level of medication errors or rate of change Unit size significantly related to initial level of medication errors i.e. larger nursing units reported more medication errors/1000 patient days No lagged effect of nurse staffing on medication errors</p>
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Nurse Outcomes-Medication Error Occurrence and Reporting

Nurse outcomes of interest in this study are: 1) medication errors and 2) decisions about reporting the error. Medication errors occur when the patient does not receive the medication that was ordered or the nurse administers a medication with a violation of one of the five rights: the wrong patient, time, dose, route, or frequency. When a medication error does occur, the nurse must make a decision of whether or not to report the error. These two nurse outcomes influence the patient outcome of potential or actual consequences of medication errors and are influenced by the remaining concepts in the Conceptual Model of Medication Safety.

Medication Error Occurrence

Medication errors can occur as a result of person (individual health care professional) issues or system issues (McBride-Henry & Foureur, 2006). Following is a presentation of the evidence from the literature that supports the concepts contained within the Conceptual Model of Medication Safety.

Person Attribute. The literature supports that the person attribute of adequate knowledge influences the nurse outcomes pertaining to medication administration. Limited knowledge has been identified as one of the top five reasons medication errors occur (Wakefield, Wakefield, Uden-Holman, & Blegen, 1998). Explanations reported by nurses about why they make medication errors included similar medication names (Mayo & Duncan, 2004) and limited knowledge of adverse effects (Wakefield, et al., 1998). Person attributes also included lack of knowledge of equipment used in medication administration and poor mathematical skills (Cheek, 1997; Fry & Dacey, 2007;

Gladstone, 1995; Mrayyan, Shishani, & Al-Faouri, 2007; Wakefield, Uden-Holman, & Wakefield, 2005; Wakefield, et al., 1998). Inadequate knowledge would be considered an active failure using Reason's Model and creates weaknesses in the protective layers that organizations develop. The lack of this person attribute (knowledge) can result in active failures, has the ability to produce an error immediately, and can cause harm to the patient.

System Attributes. Several system attributes contribute to why medication errors occur. System attributes, in the Conceptual Model of Medication Safety, are defined as distinct features in an organization that influence patient safety. The literature indicates that the system attributes of policies and procedures, communication, organizational structure, and professional models of care can impact nurse outcomes related to medication errors. A discussion of these attributes follows.

Policy and procedures are those documents developed by organization leaders to serve as guidelines for practice. Policy and procedure related issues included both the absence of and failure to follow procedure. There was a lack of attention to safeguards for preventing medication errors when policies and procedures were not followed. Specifically, failure to follow the policy and procedure of checking the patient's arm band with the patient's medication administration record before administering the medication accounted for why medication errors occurred (Armutlu, Foley, Surette, Belzile, & McCusker, 2008; Gladstone, 1995; Mayo & Duncan, 2004; Ulanimo, O'Leary-Kelley, & Connolly, 2007). This example is consistent with an active failure in Reason's Model, where inattention to policies and procedures can lead to medication error occurrence.

Communication can be defined as the exchange of information among health care providers. Open communication occurs when staff members feel comfortable asking questions of those in authority and feel free to address situations or issues that may negatively impact patient care. Staff nurses described how communication between multidisciplinary team members was essential to safe medication processes. Having a coworker double check a medication dosage calculation is an example of how communication helped prevent an error (Balas, Scott, & Rogers, 2004). Also discussed were ineffective mechanisms which can undermine care of the patient. Staff cited examples of stat medication orders being written but not communicated verbally. Subsequently, patients did not receive the medication in a timely fashion (McBride-Henry & Foureur, 2007). Other communication issues including transcription errors (Balas, et al., 2004; Wakefield, et al., 1998), use of abbreviations, and illegible handwriting (Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; Ulanimo, O'Leary-Kelley, & Connolly, 2007; Wakefield, et al., 1998) have been identified as contributing to medication error occurrence. Additionally, medication labels/packaging of poor quality or damaged (Fry & Dacey, 2007; Mayo & Duncan, 2004; Mrayyan, et al., 2007; Ulanimo, et al., 2007), failure to communicate medications missed and to be given later, and incomplete or incorrect interpretation of physicians' orders (Wakefield, et al., 1998) are other communication issues that have accounted for reasons medication administration errors occurred.

Failure to communicate missed medications and misinterpreting physician orders can be viewed as active failures in Reason's Model, having the potential to produce patient harm immediately. Use of abbreviations, illegible handwriting and medication

packaging can all be viewed as latent failures. If interpreted correctly, they will not cause an error. If, however, holes in the defenses line up—inadequate staff knowledge along with a latent failure—an error can occur.

Organizational structure and professional model of care are also system attributes that contribute to medication error occurrence. Organizational structure is defined as how the work is organized, including physical layout of the nursing unit and support staff availability. Professional model of care is defined as the nursing care delivery model implemented, including skill mix of staff and schedule/shift options. Distractions and interruptions from co-workers, patients, and unit events during the medication administration phase have been reported as contributing to errors (Balas, et al., 2004; Cohen, Robinson, & Mandrack, 2003; Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; McKeon, Fogarty, & Hegney, 2006; Mrayyan, et al., 2007; Stratton, et al., 2004; Tang, Sheu, Yu, Wei, & Chen, 2007; Ulanimo, et al., 2007; Wakefield, et al., 1998; Walters, 1992). Late or slow deliveries from pharmacy were also cited as contributing to medication administration errors (Hackel, Butt, & Banister, 1996; Walters, 1992). Lack of resources, making it difficult to look up medications (Cheek, 1997; Gladstone, 1995; Mrayyan, et al., 2007; Wakefield, et al., 1998), as well as lack of other healthcare provider resources such as medical staff and pharmacist availability was described as contributing to medication error occurrence (Cheek, 1997; McKeon, et al., 2006). Staffing mix has also been shown to contribute to nursing errors (Moody, 2006; Stratton, et al., 2004; Wilkins & Shields, 2008). Staff nurses described that inadequate staffing levels prohibited them from administering medications on time and assessing newly admitted patients (Balas, et al., 2004; Fogarty & McKeon, 2006; McKeon, et al., 2006;

Stetina, Groves, & Pafford, 2005). The skill mix of staff, namely the amount of experience on each shift, was described as contributing to medication errors. Staff described that working with individuals with limited experience increased the risk of medication errors because of less experienced staff inability to recognize high-risk situations (Cheek, 1997; Tang, et al., 2007). A greater number of medication errors were reported on units that had fewer nursing care hours per patient (Moody, 2006). Additionally, rotating shifts and length of shifts contributed to increased medication errors (Balas, et al., 2004; Mayo & Duncan, 2004). Fatigue and exhaustion due to staffing were described by nurses as contributing to medication errors (Ulanimo, et al., 2007). More overtime hours were associated with increases in adverse patient events in nurses working in a Magnet hospital (Capuano, et al., 2005) and in Canadian hospitals (Wilkins & Shields, 2008).

Critical Analysis of Literature on Medication Error Occurrence

Qualitative, mixed method, and quantitative studies included in this review were conducted in the United States (Stetina, et al., 2005; Balas, et al., 2004; Walters, 1992; Hackel, et al., 1996; Wakefield, et al., 1998; Stratton et al., 2004; Mayo & Duncan, 2004; Cohen et al., 2003), Australia (Cheek, 1997; McKeon et al., 2006), Taiwan (Tang, et al. 2007), England (Gladstone, 1995), Europe (Fry & Dacey, 2007), Canada (Armutlu, et al., 2008), the Middle East (Mrayyan, et al., 2007) and New Zealand (McBride-Henry & Foureur, 2007), representing a wide geographic region. The body of evidence for the reasons medication errors occur is homogenous; when examining the same concepts, the findings of all studies were consistent with each other. Samples in the studies were predominately female nurses working in acute care facilities. The qualitative studies

included demonstrated credibility (Balas, et al., 2004; Cheek 1997), confirmability (Cheek, 1997), and transferability (Balas, et al., 2004). The research questions were congruent in each of the included studies. Of concern in one study was that the investigator did not provide a definition of a medication error. As a result, participants expressed confusion about what constituted a medication error (Gladstone, 1995).

The quantitative studies were exploratory or descriptive, making the risk of error and bias in the findings a concern. Convenience sampling was used in all of the studies except one (Mayo & Duncan, 2004), posing a threat to the internal validity (Walters, 1992; Hackel, et al., 1996; Wakefield et al., 1998; Stratton et al., 2004; Mrayyan, et al., 2007; Armutlu, et al., 2008; Cohen, et al., 2003). Two studies used the same instrument (Wakefield, et al., 1998; Stratton, et al., 2004) which has documented reliability and validity. The instrument used in two other studies (Mrayyan, et al., 2007; Mayo & Duncan, 2004) also has documented reliability and validity. Other studies used instruments that possessed content validity (Walters, 1992; Hackel, et al., 1996; Armutlu, et al., 2008; Cohen, et al., 2003; Fry & Dacey, 2007). Findings from the qualitative studies support the findings from the quantitative studies, strengthening the evidence.

It is clear from the nurses' descriptions of factors contributing to medication error occurrence that errors often result from multiple person and system factors. The medication administration process is a multidisciplinary process that requires communication, resource availability, and an environment conducive to no interruptions.

The system attributes described in the reviewed studies would be classified as latent conditions according to Reason's Model. Decisions that the organizational leaders make regarding staffing, unit design, and available resources can all contribute to

medication error occurrence. Thus, there is well documented evidence of the impact that system attributes can have on the incidence of medication errors.

Medication Error Reporting

Person Attributes. When a medication error occurs, the nurse is faced with the decision of whether or not to report the error. Responsible decision making and recognizing harm to the patient are person attributes that have been described in the literature that influence the nurse's willingness to report medication errors.

Responsible decision making was a theme that emerged from the participants in a qualitative study (Rassin, Kanti, & Silner, 2005). Participants described reporting stress-related symptoms after making an error, but none tried to hide the error. They coped with the situation in a way that minimized the imminent danger to the patient. This supports the prevailing professional ethic that guides nurses to care for their patients first, while taking responsibility for their own actions. Meurier and colleagues, (Meurier, Vincent, & Parmar, 1997) found similar results in a study they conducted. Findings indicated there was a strong professional ethic that existed among the nurses regarding the issue of responsibility. Nurses who internalized the error were more likely to accept responsibility for the medication errors they made, in both serious and non-serious outcomes. Failing to report errors or near misses could lead to a misjudgment of risks to a patient and poor decision making in clinical practice. Arndt (1994) conducted a qualitative study focused on the meaning of the experience of making an error. Nurses identified their role as being responsible for their patients and accountable for their actions. They demonstrated a willingness to take responsibility for their mistakes, even if it resulted in disciplinary action (Arndt, 1994).

Recognizing harm is another attribute of the nurse when deciding to report/not report a medication error. A study conducted by Mayo and Duncan (2004) concluded that reporting a medication error is dependent on a person's decision making process. They found that there was a knowledge gap between the nurse's perceived knowledge and his/her actual knowledge of what constituted a medication error. The ability to recognize harm is dependent on the nurse's ability to identify potential or actual medication errors. Patient safety programs can be enhanced by accurate and comprehensive reporting, ultimately ensuring patient safety. Walker and Lowe (1998) investigated nurses' views about reportable medication incidents and beliefs about incident reporting. A dominant theme was that harm to the patient influenced a nurse's decision to report an error. The ability to recognize harm or potential for harm was a necessary attribute of patient and nurse outcomes.

System Attributes. Nursing leadership, co-worker relationships, and professional development are attributes of the system that have been identified as precluding the nurse from reporting medication errors. Nurses' explanations for under reporting medication errors included fear of manager and co-worker reactions (Chiang & Pepper, 2006; Cohen, et al., 2003; Mayo & Duncan, 2004; Stratton, et al., 2004; Wakefield, et al., 2001; Walker & Lowe, 1998). Participants expressed reluctance to report a colleague, especially if the colleague was more experienced. They were reluctant to report a friend for fear the friend would be in trouble. Past experience with reporting influenced staff nurse willingness to report medication errors committed or discovered; lack of feedback and perceived inaction on reported errors were cited as reasons for not reporting errors (Kingston, Evans, Smith, & Berry, 2004; Walker & Lowe, 1998). Inaccurate perception

of an error's significance (Mayo & Duncan, 2004) and lack of knowledge of what constitutes a medication error (Chiang & Pepper, 2006; Walker & Lowe, 1998) were also cited as reasons for not reporting medication errors. Nurses also reported that the length of time it took to complete an incident report (Chiang & Pepper, 2006; Walker & Lowe, 1998), lack of positive feedback for passing medications correctly (Chiang & Pepper, 2006; Wakefield, Wakefield, Uden-Holman, & Blegen, 1996), and too much emphasis on medication administration errors as a quality indicator of nursing care were also seen as barriers to reporting errors (Chiang & Pepper, 2006; Stratton, et al., 2004; Wakefield, et al., 1996). Thus, evidence from the literature supports that the system attributes of nursing leadership, co-worker relationships, and professional development influence a nurse's decision to report a medication error.

Critical Analysis of Literature on Medication Error Reporting

The qualitative, mixed method, and quantitative studies that addressed barriers to medication error reporting were from several geographic regions: England (Gladstone, 1995), Australia (Walker & Lowe, 1998; Kingston, et al., 2004), Jordan (Mrayyan, et al., 2007), Taiwan (Chiang & Pepper, 2006), and the United States (Stratton, et al., 2004; Wakefield, et al., 1996; Cohen et al., 2003; Mayo & Duncan, 2004; Blegen, et al., 2004; Ulanimo, et al., 2007). Only one study sample contained a higher percentage of male nurses (54%) and gender was noted as the only predictor of medication errors; with females recalling making more errors (Mrayyan, et al., 2007). The small number of male participants in the other studies did not allow gender comparison. Three studies used the Gladstone (1995) instrument or a modification (Mrayyan, et al., 2007; Mayo & Duncan, 2004; Ulanimo, et al., 2007). In each of these studies, selection bias is a threat to internal

validity (Polit & Beck 2008) because of convenience sampling (Ulanimo, et al., 2007; Mrayyan, et al., 2007; Stratton, et al., 2004; Wakefield, et al., 1996; Chiang & Pepper, 2006) and external validity is threatened because of homogeneity of the sample (Mayo & Duncan, 2004). Three studies used an instrument developed by Wakefield, et al., (Wakefield, et al., 1996; Stratton, et al., 2004; Chiang & Pepper, 2006) which has demonstrated reliability and validity. Additionally, two of the studies (Wakefield, et al., 1998; Wakefield, et al., 1996) were conducted by the same research group using nurses in the same region of the United States, further limiting the generalizability of findings.

The body of evidence in the qualitative and mixed method studies for barriers to reporting medication errors is homogenous; themes that emerged were consistent across studies. The studies included demonstrated credibility; data triangulation (Walker & Lowe, 1998; Kingston, et al., 2004; Gladstone, 1995; Ulanimo, et al., 2007) and investigator triangulation and dependability (Kingston, et al., 2004). Results in the quantitative studies were homogeneous with the exception of fear of disciplinary action. Non-unionized nurses in the Veterans Administration Hospital and unionized nurses in California hospitals did not identify this as a barrier to reporting (Mayo & Duncan, 2004; Ulanimo, et al., 2007). Not being afraid of disciplinary action could be explained by the small sample size and subsequently the power of the study to denote differences (Ulanimo, et al., 2007) making it difficult to detect true relationships (Polit & Beck, 2008). Nurses in the other study may have felt “protected” by a union contract (Mayo & Duncan, 2004) and, subsequently were not concerned about job security.

The literature supports that the influence of person and system attributes on medication error occurrence and person and system attributes on medication error

reporting. All of the concepts in the Conceptual Model of Medication Safety and their relationships exist within the safety culture in an organization.

Safety Culture

There are many terms in the literature used to describe a safety culture. These include safety climate, safety organizing system, and safety performance. For consistency, the term safety culture was used in this study. The nature of the safety culture will influence the medication administration process.

Organizational variables

Organizational variables such as quality management processes and extent of continuous quality improvement, staffing patterns, work organization, leadership practices, nurse-physician communication, overall perception of safety culture, and design features have been reported as contributing to medication error occurrence and nurses' willingness to report errors.

Quality management processes. Quality management processes or continuous quality improvement were investigated to determine barriers to nurses reporting medication errors (Blegen, et al., 2004; Wakefield, et al., 2001). A significant positive correlation was found between quality management process in the unit and reporting medication errors (Blegen et al., 2004). A significant negative relationship existed between perceptions of a strong quality management process and lower agreement with reasons for not reporting medication errors including personal reasons (patient and colleagues will have a poor opinion) and administrative response reasons (concern how administration will respond to error) (Blegen et al., 2004). Estimated overall reporting of

medication errors was associated with a group-oriented culture, one with a focus on affiliation and trust, and with continuous quality improvement implementation, but not at a significant level (Wakefield et al., 2001).

Staffing patterns and work organization. Units that employed a lower proportion of professional nursing staff reported higher numbers of medication errors (Hall, Doran, & Pink, 2004). Nursing education level had a significant nonlinear relationship with severe medication errors only: as the percentage of nurses with a baccalaureate degree increased (up to 54%) severe medication errors decreased (Chang & Mark, 2009). In a study investigating the proportion of RN hours and medication errors over a six-month period, only one month showed a significant difference between RN hours and medication error reports. During this month, high RN hours were associated with lower medication errors (Mark & Belyea, 2009). Fewer numbers of direct care hours worked by nurses were associated with significantly higher rates of reported medication administration errors (Moody, 2006).

Additionally, medication errors were significantly related to more overtime hours worked. In contrast, nurses who typically worked 12 hours reported significantly lower medication errors than those who worked shorter shifts. No relationship between medication errors and employment status, full or part time, shift worked, or working more than 40 hours per week was found (Wilkins & Shields, 2008). One study found that the more years of experience a nurse had, the more likely medication errors were reported (Manojlovich & DeCicco, 2007).

A study investigating the impact of professional nursing work environment characteristics described in Magnet-designated hospitals found the work environment

played an important role in patient safety outcomes. Adequate levels of nursing staff were a result of leadership on the unit which resulted in collaborative relationships with physicians and greater involvement of nurses in decision making. These characteristics were associated with emphasis on a nursing model of care which had direct effects on patient safety outcomes (Laschinger & Leiter, 2006), one being medication errors.

Leadership practices. Leadership practices were also investigated for a relationship with medication safety. No significant differences were found between leadership practice at the unit or hospital level and the degree of sophistication of a medication safety program. Further exploration found a significant directional relationship between academic affiliation and safety performance, with teaching hospitals having high or very high safety levels. Magnet-designated hospitals had higher safety performance and the leaders demonstrated practices toward promoting patient safety with greater frequency (Walsh, 2003) than non-Magnet hospitals. Open communication on the nursing unit was found to be positively associated with increased willingness to report errors and the more positively nurses perceived nursing managements' actions and expectations promoting safety on the units, the greater the frequency of error reporting (Moody, 2006). In another study, Korean nurses reported that hospital management cared less about promoting safety than they did about cutting costs. This perceived lack of concern for patient safety translated into the nurses conveying that it was by chance that more serious errors did not occur on their working unit (Kim, 2007).

Nurse-physician communication. Communication between nurse-physician by-unit variance was found to be a small but significant predictor of perceived medication errors in a study of Intensive Care Unit nurses working in 25 hospitals in southern

Michigan. This finding suggests that as nurses' perceptions of their communication with physicians improved, the nurses' perceptions of medication errors decreased. However, workplace empowerment and characteristics of Magnet-designated hospitals were not associated with medication errors (Manojlovich & DeCicco, 2007).

Overall perception of safety culture. The literature indicates that errors are more likely to occur when the organizational climate is poor, meaning low morale and workplace distress (Fogarty & McKeon, 2006). When the organization is supportive and a constructive approach is used to address medication errors, staff members feel comfortable reporting potential safety hazards. Staff nurses were more willing to report errors when they perceived that management positively handled and responded to the error. Errors were reported less frequently when staff nurses felt nurse managers dealt with the error themselves rather than reporting the error through appropriate hospital channels (Kagan & Barnoy, 2008).

Several studies have examined the effect of overall perceived safety culture and medication errors. In one study, overall safety culture of the unit significantly predicted medication errors. There was a strong negative relationship between safety culture and the incidence rate of medication errors and a weaker relationship when patient conditions were less complex (Hofmann & Mark, 2006). Higher numbers of reported medication errors were associated with low ratings of quality of care by nurse managers (Vogus & Sutcliffe, 2007b).

When exploring safety culture and leadership, and safety culture and use of care pathways, it was found that the interaction effects between safety and trusted leadership and safety and care pathways had significant negative relationships with reported

medication errors. High levels of trust in a manager and high levels of safety resulted in one fewer reported medication error/unit than those with lower levels of trust. Extensive use of care pathways combined with high levels of safety resulted in approximately three fewer reported medication errors/unit than those with less extensive pathways. The authors did not identify a time frame (Vogus & Sutcliffe, 2007a).

Design features. Hospital and unit characteristics were investigated to determine the impact they had on medication error rates and rates of change over time. Hospitals with a higher case mix index (hospital characteristic) had smaller increases in medication errors over time. Teaching hospitals had larger increases in medication errors over time. Unit characteristics such as average occupancy, uncertainty of work, and systems to support medication administration had no effect on initial level of medication errors or rate of change. Unit size significantly related to initial level of medication errors; i.e. the larger nursing units reported more medication errors/1,000 patient days. The effect of changes in nurse staffing on medication errors occurred more immediately (within the month), rather than delayed (during a 6 month period) (Mark & Belyea, 2009).

Critical Analysis of Literature on Safety Culture

The samples in the studies included acute care nurses working in hospitals in a variety of inpatient units from various geographic regions: United States (Wakefield et al., 2001; Walsh, 2003; Hofmann & Mark, 2006; Moody, 2006; Manojlovich & DeCicco, 2007; Vogus & Sutcliffe, 2007b; Vogus & Sutcliffe, 2007a; Chang & Mark, 2009; Mark & Belyea, 2009), Australia (Fogarty & McKeon, 2006), the Middle East (Kim, 2007; Kagan & Barnoy, 2008), and Canada (Hall et al., 2004; Laschinger et al., 2006; Wilkins & Shields, 2008). The purpose of each included study was to describe the influence of

some variable/s within an organization and the effect on patient safety, specifically medication errors. Convenience sampling was the predominant sampling method used which poses a threat to internal validity. When the response rate was less than 50%, t-tests were run to assess differences between respondents and non-respondents. No statistically significant differences were found, suggesting that the validity is less threatened (Vogus & Sutcliffe, 2007a).

Results were homogeneous when measuring the same concepts, including quality management (Blegen et al., 2004; Wakefield et al., 2001), staffing patterns (Hall et al., 2004; Chang & Mark, 2009; Moody, 2006), and leadership practices (Moody, 2006; Kim, 2007). Walsh (2003) did not find a significant difference between leadership practice at the hospital or unit level and the degree of sophistication of the medication safety program. One explanation could be that the nurse respondents were asked their perceptions of leadership practices, not about actual leadership behaviors. Walsh (2003) did find a significant directional relationship between academic affiliation and safety scores. She also found leaders in Magnet-designated hospitals demonstrated stronger practice toward safety.

Instruments used in the reviewed studies varied. Two studies used the Agency for Healthcare Research and Quality (AHRQ) instrument to measure patient safety culture (Kim, 2007; Moody, 2006) and two studies used the Safety Organizing Scale (Vogus & Sutcliffe, 2007a, 2007b), both of which have demonstrated reliability and validity. The remaining studies all used investigator-developed instruments to measure the concepts. All instruments used have documented reliability and validity. Each study identified the unit of analysis as the nursing unit with the exception of the studies that utilized the

AHRQ survey and Wakefield (Wakefield et al. 2001) who measured concepts at the individual, unit/department, and hospital level. Kagan and Barnoy (2008) did not specify a level of analysis. Identifying the unit of analysis allows for comparison of findings.

The literature indicates that there is a link between organizational culture and safety behaviors, which are actions taken by the nurse that promote patient safety. Using the Conceptual Model of Medication Safety, safety behaviors to ensure patient safety would include: reporting errors when they are discovered, following policies and procedures, and obtaining adequate knowledge when administering medications. Path analyses revealed direct and indirect effects of organizational culture on errors (Fogarty & McKeon, 2006). When the culture was positive, meaning supportive leadership, staff participation in clinical decisions, emphasis on professional development, and reasonable workloads, nurses were less likely to make errors. When the organization is supportive and a constructive approach is used to address medication errors, staff members feel comfortable reporting potential safety hazards. Such an environment promotes learning and encourages reporting that is necessary for identifying and solving problems that led to errors (Manno, Hogan, Heberlein, Nyakiti, & Mee, 2006).

