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Medication Errors: It's a Matter of Time

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Medication Errors: It's a Matter of Time

By

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A scholarly thesis presented to the faculty of
Gardner-Webb University School of Nursing
in partial fulfillment of the requirements for the
Degree of Master of Science in Nursing

Boiling Springs, North Carolina

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Date

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Abstract

A retrospective review of medication errors is presented as a measurement tool. Times of medication errors are separated into categories. The numbers of errors are associated with the numbers of medication administrations. The first data set contains errors that occurred within the first 8 hours of a 12-hour shift and the second data set contains errors that occurred during the last 4 hours of a 12-hour shift.

Data was obtained from a 108 bed critical care hospital in the southeastern United States. A time period will be reviewed between the months of September 2010 until August 2011. All reports of incidence occurring within the given time frame will be included in the data set. No other demographic information was made available.

In this scenario, H_A = There is a difference in the rate of medication error between the first 8 hours of a 12-hour shift and the last 4 hours of a 12-hour shift; H_o = There is no difference between the two shift times.

A chi-square test was run to evaluate the data. The measurement of observed data did show that medication errors occurred at a higher rate than anticipated in the last 4 hours of the shift however with $p .060$ the analysis failed to reach the accepted value of $< .050$ so the analysis failed to reject the null hypothesis.

In conclusion the incident of medication error is a factor affecting patients in the healthcare setting. Fatigue and longer working hours have been associated with higher rate of incident. Evidence was presented representing this rate of error. Even though the results were not significantly sufficient to satisfy the analysis, further expansion of this work may lead to evidence that may promote a reduction in the occurrence of medication errors.

Chapter 1

Introduction

Can patient safety be increased related to number of medication errors if nurses worked 8-hour shifts versus 12-hour shifts in an acute care facility? The following data will be presented in an attempt to satisfy this question. The research procedure will consist of a retrospective review of documented medication errors spanning a twelve month period. The errors will be categorized and then further analyzed using SPSS software (version 18). Furthermore, the results will be measured for statistical significance.

Statement of Problem

When an individual experiences a medical challenge this person may choose to seek out direction from a health care provider. In the event of a complex situation where the individual requires admission to a health care facility this person trusts that he/she will receive the highest quality of care available with the fewest amounts of errors possible.

Although healthcare providers are not expected to make errors, mistakes do occur, and some mistakes have resulted in serious injury or death. Each year, approximately 1.3 million patients are injured because of error during their hospitalization, and more than 100,000 deaths due to preventable adverse events occur. The effects of human error may be more significant for patients in critical care units (CCUs). These patients are not only exposed to more medications and treatments than are patients in general care areas but are also seriously ill, with

little natural resilience or ability to defend themselves from the consequences of healthcare mishaps. (Scott, Rogers, Hwang, & Zhang, 2006, p. 30)

Throughout our lives human beings are faced with the question of what events are acceptable and what are not. It is the purpose of this paper to provide evidence to clarify whether or not the rate of medication errors increases in the last 4 hours of a 12-hour nursing shift. The aim of this paper is to aid in the positive direction of nursing efforts while supporting a level of care that will fortify client trust as well as meeting the client's expectations.

Background

Medication errors are a serious problem which plagues our healthcare system. Every year over one million people are injured as a result of medication errors and every day at least one person dies (U.S. Food and Drug Administration, 2011). Several recent studies have indicated that long work hours have adverse effects on the performance of healthcare providers. In 2009, an extensive literature review revealed a relationship of increased rate of medication errors occurring within a 12-hour work shift versus an eight work shift. The study then credited the nurse's workload as a major reason for these errors. In a 2006 article by Berger and Hobbs provided reference to research connecting an increase in errors with working 12-hour shifts. Furthermore a pilot study by Dorrian et al. (2006) suggests a potential link between fatigue and medical error rates. Scott et al. (2006) found that longer working hours are associated with an increase in errors and suggest that hospitals cut back on staffing 12-hour shifts. Simone (2009) conducted a literature review which resulted in the statement that employees working more than 8 hours show an increase in errors, fatigue, and adverse events. Barker and Nussbaum

(2011) reinforced this idea that longer shifts are associated with increased fatigue as well as an increased chance for error. Therefore, this study is motivated to persuade a change that will ultimately result in a reduction of errors and a decrease in medication related adverse or untoward events.