In summary, the Conceptual Model of Medication Safety provides nurse leaders with a framework that allows them to focus on enhancing person and system attributes that reduce the frequency of medication errors, as well as, person and system attributes that promote reporting of errors that do occur. Persons produce errors that are commonly the result of systems factors. Organization leaders who encourage error reporting and use the information as a quality improvement tool may improve patient and nurse outcomes.

Instruments Used to Measure Study Concepts

In the following paragraphs, a critique of the commonly used instruments to measure reasons medication errors occur, reasons medication errors are not reported, nurses' work environment, and safety culture are presented followed by a synthesis of the theoretical and empirical literature.

Medication Error Occurrence and Barriers to Reporting Instruments

A review of the literature identified several surveys that measured nurse perception of reasons medication errors occur and barriers to reporting medication errors. Most of the surveys were developed by the researcher for her particular study. Only one instrument described in the literature has been used in a variety of studies and has consistently demonstrated reliability and validity (Wakefield, et al., 2005), justifying its use in this study.

The Medication Administration Error (MAE) Reporting Survey is an instrument intended for use with nurses at all educational levels (LPN to advanced practice). The instrument contains 45 questions in 2 general content areas; (a) reasons why medication errors occur (29 items) and (b) reasons why medication errors are not reported (16 items) (Wakefield et al., 2005).

The instrument has five subscales for "why MAEs occur" and four subscales for "why MAEs are not reported." Internal consistency of each subscale was acceptable (Polit & Beck, 2008), with Cronbach's alpha ranging from .62-.91 (Wakefield et al., 2005). The subscales appear to address all relevant subconcepts. The authors attempted to

include all reasons MAEs may not be reported and why MAEs may occur, but it may not account for all of the reasons, a possible limitation of the survey.

At the time the survey was developed, there were no other questionnaires available that addressed medication error reporting or medication errors. As a result, a pilot study was conducted comparing other measures of the same construct, specifically nurses' perceptions of organizational culture and continuous quality improvement implementation. Data from the pilot study supported criterion-related validity of the subscales. The authors used their experiences as a quality improvement clinician and health sciences researchers as well as the literature to develop the instrument, thus contributing to the instrument's content validity.

The MAE Survey can be used to measure the person and system attributes that contribute to medication errors, influence nurses' willingness to report errors, and nurse outcomes. The three subscales of the instrument measure the concepts of medication error occurrence, medication error reporting, and measures of safety culture within an organization. Use of this survey instrument can provide a basis for making changes in the person and system to improve patient safety (Wakefield, et al., 2005).

Nursing Work Environment Instrument

The Practice Environment Scale of the Nursing Work Index (PES-NWI) was developed to aid researchers in discovering the contribution of the practice environment to nurse and patient outcomes. The NWI was originally developed to assess hospitals that were successful in attracting and retaining nurses during the nursing shortage of the 1980s (Lake, 2002); now known as Magnet-designated hospitals. These hospitals had a

common set of attributes that had a bearing on staff satisfaction and quality nursing care (Kramer & Hafner, 1989).

The theoretical foundation for the nursing practice environment is the sociology of organizations, occupations, and work (Lake, 2002). The authors define nursing practice environment as the “organizational characteristics of a work setting that facilitate or constrain professional nursing practice” (p. 178). The characteristics of a professional model underpin this definition. Rather than developing a new set of theoretically relevant organizational characteristics, the authors chose to use the NWI.

The practice environment scale was developed and evaluated in five stages. The first stage involved a review of the items on the NWI, of which 48 were selected because they met the author’s definition of a practice environment. The second stage involved exploratory factor analysis to identify subscales that represented the nursing practice environment. Also during this stage, a mean score of each subscale for each nurse was calculated and a composite measure was created from all five mean subscale scores. The third stage involved examining individual and hospital level reliabilities of the five subscales and the composite score. The fourth stage involved assessing the construct validity of the subscales and the composite. The fifth stage evaluated whether individual items fit better into their hypothesized subscale or another subscale. The subscales have acceptable reliability and validity (Lake, 2002).

The PES-NWI can be used to measure the nursing practice environment within an organization, either Magnet, Magnet- aspiring, or non-Magnet hospitals. This instrument measures the extent to which the environment fosters professional nursing practice and subsequently nurse and patient outcomes.

Safety Culture Instrument

The AHRQ developed the Hospital Survey on Patient Safety Culture (HSOPSC) to be used by hospitals to assess patient safety culture from the staff and employee perspective. Both the culture in the organization as a whole and the culture on the individual unit are assessed.

The authors developed the instrument based on concepts found in the literature on patient safety, safety management in the nuclear and manufacturing industry, organizational and safety climate, and medical errors and reporting. Additionally, a review was conducted on instruments measuring safety culture and climate. An analysis of these instruments led to the development of the safety culture dimensions and types of items on the HSOPSC.

This questionnaire has been used in 622 hospitals across the United States with 196,462 hospital staff respondents (average response rate per hospital 52%; "Hospital Survey on Patient Safety Culture," 2009). Hospitals varied in size, teaching affiliation, ownership, and geographic region. Thirty-six percent of the respondents were nurses. The HSOPSC instrument has theoretical underpinnings of concepts from high reliability organizations and has been used in healthcare with nurses as subjects. The instrument also has the necessary breadth to measure the concept of safety culture in the Conceptual Model of Medication Safety. The instrument can be used to assist in identifying strategies that may enhance patient safety efforts (Sorra & Nieva, 2007).

Synthesis of the Literature

A significant amount of research has produced empirical support for the concepts of medication error occurrence and medication error reporting. The literature supports the premise that medication errors result from multiple person and system factors. Decisions organizational leaders make can influence the occurrence of medication errors. Nurses cite various person and system attributes that are barriers to reporting medication errors. There is less empirical evidence that supports the concept of safety culture and the influence of organizational variables on medication error occurrence and barriers to reporting. Only one study investigated the relationship between the nurses' work environment, specifically nurse-physician communication, and medication errors (Laschinger & Leiter, 2006).

Strengths and limitations of the body of evidence

Papers included with an international perspective are a strength of this review. However, restriction to publications only in English may limit validity. Random samplings of hospitals included in some of the studies were conducted with convenience sampling of nurse respondents on nursing units within those hospitals (Blegen, et al., 2004; Chang & Mark, 2009; Hofmann & Mark, 2006). This sampling strategy ensured that differences in the hospital attributes were purely by chance (Polit & Beck, 2008). Convenience sampling in the other studies increases the risk of sampling bias (Polit & Beck, 2008).

Another limitation of the studies was the reliance on incident reports to identify medication error occurrence (Hofmann & Mark, 2006; Moody, 2006; Vogus & Sutcliffe,

2007a; Chang & Mark, 2009; Mark & Belyea, 2009). Using incident report data completed by nurses is likely to produce underreporting (Blegen, et al., 2004; Flynn, et al., 2002). This review did not address the impact of technology on the reporting and occurrence of medication errors. Incorporation of anonymous electronic reporting systems and other technological advances into health care facilities may demonstrate changes in medication error reporting rates as well as staff willingness to report errors.

Findings from this review indicate medication errors were underreported (Wakefield et al., 1996; Wakefield et al., 1998; Wakefield et al., 2001; Blegen et al., 2004). In one study, data were obtained via phone interview regarding the frequency a patient, over a 12-month period, may have received the wrong medication or dose (Wilkins & Shields, 2008). This method of obtaining data did not allow validation against objective sources, which is a limitation of the study.

Most of the included studies operationalized medication errors using similar definitions. One study limited medication errors to those that caused harm (Hofmann & Mark, 2006). In studies that did not define a medication error, nursing staff expressed confusion about what constituted a medication error. For medication errors to be used successfully as quality improvement tools, medication errors need to be reported. Hospitals need to clearly define what they would like to be reported so errors can be investigated and system improvements can be made.

A strength of this review is that many of the studies used a theoretical or conceptual model to guide investigation. The findings of research may have broader significance and usefulness when the research is performed within the context of a theoretical framework (Polit & Beck 2008).

The included studies had methodological differences, limiting comparability. Additionally, studies investigated different organizational variables, making it difficult to compare results. It appears from this review that there are a number of interrelationships among various organizational factors and patient safety, specifically medication errors. Further investigation is needed to identify the variables within an organization that significantly impact patient safety, specifically, medication error occurrence and reporting. This review also identified reliable and valid instruments for measuring concepts in the Conceptual Model of Medication Safety

Summary of the Literature Gap

Patient safety has been a major focus of health care. Nurses are in a vital position to foster patient safety through appropriate incident reporting of medication errors. The immediate concern when making an error is the welfare of the patient. A longer term benefit of reporting is identification of trends, evaluation of processes, and modification of systems. The safety culture in an organization needs to be supportive of error reporting rather than looking to blame individuals.

Examination of the studies indicates a knowledge gap of factors and approaches that can create and maintain an environment that decreases the nurse outcome of medication error occurrence and that enhances the nurse outcome of deciding to report the errors. The “forces of magnetism” are used by nursing leaders in Magnet-designated hospitals to aid in organization improvement. These organizational characteristics have been shown to improve patient outcomes. Few studies address the nurse outcomes of medication error occurrence and barriers to reporting and the influence of a safety culture in Magnet, Magnet- aspiring, or non-Magnet-designated hospitals. Only one study

specifically looked at a component of the nurses' work environment and the influence on medication errors.

There is a gap in the knowledge of whether the reasons for medication error occurrence and the barriers to reporting medication administration errors, in hospitals that meet the structural criteria for Magnet designation, are the same as in non-Magnet-designated hospitals. In addition, there is a need to obtain a more comprehensive view of the variables that impact the nurse outcomes of medication error occurrence and the decision to report medication errors. This evidence will provide nursing leaders with the data necessary to target specific aspects of the organization, culture, and work environment, which can improve patient safety.

CHAPTER 3: METHODOLOGY

The Conceptual Model of Medication Safety provided the framework for investigating the influence of the nurses' work environment and safety culture on medication error occurrence and medication error reporting. Additionally, comparisons among nurses working in Magnet, Magnet- aspiring, and non-Magnet, hospitals were investigated.

This chapter identifies the study design of this investigation, subject recruitment and the use of online human participants' research, and operational definitions of the variables. Detailed descriptions of procedures used and statistical analysis is also described.

Research Design

This research study was a descriptive correlational study using a cross sectional design. Additionally, for several of the research questions, a between- participants design was used to evaluate differences among acute care nurses in Magnet, Magnet- aspiring, and non-Magnet hospitals in perceptions of medication error occurrence and reporting, work environment, and safety culture.

Sample

As of March 2008, there were an estimated 3,063,163 licensed registered nurses living in the United States. Sixty-two percent of employed registered nurses were working in hospitals in 2008, with 70% of those employed in inpatient units. The majority of those RNs (66.3%) had the job title as staff nurse (U.S. Department of Health and Human Services, 2010).

This study population included nurses working in acute care Magnet, Magnet-aspiring, and non-Magnet-designated hospitals. Data were collected between June and August using an online questionnaire. To recruit these participants, the questionnaire was posted on the following websites: 1) nursing professional association websites, 2) listservs of professional organizations, 3) nursing professional association Facebook site, 4) professional association's e-newsletter, and 5) e-newsletters of other organizations using the Qualtrics web-based software. The sample size was calculated based on the power analysis for question 6 because this question required the largest number of predictor variables. An alpha level of .05 and power of .80 for a medium sized effect was used. There are no earlier relevant findings to assist with the effect size calculation. Because of that, a modest effect size was selected which is typically what most nursing studies have (Polit & Beck, 2008). Power analysis indicated a sample size of 170 participants was needed.

Online Human Participants Research

Recently, researchers have been provided a new environment for conducting research, the World Wide Web (Ahern, 2005). Web-based survey design features include: permitting non response to individual items, providing respondents a means to assess their survey progress, and allowing respondents to interrupt their session, save their answers, and complete the survey at a later time (Austin, Richter, & Reinking, 2008). Recruitment of participants with similar characteristics can be accomplished on various internet environments where these participants meet (Van Selm & Jankowski, 2006). There are several advantages to conducting online research, but there are also disadvantages and limitations to its use. A discussion of these factors follows.

Advantages to Online Data Collection

Advantages for study participants. Medication errors and reporting can be viewed as a sensitive subject. Nurses may be reluctant to share information for fear of repercussions. An online survey provided an opportunity for nurses to be more open in their responses without fear of reprisals (Eaton & Struthers, 2002; Rhodes, Bowie, & Hergenrather, 2003). An organizational study conducted to test the viability of using the internet to recruit and collect data from participants found evidence that suggested the internet sample was more honest in reporting their judgments of the organization than the non-internet sample. The researchers, through responses to a short paragraph regarding a negative incident involving participants and their organization, found that self-disclosure and candor was increased in the internet group (Eaton & Struthers, 2002).

Additionally, online research allows participants to respond at their own pace (Ahern, 2005; Lyons, Cude, Lawrence, & Gutter, 2005). An increased sense of control, increased willingness to participate because of the newness of the approach, and ease of use are also potential advantages for study participants (Ahern, 2005).

Advantages for the Researcher. An internet survey is less expensive than traditional paper and pencil surveys, which is an advantage for the researcher. The cost associated with paper storage, the time-consuming process of data entry, and the need for data entry technicians is removed (Hanscom, Lurie, Homa, & Weinstein, 2002). Online data collection costs are 20 to 80 percent less than the traditional methods of data collection (Rhodes et al., 2003). There is also an increased accuracy of data entry and analysis (Ahern, 2005).

Accessing populations of interest such as those working in particular industries is another benefit to the researcher (Eaton & Struthers, 2002). In this study, nurses working in acute care hospitals were the target population. The ability to obtain data from this large pool of nurses provided an opportunity to strengthen the external reliability (generalizability) of the results.

In a study comparing missing data and consistency of data, researchers found that computerized surveys had approximately half the missing data value rate as the paper survey. Additionally they found fewer inconsistent responses on the computer survey which added to the internal consistency of the data collected (Hanscom, Lurie, Homa, & Weinstein, 2002).

Disadvantages and Limitations to Online Data Collection. Disadvantages to online data collection focus on sampling issues, potential for multiple submissions, bias in participants, and recruiting problems. Calculation of non-respondents can be a problem with internet research. In order to address this, response rates can be determined by web counters that document the visits to the survey's web site. This provides the researcher with an opportunity to calculate approximate participation percentage (Duffy, 2002). Self-selection is another sampling issue identified as a disadvantage in online research; however, all participants in research, traditional or online are self-selected.

There is also the potential for a respondent to submit multiple submissions. There are several confirmed techniques that can be used to minimize this. On the first page, researchers can ask the participants to complete the survey only once. Additionally, a question can be embedded within the survey asking whether the respondent has completed the survey previously (Rhodes, et al., 2003).

Recruitment of potential participants may pose a problem for researchers. Flexible recruitment strategies are necessary to obtain an adequate sample size. Possible strategies include offering electronic gift certificates and recognizing the importance of timing. Timing issues were identified in three studies using an online data collection method (E.O. Im & Chee, 2004; E. Im, Meleis, & Lee, 1999). Responses during the summer and winter vacation times were rarely received (Im & Chee, 2004).

Qualtrics was selected as the online survey management system in this study. The software was easy to use and provided a platform for designing, distributing, and evaluating research results ("Qualtrics," 2010). It allowed the researcher to build her own survey site. Qualtrics software is based upon a point-and-click system which makes it easy for participants to respond to items. Responses to survey items were downloaded into Statistical Package for Social Sciences (SPSS) Graduate Pack 17.0 eliminating the need for manual data entry.

Measurement of Concepts

Several instruments were selected for use in this study (see Figure 3). Permission for use of each was granted (see Appendices A, B, and C).

Medication Error Occurrence

Medication error occurrence was operationalized using the Medication Administration Error (MAE) Reporting Survey; Reasons Why Medication Errors Occur (Wakefield, Uden-Holman, & Wakefield, 2005) (Appendix D). This questionnaire contains 29 items asking respondents to indicate agreement using a Likert-type scale, with responses ranging from 1 = strongly disagree to 6 = strongly agree. The instrument

has five subscales for “why MAEs occur” measured with the individual nurse as the unit of analysis. Means and standard deviations are used to calculate scores for individual items or subscales. No total scale scores are calculated. Adding the value for each equally-weighted item and dividing by the number of items in the subscale provides subscale values. Scores in the subscales can range from 2 - 12 (transcription-related), 3 - 18 (medication packaging and pharmacy processes), 4 - 24 (nurse staffing), and 6 - 36 (physician communication).

Wakefield et al (2005) evaluated validity by using principle component exploratory factor analysis with orthogonal rotation to determine if items fit into subscales. Subscale factors were established with an Eigen value of 1.0 or greater. A factor loading of .40 or greater was used for individual items to be included in the factor (Wakefield, et al., 2005). Internal consistency of each subscale using Cronbach’s alpha ranged from .62 - .91 (.83 for physician communication, .81 for medication packaging, .88 for transcription-related, .91 for pharmacy processes, and .62 for nurse staffing). In this research study, internal consistency of each subscale using Cronbach’s alpha ranged from .74 - .973 (.822 for physician communication, .824 for medication packaging, .973 for transcription-related, .918 for pharmacy processes, and .740 for nurse staffing). Test-retest reliability was assessed for the subscales using a sample of graduate nursing students. Participants completed the questionnaire after signing a consent form and then again 3 weeks later. Pearson’s correlation coefficients from Time 1 to Time 2 were used to assess test-retest reliability ($r = 0.53- 0.78$) (Wakefield, et al., 2005) which is typically what is expected (Polit & Beck, 2008).

Medication Error Reporting

Medication error reporting was operationalized using the Medication Administration Error Reporting Survey; Reasons Why Medication Errors are not Reported (see Appendix E). This instrument contains 16 items using a Likert-type scale. Participants are asked to indicate agreement, with responses ranging from 1 = strongly disagree to 6 = strongly agree. The instrument has four subscales for “why MAEs are not reported” measured with the individual nurse as the unit of analysis. Means and standard deviations are used to calculate scores for individual items or subscales. Adding the value for each equally-weighted item and dividing by the number of items in the subscale provides subscale values. Subscale scores range from 2 - 12 (reporting effort), 4 - 24 (disagreement with definition and administrative response), and 5 - 30 (fear).

Wakefield et al (2005) evaluated validity by using principle component exploratory factor analysis with orthogonal rotation to determine if items fit into subscales. Subscale factors were established with an Eigen value of 1.0 or greater. A factor loading of .40 or greater was used for individual items to be included in the factor. Subscales that emerged are reporting effort, disagreement over error, fear, and administrative response. Internal consistency of each subscale using Cronbach’s alpha ranged from .69 - .87 (.82 for reporting effort, .76 for disagreement over error, .87 for fear, and .69 for administrative response) (Wakefield, et al., 2005). In this study, internal consistency of each subscale using Cronbach’s alpha ranged from .76 - .92 (.76 for reporting effort, .83 for disagreement over error, .92 for fear, and .83 for administrative response).

Safety Culture

Safety culture was operationalized using the Hospital Survey on Patient Safety Culture (HSPSC) (Nieva & Sorra, 2003); (see Appendix F). The survey consists of 79 items measuring 12 dimensions: 2 outcome dimensions and 10 safety culture dimensions. A 5-point Likert scale is used for 9 of the dimensions in terms of agreement ranging from 1-strongly disagree to 5- strongly agree. The other 3 dimensions use a 5-point scale in terms of frequency ranging from 1-never to 5- always. The survey can be used with all types of hospital staff, but is best suited for staff members that have direct contact with patients. Scoring for the questionnaire can be accomplished by calculating the mean score for each dimension after reverse coding of negatively-worded items (Sorra & Nieva, 2004). Potential mean scores range from 1 - 5 with higher scores indicating more agreement or frequency that the subscale items are present in their work area. Subscale scores range from 3 - 15 (frequency of event reporting, organizational learning—continuous improvement, communication openness, feedback and communication about error, nonpunitive response to error, staffing, and hospital management support for patient safety) and 4 - 20 (overall perceptions of safety, supervisor/manager expectations & actions promoting safety, teamwork within hospital units, teamwork across hospital units, and hospital handoffs & transitions). A mean score was calculated for each of the 12 subscales.

The safety culture dimensions assessed at the unit level include: communication openness (3 items, $\alpha = .78$), feedback and communication about error (3 items, $\alpha = .78$), management support for patient safety (3 items, $\alpha = .83$), nonpunitive response to error (3 items, $\alpha = .79$), organizational learning-continuous improvement (3 items, $\alpha =$

.76), teamwork within units (4 items, $\alpha = .83$), supervisor/manager expectations and actions promoting safety (4 items, $\alpha = .75$), and staffing (4 items, $\alpha = .63$). The safety culture dimensions assessed at the hospital-wide level include: teamwork across units (4 items, $\alpha = .80$) and hospital handoffs and transitions (4 items, $\alpha = .80$). The two outcome measures are frequency of event reporting (3 items, $\alpha = .84$) and overall perceptions of safety (4 items, $\alpha = .74$) (Nieva & Sorra, 2003).

In this study, internal consistency reliability using Cronbach's alpha ranged from .72 - .91 (.75 for overall perception of safety, .79 for supervisor expectations, .83 for organizational learning, .91 for teamwork within hospital, .89 for non-punitive response to error, .72 for staffing, .84 for hospital management, .89 for teamwork across hospital, .88 for hospital handoffs, .78 for communication, .84 for feedback communication, and .83 for frequency of events reported). The questionnaire was pilot tested on 1,437 hospital employees and physicians (response rate 29%) in 21 hospitals across 6 states in the United States. Hospitals selected varied by geographic region, teaching status, and hospital size strengthening the external validity (Polit & Beck, 2008).

Practice Environment Scale of the Nursing Work Index

The nurse's work environment was operationalized using the Practice Environment Scale of the Nursing Work Index (PES-NWI) instrument (see Appendix G; Lake, 2002). The PES-NWI consists of 31 items in five subscales that characterized professional practice in the original Magnet hospitals. Nurses are asked to rate each item on a scale of 1 - strongly disagree to 4 - strongly agree to indicate whether the feature is "present in the current job." Unit level nurse-specific subscale scores are calculated as the mean of the items in the subscale. Potential mean scores range from 1 - 4 with higher

scores indicating more agreement that the subscale items are present in their present job. Subscale scores can range from 3 - 12 (collegial nurse-physician relations), 4 - 16 (staffing and resource adequacy), 5 - 20 (nurse manager ability, leadership, and support of nurses), 9 - 36 (nurse participation in hospital affairs), and 10 - 40 (nursing foundations for quality of care). An overall composite score is calculated using the mean of the five subscale scores and can range from 31 – 124.

The PES-NWI subscales and composite have demonstrated reliability at the individual level. The reliability for the subscales include: nurse participation in hospital affairs (individual level $\alpha = .83$), nursing foundations for quality of care (individual level $\alpha = .80$), nurse manager ability, leadership, and support of nurses (individual level $\alpha = .84$), staffing and resource adequacy (individual level $\alpha = .80$), and collegial nurse-physician relations (individual level $\alpha = .71$). The reliability for the composite score at the individual level had a strong Cronbach's alpha ($\alpha = .82$.) (Polit & Beck, 2008). In this study, internal consistency reliability using Cronbach's alpha include: nurse participation in hospital affairs (individual level $\alpha = .91$), nursing foundations for quality of care (individual level $\alpha = .88$), nurse manager ability, leadership, and support of nurses (individual level $\alpha = .90$), staffing and resource adequacy (individual level $\alpha = .91$), and collegial nurse-physician relations (individual level $\alpha = .92$).

Personal Demographic Characteristics

The personal demographic characteristics were operationalized in this study using a tool that was modeled after various studies that measured medication error occurrence and reporting, work environment, and safety culture (see Appendix H). Demographic

characteristics for the individual nurse include: gender, position, educational level, number of years working as a nurse, number of years in current position, and number of hours worked per week. These characteristics provided an adequate description of individual nurse characteristics found in other studies (Armutlu, et al., 2008; Chang & Mark, 2009; Kim, 2007; Manojlovich & DeCicco, 2007; Mayo & Duncan, 2004; Mrayyan, et al., 2007; Wakefield, et al., 2001; Wakefield, et al., 1998; Wakefield, et al., 1996; Walters, 1992). In previous studies, staff nurse gender, education level, years of experience, and number of hours worked have shown relationships with questionnaire response items related to medication error occurrence and reporting (Kim, 2007; Manojlovich & DeCicco, 2007; Walters, 1992; Mayo & Duncan, 2004; Mrayyan, Shishani, & Al-Faouri, 2007). Work experience, and years working at the facility have been shown to influence perceived safety culture (Kim, 2007).