Purpose and Rationale

It is not only the purpose of this study to describe the timing and rate of medication errors during the 12 hour shift but it is to show a correlation between these two factors. Evidence showing an increased rate of error with longer working hours supports the idea that shortened shift durations can result in a safer patient environment. More specifically, objective evidence is provided with the intention to show the rate of medication errors in the first 8 hours of a 12-hour shift is less than the rate errors occurring in the last 4 hours of a 12-hour shift. If a relationship exists between longer working hours and the increased rate of medication errors, the rationale of shortened nursing shifts is related to the need for nursing to safeguard the client's therapeutic environment. More precisely this study aims to improve the client's healthcare experience by increasing safety through the reduction of medication related errors.

Definition of Terms

In order to better understand this proposed study further definitions of key terminology are explained in the following remarks. Untoward event is any event that is unfavorable. In this study untoward is not meant to imply that an adverse reaction actually resulted but it does leave open the possibility for this type of reaction. As related to this study, untoward is defined by *Merriam-Webster's Collegiate Dictionary* as "not favorable, adverse, or improper."

In the health care industry negative situations may bring harm or threaten the safety of patients. One type of negative impact can be brought about by medication related errors. These errors often result from the direct actions of health care workers. Other times these errors are recognized and corrected prior to reaching the client. In this type of situation, these incidents are classified not only as errors but are they also labeled as “near misses”. A near miss can be any variation that did not affect an outcome but could have caused a serious problem (Shostek et al., 2009). Whether a specific incident was labeled as a near miss or an actual error all incidents represented in this study will be classified as a medication error.

The Institute of Medicine (IOM) adopted the following definition of an error: An error is defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. This definition was further clarified by the Quality Interagency Coordination Task Force (QuIC) by including that errors can include problems in practice, products, procedures, and systems (Quality Interagency Coordination Task Force, 2000). Furthermore, the U.S. Food and Drug Administration (2011a) uses the definition of medication error as expressed by the National Coordinating Council for Medication Error Reporting and Prevention (1995) as a preventable event that can cause an inappropriate use of medication when the medication is in the control of a health care professional, patient, or consumer.

Descriptive statistics is described as a method to allow the researcher to give meaning to data (Burns & Grove, 2009). Correlation of variables is basically defined as the relationship between the variables (Field, 2009). In this study the existence of medication errors related to working the first 8 hours of a 12-hour shift versus the

existence of medication errors related to working the last 4 hours of a 12-hour shift will be assessed.

Research Question

In this study the underlying question investigated will be: Can patient safety be increased related to the number of medication errors if nurses worked 8-hour shifts versus 12-hour shifts in an acute care setting?

Significance

When considering implications related to this issue the effects for some patients as well as health care institutions can be drastic. As the need for high quality health care grows, the overall cost may show exponential increases resulting from medication related variance.

An Institute of Medicine (IOM) report concluded that there are 1.5 million preventable adverse drug events (ADEs) occurring in the United States annually. Many are from medication errors. The estimated cost of medication errors, although incomplete, is greater than \$4 billion, according to the report. The problem has grown dramatically over the past 20 years, leading to ADEs as the fifth most common cause of death in the United States. In fact, the best estimates are that for every \$1 spent on pharmaceuticals combined, the United States spends \$1.30 treating adverse health consequences of medications. (Weisbart, 2006, p. 28)

Additional charges alone are not the only concern but the added stress to patients and families as well as the attributed mortality rate provide an implicit and significant need for further research.

Chapter 2

Literature Review

A literature review was conducted utilizing databases including: CINAHL plus with full text, Health Source: Consumer Edition, and PubMed. The key words used in this search included: medication, error, nursing, and shift. Full text, peer reviewed articles were included from 2006 to present. One source referenced by Brady, Malone, and Fleming (2009) was completed outside of the specified time frame but the researcher chose to include this work in support of Brady, Malone, & Fleming's (2009) previous work. Out of this search nine studies were considered relevant to this research.

Articles

Brady, Malone, and Fleming (2009) conducted a literature review covering research related to individual and system factors that contributed to medication errors in nursing practice. "The aim of the review was to explore the empirical literature on medication errors, to identify what factors within the medication management process contribute to medication errors and the implications for nursing practice" (Brady, Malone, & Fleming, 2009, p. 679). The review was conducted using the following databases: CINAHL, PubMed, Science Direct and Synergy. Search terms included: medication errors, medication knowledge and mathematical skill, medication management, medication reconciliation, reporting medication errors, as well as a combination of terms. Key ideas were identified to clarify pertinent issues. The search was confined to peer-reviewed research articles. Studies were utilized that focused on factors contributing to medication errors having a direct relevance on nursing practice. The literature search revealed 93 papers that were retrieved for more detailed evaluation.

Williams (2004) as cited by Brady, Malone, and Fleming (2009) provided the comment that good people can unintentionally make mistakes as a result of inadequate training or knowledge, staff shortages and overwork and fatigue. This association of overwork, fatigue and medication related errors were shown to be more prevalent in a 12-hour work shift versus an 8-hour work shift. The study expressed that 37.5% of medication errors were related to the nurse's workload. The author did state that when the nurse experienced a higher workload the nurse was susceptible to a higher risk of error. As cited in Brady, Malone, and Fleming (2009) a national study referenced in a Rogers et al. (2004) work expressed that nurses working more than 12 hours are associated with higher rates of error. Therefore longer shifts can be assumed to equal higher rates of errors. In support of this evidence researchers did stress the importance that managers implement strategies to reduce medication errors that are in part related to nursing workload and staffing patterns.

Berger and Hobbs (2006) presented an extensive review pertaining to the impact that shift work has on nurse and patient safety. Although the primary focus of this paper is centered around sleep disturbances as it relates to shift work and the reduction of problems related to shift work, specific evidence was revealed connecting an increase in errors while working 12-hour or greater shifts. The researchers cite the Institute of Medicine's 2004 statement that after 12 hours on duty, the risk of making a medication error or causing a needle stick can be twofold compared to the risk associated with an 8-hour shift. Furthermore it is stated that "safety is impaired . . . during the second half of the shift" (Berger & Hobbs, 2006, p. 467). Even though the primary focus of this literature review was not directly related to increased medication errors occurring in the

12-hour nursing shift, evidence was provided that associated longer working hours with an increase opportunity for error. This article was peer reviewed and published in the *Clinical Journal of Oncology Nursing* 2006.

Dorrian et al. (2006) conducted a pilot study that focused on safety implications related to sleep and work hours of Australian nurses. The aim of this study is to examine the work hours, sleep, fatigue, and error occurrence of nurses (Dorrian et al., 2006).

Despite the recognized link between fatigue and error in other industries, to date, few studies of medical errors have assessed the fatigue of the healthcare professionals. . . . Nurses work extended and unpredictable hours with a lack of regular breaks and are therefore are likely to experience elevated fatigue. (Dorrian et al., 2006, p.1149)

In this study 23 full-time nurses used logbooks for one month to record their scheduled and actual work hours, sleep length and quality, sleepiness, and fatigue levels. Also, frequency and type of nursing errors, near errors, and observed errors (made by others) were recorded (Dorrian et al., 2006). “Overall, 20 errors, 13 near errors, and 22 observed errors were reported . . . studies suggest a potential link between fatigue and medical error rates” (Dorrian et al., 2006). This study concluded that more research would be needed to show a relationship between work hours and medical errors.

Scott et al. (2006) worked to determine if an association exists between the occurrence of errors and the hours worked by nurses. Data was obtained from a random sample of critical-care nurses. Participants kept a 14-day log book. Information collected included: hours worked, the time of day worked, overtime hours, days off, and sleep wake patterns. On the days worked participants provided answers to work-related

questions relating to difficulties staying awake, any errors or near errors that might have occurred. On the nurses days off information was provided concerning sleep-wake patterns, mood, and caffeine intake.