Hospital characteristics include: type of nursing unit (medical, surgical, etc.), hospital designation (community, community/teaching, urban, urban teaching, other), and magnet designation status. These demographic characteristics provide an adequate description of hospital characteristics found in other studies (Walsh, 2003; Hall, Doran, & Pink, 2004; Stratton, Blegen, Pepper, & Vaughn, 2004; Kim, 2007). In addition, higher safety performance was found in both Magnet and teaching designated hospitals (Walsh, 2003). Linkages were also found in the literature among type of nursing unit and medication error occurrence and reporting (Mayo & Duncan, 2004; Stratton, Blegen, Pepper, & Vaughn, 2004). The investigator was interested in the use of computerized physician order entry and an electronic incident reporting system in the acute care hospitals because they can influence the reasons medication errors occur and why

medication errors are not reported respectively; thus questions were added to address these variables.

Procedure

Institutional Review Board (IRB) approval was obtained using the exempt review process. A cover letter preceded the link to the surveys explaining the study, directions for how to access the survey and what to do if problems occurred with accessing the hyperlink, the ability to terminate completion at any time, and where the data would be stored. The security of the system was stressed to the participants to enhance willingness to complete the questionnaires.

The study instruments were placed online using Qualtrics web-based software. Potential participants were able to click on a link that took them directly to the questionnaire. The initial screen for the potential participant served as the consent for participation. Participants were given the opportunity to participate in the research by clicking “I agree.” If participants selected “I do not agree,” a validation of the selection was asked on the next screen. If participants selected “I agree,” the next screen took them to the questionnaires. A pilot test was conducted using five acute care nurses to determine the amount of time for questionnaire completion. The average amount of time recorded was approximately 15 – 20 minutes.

Radio buttons for selection of responses were used for most of the data collected. Participants were able to type in the “other” category on the demographic questionnaire. An interactive approach was selected to allow multiple questions per screen that dealt with the same concept. The literature identifies that placing similar items on the same page results in faster completion, less missing data, and better inter-item correlations than

presenting one item per screen (Couper, 2000). A progress report was available to respondents to give them an indication of how much of the survey remained. Respondents were allowed to leave items blank, but were prompted about the missing response before they could proceed to the next question. This approach allowed the respondents to maintain their right not to respond to an individual question and has been found to result in less missing data (DeRouvray & Couper, 2002). The Qualtrics software produced a data file which was secured on a Qualtrics computer and only accessible to the site administrator and researcher, thus assuring confidentiality of responses. Participants who completed the questionnaire were given the opportunity to be entered into a drawing to receive an electronic gift certificate.

Data Analysis

The SPSS Graduate Pack 17.0 was used to analyze the data. Analysis included descriptive and inferential statistics including Pearson's correlational analysis, ANOVA, general linear modeling and multiple regression. Descriptive statistics (frequency distributions and means) were used to summarize the sample characteristics. Pearson's correlation analysis was used to evaluate the relationship between the mean subscale scores for safety culture and the mean subscale scores for medication error occurrence, medication error reporting, and nurses' work environment. Pearson's correlation analysis was also used to evaluate the relationship between the demographic characteristics and the mean subscale scores for medication error occurrence, medication error reporting, perceived safety culture, and the mean subscale score for the nurses' work environment.

Research Questions 1 and 2

1. *What are the explanations for medication error occurrence by acute care staff nurses working in Magnet, Magnet- aspiring, and non-Magnet-designated hospitals?*
2. *What are the explanations for medication errors not being reported by acute care staff nurses working in Magnet, Magnet- aspiring and non-Magnet-designated hospitals?*

Measures of central tendency and variability for individual items and each subscale were used to analyze the data regarding medication error occurrence and reasons medication errors are not reported in each of the groups and in the combined sample.

Research Questions 3, 4, and 5

3. *Is there a difference in the explanations for medication error occurrence in nurses working in Magnet, Magnet- aspiring, and non-Magnet acute care designated hospitals?*
4. *Is there a difference in the reasons why medication errors are not reported by acute care nurses working in Magnet, Magnet- aspiring, and non-Magnet-designated facilities?*
5. *Is there a difference in perceived work environment among acute care nurses' in Magnet, Magnet- aspiring, and non-Magnet hospitals?*

An analysis of variance (ANOVA) was used to detect differences between the categorical variable (Magnet status) and the interval level mean subscale scores of medication error occurrence, reasons why medication errors are not reported, and nurses' work environment. Where significant differences were found among groups, Turkey's post-hoc testing was conducted.

Research Questions 6, 7, 8, 9, and 10

6. *What is the influence of perceived safety culture and demographic characteristics (hours worked per week and type of work unit) on reasons medication errors occur?*

The outcome variables were the scores for each subscale of why medication errors occur (transcription related, medication packaging, pharmacy processes, nurse staffing, and physician communication). The predictor variables were scores for each subscale of safety (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety) and demographic characteristics (hours worked per week and type of work unit).

A separate regression model was fit for each outcome variable, that is, for each subscale of why medication errors occur. Correlations were calculated between the predictor variables and each outcome variable. When a predictor variable (safety culture subscales and demographic characteristics) had a significant correlation with a subscale score for why medication errors occur, that predictor variable was entered into the regression model for that outcome variable.

7. *What is the influence of acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification) on reasons medication errors occur?*

The outcome variables were scores for each subscale of why medication errors occur (transcription related, medication packaging, pharmacy processes, nurse staffing, and physician communication). The predictor variables were scores for each subscale of

the perceived work environment (collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership, and support of nurses, nurse participation in hospital affairs, and nursing foundations for quality of care) and demographic characteristics (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification).

A separate regression model was fit for each outcome variable, that is, for each subscale of why medication errors occur. Correlations were calculated between the predictor variables and each outcome variable. When a predictor variable (work environment subscales and demographic characteristics) had a significant correlation with a subscale score for why medication errors occur, that predictor variable was entered into the regression model for that outcome variable.

8. *What is the influence of perceived safety culture and demographic characteristics (type of work unit, years of experience, and years working at the facility) on reasons why medication errors are not reported?*

The outcome variables were scores for each subscale of reasons why medication errors are not reported (reporting effort, disagreement with definition, administrative response, and fear). The predictor variables were scores for each subscale of safety (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety) and demographic characteristics (type of work unit, years of experience, and years working at the facility).

A separate regression model was fit for each outcome variable, that is, for each subscale of reasons why medication errors are not reported. Correlations were calculated between the predictor variables and each outcome variable. When a predictor variable (safety culture subscales and demographic characteristics) had a significant correlation with a subscale score for reasons why medication errors are not reported, that predictor variable was entered into the regression model for that outcome variable.

9. *What is the influence of the acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, gender, type of nursing unit) on reasons why medication errors are not reported?*

The outcome variables were scores for each subscale of reasons why medication errors are not reported (reporting effort, disagreement with definition, administrative response, and fear). The predictor variables were scores for each subscale of the perceived work environment (collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership, and support of nurses, nurse participation in hospital affairs, and nursing foundations for quality of care) and demographic characteristics (education level, years of experience, gender, and type of nursing unit).

A separate regression model was fit for each outcome variable, that is, for each subscale of reasons why medication errors are not reported. Correlations were calculated between the predictor variables and each outcome variable. When a predictor variable (work environment subscales and demographic characteristics) had a significant correlation with a subscale score for reasons why medication errors are not reported, that predictor variable was entered into the regression model for that outcome variable.

10. What is the influence of the acute care nurses' perceived organizational safety and demographic characteristics (age, experience level, hours worked per week, and hospital classification) on acute care nurses' perceived work environment?

The outcome variables were scores for each subscale of the perceived work environment scale (collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership, and support of nurses, nurse participation in hospital affairs, and nursing foundations for quality of care). The predictor variables were scores for each subscale of safety culture (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety) and demographic characteristics (experience level, hours worked per week, and hospital classification).

A separate regression model was fit for each outcome variable, that is, for each subscale of perceived work environment. Correlations were calculated between the predictor variables and each outcome variable. When a predictor variable (safety culture and demographic characteristics) had a significant correlation with a subscale score of perceived work environment, that predictor variable was entered into the regression model for that outcome variable.

In conclusion, Chapter 3 described the research methodology used to investigate medication error occurrence and reporting among acute care nurses working in non-Magnet, Magnet- aspiring, and Magnet-designated hospitals and the influence of the nurses' work environment and perceived safety culture. A discussion of the advantages,

disadvantages, and limitations of online human participants' research was presented. A description of the instruments and participant recruitment was presented, followed by a discussion of the procedures used for statistical analysis.

CHAPTER 4: RESULTS

Introduction

This chapter examines the data from a descriptive correlational study. First, a description of the sample and theoretical variables will be presented. Next, the associations between the dependent and independent variables will be presented followed by findings for the individual research questions. Lastly, a summary of the results will be offered.

Data analyses were performed using the Statistical Package for Social Science (SPSS) Version 17.0 for Windows. A significance level of .05 was used for all of the analysis.

Characteristics of the Sample

The study sample consisted of 447 nurses working in acute care Magnet, Magnet aspiring, and non-Magnet hospitals. Five hundred twenty-two nurses began the survey with 447 surveys completed for a response rate of 81%. Although 447 nurses completed the survey, there were missing data for some of the variables; therefore, the “*N*” will be reported where appropriate.

A breakdown of the nurse sample, as shown in Table 5, revealed that of the 385 nurses who responded to the gender question, 356 were female (92.5%) and 29 (7.5%) were male. This percentage of males was slightly higher than the 6.2 % reported in the 2008 National Sample Survey of Registered Nurses (NSSRN; U.S. Department of Health and Human Services, 2010). Of the 390 nurses who responded to the education level question, 112 (28.7%) held a Master’s degree or higher, 161 (41.3%) a Baccalaureate

degree, 85 (21.8%) an Associate degree, 26 (6.7%) a diploma, and 6 (1.5%) a Licensed Practical Nurse. The number of respondents who held a Baccalaureate degree or higher is more than the 50% reported in the 2008 NSSRN (U.S. Department of Health and Human Services, 2010). Approximately 71% of the respondents indicated they held the position of staff nurse while 29% indicated they held a management position or advanced practice position. Among the respondents, years worked as a nurse shows a fairly even distribution, ranging from 0-5 years to 41 or more years, while the highest percentage of nurses worked at their current hospital (30.5%) and on their current unit for 1-5 years (36.9%).

Table 5: Demographic Characteristics of the Nurse Study Sample

Variable	Characteristic	<i>n</i> (%)
Gender (<i>N</i> = 385)	Female	356 (92.5)
	Male	29 (7.5)
Nursing education (<i>N</i> = 390)	LPN	6 (1.5)
	Diploma	26 (6.7)
	Associate Degree	85 (21.8)
	Baccalaureate Degree	161 (41.3)
	Master's Degree or greater	112 (28.7)
Current Position (<i>N</i> = 382)	Staff Nurse	273 (71.3)
	Head Nurse/other Administrative	56 (14.6)
	Educator	21 (5.5)
	Advanced Practice	19 (5.0)
	Other	13 (3.4)

Years worked as a nurse (<i>N</i> = 388)	0-5 years	57 (14.7)
	6-10 years	55 (14.2)
	11-15 years	48 (12.4)
	16-20 years	42 (10.8)
	21-25 years	52 (13.4)
	26-30 years	38 (9.8)
	31-35 years	43 (11.1)
	36-40 years	34 (8.8)
	41 or more years	19 (4.9)
Years at current hospital (<i>N</i> = 387)	Less than 1 year	22 (5.7)
	1-5 years	118 (30.5)
	6-10 years	86 (22.2)
	11-15 years	49 (12.7)
	16-20 years	38 (9.8)
	21 or more years	74 (19.1)
Years on current work area	Less than 1 year	36 (9.3)
	1-5 years	143 (36.9)
	6-10 years	88 (19.7)
	11-15 years	55 (14.2)
	16-20 years	25 (6.4)
	21 or more years	41 (10.6)

Data regarding hospital characteristics were also obtained. Of the 443 participants, 39 states were represented with 44.6% of the participants from 6 states (Pennsylvania, 59 [13.2%]; Virginia, 48 [10.7%]; California, 28 [6.3%]; Maryland, 23 [5.1%]; Florida, 20 [4.5%]; and North Carolina, 20 [4.5%]). Hospital classification and type of nursing unit were also obtained. Over 90% of the respondents were employed in a community hospital (36.7%), community teaching hospital (34.4%), or an urban teaching hospital (20.7%).

As indicated in Table 6, of the 384 nurses who responded to type of work unit, approximately 75% reported working on one of six types of inpatient nursing units: intensive care units (i.e., ICU, CCU, PICU, NICU, SICU; 41.8%), combined medical/surgical (18.0%), medicine (6.5%), surgical (5.5%), emergency room (4.7%), and telemetry (3.6%). The remaining 25% of respondents were from a variety of more specialized units (e.g., obstetrics, pediatrics, psychiatric, float pool, step down). Magnet status was also collected. One hundred fifty-one hospitals (39.7%) were classified as Magnet-designated, 114 as non-Magnet (30.0%), and 115 as Magnet-aspiring (30.3%). Magnet status was not indicated in 67 (15%) of the responses.

Additional data regarding hospital characteristics were obtained including use of an electronic incident reporting system, computerized physician order entry (CPOE), and membership in a bargaining unit. Of the 386 nurses who responded to the electronic incident reporting question, 313 (81.1%) indicated that they used an electronic incident reporting system. Of the 385 nurses who responded to the CPOE question, 185 (48.1%) indicated that their hospital used CPOE. Of the 384 participants who indicated union

status, 82 (21.4%) were members of a bargaining unit and 302 (78.6%) were not members of a bargaining unit.

Table 6: Type of Nursing Unit

Variable	<i>N</i> (%)
Telemetry	14 (3.6)
ER	18 (4.7)
Neonatal ICU	18 (4.7)
Pediatric ICU	20 (5.2)
Surgical	21 (5.5)
Medical	25 (6.5)
CCU	26 (6.8)
Medical/Surgical	69 (18.0)
ICU	77 (20.1)
Other	96 (24.9)

Of the 382 nurses who responded to working full or part time on the nursing unit, over 80% of the respondents were employed full time. Of the 389 nurses who responded to number of hours worked per week, approximately 89% either worked 20-39 hours per week (46.5%) or 40-59 hours per week (42.4%). The remaining respondents worked less than 20 hours per week (6.4%) or 60 or more hours per week (4.6%). Descriptions of the theoretical variables are presented next, followed by an evaluation of the associations between the dependent and independent variables and a description of the research findings for each of the research questions addressed in this study.

Description of Theoretical Variables

Reasons Why Medication Administration Errors Occur Subscales

Measures of central tendency and variability for individual items and each mean subscale score were used to analyze the data regarding reasons medication errors occur in each of the groups (non-Magnet, Magnet-aspiring, and Magnet) and in the combined sample. The combined scores were obtained by including all participant responses to each of the questions. If the number of responses were different for the individual items in the combined sample (see Table 7), a column under the combined sample with the “N” is indicated. Data for each of the five subscale scores (physician communication, nurse staffing, medication packaging, pharmacy process, and transcription related) for each of the groups and the combined sample are presented first, followed by data for individual items in each of the subscales.

Table 7 describes the mean and standard deviation for each of the subscale means in the Reasons Why Medication Errors Occur instrument in non-Magnet, Magnet-aspiring, and Magnet-designated hospitals, as well as the mean, standard deviation, skewness, and kurtosis for each subscale in the combined sample. Results revealed a normal distribution of all mean subscale scores. The Reasons Why Medication Errors Occur instrument has a 6-point response scale: 1 = strongly disagree, 6 = strongly agree. Mean scores ranged from 2.9 – 4.5 with a smaller number indicating more disagreement that the item contributes to medication error occurrence.

This survey was administered three times over a five year period, in 1996, 1998, and 2001 by the authors of the instrument. Subscale scores ranged from 2.5 – 4.1 (Wakefield, et al., 2005). Mean subscale scores in this study, for the combined sample,

were higher than the mean subscale scores reported in the original instrument studies for all subscales except transcription related, showing that nurses in this study agreed more strongly that physician communication, medication packaging, pharmacy processes, and nurse staffing contributed to reasons why medication errors occur than the nurses in the studies conducted by the authors of the instrument.

Table 7: Descriptive Statistics for the Subscales of the Reasons Medication Errors Occur Instrument

Subscale	Combined Sample (<i>N</i> = 358)				Non-Magnet (<i>n</i> = 100)		Magnet-aspiring (<i>n</i> = 110)		Magnet (<i>n</i> = 148)	
	M	SD	Std Error Skewness	Std Error Kurtosis	M	SD	M	SD	M	SD
Physician communication	3.95	.10	.13	.26	4.11	1.08	3.91	1.15	3.86	1.07
Nurse staffing	4.52	1.06	.13	.26	4.61	.987	4.69	1.13	4.34	1.02
Medication packaging	4.14	1.23	.13	.26	4.22	1.29	4.12	1.20	4.09	1.21
Pharmacy process	2.91	1.31	.13	.26	2.92	1.27	2.82	1.32	2.96	1.32
Transcription related	3.02	1.66	.13	.26	3.30	1.72	2.98	1.62	2.86	1.64

Note. Means were calculated using subscale mean scores

Medication Packaging Subscale

Table 8 describes the mean and standard deviation for individual item scores in the medication packaging subscale of the Reasons Why Medication Errors Occur instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, and Magnet). These results will be discussed under their corresponding research question (Research Question # 1).

Table 8: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Medication Packaging Subscale of the Reasons Why Medication Errors Occur Instrument

Item	Combined Sample			Non-Magnet (<i>n</i> = 113)		Magnet-aspiring (<i>n</i> = 114)		Magnet (<i>n</i> = 150)	
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Packaging of many medications is similar	440	4.28	1.49	4.39	1.59	4.16	1.47	4.27	1.45
Names of medications are similar	444	4.14	1.40	4.26	1.39	4.32	1.33	4.07	1.42
Different medications look alike	440	3.97	1.44	4.19	1.51	3.91	1.42	3.88	1.39

Note. ANOVA, Mean scores of the individual items did not differ by Magnet category

Physician Communication Subscale

Table 9 describes the mean and standard deviation for individual item scores in the physician communication subscale of the Reasons Why Medication Errors Occur instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, and Magnet). These results will be discussed under their corresponding research question (Research Question # 1).

Table 9: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Physician Communication Subscale of the Reasons Why Medication Errors Occur Instrument

Item	Combined Sample (<i>N</i> = 376)		Non-Magnet (<i>n</i> = 112)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 151)	
	M	SD	M	SD	M	SD	M	SD
Physicians change orders frequently	4.33	1.30	4.25	1.37	4.42	1.32	4.32	1.23
Physician orders not clear	4.22	1.36	4.45	1.29	4.15	1.43	4.11	1.35
Poor communication between nurses and physicians	4.13	1.41	4.26	1.44	4.16	1.40	4.01	1.38
Physician* orders not legible	3.98	1.81	4.37	1.59	3.87	1.96	3.77	1.83
Verbal orders are used instead of writing	3.63	1.54	3.81	1.47	3.56	1.56	3.56	1.57
Abbreviations are used	3.46	1.71	3.70	1.64	3.38	1.74	3.34	1.73

Note. ANOVA, * $p < .05$

Transcription Related Subscale

Table 10 describes the mean and standard deviation for individual item scores in the transcription related subscale for the Reasons Why Medication Errors Occur instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, and Magnet). These results will be discussed under their corresponding research question (Research Question # 1).

Table 10: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Transcription Related Subscale of the Reasons Why Medication Errors Occur Instrument

Item	Combined Sample (<i>N</i> = 369)		Non-Magnet (<i>n</i> = 107)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 149)	
	M	SD	M	SD	M	SD	M	SD
Medication orders not transcribed	3.04	1.71	3.27	1.77	3.04	1.67	2.87	1.68
Errors on the Kardex	3.00	1.66	3.26	1.70	2.96	1.64	2.85	1.63

Note. ANOVA, Mean scores of the individual items did not differ by Magnet category

Pharmacy Processes Subscale

Table 11 describes the mean and standard deviation for individual item scores in the pharmacy processes subscale of the Reasons Why Medication Errors Occur for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, and Magnet). These results will be discussed under their corresponding research question (Research Question # 1).

Table 11: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for Items in the Pharmacy Processes Subscale of the Reasons Why Medication Errors Occur Instrument

Item	Combined Sample (<i>N</i> = 369)		Non-Magnet (<i>n</i> = 107)		Magnet- Aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 149)	
	M	SD	M	SD	M	SD	M	SD
Delivered incorrectly	3.12	1.44	3.10	1.45	3.09	1.43	3.16	1.44
Does not prepare correctly	2.83	1.41	2.79	1.39	2.73	1.44	2.94	1.40
Does not label correctly	2.76	1.40	2.82	1.40	2.68	1.41	2.78	1.39

Note. ANOVA, Mean scores of the individual items did not differ by Magnet category

Nurse Staffing Subscale

Table 12 describes the mean and standard deviation for individual item scores in the nurse staffing subscale of the Reasons Why Medication Errors Occur instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, and Magnet). These results will be discussed under their corresponding research question (Research Question #1).

Table 12: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for Items in the Nurse Staffing Subscale of the Reasons Why Medication Errors Occur Instrument

Item	Combined Sample (<i>N</i> = 369)		Non-Magnet (<i>n</i> = 107)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 149)	
	M	SD	M	SD	M	SD	M	SD
Nurses are* interrupted	5.32	.97	5.44	.78	5.44	.97	5.15	1.06
Inadequate staffing levels	4.57	1.43	4.57	1.43	4.74	1.39	4.43	1.46
All ** medications cannot be passed within acceptable time frame	4.22	1.57	4.31	1.65	4.58	1.60	3.88	1.43
Nurses get pulled	3.95	1.59	3.96	1.62	4.04	1.66	3.89	1.53

Note. ANOVA, * $p < .05$, ** $p = .001$

Reasons Why Medication Errors are not Reported Subscales

Table 13 describes the mean, standard deviation, and variability for each of the subscale mean scores in the Reasons Why Medication Errors are not Reported instrument in non-Magnet, Magnet-aspiring, and Magnet-designated hospitals. Data for each of the four subscale scores (fear, administrative response, disagree with definition, and reporting effort) for each of the groups and the combined sample are presented first, followed by data for individual items in each of the subscales. Results revealed a normal distribution of all mean subscale scores in the combined sample. The Reasons Why Medication Errors are not Reported instrument has a 6-point response scale: 1 = strongly disagree, 6 = strongly agree. Mean scores ranged from 3.58 – 4.52 with a smaller number indicating more disagreement that the item contributes to medication error occurrence.

This survey was administered four times over a seven year period, in 1994, 1996, 1998, and 2001, by the authors of the instrument with subscale scores ranging from 3.0 – 3.6 (Wakefield, et al., 2005). Mean subscale scores in this study, for the combined sample, were all higher than the mean subscale scores reported in the original studies of the instrument (Wakefield, et al., 2005), showing that nurses in this study agree more strongly that disagreement over error, reporting effort, fear, and administrative response contribute to reasons why medication errors are not reported than the nurses in the studies conducted by the instrument developers.

Table 13: Descriptive Statistics for the Subscales of the Reasons Why Medication Errors are Not Reported Instrument

Subscale	Combined Sample (<i>N</i> = 374)				Non-Magnet (<i>n</i> = 114)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 147)	
	M	SD	Std Error Skewness	Std Error Kurtosis	M	SD	M	SD	M	SD
Fear	4.52	1.28	.13	.25	4.71	1.16	4.43	1.28	4.42	1.35
Administrative response	3.93	1.35	.13	.25	4.16	1.33	3.82	1.44	3.84	1.27
Disagree with definition	3.58	1.27	.13	.25	3.88	1.21	3.70	1.18	3.26	1.30
Reporting effort	3.92	1.39	.13	.25	4.13	1.32	3.96	1.52	3.74	1.34

Note. Means were calculated using subscale mean scores

Disagree with Definition Subscale

Table 14 describes the mean and standard deviation for the individual item scores in the disagree with definition subscale of the Reasons Why Medication Errors are not Reported instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, Magnet). These results will be discussed under their corresponding research question (Research Question # 2).

Table 14: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Disagree with Definition Subscale of the Reasons Why Medication Errors are not Reported Instrument

Item	Combined Sample (<i>N</i> = 374)		Non-Magnet (<i>n</i> = 114)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 147)	
	M	SD	M	SD	M	SD	M	SD
May not* think error important enough	4.32	1.52	4.68	1.42	4.36	1.49	4.01	1.56
Do not** recognize an error occurred	3.73	1.48	4.05	1.36	3.99	1.35	3.28	1.57
Disagree* with hospital definition	3.19	1.62	3.43	1.54	3.30	1.70	2.92	1.61
Medication* error not clearly defined	3.08	1.57	3.34	1.62	3.15	1.53	2.83	1.52

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

Reporting Effort Subscale

Table 15 describes the mean and standard deviation for the individual item scores in the reporting effort subscale of the Reasons Why Medication Errors are not Reported instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, Magnet). These results will be discussed with their corresponding research question (Research Question # 2).

Table 15: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Reporting Effort Subscale of the Reasons Why Medication Errors are not Reported Instrument

Item	Combined (<i>N</i> = 374)		Non-Magnet (<i>n</i> = 114)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 147)	
	M	SD	M	SD	M	SD	M	SD
Filling out incident report takes too much time	4.31	1.55	4.42	1.43	4.35	1.66	4.20	1.54
Contacting* physician takes too much time	3.53	1.57	3.83	1.53	3.56	1.62	3.28	1.52

Note. ANOVA, * $p < .05$

Fear Subscale

Table 16 describes the mean and standard deviation for the individual item scores in the fear subscale of the Reasons Why Medication Errors are not Reported instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, Magnet). These results will be discussed under their corresponding research question (Research Question #2).

Table 16: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Fear Subscale of the Reasons Why Medication Errors are not Reported Instrument

Item	Combined Sample (<i>N</i> = 374)		Non-Magnet (<i>n</i> = 114)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 147)	
	M	SD	M	SD	M	SD	M	SD
Blamed if something happens to patient	4.84	1.41	4.99	1.33	4.82	1.42	4.74	1.45
Adverse consequences	4.71	1.46	4.97	1.35	4.67	1.45	4.53	1.54
Patient/family may have a negative attitude or sue nurse	4.48	1.40	4.63	1.34	4.34	1.42	4.46	1.43
Nurses think others will think they are incompetent	4.35	1.44	4.55	1.35	4.22	1.45	4.29	1.49
Physician will reprimand	4.18	1.57	4.38	1.48	4.10	1.62	4.08	1.59

Note. ANOVA, Mean scores of the individual items did not differ by hospital groups

Administrative Response Subscale

Table 17 describes the mean and standard deviation for the individual item scores in the administrative response subscale of the Reasons Why Medication Errors are not Reported instrument for the combined sample and each of the groups (non-Magnet, Magnet-aspiring, Magnet). These results will be discussed with their corresponding research question (Research Question # 2).

Table 17: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Items in the Administrative Response Subscale of the Reasons Why Medication Errors are Not Reported Instrument

Subscale	Combined Sample (<i>N</i> = 374)		Non-Magnet (<i>n</i> = 114)		Magnet-aspiring (<i>n</i> = 113)		Magnet (<i>n</i> = 147)	
	M	SD	M	SD	M	SD	M	SD
No positive feedback given for passing medications correctly	4.52	1.54	4.68	1.48	4.34	1.67	4.54	1.48
Too much emphasis as a quality indicator	3.86	1.70	3.89	1.76	3.76	1.75	3.90	1.63
Focus on* individual cause rather than system cause	3.77	1.76	4.23	1.67	3.66	1.85	3.50	1.69
Response does not match severity	3.57	1.60	3.87	1.65	3.50	1.66	3.39	1.49

Note. ANOVA, * $p < .05$

Practice Environment Scale of the Nursing Work Index

Table 18 describes the mean, standard deviation, and variability for each of the subscale items in the Practice Environment Scale of the Nursing Work Index (PES-NWI) instrument for the combined sample and for each of the groups (non-Magnet, Magnet-aspiring, Magnet-

designated hospitals). Data for each of the five subscale scores (nursing foundations for quality of care, staffing and resource adequacy, collegial nurse-physician relations, nurse participation in hospital affairs, and nurse manager ability, leadership, and support of nurses) for each of the groups and the combined sample are presented. The PES-NWI has a 4-point scale: 1 = strongly agree, 4 = strongly disagree. Scoring for each item is done by reverse coding so that higher numbers indicate greater agreement. Results revealed a normal distribution of all mean subscale scores in the combined sample. The mean subscale scores for the Magnet and non-Magnet samples in this study ranged from 2.53 – 3.01 with higher scores indicating more agreement that the item was present in the work environment.

Table 18: Descriptive Statistics and Analysis of Variance (ANOVA) Among Groups for the Subscales of the Practice Environment Scale of the Nursing Work Index

Subscale	Combined Sample (<i>N</i> = 348)				Non-Magnet (<i>n</i> = 104)		Magnet-aspiring (<i>n</i> = 106)		Magnet (<i>n</i> = 138)	
	M	SD	Std Error of Skewness	Std Error of Kurtosis	M	SD	M	SD	M	SD
Nurse** participation	2.79	.70	.12	.25	2.51	.74	2.85	.63	2.97	.66
Nurse** foundations	3.01	.56	.13	.25	2.82	.62	3.05	.52	3.13	.51
Nurse manager	2.85	.73	.13	.25	2.70	.79	2.91	.69	2.90	.71
Staffing* Resource	2.53	.74	.12	.25	2.50	.70	2.41	.77	2.67	.70
Collegial nurse- physician relationships	2.88	.69	.12	.25	2.84	.73	2.78	.68	2.97	.65

Note. Means were calculated using subscale mean scores
ANOVA, * $p < .05$, ** $p < .001$

The results from this study were consistent with the mean subscale scores in Magnet hospitals and non-Magnet hospitals in another study of the PES-NWI instrument (Lake, 2002; see Table 19).

Table 19: Subscale Means for the Practice Environment Scale of the Nursing Work Index (PES-NWI)

Subscale	M^a (SD) of Nurses in		M^b (SD) of Nurses in	
	Magnet Hospitals ($n = 138$)	Non-Magnet Hospitals ($n = 104$)	Magnet Hospitals ($n = 1,610$)	Non-Magnet Hospitals ($n = 689$)
Nurse Participation	2.97 (0.66)	2.51 (0.74)	2.76 (0.47)	2.44 (0.44)
Nurse Foundations	3.13 (0.51)	2.82 (0.62)	3.09 (0.39)	2.83 (0.36)
Nurse Manager	2.90 (0.71)	2.70 (0.79)	3.00 (0.59)	2.68 (0.60)
Staffing Resource	2.67 (0.70)	2.50 (0.70)	2.88 (0.62)	2.49 (0.62)
Collegial nurse-physician relations	2.97 (0.65)	2.84 (.73)	2.99 (0.52)	2.82 (0.55)

^a M is the mean subscale score in the current study. ^b M is the mean subscale score Adapted from “Development of the Practice Environment Scale of the Nursing Work Index,” by E. Lake, 2002, *Research in Nursing and Health*, 25, p. 183.

Description of Safety Culture

Table 20 describes the mean, standard deviation, and variability for each of the subscale items in the Hospital Survey on Patient Safety Culture instrument (HSPSC) in non-Magnet, Magnet-aspiring, and Magnet-designated hospitals. Data for each of the 12 subscale scores (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety) for each of the groups and the combined sample are presented. The HSPSC has a 5-point response scale: 1 = strongly disagree or never, 5 = strongly agree or always. Results revealed a normal distribution of all mean subscale scores in the combined sample. The safety culture subscales range from 3 – 20, with lower numbers indicating stronger disagreement with the statements.

Table 20: Descriptive Statistics for Safety Culture Variables

Subscale	Combined Sample					Non-Magnet (<i>n</i> = 104)		Magnet-aspiring (<i>n</i> = 103)		Magnet (<i>n</i> = 144)	
	<i>N</i>	<i>M</i>	<i>SD</i>	Std Error of Skewness	Std Error of Kurtosis	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Teamwork within unit	416	15.50	3.56	.120	.24	15.12	3.96	15.32	3.71	16.04	3.06
Supervisor expectations	417	14.24	3.67	.120	.24	13.62	4.12	14.91	3.24	14.23	3.57
Staffing	409	12.98	3.51	.121	.24	13.26	3.41	12.90	3.47	13.22	3.47
Teamwork across units	406	12.51	3.66	.121	.24	11.74	3.65	12.52	3.78	13.09	3.57
Overall perception	421	12.25	3.74	.119	.24	11.63	4.06	12.19	3.88	12.92	3.40
Organizational learning	416	11.90	2.35	.120	.24	11.26	2.81	12.41	1.97	12.00	2.21
Hospital handoffs	408	10.90	3.75	.121	.24	10.30	3.73	10.69	3.96	11.50	3.73
Communication	405	10.20	2.22	.121	.24	9.75	2.10	10.19	2.35	10.45	2.18
Hospital management	411	9.73	3.14	.120	.24	9.18	3.20	9.93	3.03	10.13	3.11
Feedback communication	405	9.52	2.68	.121	.24	8.91	2.74	9.82	2.09	9.80	2.93
Frequency of events	400	9.14	2.51	.122	.24	8.60	2.59	9.30	2.29	9.49	2.46
Nonpunitive response	414	7.55	3.13	.120	.24	7.11	3.04	7.63	2.94	7.88	3.31

Note. *M* is the subscale mean score.

The authors of the instrument use percent positive responses as a way to benchmark data from one hospital to another (Agency for Healthcare Research and Quality, 2006). The results of the percent positive responses for the subscales in this study ranged from 22 – 73 %. Even though respondents in this survey were from different hospitals, a comparison of percent positive responses was made between this study and the benchmark study. Results revealed nurses in this study had lower percent positive scores in 8 out of 12 subscales (overall perception, supervisor manager, nonpunitive response, hospital management support, handoffs, communication openness, feedback and communication about error, frequency of events reported; see Table 21) than the participants in the pilot test of the survey in 2003, indicating participants had more negative views about patient safety in their hospitals than the participants in the benchmark hospitals.

Table 21: Percent Positive Responses on the Hospital Survey of Patient Safety Culture Instrument

Subscales	Average % of positive responses ^a	Average % of positive responses ^b
Overall perception of safety (4 survey items)	41	56
Supervisor/manager expectations (4 survey items)	42	71
Organizational learning (3 survey items)	73	71
Teamwork within units (4 survey items)	71	74
Nonpunitive response to error (3 survey items)	22	43
Staffing (4 survey items)	45	50
Hospital management support for patient safety (3 survey items)	46	60
Teamwork across units (4 survey items)	53	53
Hospital handoffs and transitions (4 survey items)	29	45
Communication openness (3 survey items)	43	61
Feedback and communication about error (3 survey items)	35	52
Frequency of events reported (3 survey items)	30	52

Note. Adapted from “Comparing your results: Preliminary benchmarks,” Hospital Survey on Patient Safety Culture, 2006, <http://www.ahrq.gov/qual/hospculture/prebenchmk.htm>.

^a Average percent positive in this study. ^b Average percent positive in the benchmark hospitals.

Evaluation of Associations between Dependent Variables and Independent Variables

Determinations of associations were necessary to identify candidate predictors of the dependent variables (reasons why medication errors occur, reasons why medication errors are not reported, and perceived work environment) in order to answer Research Questions 6 – 10. First, the results of the associations between the reasons why medication errors occur and safety culture subscales, perceived work environment subscales, and demographics are presented. Next, the results of the associations between reasons why medication errors are not reported and safety culture subscales, perceived work environment subscales, and demographics are presented. Lastly, the results of the associations between perceived work environment and perceived safety culture and demographics are presented.

Evaluation of Candidate Predictors of Reasons Why Medication Errors Occur

Independent Variables: Safety Culture, Perceived Work Environment, and Demographics

Preliminary to evaluating predictors of reasons why medication errors occur, candidate predictors were identified by evaluating associations between the subscales of reasons why medication errors occur (medication packaging, physician communication, transcription related, pharmacy processes, and nurse staffing) and safety culture subscales (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety), perceived work environment subscales (collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership, and support of nurses, nurse participation

in hospital affairs, and nursing foundations for quality of care) and demographic variables (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification) using Pearson correlation coefficient or one-way ANOVAs.

Candidate predictors of medication packaging. There were 4 out of 12 safety culture subscales that were candidate predictors of medication packaging as a reason why medication errors occur: supervisor expectations ($p = .05$), overall perception of safety ($p = .05$), staffing ($p = .01$), and hospital handoffs ($p = .01$; see Table 22) and 1 perceived work environment subscale, nurse staffing and resources ($p = .05$; see Table 23). One-way ANOVA revealed significant differences in perception of medication packaging as a reason medication errors occur ($F = 2.265$, $p = .023$) based on years as a nurse. Tukey post-hoc testing revealed the significant differences were between 0-5 years and 31-35 years of experience and medication packaging, indicating that nurses who have less experience believe medication packaging contributes less to reasons why medication errors occur. Results of the one-way ANOVA revealed significant differences in perception of medication packaging as a reason medication errors occur ($F = 2.901$, $p = .022$) based on education level; however, none of the pairwise comparisons in the education level groups were significant.

Candidate predictors of physician communication. All but two of the safety culture subscales (organizational learning and hospital management; see Table 22) and all five perceived work environment subscales were candidate predictors of physician communication as a reason why medication errors occur (see Table 23).

Results of the one-way ANOVA revealed significant differences in physician communication ($F = 5.379$, $p = .001$) based on hours worked per week. Tukey post-hoc testing revealed the differences were between those working 60 or more hours per week and 20-

39 hours ($p = .001$) and 40-59 hours ($p = .018$), indicating nurses who work 20-39 hours and 40-59 hours per week believe physician communication contributes less to reasons medication errors occur than nurses who work 60 or more hours per week.

One-way ANOVA revealed significant differences in physician communication ($F = 5.291$, $p = < .001$) based on type of hospital. Tukey post-hoc testing revealed the differences were between community and community teaching hospitals ($p = .003$) and community and urban teaching hospitals ($p = .008$) indicating nurses who work in community hospitals believe physician communication contributes more to medication error occurrence than nurses working in community teaching and urban teaching hospitals.

Results of the one-way ANOVA revealed significant differences in physician communication ($F = 3.161$, $p < .001$) based on type of nursing unit. Tukey post-hoc testing revealed the differences in the physician communication subscale scores were between NICU and the following units: medical ($p = .009$), surgical ($p = .036$), CCU ($p = .014$), medical/surgical ($p = .001$), ICU ($p = .001$), telemetry ($p = .004$) and "Other" ($p < .001$) indicating nurses working in the NICU believe physician communication contributes less to medication error occurrence than nurses working in the other units. Tukey post-hoc testing also revealed the differences in the physician communication subscale scores were between PICU and the following units: medical/surgical ($p = .036$), ICU ($p = .034$), and "Other" ($p = .012$) indicating nurses working in the PICU believe physician communication contributes less to medication error occurrence than nurses working in the other units.

Candidate predictors of transcription related. Candidate predictors of transcription related factors as a reason why medication errors occur included 8 out of 12 safety culture subscales: supervisor expectation ($p = .01$), overall perception of safety ($p = .01$),

organizational learning ($p = .01$), staffing ($p = .01$), hospital management ($p = .05$), hospital handoffs ($p = .01$), communication ($p = .01$), and feedback communication ($p = .05$; see Table 22) and all of the perceived work environment subscales (see Table 23). Results of the one-way ANOVA revealed significant differences in perceptions of transcription related factors as reasons medication errors occur ($F = 2.709$, $p = .045$) based on hours worked per week; however, none of the pairwise comparisons in the number of hours worked per week groups were significant.

Results of the one-way ANOVA revealed significant differences in transcription related ($F = 2.136$, $p = .006$) based on type of nursing unit. None of the pairwise comparisons in the type of nursing unit groups were significant.

Candidate predictors of pharmacy processes. Candidate predictors of pharmacy processes as a reason why medication errors occur included only 3 out of 12 safety culture subscales (supervisor expectation [$p = .01$], staffing [$p = .01$], and hospital handoffs [$p = .05$; see Table 22]) and only 1 perceived work environment subscale (nursing foundations, $p = .05$; see Table 23). Results of the one-way ANOVA revealed significant differences in perception of pharmacy processes as a reason medication errors occur ($F = 4.152$, $p = .003$) based on education level. Tukey post-hoc testing revealed the differences in the pharmacy processes subscale scores were between ADN and MSN ($p = .045$) and BSN and MSN ($p = .003$), indicating ADN and BSN-prepared nurses believe pharmacy processes contribute less to medication error occurrence than MSN-prepared nurses.

Results of the one-way ANOVA revealed significant differences in perception of pharmacy processes as a reason medication errors occur ($F = 1.935$, $p = .014$) based on type of nursing unit. None of the pairwise comparisons in the education level groups were significant.

Candidate predictors of nurse staffing. All 12 safety culture subscales (see Table 22) and all 5 of the perceived work environment subscales were candidate predictors of nurse staffing as a reason why medication errors occur (see Table 23).

Table 22: Correlations between Safety Culture Subscale Scores and Medication Error Occurrence Subscale Scores

Subscale	Medication packaging	Physician communication	Transcription related	Pharmacy process	Nurse staffing
Supervisor expectation	-.121*	-.180**	-.200**	-.172**	-.310**
Overall perception	-.113*	-.255**	-.192**	-.075	-.351**
Organizational learning	.057	-.044	-.179**	.000	-.116*
Teamwork within units	-.057	-.097*	-.066	-.077	-.178**
Non-punitive response	-.093	-.266**	-.150	-.054	-.388**
Staffing	-.134**	-.174**	-.141**	-.142**	-.464**
Hospital management	-.090	-.086	-.120*	-.089	-.315**
Teamwork across units	-.056	-.142**	-.059	-.012	-.195**
Hospital handoffs	-.176*	-.340**	-.192**	-.126*	-.360**
Communication	-.096	-.196**	-.149**	-.031	-.217**
Feedback communication	-.007	-.102*	-.114*	.032	-.177**
Frequency of events reported	-.005	-.105*	-.087	.035	-.199**

* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Table 23: Correlations between Perceived Work Environment Subscale Scores and Medication Error Occurrence Subscale Scores

Subscale	Medication packaging	Physician communication	Transcription related	Pharmacy process	Nurse Staffing
Nurse staffing and resources	.110*	.183**	.123**	.276	.419**
Collegial nurse/physician relationship	.080	.242**	.135**	.023	.293**
Nursing foundations	.042	.158**	.163**	.112*	.192**
Nurse manager	.069	-.132*	.131*	.077	.287**
Nurse participation	.035	.109**	.195**	.061	.261**

* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Evaluation of Candidate Predictors of Reasons Why Medication Errors are not Reported

Independent Variables: Safety Culture, Perceived Work Environment, and Demographics

Preliminary to evaluating predictors of reasons why medication errors are not reported, candidate predictors were identified by evaluating associations between the subscales of reasons why medication errors are not reported (reporting effort, disagreement with definition, administrative response, and fear) and safety culture subscales (communication openness, feedback and communication about error, management support for patient safety, nonpunitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of safety), perceived work environment subscales (collegial nurse-physician relations, staffing and

resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care) and demographic variables (education level, years of experience, gender, type of nursing unit, and years working at the facility) using Pearson correlation coefficient (see Table 24), one-way ANOVAs, or an Independent *t*-test.

Candidate predictors of disagree with definition. All 12 safety culture subscales (see Table 24) and all 5 perceived work environment subscales (see Table 25) were candidate predictors of disagree with definition as a reason why medication errors are not reported.

One-way ANOVA results revealed significant differences in disagree with definition ($F = 2.130$, $p = .006$) based on type of work unit. Tukey post-hoc testing revealed the differences in disagree with definition subscale scores were between the NICU and telemetry ($p = .027$) and the ICU and NICU ($p = .004$). These results indicate nurses who work in the NICU believe “disagree with definition” contributes less to reasons why medication errors are not reported than nurses who work in telemetry and ICU.

One-way ANOVA revealed significant differences in “disagree with definition” ($F = 2.294$, $p = .045$) based on years at hospital. None of the pairwise comparisons in the years at hospital groups were significant.

Candidate predictors of reporting effort. All 12 safety culture subscales (see Table 24) and all 5 perceived work environment subscales were candidate predictors of reporting effort as a reason why medication errors are not reported (see Table 25).

One-way ANOVA results revealed significant differences in reporting effort ($F = 1.674$, $p = .045$) based on type of work unit. Tukey post-hoc testing revealed significant differences were between telemetry and NICU ($p = .044$). These results indicate nurses who work in the

NICU believe “reporting effort” contributes less to reasons why medication errors are not reported than nurses who work in telemetry and ICU.

Candidate predictors of fear. All 12 safety culture subscales (see Table 24) and all 5 perceived work environment subscales were candidate predictors of fear as a reason why medication errors are not reported (see Table 25).

One-way ANOVA also revealed significant differences in fear ($F = 3.443$, $p = .001$) based on years as a nurse. Tukey post-hoc testing revealed the differences were between 0-5 years and 36 or more years ($p = .037$), 6-10 years and 26-30 years ($p = .026$), and 6-10 years and 36-40 years ($p = .005$). These results indicate nurses with more years of experience believe fear contributes less to reasons medication errors are not reported than nurses with less experience.

One-way ANOVA revealed significant differences in fear ($F = 3.761$, $p = .002$) based on years at hospital. Tukey post-hoc testing revealed the differences in fear were between nurses who work less than 1 year and 21 or more years ($p = .042$) and 1 to 5 and 21 or more years at the hospital ($p = .003$). These results indicate nurses who have worked at the facility longer believe fear contributes less to reasons why medication errors are not reported than nurses who have been at the facility for 5 or fewer years.

Candidate predictors of administrative response. All 12 safety culture subscales (see Table 24) and all 5 perceived work environment subscales were candidate predictors of administrative response as a reason why medication errors are not reported (see Table 25). The mean subscale scores for administrative response did not differ by education level, years of experience, gender, type of nursing unit, or years working at the facility.

Table 24: Correlations between Safety Culture Subscale Scores and Reasons Why Medication Errors are not Reported Subscale Scores

Subscale	Disagree with Definition	Reporting effort	Fear	Administrative response
Supervisor expectation	-.298*	-.282*	-.323*	-.532*
Overall perception	-.326*	-.329*	-.381*	-.508*
Organizational learning	-.222*	-.160*	-.204*	-.396*
Teamwork within units	-.155*	-.161*	-.222*	-.302*
Non-punitive response	-.411*	-.352*	-.629*	-.632*
Staffing	-.290*	-.268*	-.309*	-.450*
Hospital management	-.267*	-.234*	-.269*	-.503*
Teamwork across units	-.243*	-.223*	-.283*	-.294*
Hospital handoffs	-.338*	-.355*	-.462*	-.449*
Communication	-.292*	-.240*	-.349*	-.393*
Feedback communication	-.302*	-.281*	-.283*	-.413*
Frequency of events reported	-.385*	-.348*	-.412*	-.402*

* $p < .01$, two-tailed.

Table 25: Correlations between Perceived Work Environment and Reasons Why Medication Errors are not Reported Subscale Scores

Subscale	Disagree with definition	Reporting effort	Fear	Administrative response
Nursing foundations	.357*	.301*	.323*	.468*
Staffing and resources	.329*	.255*	.343*	.417*
Collegial nurse/physician relations	.271*	.265*	.311*	.345*
Nurse manager	.342*	.308*	.373*	.523*
Nurse participation	.303*	.201*	.279*	.479*

* $p < 0.01$, two-tailed.

Evaluation of Candidate Predictors of Perceived Work Environment

Independent Variables: Safety Culture and Demographics

Preliminary to evaluating predictors of perceived work environment, candidate predictors were identified by evaluating associations between the subscales of perceived work environment (collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership, and support of nurses, nurse participation in hospital affairs, and nursing foundations for quality of care) and safety culture subscales (communication openness, feedback and communication about error, management support for patient safety, non-punitive response to error, organizational learning-continuous improvement, teamwork within units, supervisor/manager expectations and actions promoting safety, staffing, teamwork across units, hospital handoffs and transitions, frequency of event reporting, and overall perceptions of

safety), and demographic variables (experience level, hours worked per week, and hospital classification) as candidate predictors using Pearson correlation coefficient (see Table 26) or one-way ANOVAs. None of the mean subscale scores for perceived work environment differed by hospital classification.

Candidate predictors of nurse participation. All 12 safety culture subscales were candidate predictors of nurse participation in the perceived work environment (see Table 26).

Candidate predictors of nursing foundations. All 12 safety culture subscales were candidate predictors of nursing foundations in the perceived work environment (see Table 26).

Candidate predictors of staffing resources. All 12 safety culture subscales were candidate predictors of staffing resources in the perceived work environment (see Table 26).

Results of the one-way ANOVA revealed significant differences in staffing and resources ($F = 1.648, p = .024$) based on years as a nurse. Post-hoc testing was not able to be performed because at least one category had fewer than 2 cases.

Candidate predictors of nurse manager. All 12 safety culture subscales were candidate predictors of nurse manager in the perceived work environment (see Table 26).

Candidate predictors of collegial nurse-physician relations. All but one safety culture subscale (frequency of events reported) were candidate predictors of nursing foundations in the perceived work environment (see Table 26). Results of the one-way ANOVA revealed significant differences in collegial nurse-physician relations ($F = 2.735, p = .004$) based on hours worked per week. Post-hoc testing was not able to be performed because at least one category had fewer than 2 cases.