Out of the 502 participants, evidence revealed that nurses consistently worked longer than scheduled hours and that longer work duration increased the risk of errors as well as near errors and decreased the nurses alertness. The literature review for this study revealed that in other industries accident rates increase when workers work 12 hours or more. Even though this review was not specifically focused on health care workers, it did show a relationship between longer work hours and increased rate of error. “As it becomes increasingly clear that long work hours are associated with errors, we must accept the obligation of all healthcare providers and consumers to ensure that patients are safe, beginning with the elimination of extended work shifts” (Scott et al., 2006, p. 36). This study’s conclusion was found to support the Institute of Medicine recommendations to minimize the use of 12-hour work shifts (Scott et al., 2006).

Simone (2009) presented an article which reviewed current literature on shift work, the definition of shift work, error rates and adverse outcomes related to shift work, health effects on shift workers, shift work effects on older workers, recommended optimal shift length, positive and negative effects of shift work on the shift worker, hazards associated with driving after extended shifts, and implications for occupational health nurses. The author of this article states, “The current shortage of nurses in the United States and around the world has stressed health care organizations. One of the ways that organizations have attempted to alleviate staffing shortages has been to create longer work shifts” (Simone, 2009, p. 497). The author cited studies revealing that

working beyond the traditional 8 hours have been associated with increased risk of errors, incidents, and accidents; extended work hours negatively affect employee health and well-being and result in increased fatigue for shift workers and decreased alertness and productivity

Simone (as cited in Lockley et al., 2007), Scott et al. (2007), and Smith et al. (1998) provided evidence that nurses working more than 8 hours report more medication errors, difficulty staying awake even falling asleep during work hours, a decrease in productivity the last 4 hours of the shift, as well as an increased risk of errors and near errors. Furthermore the author states that “shifts beyond the traditional 8 hours increase staff fatigue, health care errors, and adverse events and outcomes and decrease alertness and productivity” (Simone, 2009, p. 497).

Barker and Nussbaum (2011) conducted a study investigating perceived levels of mental, physical and total fatigue, and acute and chronic fatigue states, among registered nurses. The relationships between fatigue and performance were investigated, as were differences in fatigue across various demographic and work environmental situations. In this study a cross-sectional online survey was utilized to measure mental, physical, and total fatigue dimensions, acute and chronic fatigue states, and performance. A total of 745 registered nurses completed the survey.

In relation to increased fatigue in the work environment this study provides that:

Nurses are frequently required to complete long working hours and a combination of both physically and mentally demanding tasks, which may lead to increased levels of multiple dimensions of fatigue and to acute and chronic fatigue states . . .

As such, the role of fatigue in medical errors and healthcare worker safety should be further clarified. (Barker, & Nussbaum, 2011, p. 1371)

The researcher continued by referring to Narumi et al. 1999, & Rogers 2004 work stating that nurses working shifts greater than 12.5 hours are more than three times likely to commit an error. With this evidence it can be extrapolated that longer shifts are associated with increased fatigue as well as an increased chance for error.

Olds and Clarke (2006) conducted a study focused on the relationship between registered nurses' extended work duration with adverse events and errors, including needle stick injuries, work-related injuries, patient falls with injury, nosocomial infections, and medication errors was investigated. Through the use of bivariate and multivariate logistic regression from randomly selected surveys responses the researchers measured responses from 11,516 registered nurses to determine if an association exists between extended work duration and adverse events (Olds & Clarke, 2006). The primary focus for this study seems to confirm prior findings that increased work hours raise the likelihood of adverse events and errors in healthcare.

Overall, there is strong evidence that fatigue associated with extended work schedules is related to adverse events and errors in patients and healthcare workers . . . A large body of literature has demonstrated that extended-work duration results in healthcare worker fatigue. Fatigue-related cognitive impairment, in turn, has been linked to adverse events and errors for patients and for healthcare workers. (Olds & Clarke, 2010, p. 10)

A large part of this review is focused on work related fatigue. Although the review did support a connection between increased fatigue associated with longer

working hours and a higher incident of error, no studies actually set a clear precedent for this research project. This project intends to specifically measure the rate of medication error within the specified categories. The review did, however, provide evidence associated with the foundation of this work.