Table 26: Correlations between Safety Culture and Perceived Work Environment Subscale Scores

Subscale	Nurse participation	Nursing foundations	Staffing resources	Nurse manager	Collegial relations
Supervisor expectation	-.576*	-.553*	-.452*	-.752*	-.407*
Overall perception	-.498*	-.521*	-.545*	-.521*	-.407*
Organizational learning	-.578*	-.621*	-.363*	-.584*	-.365*
Teamwork within units	-.358*	-.390*	-.400*	-.485*	-.441*
Non-punitive response	-.493*	-.448*	-.470*	-.578*	-.417*
Staffing	-.440*	-.425*	-.665*	-.490*	-.415*
Hospital management	-.684*	-.631*	-.603*	-.598*	-.394*
Teamwork across units	-.350*	-.371*	-.425*	-.394*	-.379*
Hospital handoffs	-.388*	-.450*	-.490*	-.416*	-.368*
Communication	-.450*	-.493*	-.377*	-.491*	-.424*
Feedback	-.563*	-.556*	-.404*	-.589*	-.400*
communication					
Frequency of events reported	-.413*	-.507*	-.343*	-.355*	-.327

* $p < .01$, two-tailed.

Findings for the Research Questions

Research Question 1: What are the explanations for medication error occurrence by acute care staff nurses working in non-Magnet, Magnet-aspiring, and Magnet-designated hospitals?

Results from responses to the Reasons Why Medication Errors Occur are presented by subscale: medication packaging, physician communication, transcription related, pharmacy processes, and nurse staffing for the combined sample and for the groups (non-Magnet, Magnet-

aspiring, and Magnet). Results will be presented in descending order for the combined sample followed by results from the groups.

Medication Packaging

For the combined sample, the mean score for items in the medication packaging subscale of the Reasons Why Medication Errors Occur were, in descending order, as follows: “packaging of many medications is similar” ($M = 4.28$, $SD = 1.492$), “names of medications are similar” ($M = 4.14$, $SD = 1.400$) and “different medications look alike” ($M = 3.97$, $SD = 1.444$; see Table 8). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences in mean subscale scores were noted in the individual item “different medications look alike” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 3.88$, $SD = 1.385$) and nurses working in non-Magnet hospitals having the highest mean score ($M = 4.19$, $SD = 1.51$). Lowest group differences were noted in the “packaging of many medications is similar” with nurses working in Magnet-aspiring hospitals having the lowest mean score ($M = 4.16$, $SD = 1.467$) and nurses working in non-Magnet hospitals having the highest mean score ($M = 4.39$, $SD = 1.59$; see Table 8). Apparent differences will be evaluated under Research Question # 3.

Physician Communication

For the combined sample, the mean score for items in the physician communication subscale of the Reasons Why Medication Errors Occur were, in descending order, as follows: “physicians change orders frequently” ($M = 4.33$, $SD = 1.297$), “physician orders not clear”

($M = 4.22$, $SD = 1.360$), “poor communication between nurses and physicians” ($M = 4.13$, $SD = 1.405$), “physician orders not legible” ($M = 3.98$, $SD = 1.814$), “verbal orders are used instead of writing” ($M = 3.63$, $SD = 1.538$), and “abbreviations are used instead of writing the orders out completely” ($M = 3.46$, $SD = 1.709$; see Table 9). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences in mean scores were for the individual item “physician orders not legible,” with nurses working in Magnet hospitals having the lowest mean score ($M = 3.77$, $SD = 1.83$) and nurses working in non-Magnet hospitals with the highest mean score ($M = 4.37$, $SD = 1.59$). Lowest group differences in mean scores were for the individual item “physicians change orders frequently,” with nurses working in non-Magnet hospitals having the lowest mean score ($M = 4.25$, $SD = 1.37$) and nurses working in Magnet-aspiring hospitals having the highest mean score ($M = 4.42$, $SD = 1.32$; see Table 9). Apparent differences will be evaluated under Research Question # 3.

Transcription Related

For the combined sample, the mean score for items in the transcription related subscale of the Reasons Why Medication Errors Occur were, in descending order, as follows: “medication orders not transcribed” ($M = 3.04$, $SD = 1.71$) and “errors on the Kardex” ($M = 3.00$, $SD = 1.66$; see Table 10). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences were noted in the individual item “errors on the Kardex” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 2.85$, $SD =$

1.626) and nurses working in non-Magnet-designated hospitals having the highest mean score ($M = 3.26, SD = 1.70$). Lowest group differences were noted in the individual item “medication orders not transcribed” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 2.87, SD = 1.682$) and nurses working in non-Magnet hospitals having the highest mean score ($M = 3.27, SD = 1.71$; see Table 10). Apparent differences will be evaluated under Research Question # 3.

Pharmacy Processes

For the combined sample, the mean score for items in the pharmacy processes subscale of the Reasons Why Medication Errors Occur were, in descending order as follows: “pharmacy delivers incorrect doses to this unit” ($M = 3.12, SD = 1.435$), “pharmacy does not prepare the medication correctly” ($M = 2.83, SD = 1.406$), and “pharmacy does not label the medication correctly” ($M = 2.76, SD = 1.398$; see Table 11). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences were noted in the individual item “pharmacy does not prepare the medication correctly,” with nurses working in Magnet-aspiring hospitals having the lowest mean score ($M = 2.73, SD = 1.44$) and nurses working in Magnet-designated hospitals having the highest mean score ($M = 2.94, SD = 1.40$). Lowest group differences were noted in the individual item “pharmacy delivers incorrect doses to this unit” with nurses working in Magnet-aspiring hospitals having the lowest mean score ($M = 3.09, SD = 1.43$) and nurses working in Magnet-designated hospitals having the highest mean score ($M = 3.16, SD = 1.44$; see Table 11). Apparent differences will be evaluated under Research Question # 3.

Nurse Staffing

For the combined sample, the mean score for items in the nurse staffing subscale of the Reasons Why Medication Errors Occur were, in descending order, as follows: “nurses are interrupted while administering medication to perform other duties” ($M = 5.32, SD = .968$), “unit staffing levels are inadequate” ($M = 4.57, SD = 1.430$), “all medications for one team of patients cannot be passed within an accepted time frame” ($M = 4.22, SD = 1.573$) and “nurses get pulled between teams and from other units” ($M = 3.95, SD = 1.593$; see Table 12). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences were noted in the individual item “all medications cannot be passed within acceptable time frame,” with nurses in the Magnet-designated hospitals having the lowest mean score ($M = 3.88, SD = 1.43$) and nurses working in Magnet-aspiring hospitals having the highest mean score ($M = 4.58, SD = 1.60$). The lowest mean score differences were noted in the individual item “nurses get pulled between teams and to other units,” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 3.89, SD = 1.527$) and nurses working in Magnet-aspiring hospitals having the highest mean score ($M = 4.04, SD 1.663$; see Table 12). Apparent differences will be evaluated under Research Question # 3.

In summary, nurses in the combined sample had the highest mean subscale score, slightly to moderately agree, that nurse staffing contributes to reasons why medication errors occur on their unit followed by medication packaging and physician communication. Nurses working in Magnet hospitals had the lowest mean scores in four out of five subscales indicating they agree

less that the items contribute to reasons why medication errors occur than nurses working in Magnet-aspiring or non-Magnet hospitals.

“Packaging of many medications is similar,” “physicians change orders frequently,” and “nurses are interrupted while passing medications” were individual items with the highest mean scores in the combined sample and in each of the groups, indicating nurses slightly to moderately agree that these items contribute to reasons why medication errors occur on their units.

Research Question 2: What are the explanations for medication errors not being reported by acute care staff nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

Results from responses to Reasons Why Medication Errors are not Reported are presented by subscale: disagree with definition, reporting effort, fear, and administrative response for the combined sample and for the groups (non-Magnet, Magnet-aspiring, and Magnet). Results will be presented in descending order for the combined sample followed by results from the groups.

Disagree with Definition

For the combined sample, the mean score for items in the disagree with definition subscale of the Reasons Why Medication Errors are not Reported were, in descending order, as follows: “nurses may not think the error is important enough to be reported” ($M = 4.32, SD = 1.518$), “nurses do not recognize an error occurred” ($M = 3.73, SD = 1.482$), “nurses do not agree with hospital’s definition of a medication error” ($M = 3.19, SD = 1.624$), and “medication error is not clearly defined” ($M = 3.08, SD = 1.566$; see Table 14). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score

indicating more agreement that the item contributes to reasons why medication errors are not reported.

Highest group differences were noted in the individual item “nurses do not recognize an error occurred,” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 3.28$, $SD = 1.565$) and nurses working in non-Magnet-designated hospitals having the highest mean score ($M = 4.05$, $SD = 1.36$). Lowest group differences were noted for the individual items “nurses do not agree with hospital’s definition of a medication error” and “medication error is not clearly defined,” with nurses working in Magnet-designated hospitals having the lowest mean scores ($M = 2.92$, $SD = 1.607$ and $M = 2.83$, $SD = 1.519$ respectively) and nurses working in non-Magnet-designated hospitals having the highest mean scores ($M = 3.43$, $SD = 1.54$ and $M = 3.34$, $SD = 1.62$ respectively; see Table 14). Apparent differences will be evaluated under Research Question #4.

Reporting Effort

For the combined sample, the mean score for items in the reporting effort subscale of Reasons Why Medication Errors are not Reported were, in descending order, as follows: “filling out an incident report takes too much time” ($M = 4.31$, $SD = 1.545$) and “contacting the physician about a medication error takes too much time” ($M = 3.53$, $SD = 1.568$; see Table 15). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors are not reported.

Highest group differences were noted for the individual item “contacting the physician takes too much time” with nurses in the Magnet group having the lowest mean score ($M = 3.28$, $SD = 1.52$) and nurses working in non-Magnet-designated hospitals having the highest mean

score ($M = 3.83$, $SD = 1.53$). Lowest group differences were noted for the individual item “filling out an incident report takes too much time,” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 4.20$, $SD = 1.54$) and nurses working in non-Magnet hospitals having the highest mean score ($M = 4.42$, $SD = 1.43$; see Table 15). Apparent differences will be evaluated under Research Question # 4.

Fear

For the combined sample, the mean score for items in the fear subscale of Reasons Why Medication Errors are not Reported were, in descending order, as follows: “nurses could be blamed if something happens to the patient as a result of the medication error” ($M = 4.84$, $SD = 1.406$), “nurses fear adverse consequences from reporting medication errors” ($M = 4.71$, $SD = 1.464$), “patient or family might develop a negative attitude toward the nurse, or may sue the nurse if a medication error is reported” ($M = 4.48$, $SD = 1.400$), “nurses believe that other nurses will think they are incompetent if they make medication errors” ($M = 4.35$, $SD = 1.440$), and “nurses are afraid the physician will reprimand them for the medication error” ($M = 4.18$, $SD = 1.567$; see Table 16). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors are not reported.

Highest group differences were noted in the individual item “nurses fear adverse consequences from reporting medication errors” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 4.54$, $SD = 1.54$) and nurses working in non-Magnet-designated hospitals having the highest mean score ($M = 4.97$, $SD = 1.35$). Lowest group differences were noted in the individual item “nurses could be blamed if something happens to the patient as a result of the medication error” with nurses working in Magnet-

designated hospitals having the lowest mean score ($M = 4.74$, $SD = 1.45$) and nurses working in non-Magnet-designated hospitals having the highest mean score ($M = 4.99$, $SD = 1.33$; see Table 16). Apparent differences will be evaluated under Research Question # 4.

Administrative Response

For the combined sample, the mean score for items in the administrative response subscale of Reasons Why Medication Errors are not Reported were, in descending order, as follows: “no positive feedback given for passing medications correctly” ($M = 4.52$, $SD = 1.54$), “too much emphasis is placed on medication errors as a measure of the quality of nursing care provided” ($M = 3.86$, $SD = 1.70$), “when medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error” ($M = 3.77$, $SD = 1.755$), and “the response by nursing administration does not match the severity of the error” ($M = 3.57$, $SD = 1.60$; see Table 17). The response scale ranges from 1 = strongly disagree to 6 = strongly agree, with a higher mean score indicating more agreement that the item contributes to reasons why medication errors occur.

Highest group differences were noted for the individual item “when medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 3.50$, $SD = 1.69$) and nurses working in non-Magnet-designated hospitals having the highest mean score ($M = 4.23$, $SD = 1.67$). Lowest group differences were noted for the individual item “too much emphasis is placed on medication errors as a measure of the quality of nursing care provided” with nurses working in Magnet-designated hospitals having the lowest mean score ($M = 3.90$, $SD = 1.627$) and nurses working in Magnet-

aspiring hospitals having the highest mean score ($M = 3.76$, $SD = 1.749$; see Table 17).

Apparent differences will be evaluated under Research Question # 4.

In summary, the highest mean subscale score in the combined sample and in each group was fear, with nurses indicating they slightly to moderately agree that fear contributes to reasons why medication errors are not reported followed by the administrative response and the reporting effort subscales. Individual items: “nurses may not think error is important enough,” “filling out an incident report takes too much time,” “nurses could be blamed if something happens to the patient as a result of the medication error,” and “nurses fear adverse consequences from reporting medication errors” were all items nurses slightly to moderately agree contribute to reasons why medication errors are not reported.

Research Question 3: Is there a difference in the explanations for medication error occurrence in nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

Results of the one-way ANOVA indicated significant differences among the Magnet, Magnet-aspiring, and non-Magnet groups only for the nurse staffing subscale ($F = 4.132$, $p = .017$). Tukey post-hoc testing revealed that the significant difference was between the Magnet group and the Magnet-aspiring group ($p = .014$), with the Magnet group indicating less agreement that nurse staffing contributes to medication error occurrence.

Individual items in each of the subscales were evaluated to see if there were significant differences among the groups. In the physician communication subscale, results of the one-way ANOVA revealed significant differences among the groups (Magnet, Magnet-aspiring, and non-Magnet) in the “physicians’ medication orders are not legible” item ($F = 3.067$, $p = .028$; see Table 9). Tukey post-hoc testing revealed the significant difference was between the Magnet

group and non-Magnet group ($p = .029$) with the Magnet group indicating less agreement that physicians' orders are not legible contributes to medication error occurrence.

In the nurse staffing subscale, results of the one-way ANOVA revealed significant group differences in two of the individual items: "nurses are interrupted while administering medications to perform other duties" ($F = 5.026, p = .007$) and "all medications for one team of patients cannot be passed within an accepted time frame" ($F = 7.019, p = .001$; see Table 12). First, Tukey post-hoc testing revealed significant differences between the Magnet and Magnet-aspiring groups ($p = .024$) and the Magnet and non-Magnet groups ($p = .018$) in the "nurses are interrupted while administering medications to perform other duties," indicating nurses working in Magnet hospitals agree less that this contributes to reasons why medication errors occur. Tukey post-hoc testing also revealed significant differences between the Magnet and Magnet-aspiring groups ($p = .001$) in the "all medications for one team of patients cannot be passed within an accepted time frame," indicating nurses working in Magnet hospitals agree less that this contributes to reasons why medication errors occur than the Magnet-aspiring group. None of the individual items in the medication packaging subscale (see Table 8), the transcription related subscale (see Table 10), or the pharmacy processes subscale (see Table 11) differed by hospital classification.

In summary, significant differences were noted in the mean subscale scores in the nurse staffing subscale, with nurses working in Magnet hospitals agreeing less that nurse staffing contributes to reasons why medication errors occur than nurses working in Magnet-aspiring hospitals. Significant differences were noted in several individual items in the physician communication and nurse staffing subscales: "physicians' medication orders not legible," nurses are interrupted while administering medications to perform other duties" and "all medications for

one team of patients cannot be passed within an accepted time frame.” Nurses working in Magnet-designated hospitals had lower mean scores than nurses working in Magnet-aspiring and non-Magnet hospitals indicating less agreement that these items contribute to reasons why medication errors occur.

Research Question 4: Is there a difference in the reasons why medication errors are not reported by acute care nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

Results of the one-way ANOVAs indicated significant difference among the Magnet, Magnet-aspiring, and non-Magnet groups only for the “disagree with definition” subscale ($F = 8.672, p < .001$). Tukey post-hoc testing revealed the differences were between the Magnet and non-Magnet groups ($p < .001$) and Magnet and Magnet-aspiring groups ($p = .011$), indicating nurses who work in Magnet-designated hospitals believe disagree with definition contributes less to reasons medication errors are not reported than did the Magnet-aspiring and non-Magnet groups.

Individual items in each of the subscales were evaluated to see if there were significant differences among the groups. Results of the one-way ANOVAs revealed significant group differences in all four of the individual items in the disagree with definition subscale: “nurses do not agree with hospital’s definition of a medication error” ($F = 3.605, p = .028$), “nurses do not recognize an error occurred” ($F = 11.974, p = < .001$), “medication error is not clearly defined” ($F = 3.701, p = .026$), and “nurses may not think the error is important enough to be reported” ($F = 6.535, p = .002$; see Table 14). First, Tukey post-hoc testing revealed significant differences between the Magnet and non-Magnet groups ($p = .036$) in the “nurses do not agree with the hospital’s definition of a medication error,” indicating nurses who work in

Magnet hospitals agree less that this item contributes to reasons why medication errors are not reported. Second, significant differences were found in the “nurses do not recognize an error occurred” between Magnet and non-Magnet ($p < .001$) and Magnet and Magnet-aspiring ($p < .001$), indicating nurses who work in Magnet hospitals agree less that this item contributes to reasons why medication errors are not reported than nurses who work in Magnet-aspiring and non-Magnet hospitals. Third, there was a significant difference ($p = .023$) in the “medication error is not clearly defined” item, between Magnet and non-Magnet hospitals, indicating nurses who work in Magnet hospitals agree less that this item contributes to reasons why medication errors occur. Finally, there was a significant difference ($p = .001$) in the “nurses may not think the error is important enough to be reported” item between Magnet and non-Magnet hospitals, indicating nurses who work in Magnet hospitals agree less that this item contributes to reasons why medication errors occur.

In the reporting effort subscale, the results of the one-way ANOVA revealed significant differences among the groups for the individual item “contacting the physician about a medication error takes too much time” ($F = 4.422, p = .013$; see Table 15). Tukey post-hoc testing revealed the significant difference was between the Magnet and non-Magnet group ($p = .010$), with the Magnet group indicating less agreement that this item contributes to reasons why medication errors are not reported than the non-Magnet.

In the administrator responses subscale, results of the one-way ANOVA revealed significant differences among the groups for the individual item “when medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error” ($F = 5.283, p = .005$; see Table 17). Tukey post-hoc testing revealed the differences were between the Magnet and the non-Magnet group ($p = .005$) and the Magnet and

Magnet-aspiring group ($p = .049$), indicating nurses working in Magnet hospitals agree less that this item contributes to reasons why medication errors are not reported than nurses in the other groups. None of the individual items in the fear subscale (see Table 16) differed by hospital classification.

In summary, there were significant differences at the subscale level in the reasons why medication errors are not reported among the Magnet, Magnet-aspiring, and non-Magnet groups in only one out of the four subscales: disagree with definition, with nurses working in Magnet hospitals agreeing less that disagree with definition contributes to reasons why medication errors are not reported than nurses who work in non-Magnet hospitals. Significant differences were found at the individual item level in three out of the four subscales: disagree with definition, reporting effort, and administrative response, with nurses working in Magnet hospitals differing most from nurses working in non-Magnet hospitals.

Research Question 5: Is there a difference in perceived work environment among acute care nurses in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

Results of the one-way ANOVA revealed significant group differences in 3 out of the 5 subscales: nurse participation in hospital affairs ($F = 15.816, p < .001$), nursing foundations for quality of care ($F = 10.307, p < .001$), and staffing and resource adequacy ($F = 3.577, p = .029$). First, Tukey post-hoc testing revealed significant differences between the Magnet and non-Magnet group ($M = 26.78, M = 22.54; p < .001$) and between Magnet-aspiring and non-Magnet group ($M = 25.62, M = 22.54; p = .001$) in the nurse participation in hospital affairs subscale, indicating that nurses working in Magnet and Magnet-aspiring hospitals more strongly believed nurse participation in hospital affairs is present in their current job. Second, significant differences were found between Magnet and non-Magnet ($M = 31.19, M = 28.08$;

$p < .001$) and Magnet-aspiring and non-Magnet ($M = 30.51$, $M = 28.08$; $p = .004$) groups in the nursing foundations for quality of care subscale, indicating that nurses working in Magnet and Magnet-aspiring hospitals believe more strongly than nurses working in non-Magnet hospitals that there is a nursing foundation for quality care present in their hospitals. Third, there was a significant difference ($p = .039$) in the staffing and resources adequacy mean subscale scores between the Magnet and Magnet-aspiring ($M = 10.1$, $M = 9.72$) groups, indicating that nurses in Magnet hospitals believed they had more adequate resources to provide quality patient care. No significant difference between Magnet and non-Magnet mean subscale scores for staffing and resources adequacy was found.

Research Question 6: What is the influence of perceived safety culture and demographic characteristics (hours worked per week and type of work unit) on reasons why medication errors occur?

The dependent variables (nurse staffing, medication packaging, transcription related, physician communication, and pharmacy process) were regressed on their respective safety culture and demographic candidate predictors using multiple regression. Table 27 displays the multiple regression summaries for the prediction models.

Nurse Staffing

Nurse staffing was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, nonpunitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 22). A 4-variable model (organizational learning, nonpunitive response,

staffing, and hospital handoffs) explained 27% of the variance in nurse staffing as a reason for medication error occurrence (see Table 27).

Medication Packaging

Medication packaging was regressed on the four candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, staffing, and hospital handoffs (see Table 22). Only one variable, “hospital handoffs” was a predictor of medication packaging, explaining only 3% of the variance (see Table 27).

Transcription Related

Transcription related was regressed on the eight candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, staffing, hospital management, hospital handoffs, communication, and feedback communication (see Table 22). Only one variable, “hospital handoffs,” was a predictor of transcription related explaining only 5% of the variance (see Table 27).

Physician Communication

Physician communication was regressed on the 10 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, teamwork within units, non-punitive response to error, staffing, teamwork across units, hospital handoffs, communication, feedback communication, and frequency of events reported (see Table 22) and one demographic candidate predictor identified earlier (hours worked per week). A 3-variable model (hours worked > 59, hospital handoffs, and nonpunitive response) explained 16.6% of

the variance in physician communication contributing to medication error occurrence (see Table 27).

Pharmacy Process

Pharmacy process was regressed on the three candidate predictors of safety culture identified earlier: supervisor expectation, staffing, and hospital handoffs (see Table 22). There were no significant predictors of pharmacy processes as a reason for medication error occurrence (see Table 27).

Table 27: Predictors of Nurse Staffing (n = 375), Medication Packaging (n = 390), Transcription Related (n = 375), and Physician Communication (n = 374) with Unstandardized Beta Weights, Standard Error Beta and β

Predictor	Nurse Staffing ^a			Medication Packaging ^b			Transcription Related ^c			Physician Communication ^d		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Organizational learning	.31	.12	.17*									
Non-punitive response	-.17	.08	-.13*							-.37	.14	-.17**
Staffing	-.43	.07	-.35**									
Hospital handoffs	-.20	.07	-.18**	-.15	.06	-.16**	-.11	.05	-.13*	-.42	.11	-.24***
Hours worked > 59										5.52	1.89	.16**

^aAdjusted $R_2 = 0.27$, $df = 12$, $F = 12.458$, $p < .001$

^bAdjusted $R_2 = .031$, $df = 4$, $F = 4.097$, $p = .008$

^cAdjusted $R_2 = .050$, $df = 11$, $F = 2.772$, $p = .002$

^dAdjusted $R_2 = .166$, $df = 13$, $F = 6.759$, $p < .001$

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 7: What is the influence of acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification) on reasons medication errors occur?

The dependent variables (medication packaging, physician communication, transcription related, pharmacy process, and nurse staff) were regressed on their respective candidate predictors of perceived work environment and demographic variables using multiple regression. Table 28 displays the multiple regression summaries for the prediction models.

Transcription Related

Transcription related was regressed on the five candidate predictors of perceived work environment identified earlier: nurse participation in hospital affairs, nurse staffing and resources, collegial nurse/physician relationships, nursing foundations, and nurse manager (see Table 23) and one demographic candidate predictor (type of nursing unit). Only one variable, “nurse participation in hospital affairs,” was a predictor of transcription related as a reason for medication errors, explaining only 3.4% of the variance (see Table 28).

Physician Communication

Physician communication was regressed on the five candidate predictors of perceived work environment identified earlier (staffing and resources, collegial nurse-physician relationships, nursing foundations, nurse manager, and nurse participation; see Table 23) and one demographic candidate predictor (type of unit). A 3-variable model (collegial nurse physician relations, working in the PICU, and working in the NICU) explained 13.6% of the variance in physician communication as a reason medication errors occur (see Table 28).

Medication Packaging

Medication packaging was regressed on the one candidate predictor of perceived work environment identified earlier (nurse staffing and resources; see Table 23). Staffing and resources explained 6% of the variance in medication packaging as a reason medication errors occur (see Table 28).

Nurse Staffing

Nurse staffing was regressed on the five candidate predictors of perceived work environment identified earlier: staffing and resources, collegial nurse-physician relationships, nursing foundations, nurse manager, and nurse participation (see Table 23). Staffing and resource availability explained 20% of the variance in nurse staffing as a reason medication errors occur (see Table 28).

Pharmacy Processes

Pharmacy processes was regressed on the one candidate predictor of perceived work environment identified earlier: nursing foundations (see Table 23). Nursing foundations explained 1% of the variance in pharmacy processes as a reason medication errors occur (see Table 28).

Table 28: Predictors of Transcription Related (n = 350), Physician Communication (n = 355), Medication Packaging (n = 379), Nurse Staffing (n = 357), and Pharmacy Process (n = 375) with Unstandardized Beta Weights, Standard Error Beta and β

Predictor	Transcription ^a Related			Physician ^b Communication			Medication ^c Packaging			Staffing ^d			Pharmacy Processes ^e		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Nurse participation	.11	.05	.22*												
Collegial nurse-physician relations				.47	.19	.15*									
PICU				-.16	.78	-.11*									
NICU				-.41	.11	-.21***									
Staffing and resources							.16	.07	.13*	.58	.09	.39***			
Nursing foundation													.08	.04	.11*

^aAdjusted $R_2 = .034$, $df = 5$, $F = 3.467$, $p = .005$

^bAdjusted $R_2 = .136$, $df = 14$, $F = 4.982$, $p < .001$

^cAdjusted $R_2 = .039$, $df = 9$, $F = 2.713$, $p = .005$

^dAdjusted $R_2 = .202$, $df = 5$, $F = 19.003$, $p < .001$

^eAdjusted $R_2 = .010$, $df = 1$, $F = 4.748$, $p < .030$

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 8: What is the influence of perceived safety culture and demographic characteristics (type of work unit, years of experience, and years working at the facility) on reasons why medication errors are not reported?

The dependent variables (reporting effort, administrative response, disagree with definition, and fear) were regressed on their respective candidate predictors of safety culture and demographic variables using multiple regression. Table 29 displays the multiple regression summaries for the prediction model.

Reporting Effort

Reporting effort was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 24) and one demographic candidate predictor identified earlier: type of nursing unit. A 4-variable model (non-punitive response, hospital handoffs, frequency of events, and NICU) explained 23% of the variance in reporting effort subscale of reasons why medication errors are not reported (see Table 29).

Administrative Response

Administrative response was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 24). A 3-variable model (supervisor expectation, non-punitive

response and hospital handoffs) explained 48.3% of the variance in the administrative response subscale of reasons why medication errors are not reported (Table 29).

Disagree with Definition

Disagree with definition was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 24) and 2 demographic candidate predictors identified earlier: type of unit and years working at hospital. A 3-variable model (non-punitive response, frequency of events reported, and NICU) explained 23.6% of the variance in disagree with definition as a reason why medication errors are not reported (see Table 29).

Fear

Fear was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 22) and 1 demographic candidate predictor identified earlier: years as a nurse. A 5-variable model (non-punitive response, hospital management, hospital handoffs, frequency of events, and working as a nurse for 36-40 years) explained 50% of the variance in fear as a reason why medication errors are not reported (Table 29).

Table 29: Predictors of Reporting Effort (n = 376), Administrator Response (n = 373), Disagree with Definition (n = 375), and Fear (n = 359) with Unstandardized Beta Weights, Standard Error of Beta, and β

Predictor	Reporting Effort ^a			Administrator Response ^b			Disagree with Definition ^c			Fear ^d		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Non-punitive response	-.14	.06	-.15*	-.66	.09	-.39***	-.36	.10	-.22***	-1.08	.11	-.52***
Hospital handoffs	-.10	.04	-.14*	-.15	.07	-.11*				-.34	.09	-.20***
Frequency of events	-.19	.07	-.17**				-.35	.12	-.17**	-.41	.13	-.15**
Reported NICU	-.11	.04	-.13**				-.18	.07	-.18*			
Supervisor expectations				-.25	.08	-.17**						
Hospital management										.24	.12	.18*
36-40 years as nurse										-3.66	1.41	-.16*

^aAdjusted $R_2 = .232$, $df = 15$, $F = 8.542$, $p < .001$

^bAdjusted $R_2 = .483$, $df = 12$, $F = 29.963$, $p < .001$

^cAdjusted $R_2 = .236$, $df = 17$, $F = 7.806$, $p < .001$

^dAdjusted $R_2 = .502$, $df = 20$, $F = 19.041$, $p < .001$

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 9: What is the influence of the acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, gender, type of nursing unit) on reasons why medication errors are not reported?

The dependent variables (administrative response, disagree with definition, fear, and reporting effort) were regressed on their respective candidate predictors of perceived work environment identified earlier: collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care (see Table 25) using multiple regression. There were no demographic candidate predictors that had significant associations with the dependent variables. Table 30 displays the multiple regression summaries for the prediction models.

Disagree with Definition

Disagree with definition was regressed on the five candidate predictors of perceived work environment identified earlier: collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care (see Table 25). A 2-variable model (nursing foundations and staffing and resources) explained 16.6% of the variance in disagree with the definition as a reason why medication errors are not reported (see Table 30).

Fear

Fear was regressed on the five candidate predictors of perceived work environment identified earlier: collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care (see Table 25). A 3-variable model (nursing foundation,

staffing and resources, and nurse manager ability) explained 18.4% of the variance in fear as a reason why medication errors are not reported (Table 30).

Reporting Effort

Reporting effort was regressed on the five candidate predictors of perceived work environment identified earlier: collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care (see Table 25). A 3-variable model (nursing foundation, nurse participation, and nurse manager ability) explained 14.3% of the variance of reporting effort as a reason why medication errors are not reported (see Table 30).

Administrative Response

Administrative response was regressed on the five candidate predictors of perceived work environment identified earlier: collegial nurse-physician relations, staffing and resource adequacy, nurse manager ability, leadership and support of nurses, nurse participation in hospital affairs, and nursing foundation for quality of care (see Table 25). A 3- variable model (nursing foundations, nurse manager ability, and staffing and resources) explained 33% of the variance in administrative response as a reason why medication errors are not reported (see Table 30).

Table 30: Predictors of Reporting Effort (n = 358), Administrator Response (n = 355), Disagree with Definition (n = 357), and Fear (n = 357) with Unstandardized Beta Weights, Standard Error of Beta, and β

Predictor	Disagree with Definition ^a			Fear ^b			Reporting Effort ^c			Administrative Response ^d		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Nursing foundations	.18	.07	.20**	.18	.08	.16*	.15	.04	.30***	.17	.06	.18**
Staffing and resources	.31	.11	.18**	.38	.14	.17**				.27	.11	.14*
Nurse manager ability				.30	.13	.17*	.12	.06	.16*	.35	.10	.23***
Nurse participation							-.09	.04	-.20*			

^aAdjusted $R_2 = .166$, $df = 5$, $F = 15.217$, $p < .001$

^bAdjusted $R_2 = .184$, $df = 5$, $F = 17.020$, $p < .001$

^cAdjusted $R_2 = .143$, $df = 5$, $F = 12.930$, $p < .001$

^dAdjusted $R_2 = .332$, $df = 5$, $F = 36.159$, $p < .001$

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 10: What is the influence of the acute care nurses' perceived organizational safety and demographic characteristics (experience level, hours worked per week, and hospital classification) on acute care nurses' perceived work environment?

The dependent variables (nurse manager ability, collegial nurse-physician relationships, nursing foundations for quality care, nurse participation in hospital affairs, and staffing and resource adequacy) were regressed on their respective candidate predictors of safety culture using multiple regression. Table 31 displays the multiple regression summaries for the prediction models.

Nurse Manager Ability

Nurse manager ability was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 26). A 5-variable model (supervisor expectations, teamwork within unit, non-punitive response, hospital management, and feedback communication) explained 65% of the variance in nurse manager ability being present in the perceived work environment (see Table 31).

Collegial Nurse-Physician Relationships

Collegial nurse-physician relationships were regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, nonpunitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback

communication and frequency of events reported (see Table 26). A 2-variable model (teamwork within units and staffing) explained 31% of the variance in collegial nurse-physician relations being present in the perceived work environment (Table 31).

Nursing Foundations

Nursing foundations were regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 26). A 4-variable model (organizational learning, hospital management, hospital handoffs, and frequency of event reporting) explained 55% of the variance in nursing foundations being present in the perceived work environment (see Table 31).

Nurse Participation in Hospital Affairs

Nurse participation in hospital affairs was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 26). A 3-variable model (organizational learning, hospital management, and feedback and communication about error) explained 54% of the variance in nurse participation in hospital affairs being present in the perceived work environment (see Table 31).

Staffing and Resource Adequacy

Staffing and resources adequacy was regressed on the 12 candidate predictors of safety culture identified earlier: supervisor expectation, overall perception of safety, organizational learning, teamwork within units, non-punitive response to error, staffing, hospital management, teamwork across units, hospital handoffs, communication, feedback communication and frequency of events reported (see Table 26). A 3-variable model (staffing, management support for patient safety, and hospital handoffs) explained 53% of the variance in staffing and resource adequacy being present in the perceived work environment (Table 31).

Table 31: Predictors of Nurse Manager Ability (n = 354), Collegial Nurse Physician Relations (n = 362), Nursing Foundations for Quality Care (n = 351), Nurse Participation in Hospital Affairs (n = 367), and Staffing and Resource Adequacy (n = 361) with Unstandardized Beta Weights, Standard Error of Beta, and β

Predictor	Nurse Manager Ability ^a			Collegial Nurse Physician Relations ^b			Nursing Foundations ^c			Nurse Participation ^d			Staffing and Resource Adequacy ^e		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
	<i>B</i>														
Supervisor expectation	-.44	.05	-.45***												
Non-punitive response	-.21	.05	-.19***												
Management support for safety	-.16	.06	-.14***				.49	.10	-.27***	-.84	.11	-.42***	-.22	.05	-.24***
Feedback communication	-.20	.06	-.15**							-.40	.12	-.17**			
Teamwork within units	-.11	.04	-.11*	-.11	.03	-.18**									
Staffing				-.08	.04	-.13*							-.35	.04	-.42***
Organizational learning							-.67	.13	-.29***	-.35	.14	-.13*			
Frequency of event reporting							-.38	.10	-.16***						
Hospital handoffs							-.26	.07	-.18***				-.11	.04	-.15**

^aAdjusted $R_2 = .654$, $df = 12$, $F = 56.589$, $p < .001$

^bAdjusted $R_2 = .310$, $df = 12$, $F = 14.545$, $p < .001$

^cAdjusted $R_2 = .551$, $df = 12$, $F = 36.729$, $p < .001$

^dAdjusted $R_2 = .544$, $df = 12$, $F = 37.328$, $p < .001$

^eAdjusted $R_2 = .533$, $df = 12$, $F = 35.263$, $p < .001$

* $p < .05$, ** $p < .01$, *** $p < .001$

Summary

This descriptive study examined the reasons medication errors occur and the reasons why medication errors are not reported in nurses working in acute care hospitals. Differences in nurses' responses were evaluated based upon hospital status; Magnet, Magnet-aspiring, and non-Magnet designation. Nurses working in Magnet-designated hospitals perceive that "nurse staffing" contributes significantly less to reasons medication errors occur than nurses working in Magnet-aspiring hospitals. Results also revealed that nurses working in Magnet-designated hospitals perceive "disagree with definition" contributed significantly less to reasons medication errors are not reported than nurses in the Magnet-aspiring and non-Magnet groups. Nurses working in Magnet and Magnet-aspiring hospitals more strongly believe nurse participation in hospital affairs is present in their current job and there is a nursing foundation for quality care present in their job than nurses working in non-Magnet-designated hospitals. Additionally, nurses working in Magnet-designated hospitals believe they had more adequate resources to provide quality care than nurses working in Magnet-aspiring hospitals.

Of predictors of the subscales of reasons medication errors occur, hospital handoffs was shown to be a significant predictor of four subscales (nurse staffing, medication packaging, transcription related, and physician communication) and nonpunitive response was a significant predictor in two subscales (nurse staffing and physician communication). Staffing and resources was a significant predictor in two subscales (medication packaging and staffing) while collegial nurse-physician relations

and working in the PICU and NICU were both significant predictors of physician communication.

Of predictors of the subscales of reasons why medication errors are not reported, non-punitive response was a significant predictor of all four subscales (fear, administrative response, disagree with definition, and reporting effort). Hospital management and 36-40 years as a nurse were predictors of fear as a reason medication errors are not reported. The relationship between 36-40 years working as a nurse and fear as a reason medication errors are not reported was inversely related such that this group of nurses reported fear as a reason medication errors are not reported less than the other categories of years as a nurse. Nursing foundation for quality care was a significant predictor of all four subscales (fear, administrative response, disagree with definition, and reporting effort) while staffing and resources and nurse manager ability, leadership, and support were significant predictors of fear and administrative response as reasons why medication errors are not reported.

Of predictors of the subscales of perceived work environment, hospital management was a significant predictor of four of the five subscales (nurse manager ability, nursing foundation for quality care, nurse participation in hospital affairs, and staffing and resource adequacy). Staffing, feedback communication, teamwork within units, organizational learning, and hospital handoffs were all significant predictors of the presence of nurse manager ability, collegial nurse-physician relations, nursing foundation of quality of care, nurse participation in hospital affairs, and staffing and resource adequacy of the perceived work environment.

CHAPTER 5: DISCUSSION

This chapter presents a discussion of the research findings and their consistency or lack of consistency with previous research. Findings for each of the research questions will be discussed first, followed by the implications for theory and practice. Implications for future research will be described followed by study strengths and limitations and a discussion of the conclusion obtained from this research.

Study Findings Related to Previous Research

Research Question 1: What are the explanations for medication error occurrence by acute care staff nurses working in non-Magnet, Magnet aspiring, and Magnet-designated hospitals?

Discussions of the research findings are presented by subscale first for the combined sample and then for individual items within the subscales. The subscale having the highest mean score will be discussed first; the other subscales will be discussed in descending order based on the mean score. Implications for theory and practice are discussed for each finding.

In the combined sample, nurse staffing had the highest mean subscale score (see Table 7), indicating that nurses perceive this contributes most to reasons why medication errors occur. This finding supports the system attributes of organizational structure and professional models of care in the Conceptual Model of Medication Safety as variables that influence reasons medication errors occur. Medication packaging and physician communication were the next highest subscale mean scores. These findings support the system attribute of communication in the Conceptual Model of Medication Safety as

influencing reasons medication errors occur. The subscale scores for pharmacy process and transcription related will not be discussed further because nurses slightly disagreed these contributed to reasons why medication errors occur.

“Packaging of medications is similar” (medication packaging subscale), “physicians change orders frequently” (physician communication subscale), and “nurses are interrupted while passing medications” (nurse staffing subscale) were individual subscale items with the highest mean scores (see Tables 8, 9, and 12). They provide additional detail and empiric support to the Conceptual Model of Medication Safety concepts: system attributes of communication, organizational structure, and professional models of care. “Names of medications are similar” (medication packaging subscale) was also identified as contributing to reasons why medication errors occur. This finding provides support for the Conceptual Model of Medication Safety concept: person attribute of knowledge as a variable that contributes to medication error occurrence.

Findings of this study support the concepts of person and system attributes in the Conceptual Model of Medication Safety as variables that influence the reasons why medication errors occur. Interruptions while passing medications (system attribute – organizational structure) and inadequate unit staffing levels (system attribute – professional models of care) were identified as contributing to medication error occurrence. These findings are consistent with empiric evidence (Balas, et al., 2004; Cohen, et al., 2003; Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; McKeon, et al., 2006; Mrayyan, et al., 2007; Stratton, et al., 2004; Tang, et al., 2007; Ulanimo, et al., 2007; Wakefield, et al., 1998; Walters, 1992) where nurses have identified interruptions and inadequate unit staffing levels and the inability to pass all

medications within an accepted timeframe as contributing to medication error occurrence. The finding that similar medication names (person attribute – knowledge) contribute to medication error occurrence is consistent with the findings of Mayo and Duncan (2004). Findings also indicated that nurses identified transcription-related errors, use of abbreviations, and illegible handwriting (system attribute – communication) as contributing to medication errors. These findings are consistent with other studies (Balas, et al., 2004; Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; Ulanimo, et al., 2007; Wakefield, et al., 1998).

Implications for Practice

The finding that nurse staffing and communication contribute to reasons why medication errors occur has implications for practice. Having an adequate number of nurses available to administer the patient's ordered medications within the designated time is important to help reduce nurse staffing as a contributor to reasons why medication errors occur. Affording nurses uninterrupted time when administering medications and providing the necessary support staff to aid the nurses in caring for the assigned patients is also necessary to reduce this variable as a contributor to reasons why medication errors occur.

Improved communication mechanisms: improving legibility of physician orders, packaging of medications so they do not look alike, changing names of medications so they are not similar, limiting use of abbreviations, especially those on the do not use list, are all strategies that can potentially reduce the incidence of medication error occurrence. Additionally, the Joint Commission on Accreditation of Health Organizations (The Joint Commission, 2011) recommends hospitals develop a list of at least 10 look-alike or

sound-alike drug pairs, review them annually (Metules & Bauer, 2007) and implement strategies to prevent errors.

Research Question 2: What are the explanations for medication errors not being reported by acute care staff nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

Explanations for the research findings are presented by subscale for the combined sample and then for individual items within the subscales. The subscale having the highest mean score will be discussed first; the other subscales will be discussed in descending order based on the mean score. Implications for theory and practice are discussed for each finding.

Nurses in the combined sample most highly agreed that fear was a reason medication errors are not reported (see Table 13). This finding provides empiric support for the Conceptual Model of Medication Safety concepts: system attributes of nursing leadership and co-worker relationships.

The findings that administrative response (system attribute – nursing leadership) and reporting effort (system attribute – professional development) were also identified as reasons medication errors are not reported support the concept of system attributes in the Conceptual Model of Medication Safety as variables that influence reasons medication errors are not reported. Findings that fear (system attribute – co-worker relationship) and administrative response (system attribute – nursing leadership) were identified as contributing to reasons medication errors are not reported are consistent with prior research, in which fear of manager and coworker reactions (Chiang & Pepper, 2006; Cohen, et al., 2003; Mayo & Duncan, 2004; Stratton, et al., 2004; Wakefield, et al., 2001;

Wakefield, Wakefield, Uden-Holman, et al., 1999; Walker & Lowe, 1998) and lack of positive feedback for passing medications correctly (Chiang & Pepper, 2006; Wakefield, et al., 1996) have also been cited in the literature as reasons medication errors are not reported. There have been two reported studies (Mayo & Duncan, 2004; Ulanimo, et al., 2007) where fear of disciplinary action was not identified as a reason medication errors are not reported. Nurses in these studies worked in a non-unionized Veterans Administration Hospital or unionized California hospitals, which could help to explain the different findings. Not being afraid of disciplinary action could be explained by the small sample size and subsequently the power of the study to denote differences (Ulanimo, et al., 2007) making it difficult to detect true relationships (Polit & Beck, 2008). Nurses in the other study may have felt “protected” by a union contract and, subsequently were not concerned about job security (Mayo & Duncan, 2004).

Individual items “nurses may not think error important enough” (disagree with definition subscale; see Table 14), “filling out an incident report takes too much time” (reporting effort subscale; see Table 15), “nurses could be blamed if something happens to the patient as a result of the medication error” (fear subscale; see Table 16), and “nurses fear adverse consequences from reporting medication errors” (fear subscale) provide additional detail and empiric support for the Conceptual Model of Medication Safety concepts: person attribute of recognizing harm and the system attributes of nursing leadership and co-worker relationships as variables that influence reasons medication errors are not reported. Length of time it takes to fill out an incident report (Chiang & Pepper, 2006; Walker & Lowe, 1998) and inaccurate perception of an error’s

significance (Mayo & Duncan, 2004) have also been cited as reasons medication errors are not reported.

Implications for Practice

The finding that fear contributes to reasons medication errors are not reported has implications for practice. It is important for managers to realize the need to provide an environment where staff feel comfortable reporting medication errors. Hospitals that scored high on establishing a leadership-supported non-punitive approach to error reduction had better scores on detecting, reporting, and analyzing errors (Smetzer, et al., 2003). A supportive, non-punitive working environment is needed so that errors or potential errors can be evaluated and prevented in the future. One hospital found developing a Non-punitive Patient Safety Policy, educating the administrative and physician staff, and then providing an interactive educational program for the nurses, helped to create a culture where staff were beginning to report medication errors without fear of punishment (Potylycki, et al., 2006).

Nursing staff need to be made aware and shown that the information obtained through the reporting system will be used to identify system issues within the organization that contributed to the medication error occurrence, not to penalize individuals for their mistakes. Staff need to be made aware that any medication error is significant enough to report and the reporting process should not be cumbersome; staff should not feel it takes too much time to complete. Use of an anonymous coupon reporting system has shown an increase in the reporting of both actual medication errors and near miss medication errors (Patrician & Brosch, 2009). Staff should be asked to

participate in recommendations for improvement in the medication administration and reporting process, as they are more aware of the problems with the existing system processes.

Research Question 3: Is there a difference in the explanations for medication error occurrence in nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

The finding that nurses who work in Magnet-designated hospitals indicated less agreement than nurses who work in Magnet-aspiring hospitals that nurse staffing (see Table 12) contributes to medication error occurrence has implications for theory and , practice. This finding provides empiric support for the concept of system attributes – organizational structure and professional models of care – in the Conceptual Model of Medication Safety as variables that influence reasons why medication errors occur. The nurse staffing subscale (system attributes – professional models of care and organizational structure) consists of four items: nurses get pulled, nurses are interrupted during medication administration, staffing levels are inadequate, and all medications can't be passed within an accepted time frame. It is not surprising that nurses working in Magnet-designated hospitals reported less agreement that these are reasons medication errors occur. Magnet hospitals have been reported to have better staffing than Magnet aspiring and non-Magnet hospitals (Kramer, Schmalenberg, & Maguire, 2004a). It was also noted by Kramer and Schmalenberg (2004) that perception of adequate staffing is dependent on a number of other factors such as: care delivery models, group cohesiveness, and autonomy of practice, with the latter two being “forces of magnetism.”

The finding that nurses who work in Magnet hospitals indicated less agreement than nurses who work in non-Magnet hospitals that physicians' medication orders are not legible (see Table 9) has implications for theory and practice. This finding provides support for the system attribute of communication in the Conceptual Model of Medication Safety as a variable that influences reasons why medication errors occur. A plausible explanation for this finding could be the use of computer order entry for medication ordering in more Magnet hospitals than in non-Magnet hospitals, which would eliminate the need to decipher physician handwriting. The literature supports a reduction, by as much as 55%, in the number of medication errors attributable to the implementation of computerized provider order entry (Bates, Leape, & Cullen, 1998). Another possible explanation is that nurses working in Magnet hospitals may have better relationships with the physicians and subsequently feel freer to approach them for clarification of a medication error.

The finding that there was a difference between the Magnet and Magnet-aspiring groups and Magnet and non-Magnet groups regarding interruptions while administering medications and inability to pass all medications within an accepted time frame (see Table 12) has implications for theory and practice. Identification of interruptions during medication administration provides support for the system attributes of organizational structure and professional models of care in the Conceptual Model of Medication Safety. Interruptions during medication administration have been found to contribute to medication error occurrence in several studies (Fry & Dacey, 2007; Mayo & Duncan, 2004; Osborne, Blais, & Hayes, 1999; Tang, et al., 2007) and have been shown to increase the incidence of medication errors (Cohen, et al., 2003; Mrayyan, et al., 2007;

Ulanimo, et al., 2007). Additionally, causes of medication administration errors include workload/staffing problems and interruptions (Institute of Medicine of the National Academies, 2007), which are consistent with the findings in this study.

Implications for Practice

The finding that there was a difference in perception of nurse staffing and legibility of physicians' orders between nurses working in Magnet-designated hospitals and Magnet-aspiring hospitals has implications for practice. Interruptions were identified as contributing to medication error occurrence; therefore, implementation of no interruption zones or quiet zones during medication administration is necessary. The literature provides support that this strategy can decrease the number of interruptions during medication administration and subsequently the number of medication errors that could occur as a result of interruptions (Anthony, Wiencek, Bauer, Daly, & Anthony, 2010). Another suggestion to minimize disruptions during medication administration is the use of signage indicating "Do Not Disturb" over the medication dispensing unit. This has been shown to significantly decrease the number of interruptions during medication passing (Pape, et al., 2005).

Nurses need to be comfortable approaching physicians for clarification of medication orders. Nurse Managers can be instrumental in fostering this kind of relationship by educating physicians on the importance of a collegial relationship and the potential benefits to the patient. Nurse Managers should also educate their nursing staff on communication techniques and provide opportunities for the staff to role play to enhance communication skills with difficult physicians.

Implementation of CPOE or other computerized information systems are another strategy that can help to reduce the number of medication errors (Pizzi, Howell, Deshmukh, Cohen, & Nash, 2004). This technology can help to eliminate medication errors that result from illegible handwriting, transcription errors, and lack of knowledge about drugs (Leape & Bates, 1995). It is important to remember that while use of technology can enhance patient safety, it does not eliminate the need for staff to remain vigilant in the care of the patient.

The finding that nurses perceived an inability to pass all medications within an accepted time frame has implications for practice. One of the five rights of medication administration is the right time. Nurses are taught that medications should be administered sometime between one half hour before and one half hour after the scheduled time. In order for medications to be given at the right time, adequate staffing levels are needed.

Research Question 4: Is there a difference in the reasons why medication errors are not reported by acute care nurses working in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

The finding that nurses who work in Magnet-designated hospitals agree less than nurses who work in Magnet-aspiring and non-Magnet hospitals that the subscale, disagree with definition, contributes less to reasons medication errors are not reported (see Table 14) has implications for theory and practice. This finding provides support for adding the concept of system attributes – policy and procedure – in the Conceptual Model of Medication Safety as a variable that influences reasons medication errors are

not reported. The model identifies the system attribute of policy and procedure as only contributing to the reasons why medication errors occur.

Findings that there were significant differences among the Magnet, Magnet aspiring, and non-Magnet groups in all four of the items in the disagree with definition subscale as a reason medication errors are not reported has implications for theory and practice. This finding supports the concepts of person (knowledge) and system attributes (policy and procedure) in the Conceptual Model of Medication Safety as influencing reasons why medication errors are not reported.

“Contacting the physician about a medication error takes too much time” (reporting effort subscale; see Table 15) and “when medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error” (administrative response subscale; see Table 17) provides empiric support for the system attributes – nursing leadership and communication – in the Conceptual Model of Medication Safety as reasons medication errors are not reported. The system attribute of communication has not been previously identified as contributing to reasons medication errors are not reported.

There have not been any reported studies comparing nurse perceptions of reasons medication errors occur in Magnet, Magnet-aspiring, and non-Magnet hospitals. These findings add to the body of knowledge. Based on the awareness of characteristics of the Magnet work environment (Aiken, Havens, & Sloane, 2000; Laschinger, Almost, & Tuer-Hodes, 2003; Scott, Sochalski, & Aiken, 1999), it is not surprising that nurses working in Magnet-designated hospitals agree less that these items contribute to reasons

why medication errors occur. One of the characteristics of the Magnet environment is the control over nursing practice. Based on this tenant, nurses who work in a Magnet – designated hospital have the ability to participate in decisions that affect patient care. They may be more likely to participate in developing a policy on medication errors, whereby a medication error is defined and the expectations of reporting are clearly outlined. This contribution to the development of practice policies can result in improved patient care and safety. Findings are consistent with the research done by Walsh (2003), where Magnet-designated hospitals had higher safety performance and the leaders’ demonstrated practices toward promoting patient safety with greater frequency.

Implications for Practice

The finding that nurses who work in Magnet-designated hospitals agree less than nurses who work in Magnet-aspiring and non-Magnet hospitals that disagree with definition contributes to reasons medication errors are not reported has implications for practice. In order for systems issues to be identified, medication errors and near misses need to be reported. For this to occur, it is critical that all nursing staff (1) are aware of what constitutes a medication error, (2) agree with the definition of a medication error, and (3) realize the importance of reporting all errors regardless of their belief in the error’s significance or insignificance. One way to accomplish this would be to encourage and facilitate nurse participation in defining a medication error. If nurses are aware of what constitutes a medication error and the potential patient benefit of reporting the error, they may be more willing to communicate an actual or near miss error. The findings that nurses working in Magnet-designated hospitals agreed less than nurses working in non-Magnet hospitals that “contacting the physician about a medication error takes too much

time” and “when medication errors occur, nursing administration focuses on the individual rather than looking at systems as a potential cause of the error” has implications for practice. Physicians need to be made aware of medication errors so that necessary patient interventions can occur. Communication between providers should be efficient, rather than cumbersome. Mechanisms should be in place for contacting physicians; having a list of pagers/cell phone numbers of the physicians on call or having the attending physician contact information readily available can help to reduce the amount of time it takes to communicate an error. If managers are able to demonstrate to staff that when medication errors are reported, both actual and potential, the system processes are evaluated to determine how the error/potential error could be prevented in the future, rather than punishing individuals, nurses may be more willing to report the actual or potential error.

Research Question 5: Is there a difference in perceived work environment among acute care nurses in Magnet, Magnet-aspiring, and non-Magnet-designated hospitals?

The finding that there were differences in perceived work environment between nurses working in Magnet and non-Magnet and Magnet and Magnet-aspiring hospitals (see Table 18) has implications for theory and practice. Nurses working in Magnet and Magnet-aspiring hospitals indicated more strongly having a presence of nurse participation in hospital affairs and a nursing foundation for quality of care than nurses working in non-Magnet hospitals. This finding is consistent with the literature (Ulrich, Buerhaus, Donelan, Norman, & Dittus, 2007), that nurses working in Magnet and Magnet-aspiring hospitals perceived an emphasis on patient care was a strong priority in

their organizations and their ability to influence patient care decisions were significantly greater than in non-Magnet hospitals (Ulrich, et al., 2007).

Nurses working in Magnet hospitals indicated more strongly that they had more adequate staffing and resources to provide quality patient care than nurses working in Magnet-aspiring hospitals. These findings are consistent with the current literature on Magnet hospital attributes (Kramer, et al., 2004b). For instance, nurses in Magnet-aspiring hospitals had significantly lower mean scores on staffing and resource adequacy than nurses in Magnet hospitals (Cimiotti, et al., 2005). Also, nurses working in Magnet hospitals significantly differed in their perception of staffing adequacy from nurses working in Magnet-aspiring and non-Magnet hospitals (Kramer, et al., 2004a).

Implications for Practice

The finding that there were differences in the perception of the work environment – presence of nurse participation in hospital affairs and a nursing foundation for quality of care – between nurses who work in Magnet-designated hospitals and nurses who work in Magnet-aspiring and non-Magnet hospitals has implications for practice.

Organizations that are not in a position to seek Magnet recognition can indoctrinate the ideas behind Magnet recognition into their own settings in an effort to improve patient care quality. Specifically, the Chief Nursing Officer being visible and responsive to the staff are characteristics of the Magnet environment that can be incorporated into non-Magnet hospitals. Another example would be giving nurses autonomy in their practice; allowing them to participate in organizational as well as unit- based decisions (Scott, et al., 1999). A recent study of nurses working in Pennsylvania hospitals found that

hospitals that were ranked “poor” in three subscales of the patient care environment (nursing foundations for quality of care, nurse manager ability, and collegial nurse physician relations) using the PES-NWI instrument, had higher mortality rates and failure-to-rescue rates than hospitals that ranked high on those three subscales (Aiken, Clarke, Sloane, Lake, & Cheney, 2009).

Research Question 6: What is the influence of perceived safety culture and demographic characteristics (hours worked per week and type of work unit) on reasons medication errors occur?

Safety culture and demographic predictors of reasons why medication errors occur will be discussed in descending order, based on the number of dependent variables each predicted. For example, hospital handoffs predicted all 5 subscales of reasons why medication errors occur and will be discussed first, followed by non-punitive response, which predicted 2 subscales, then hours worked greater than 59, organizational learning, and staffing, each of which predicted 1 subscale of the reasons why medication errors occur (see Table 27). Implications for theory and practice are discussed for each finding

The finding that hospital handoffs and transitions is a predictor of each subscale of reasons medication errors occur (nurse staffing, medication packaging, transcription related, and physician communication) provides support for the concept of safety culture in the Conceptual Model of Medication Safety as influencing reasons why medication errors occur. Hospital handoffs include items dealing with change of shift report, transferring of patients to other units, and exchange of information across hospital units. The relationships between hospital handoffs and reasons medication errors occur

subscales were inversely related; such that the lower the agreement that hospital handoffs were present, the higher the perceived contribution to reasons medication errors occur. Hospital handoffs and transitions had the highest association with physician communication subscale as reasons why medication errors occur ($\beta = .24$). These findings add to the body of knowledge of reasons why medication errors occur because there were no other studies located that investigated the influence of hospital handoffs on reasons why medication errors occur.

The finding that non-punitive response is a predictor of nurse staffing and physician communication as reasons why medication errors occur has implications for theory and practice. This study is the first to demonstrate a relationship between non-punitive response and reasons why medication errors occur. It also supports the concept of nursing leadership in the Conceptual Model of Medication Safety which is a system attribute that not only influences medication error reporting, but also influences medication error occurrence. The direction of the regression coefficients suggests that as perception of a non-punitive environment increases, the less the influence of nurse staffing and physician communication on medication error occurrence.

The finding that hours worked greater than 59 per week is a predictor of reasons why medication errors occur (physician communication subscale) provides support for the concept of person attribute – hours worked per week – in the Conceptual Model of Medication Safety as a variable that influences reasons medication errors occur. Findings are consistent with Capuano et al. (2005) where higher overtime hours were associated with more adverse events. They describe quartiles of overtime, but do not define the number of hours in each quartile, making it difficult to compare findings. The findings

are not consistent with a study conducted by Wilkins and Shields (2008), who did not find a relationship between medication errors and working more than 40 hours per week. A possible explanation for the inconsistency could be the way the variables were defined. The definition in the study by Wilkins and Shields (2008) of overtime worked and working more than 40 hours per week was different, where working more than 40 hours included hours worked at all jobs. In this study, respondents were asked simply to select the number of hours they typically work per week.

The finding that organizational learning is a predictor of reasons why medication errors occur (nurse staffing subscale) provides support for the concept of safety culture in the Conceptual Model of Medication Safety as influencing reasons medication errors occur. This study is the first to demonstrate a relationship between organizational learning and reasons why medication errors occur. Organizational learning involves learning from mistakes and actively doing things to improve safety. This finding is consistent with a study by Moody (2006) where actions of the management staff and expectations promoting safety on their units resulted in greater error reporting frequency.

The finding that staffing is a predictor of nurse staffing as a reason medication errors occur provides support for the concept of safety culture in the Conceptual Model of Medication Safety as influencing the reasons why medication errors occur. Nursing hours per patient day have been linked to medication error rates; high RN hours were associated with lower medication errors (Mark & Belyea, 2009). Medication errors have also been associated with more overtime hours worked (Wilkins & Shields, 2008). Three other predictors of nurse staffing were identified (hospital handoffs, $\beta = .18$;

organizational learning, $\beta = .17$; and non-punitive response, $\beta = .13$) however, staffing had the highest association ($\beta = .35$; see Table 27) with nurse staffing.

Twenty-seven percent of the variance in nurse staffing was explained by organizational learning, non-punitive response, staffing, hospital handoffs, and hours worked more than 59. Only 3 percent of the variance in medication packaging was explained by hospital handoffs, 5 percent of the variance in transcription related was explained by hospital handoffs, and 16.6 percent of the variance in physician communication was explained by non-punitive response, hospital handoffs, and hours worked greater than 59. Other predictors that may explain some of the safety culture variance in reasons why medication errors occur may include: clinical decision making systems in place, pharmacy coverage within the hospital, the drug administration system used (unit dose or wall mounted medication cupboards), and technologies used at different phases of the medication administration cycle. Specifically, bar code scanning systems used during the administration phase, CPOE used during the ordering phase, and robots used during the dispensing phase could all be predictors of reasons medication errors occur.

Implications for Practice

The finding that hospital handoffs was a predictor of all subscales of reasons why medication errors occur has implications for practice. When participants perceived that hospital handoffs were present on their units, there was lower perception of hospital handoffs contribution to medication errors. Consistent practices that standardize the process of information transfer when a patient is handed off from one caregiver to

another are necessary to reduce the likelihood of medication errors. Some institutions have begun to use various Transforming Care At the Bedside strategies to reduce medication errors and improve other nurse sensitive patient outcomes. This strategy engages nurses at the bedside in identifying, implementing, and evaluating approaches to improve patient safety (Institute of Medicine, 2004). Implementation of strategies that focused on “safe and reliable care,” “care team vitality,” “patient-centeredness,” and “increasing value” resulted in a reduction of harmful medication errors over an 18-month period (Chaboyer, Johnson, Hardy, Gehrke, & Panuwatwanich, 2010).

The culture in an organization should be non-punitive regarding medication error occurrence and managers should be supportive of staff learning from mistakes. Creating this type of non-punitive culture takes time. The hospital industry can learn a great deal from the aviation industry, where there is a focus on dealing with the unexpected and being alert to the possibility of errors. Every day, nurses are expected to deal with a variety of issues and situations that are not expected. It is important that nurse leaders create an environment where this is recognized and staff are rewarded for discussing these situations. Nurse leaders should openly discuss errors that have occurred and obtain feedback from staff on the way these errors could be prevented in the future. This will reinforce to the nursing staff that, not only is it “safe” to report errors, but that something is actually being done to prevent them from occurring in the future.

The findings that working more than 59 hours per week and staffing are predictors of reasons why medication errors occur (physician communication subscale) has implications for practice. In light of these findings, nurses should be discouraged from working more than 59 hours per week. Nurse leaders need to evaluate the nursing

care needs of the patient population they are caring for and plan staffing accordingly. Evaluating the skill mix of the staffing based on the patient's needs and hours staff are working on any given day are all considerations for practice.

Research Question 7: What is the influence of acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, type of nursing unit, number of hours worked, and hospital classification) on reasons medication errors occur?

Perceived work environment and demographic predictors of reasons why medication errors occur will be discussed in descending order, based on the number of dependent variables each predicted. For example, staffing and resources predicted two subscales of reasons why medication errors occur and will be discussed first, followed by type of nursing unit (NICU and PICU), collegial nurse-physician relations, nurse participation in hospital affairs, and nursing foundations for care, all of which predicted one of the subscales of the reasons why medication errors occur (see Table 28).

Implications for theory and practice are addressed for each finding.

The finding that staffing and resources is a predictor of reasons medication errors occur provides support for the concept of nurses work environment – staffing and resource adequacy – in the Conceptual Model of Medication Safety as a variable that influences medication error occurrence. Staffing and resources accounted for 20 percent of the variance in reasons why medication errors occur. This study is the first to demonstrate a relationship between staffing and resources and reasons medication errors occur. This finding is consistent with those of another study (Laschinger & Leiter, 2006),

that found adequate levels of perceived staffing had a direct effect on medication errors; however, this study did not evaluate staffing and resources as a predictor of reasons medication errors occur

The demographic variable, type of nursing unit, specifically NICU and PICU, and collegial nurse physician relations were predictors of reasons why medication errors occur (physician communication subscale; see Table 28). Working in a NICU had the highest association ($\beta = .21$) with the physician communication subscale, followed by collegial nurse-physician relations ($\beta = .15$) and working in a PICU ($\beta = .11$). The finding that type of nursing unit is a predictor of physician communication provides support for adding this demographic variable – type of nursing unit – to the Conceptual Model of Medication Safety as influencing the reasons why medication errors occur. This study is the first to demonstrate a relationship between type of nursing unit and reasons medication errors occur. The direction of the regression coefficients suggests that the influence of working in a NICU or PICU decreases the contribution of physician communication as reasons medication errors occur. Nurses who work in a neonatal/pediatric critical care environment may feel more comfortable communicating with physicians to clarify any medication orders that are unclear or not legible, which could be a possible explanation for this finding.

Nurse participation in hospital affairs and nursing foundation were very weak predictors of reasons medication errors occur. This study is the first to demonstrate nurse participation and nursing foundation as predictors of reasons medication errors occur. These findings support the concept of work environment in the Conceptual Model of Medication Safety as influencing reasons why medication errors occur.

In summary, 3.4 percent of the variance in transcription related reasons medication errors occur was explained by nurse participation in hospital affairs, 13.6 percent of the variance in physician communication was explained by type of unit (NICU and PICU) and collegial nurse physician relations, 3.9 percent of the variance in medication packaging was explained by staffing and resources, 20 percent of the variance in staffing was explained by staffing and resources and only 1 percent of the variance in pharmacy processes was explained by nursing foundations. Other predictors that may explain additional variance could include: use of handheld technology to assist with drug information and calculations, educational opportunities focused on new medications and equipment used to administer medications, and demographic variables, years working at the facility, gender, and hospital classification (Greenfiled, 2007; Mark & Belyea, 2009).

Implications for Practice

To decrease medication error occurrence, it is necessary that an organization (hospital) have adequate staffing—both registered nurses and support staff. Patient acuity levels as well as nursing care hours per patient day should be evaluated to determine adequate staffing levels. An analysis of the care delivery model being utilized and the skill mix of the staff should also be evaluated to determine adequacy.

An environment that fosters open, collegial communication among nurses and physicians is also important to decrease the potential for medication error occurrence. Nurse-physician communication can improve if nurses are provided with resources, support, and opportunities. Having a sense of empowerment has been shown to link with improved physician communication (Manojlovich & DeCicco, 2007).

Research Question 8: What is the influence of perceived safety culture and demographic characteristics (type of work unit, years of experience, and years working at the facility) on reasons why medication errors are not reported?

Perceived safety culture and demographic predictors of reasons why medication errors are not reported will be discussed in descending order, based on the number of dependent variables each predicted. Specifically, non-punitive responses predicted all four subscales of reasons why medication errors are not report and will be discussed first, followed by hospital handoffs and frequency of events reported, each of which predicted three variables, and then hospital management support, years worked as a nurse, supervisor expectations, and working in the NICU, all of which predicted one of the subscales of the reasons why medication errors are not reported (see Table 29).

Implications for theory and practice are discussed for each finding.

The finding that a non-punitive response is a predictor of reasons medication errors are not reported provides support for the concept of safety culture in the Conceptual Model of Medication Safety as influencing reasons why medication errors are not reported. This study is the first to demonstrate a relationship between non-punitive response and reasons medication errors are not reported. The direction of the relationship indicates that a more positive safety climate (nurses perceive the environment to be non-punitive) was associated with less agreement that medication errors are not reported for all of the subscales (reporting effort, administrator response, disagree with definition, and fear). Many studies have found that a non-punitive response influences the nurse's willingness to report a medication error (Chiang & Pepper, 2006;

Mayo & Duncan, 2004; Stratton, et al., 2004); however, those studies did not evaluate non-punitive response as a predictor of reasons medication errors are not reported.

The finding that hospital handoffs is a predictor of reasons medication errors are not reported provides support for the system attribute – hospital handoffs – in the Conceptual Model of Medication Safety as influencing the reasons why medication errors are not reported. Hospital handoffs are a predictor in three of the four subscales (reporting effort, administrator response, and fear). The direction of the relationship indicates that a more positive safety climate (presence of effective handoffs) was associated with less agreement that reporting effort, administrator response, and fear are reasons medication errors are not reported.

The finding that frequency of events reported is a predictor of reasons medication errors are not reported provides support for the concept of safety culture in the Conceptual Model of Medication Safety as influencing reasons why medication errors are not reported. Frequency of events was found to be a predictor of three of the four subscales (reporting effort, disagree with definition, and fear). The direction of the relationship indicates that a more positive safety climate (frequency of events reported) was associated with less agreement that reporting effort, disagree with definition, and fear contribute to reasons medication errors are not reported. There have been a number of studies in the literature that support this finding (Chiang & Pepper, 2006; Mayo & Duncan, 2004; Walker & Lowe, 1998); however, these studies did not evaluate frequency of events reported as a predictor.

Hospital management support was found to be a predictor of reasons medication errors are not reported. This finding is consistent with those of another study (Moody, 2006) that found a positive perception of hospital management's actions and expectations promoting safety improves the frequency of error reporting. This finding provides empiric support of the benefit of hospital management promoting a work environment and actions that support patient safety. Such an environment promotes learning and encourages reporting that is necessary for identifying and solving problems that lead to medication errors (Manno, et al., 2006).

Years worked as a nurse (36-40 years) was found to be a predictor of reasons medication errors are not reported. This study was the first to demonstrate this relationship. This finding supports the concept of person attribute – years worked as a nurse – in the Conceptual Model of Medication Safety as a variable that influences reasons why medication errors are not reported. The direction of the relationship is such that, the more years of experience the nurse has, the less likely fear would be a reason for not reporting medication errors. In a previous study, the more years of experience a nurse had, the more likely the medication error would be reported (Manojlovich & DeCicco, 2007), which is consistent with this study's findings; however, this study did not evaluate years of experience as a predictor. Similar to this finding, an association between years worked as a nurse and frequency of reporting was found in a study of Korean nurses (Kim, 2007), however, this study did not evaluate years as a nurse as a predictor.

In summary, 23 percent of the variance in reporting effort was explained by non-punitive response, hospital handoffs, frequency of events reported, and type of nursing

unit (NICU), 48 percent of the variance in administrator response was explained by non-punitive response, hospital handoffs, and supervisor expectations, 23.6 percent of the variance in disagree with definition was explained by non-punitive response, frequency of events reported, and type of nursing unit (NICU), and 50 percent of the variance in fear was explained by non-punitive response, hospital handoffs, frequency of events reported, hospital management, and years of experience. Other possible predictors of reasons medication errors are not reported could include: type of reporting system used, paper incident reports, electronic reporting systems, or on-line anonymous reporting, responsible decision making, and the ability to recognize harm to the patient.

Implications for Practice

Results revealed there are many variables that are predictors of nurses' perceptions of reasons medication errors are not reported. Results further revealed that an organization with an environment that is non-punitive, has systems in place to provide a smooth transition when patients move from one place to another (hospital handoffs), has policies that provide a clear definition of what constitutes a medication error (disagree with definition), and employs hospital managers (hospital management) who promote patient safety are necessary to enhance nurses' willingness to report medication errors. If errors are not reported, person and system contributions to error occurrence cannot be identified or corrected.

Research Question 9: What is the influence of the acute care nurses' perceived work environment and demographic characteristics (education level, years of experience, gender, type of nursing unit) on reasons why medication errors are not reported?

The finding that nursing foundations, staffing and resources, nurse manager ability, and nurse participation in hospital affairs are predictors of reasons medication errors are not reported (see Table 30) has implications for theory and practice. These findings provide support for adding these concepts of perceived work environment in the Conceptual Model of Medication Safety as influencing reasons medication errors are not reported.

This study is the first to demonstrate a relationship between these concepts and reasons medication errors are not reported. The relationships found were strong and significant; however, they were not in the direction that was expected; as the perception of the presence of these work environment characteristics increased, the more staff agreed that they were reasons medication errors are not reported. The only logical explanation is participant fatigue, such that the participant did not read the response scale correctly for the Practice Environment Scale of the Nursing Work Index (PES-NWI). The PES-NWI scale was the last instrument in the questionnaire and the response scale was 1 = strongly agree, to 4 = strongly disagree, which was opposite that of all the other instruments used in this study. It is not possible to validate this explanation with the existing dataset.

None of the demographic variables (education level, years of experience, gender, and type of nursing unit) were predictors of reasons medication errors are not reported. No relationship was found between years of experience and medication errors (Hall, Doran, & Pink, 2004) which is consistent with findings in this study. Nursing education had a nonlinear relationship with severe medication errors only (Chang & Mark, 2009). This study did not have participants differentiate between severe and non-severe

medication errors which could explain why this study finding is not consistent with the literature. Gender had previously been identified as a predictor of reasons medication errors occur (Mrayyan, et al., 2007) but not a predictor of reasons medication errors are not reported.

Nursing foundations and staffing and resources explained 16.6 percent of the variance in disagree with definition; nursing foundations, staffing and resources, and nurse manager ability explained 18.4 percent of the variance in fear; nursing foundations, nurse manager ability, and nurse participation in hospital affairs explained 14.3 percent of the variance in reporting effort; and nursing foundations, staffing and resources and nurse manager ability explained 33.2 percent of the variance in administrative response.

Implications for Practice

The findings that nursing foundations, staffing and resources, nurse manager ability, and nurse participation in hospital affairs are predictors of reasons medication errors are not reported has implications for practice. These predictors are characteristic of the Magnet work environment. Increasing staff perception of the presence of these Magnet hospital environment characteristics will help to reduce the reasons medication errors are not reported. Nurse leaders should: foster staff participation in decision making regarding what constitutes a medication error: use mistakes as learning opportunities, not criticism: and provide opportunities to discuss medication administration issues with other staff involved in the process. These recommendations for practice could be made after validating the plausible explanation that participant fatigue resulted in not reading the PES-NWI response scale correctly using a future dataset.

Research Question 10: What is the influence of the acute care nurses' perceived organizational safety and demographic characteristics (experience level, hours worked per week, and hospital classification) on acute care nurses' perceived work environment?

The finding that management support for safety, organizational learning, hospital handoffs, feedback communication, teamwork within units, staffing, frequency of event reporting, supervisor expectations, and non-punitive response are predictors of perceived work environment (see Table 31) has implications for theory and practice. These findings provide support for adding these variables to the Conceptual Model of Medication Safety, whereby, safety culture variables influence perceived work environment. This study is the first to demonstrate a relationship between these safety culture variables and perceived work environment. The direction of the relationship is significant, but is not what would be expected; as perception of the presence of safety culture variables increase, perception of perceived work environment decreases. As with the previous research question, the only logical explanation is participant fatigue such that the participant did not read the response scale correctly for the Practice Environment Scale of the Nursing Work Index (PES-NWI). The PES-NWI was the last instrument in the questionnaire and the response scale was 1 = strongly agree, to 4 = strongly disagree, which was opposite that of all the other instruments used in this study. Again, it is not possible to validate this explanation with the existing dataset.

Supervisor expectations, non-punitive response, management support for safety, feedback communication, and teamwork within units explained 65.4 percent of the variance in nurse manager ability. Teamwork within units and staffing explained 31 percent of the variance in collegial nurse physician relations. Management support for

safety, organizational learning, frequency of event reporting, and hospital handoffs explained 55.1 percent of the variance in nursing foundations. Management support for safety, feedback communication, and organizational learning explained 54.4 percent of the variance in nurse participation in hospital affairs and management support, staffing, and hospital handoffs explained 53.3 percent of the variance in staffing and resource adequacy.

None of the demographic variables (experience level, hours worked per week, and hospital classification) were predictors of perceived work environment. There are no published studies that evaluate these variables as predictors of the perceived work environment.

Implications for Practice

The finding that supervisor expectation, non-punitive response, management support for safety, feedback communication, teamwork within units, staffing, organizational learning, frequency of event reporting, and hospital handoffs were predictors of perceived work environment has implications for practice. These variables are characteristic of a safety climate or safety culture and their presence has an impact on the perceived work environment. Regardless of the hospital's status (Magnet, Magnet-aspiring, or non-Magnet), administrative personnel should work toward introducing, integrating, and fostering these characteristics in their organizations. These recommendations for practice could be made after validating the plausible explanation that participant fatigue resulted in not reading the PES-NWI response scale correctly using a future dataset.

Recommendations for Future Research

Findings of this study support the relationships among the concepts in the Conceptual Model of Medication Safety as well other relationships not previously identified. Further research is needed to investigate the Conceptual Model of Medication Safety. Variables that have been identified as predictors of reasons why medication errors occur and reasons why medication errors are not reported need further investigation. The direction of the relationship of perceived work environment predictors of reasons why medication errors are not reported is different than one would expect; as perception of the presence of perceived work environment characteristics improve, reasons medication errors occur increases. Also, the direction of the relationship of perceived organizational safety predictors of perceived work environment is different than one would expect; as perceived organizational safety increases, perceived presence of characteristics in the work environment decreases. These relationships need further investigation by placing the PES-NWI instrument response scale in the same direction as other scales in the study to reduce the opportunity for participant error.

The authors of the Medication Administration Error (MAE) Reporting Survey added 12 questions to the original instruments (11 questions to Reasons Why Medication Errors Occur and 1 to Reasons Why Medication Errors are not Reported). These items were not included in the analysis of this study. A factorial analysis is needed to determine item fit with the instrument subscales. Inclusion of these items in future studies will expand the knowledge about the reasons why medication errors occur and are not reported.

Previous research has found non-unionized nurses in a Veterans Administration Hospital (Ulanimo, et al., 2007) and unionized nurses in California hospitals (Mayo & Duncan, 2004) did not identify fear of disciplinary action as a reason medication errors are not reported. An analysis of the data for this study should be conducted to investigate support or lack of support for this finding.

This study did not address the effects of technology on medication error occurrence. An investigation of the influence of CPOE on medication error occurrence is warranted as well as the effectiveness of bar code medication administration on nurse perceptions of medication error occurrence.

The influence of types of care delivery systems on medication error occurrence and reporting also needs to be investigated. Specifically, the influence of: 1) staffing mix, 2) skill and experience level of staff, and 3) nursing care hours per patient, would add to the body of knowledge of reasons why medication errors occur.

Strengths and Limitations

Strengths

A major strength of the study was that the instruments used had previously demonstrated reliability and validity. Strengths of the study sample include: a) the large sample size, b) the variety of geographic regions represented, c) the proportion of males participating, d) the even distribution of years worked as a nurse, and e) the distribution of responses from nurses working in Magnet, Magnet aspiring, and non-Magnet-designated hospitals. The sample size afforded a power of .80 which allowed

identification of predictors and associations. An online methodology of data collection was a study strength because medication errors and reporting can be viewed as a sensitive subject. With an online methodology, participants had the opportunity to be truthful without fear of repercussions.

Limitations

Participants self-reported their perceptions of study concepts. Self-reported instruments are subject to response bias as well as social desirability response bias (Polit & Beck, 2008). Convenience sampling was used in this study, which poses a threat to internal validity. Participants were members of professional nursing organizations that posted an advertisement of this study in their e-newsletter, emailed to them using a listserv, or posted on the organization's Facebook site. This sampling methodology can be considered a threat to external validity. Some nurses working as staff nurses who belong to professional organizations, may not have visited the professional association website in time to see the invitation to participate in this research study. Thus, this sample of nurses may not be representative of all nurses, potentially limiting generalizability of findings. Another possible limitation of using an online methodology is that the researcher cannot be positive the participants meet the inclusion criteria of the study. This potential limitation exists with other survey methodologies as well (Polit & Beck, 2008).

Conclusions

In conclusion, the primary purpose of this research was to identify the influence of organizational safety and perceived work environment on medication error occurrence and barriers to reporting errors among nurses working in Magnet, Magnet-aspiring, and non-Magnet hospitals by investigating the Conceptual Model of Medication Safety. This study revealed there are a number of person and system attributes that influence the reasons medication errors occur and the reasons medication errors are not reported, confirming the complexity of hospital systems and the influence of organizational variables on medication error occurrence and reporting and providing support for the Conceptual Model of Medication Safety.

This study also revealed that reasons medication errors occur and nurses' willingness to report those errors are influenced by the key environmental attributes of Magnet hospital settings: nursing foundations for care, nurse participation in hospital affairs, nurse manager ability support and leadership, adequate staff and resources, and collaborative nurse-physician relations influence.

It is important to understand the influence of the nurses' perceived work environment and the perceived safety culture on medication error occurrence and reporting so that healthcare leaders can target their safety strategies on factors with the greatest likelihood of improving patient safety. Enhancing the safety culture in an organization may lead to a reduction in medication errors, an increase in reporting when errors do occur, and an opportunity for nurses to participate in performance improvement efforts to reduce medication errors in the future.

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Appendix A

Permission to Use the Medication Administration Error Survey

You have permission; there is no copyright, but please reference our AHRQ citation where the tool development is described

Wakefield, B.J., Uden-Holman, T., & Wakefield, D.S. (2005). Development and validation of the Medication Administration Error Reporting Survey. In K. Henriksen, J.B. Battles, E. Marks, & D.I. Lewin, Eds. *Advances in Patient Safety: From Research to Implementation*. Vol. 4, Programs, tools, and products. AHRQ Publication No. 05-0021-4. Rockville, MD: Agency for Healthcare Research and Quality.

From: Joyce Ann Shanty [joyce.shanty@iup.edu]
Sent: Tuesday, March 02, 2010 2:53 PM
To: Wakefield, Bonnie
Subject: permission to use Medication Administration Error Survey

Dr. Wakefield,

I am writing to ask your permission to use the Medication Administration Error Survey for data collection and would also like to include it in an appendix of my dissertation.

If you own the copy right, how would you like the information displayed in the footer of the instrument?
Thank you for your time.

Joyce

Appendix B

Permission to Use the Practice Environment Scale of the Nursing Work Index

Dear Ms. Shanty,

Thank you for your inquiry. Yes you have my permission although it is not needed as the instrument is in the public domain. Here are the instrument, scoring instructions, and benchmark values for magnet and non-magnet hospitals in Table 1 of the attached article. Good luck with your research.

Happy New Year,

Dr. Lake

-----Original Message-----

From: Joyce Ann Shanty [<mailto:joyce.shanty@iup.edu>]

Sent: Friday, January 15, 2010 11:54 AM

To: Lake, Eileen

Subject: Permission for use of Nursing Work Environment; Practice Environment Scale of the Nursing Work Index

Dear Dr. Lake,

I am a doctoral nursing student at West Virginia University and I am beginning the dissertation phase of my program. I am interested in making a comparison of perceptions of safety culture, medication errors, and work environment in nurses working in Magnet verses non-Magnet hospitals.

I would like to request permission for use of your instrument for use in my dissertation research.

Thank you for your consideration and I look forward to your response.

Sincerely,

Joyce Shanty

Appendix C

Approval to Use the Practice Environment Scale of the Nursing Work Index

Hi Joyce,

I believe I responded with our approval this morning.

Thanks,

Paulette Goldweber| Associate Manager, Permissions| Global Rights - John Wiley & Sons, Inc.

Ph: 201-748-8765 | F: 201-748-6008| pgoldweb@wiley.com

-----Original Message-----

From: Joyce Ann Shanty [<mailto:joyce.shanty@iup.edu>]

Sent: Tuesday, March 09, 2010 11:27 AM

To: Permissions - US

Subject: Re: Republication/Electronic Request Form

I am a doctoral student and would like to use the Practice Environment Scale of the Nursing Work Index for data collection. I would also like to include the instrument as an appendix in my dissertation

Appendix D

Medication Administration Error Survey

The purpose of this survey is to seek input, based on your clinical experience, from the head and staff nurses on the occurrence and reporting of medication administration errors and the extent to which errors are reported on your unit.

Definition of Medication Administration Errors (MAEs): For the purposes of this survey, MAEs are defined as errors related to the actual ingestion, injection or application of individual medication doses (e.g., wrong method of administration, wrong patient, wrong additive).

A. Reasons Why Medication Errors Occur On Your Unit. Please circle the number that best reflects the extent to which you agree that the following reasons contribute to why medication errors occur on your unit.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. The names of many medications are similar.	1	2	3	4	5	6
2. Different medications look alike.	1	2	3	4	5	6
3. The packaging of many medications is similar.	1	2	3	4	5	6
4. Physicians' medication orders are not legible.	1	2	3	4	5	6
5. Physicians' medication orders are not clear.	1	2	3	4	5	6
6. Physicians change orders frequently.	1	2	3	4	5	6
7. Abbreviations are used instead of writing the orders out completely.	1	2	3	4	5	6
8. Verbal orders are used instead of written orders.	1	2	3	4	5	6
9. Pharmacy delivers incorrect doses to this unit.	1	2	3	4	5	6
10. Pharmacy does not prepare the med correctly.	1	2	3	4	5	6
11. Pharmacy does not label the med correctly.	1	2	3	4	5	6
12. Pharmacists are not available 24 hours a day.	1	2	3	4	5	6
13. Frequent substitution of drugs (i.e., cheaper generic for brand names).	1	2	3	4	5	6

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
14. Poor communication between nurses and physicians.	1	2	3	4	5	6
15. Many patients are on the same or similar medications.	1	2	3	4	5	6
16. Unit staff do not receive enough inservices on new medications.	1	2	3	4	5	6
17. On this unit, there is no easy way to look up information on medications.	1	2	3	4	5	6
18. Nurses on this unit have limited knowledge about medications.	1	2	3	4	5	6
19. Nurses get pulled between teams and from other units.	1	2	3	4	5	6
20. When scheduled medications are delayed, nurses do not communicate the time when the next dose is due.	1	2	3	4	5	6
21. Nurses on this unit do not adhere to the approved medication administration procedure.	1	2	3	4	5	6
22. Nurses are interrupted while administering medications to perform other duties.	1	2	3	4	5	6
23. Unit staffing levels are inadequate.	1	2	3	4	5	6
24. All medications for one team of patients cannot be passed within an accepted time frame.	1	2	3	4	5	6
25. Medication orders are not transcribed to the Kardex correctly.	1	2	3	4	5	6
26. Errors are made in the Medication Kardex.	1	2	3	4	5	6
27. Equipment malfunctions or is not set correctly (e.g., IV pump).	1	2	3	4	5	6
28. Nurse is unaware of a known allergy.	1	2	3	4	5	6
29. Patients are off the ward for other care.	1	2	3	4	5	6

Appendix E

Reasons Why Medication Administration Errors Are Not Reported On Your Unit.

Please circle the number that best reflects the extent to which you agree that the following reasons contribute to why errors are not reported on your unit.

	Strongly Disagree	Mod. Disagree	Slightly Disagree	Slightly Agree	Mod. Agree	Strongly Agree
30. Nurses do not agree with hospital's definition of a medication error.	1	2	3	4	5	6
31. Nurses do not recognize an error occurred.	1	2	3	4	5	6
32. Filling out an incident report for a medication error takes too much time.	1	2	3	4	5	6
33. Contacting the physician about a medication error takes too much time.	1	2	3	4	5	6
34. Medication error is not clearly defined.	1	2	3	4	5	6
35. Nurses may not think the error is important enough to be reported.	1	2	3	4	5	6
36. Nurses believe that other nurses will think they are incompetent if they make medication errors.	1	2	3	4	5	6
37. The patient or family might develop a negative attitude toward the nurse, or may sue the nurse if a medication error is reported.	1	2	3	4	5	6
38. The expectation that medications be given exactly as ordered is unrealistic.	1	2	3	4	5	6
39. Nurses are afraid the physician will reprimand them for the medication error.	1	2	3	4	5	6
40. Nurses fear adverse consequences from reporting medication errors.	1	2	3	4	5	6
41. The response by nursing administration does not match the severity of the error.	1	2	3	4	5	6
42. Nurses could be blamed if something happens to the patient as a result of the medication error.	1	2	3	4	5	6
43. No positive feedback is given for passing medications correctly.	1	2	3	4	5	6
44. Too much emphasis is placed on medication errors as a measure of the quality of nursing care provided.	1	2	3	4	5	6

	Strongly Disagree	Mod. Disagree	Slightly Disagree	Slightly Agree	Mod. Agree	Strongly Agree
45. When med errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error.	1	2	3	4	5	6

Used with permission from B Wakefield, B.J., Uden-Holman, T., & Wakefield, D.S. (2005). Development and validation of the Medication Administration Error Reporting Survey. In K. Henriksen, J.B. Battles, E. Marks, & D.I. Lewin, Eds. *Advances in Patient Safety: From Research to Implementation*. Vol. 4, Programs, tools, and products. AHRQ Publication No. 05-0021-4. Rockville, MD: Agency for Healthcare Research and Quality.

Appendix F

Hospital Survey on Patient Safety Culture

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

YOUR WORK AREA/UNIT

Please indicate your agreement or disagreement with the following statements about your work area/unit. Mark your answer by checking the box.

Think about your hospital work area/unit...	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
46. People support one another in this unit.	1	2	3	4	5
47. We have enough staff to handle the workload.	1	2	3	4	5
48. When a lot of work needs to be done quickly, we work together as a team to get the work done.	1	2	3	4	5
49. In this unit, people treat each other with respect.	1	2	3	4	5
50. Staff in this unit work longer hours than is best for patient care.	1	2	3	4	5
51. We are actively doing things to improve patient safety.	1	2	3	4	5
52. We use more agency/temporary staff than is best for patient care.	1	2	3	4	5
53. Staff feel like their mistakes are held against them.	1	2	3	4	5
54. Mistakes have led to positive changes here.	1	2	3	4	5
55. It is just by chance that more serious mistakes don't happen around here.	1	2	3	4	5
56. When one area in this unit gets really busy, others help out.	1	2	3	4	5

Think about your hospital work area/unit...	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
57. When an event is reported, it feels like the person is being written up, not the problem.	1	2	3	4	5
58. After we make changes to improve patient safety, we evaluate their effectiveness.	1	2	3	4	5
59. We work in "crisis mode" trying to do too much, too quickly.	1	2	3	4	5
60. Patient safety is never sacrificed to get more work done.	1	2	3	4	5
61. Staff worry that mistakes they make are kept in their personnel file.	1	2	3	4	5
62. We have patient safety problems in this unit.	1	2	3	4	5
63. Our procedures and systems are good at preventing errors from happening.	1	2	3	4	5

YOUR SUPERVISOR/MANAGER

Please indicate your agreement or disagreement with the following statements about your immediate supervisor/manager or person to whom you directly report. Mark your answer by checking the box.

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

COMMUNICATION

How often do the following things happen in your work area/unit? Mark your answer by checking the box.

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

FREQUENCY OF EVENT REPORTING

In your hospital work area/unit, when the following mistakes happen, how often are they reported? Mark your answer by checking the box.

Think about your hospital work area/unit...	Never	Rarely	Sometimes	Most of the time	Always
74. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	1	2	3	4	5
75. When a mistake is made, but has no potential to harm the patient, how often is this reported?	1	2	3	4	5
76. When a mistake is made that could harm the patient, but does not, how often is this reported?	1	2	3	4	5

PATIENT SAFETY GRADE

Please give your work area/unit in this hospital an overall grade on patient safety. Check one answer.

A Excellent	B Very Good	C Acceptable	D Poor	E Failing

YOUR HOSPITAL

Please indicate your agreement or disagreement with the following statements about your hospital. Mark your answer by checking the box.

Think about your hospital...	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
77. Hospital management provides a work climate that promotes patient safety.	1	2	3	4	5
78. Hospital units do not coordinate well with each other.	1	2	3	4	5
79. Things "fall between the cracks" when transferring patients from one unit to another.	1	2	3	4	5
80. There is good cooperation among hospital units that need to work together.	1	2	3	4	5
81. Important patient care information is often lost during shift changes.	1	2	3	4	5
82. It is often unpleasant to work with staff from other hospital units.	1	2	3	4	5
83. Problems often occur in the exchange of information across hospital units.	1	2	3	4	5
84. The actions of hospital management show that patient safety is a top priority.	1	2	3	4	5
85. Hospital management seems interested in patient safety only after an adverse event happens.	1	2	3	4	5

Think about your hospital...	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
86. Hospital units work well together to provide the best care for patients.	1	2	3	4	5
87. Shift changes are problematic for patients in this hospital.	1	2	3	4	5

NUMBER OF EVENTS REPORTED

88. In the past 12 months, how many event reports have you filled out and submitted?
Check one answer.

- ☐ a. No event reports
- ☐ b. 1 to 2 event reports
- ☐ c. 3 to 5 event reports
- ☐ d. 6 to 10 event reports
- ☐ e. 11 to 20 event reports
- ☐ f. 21 event reports or more

<http://www.ahrq.gov/qual/hospculture/>

Appendix G

The Practice Environment Scale of the Nursing Work Index

For each item, please indicate the extent to which you agree that the item is PRESENT IN YOUR CURRENT JOB. Indicate your degree of agreement by circling the appropriate number.

	Strongly Agree	Agree	Disagree	Strongly Disagree
89. Adequate support services allow me to spend time with my patients.	1	2	3	4
90. Physicians and nurses have good working relationships	1	2	3	4
91. A supervisory staff that is supportive of the nurses.	1	2	3	4
92. Active staff development or continuing education programs for nurses.	1	2	3	4
93. Career development/clinical ladder opportunity.	1	2	3	4
94. Opportunity for staff nurses to participate in policy decisions.	1	2	3	4
95. Supervisors use mistakes as learning opportunities, not criticism.	1	2	3	4
96. Enough time and opportunity to discuss patient care problems with other nurses	1	2	3	4
97. Enough registered nurses to provide quality patient care.	1	2	3	4
98. A nurse manager who is a good manager and leader.	1	2	3	4
99. A chief nursing officer who is highly visible and accessible to staff	1	2	3	4

	Strongly Agree	Agree	Disagree	Strongly Disagree
100. Enough staff to get the work done	1	2	3	4
101. Praise and recognition for a job well done.	1	2	3	4
102. High standards of nursing care are expected by the administration	1	2	3	4
103. A chief nursing officer equal in power and authority to other top-level hospital executives	1	2	3	4
104. A lot of team work between nurses and physicians.	1	2	3	4
105. Opportunities for advancement.	1	2	3	4
106. A clear philosophy of nursing that pervades the patient care environment.	1	2	3	4
107. Working with nurses who are clinically competent.	1	2	3	4
108. A nurse manager who backs up the nursing staff in decision making, even if the conflict is with a physician.	1	2	3	4
109. Administration that listens and responds to employee concerns.	1	2	3	4
110. An active quality assurance program.	1	2	3	4
111. Staff nurses are involved in the internal governance of the hospital (e.g., practice and policy committees).	1	2	3	4
112. Collaboration (joint practice) between nurses and physicians.	1	2	3	4
113. A preceptor program for newly hired RNs	1	2	3	4

	Strongly Agree	Agree	Disagree	Strongly Disagree
114. Nursing care is based on a nursing, rather than a medical, model.	1	2	3	4
115. Staff nurses have the opportunity to serve on hospital and nursing committees.	1	2	3	4
116. Nursing administrators consult with staff on daily problems and procedures	1	2	3	4
117. Written, up-to-date nursing care plans for all patients.	1	2	3	4
118. Patient care assignments that foster continuity of care, i.e., the same nurse cares for the patient from one day to the next.	1	2	3	4
119. Use of nursing diagnoses.	1	2	3	4

Used with permission John Wiley& Sons ® Source: Lake, E., T. (2002). Development of the practice environment scale of the nursing work index. *Research in Nursing & Health*, May/June, 25(3).

Appendix H

To assist in data analysis and interpretation of the survey results, I would appreciate if you would provide me with the following information--Please circle the number that best represents you and your unit.

120. Does your nursing unit use the unit-dose system?

1. Yes 2. No

121. What model of nursing practice is used?

1. Team 2. Primary 3. Other, please specify _____

122. What is your nursing education? (Circle all that apply)

1. LPN 2. Diploma 3. ADN 4. BSN 5. Master's degree in nursing

123. What other non-nursing degrees, if any, do you have?

Please specify _____

124. What is your current position on your unit?

1. Staff Nurse 2. Head Nurse/Other Administrative 3. Other, please specify _____

125. Typically, how many hours/week do you work in this hospital?

- Less than 20 20-39hours 40-59hours 60-79hours 80-99 100 or more

126. How often do you administer **non-IV** medications?

1. Never 2. Rarely 3. Occasionally 4. Frequently

127. How often do you administer **IV** medications?

1. Never 2. Rarely 3. Occasionally 4. Frequently

128. Are you employed full-time or part-time in your current position in this institution?

1. Full-time 2. Part-time

129. What is the average number of times you float between units per month?

0 1 2 3 4 5 6 7 8 9 10 11+

130. How many different units do you float between in a year?

1 2 3 4 5+ Not applicable, I do not float between units

131. Type of nursing unit to which your responses apply (CHOOSE ONLY ONE RESPONSE):

1. Medical	6. LTC/SNF	11. PICU
2. Surgical	7. CCU	12. Psychiatry/Mental Health
3. Medical/Surgical	8. ICU	13. Float Pool Nurse
4. Obstetrics	9. MICU	14. Other, please specify_____
5. Pediatrics	10. SICU	

132. What is your hospital's current status regarding Magnet designation?

Magnet Non-Magnet

133. If not currently Magnet-designated, are you currently in the process of seeking Magnet-designated status?

Yes No

134. Does your hospital have Physician Computerized Order Entry?

Yes No

135. Does your hospital have an electronic incident reporting system?

Yes No

136. What is your gender?

Male Female

137. How long have you been a nurse?

0-5 years 6-10 years 11-15 years 16-20 years 21-25 years

26-30 years 31-35 years 36-40 years 41 or more years

138. How long have you worked at your current hospital?

Less than 1 year 1 to 5 years 6-10 years 11-15 years 16-20 years
21 or more

139. How long have you worked in your current work area/unit?

Less than 1 year 1-5 years 6-10 years 11-15 years 16-20 years
21 or more years

140. Do the nurses in your hospital belong to a collective bargaining unit

Yes No

141. What is the classification of your hospital?

Community Community/Teaching Urban Urban
Teaching Other_____

142. In what State are you working?

Country?

143. Do you have any suggestions for improving the current system for monitoring medication errors?

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

145. Describe a medication error that you made and how it was handled by your manager