Theoretical Framework

The theoretical framework behind this study will be guided by Nola J. Pender's mid-range theory: Health Promotion Model. The proposed study is based on the benefits of positive outcomes that are anticipated to promote a more healthy practice (Allgood & Tomey, 2006). The prior behavior of medication associated errors will be correlated with the specific time that the error occurred. Contributing factors to medication related errors such as long work hours and increase fatigue discussed in the literature review are believed to be modifiable factors. The behavior- specific cognitions of the health promotion model are applied to the health care facility and staff. The desire to decrease the instance of medication related errors by the staff and facility may promote commitment to a plan of action. Therefore, the proposed study will proceed with a commitment to the planned strategy for implementation of positive actions to arrive at a better practice of care.

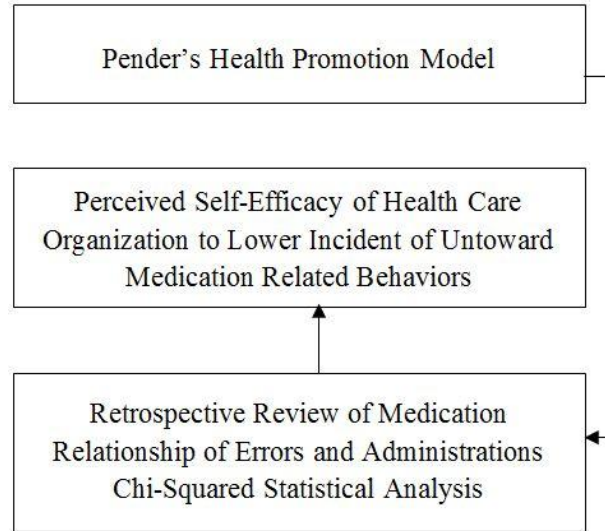


Figure 1. Conceptual-theoretical-empirical structure for theory generating research.

Chapter 3

Methodology

The individual medication variances, as stated previously, will be determined through a retrospective review. Specific data will be obtained from documented medication error reports that were completed as required by the facilities internal policy. The facility is a 108 bed critical care facility in the southeastern United States. A time period will be reviewed between the months of September 2010 until August 2011. All reports of incidence occurring within the given time frame will be included in the data set. The medication related incidents were then separated and counted. Each medication error report was categorized by the shift (day or night) from which the incident occurred as well as the specific time of day that the incident occurred.

The chi-square significance test will be utilized in this data evaluation process. This test will evaluate a relationship between two categorical values being utilized. The data for this investigation was divided into two categories. The first category included data that was found in the first 8 hours of 12-hour nursing shifts and the second category included data from the last 4 hours of 12-hour nursing shifts. Even though the data reflects time which is expressed in a chronological order the data is not presented in a linear fashion. For instance, to prevent an overlap of times, military time was used. A problem arose related to the night shift data. This data included the times of midnight and one o'clock in the morning. The entire data set covered a period from seven o'clock in the evening until seven o'clock in the morning. This situation resulted in inaccurate findings. An example of what happened would include a data set with times such as: 1900, 2000, 2400, 0100, 0300, and 0400. For this example the mean time would come

out to be around 1200 or lunchtime. The resulting analysis included a result outside of the testing range. Therefore, non-parametric testing was chosen as the preferred testing method which led to utilization of the chi-square test. Ultimately the chi-square test is a better fit in this situation since a mean time would not accurately assess the categorical data included in the data set (Field, 2009). Furthermore, the chi-square is better suited for this research since it evaluates each category of observed data and then calculates what would be an expected finding for that category. This study anticipates that the number of medication related errors will be increased in the second category. The ability to evaluate an expected amount is one aspect the chi-square equation that could benefit this study. Even though this method may be considered statistically weaker than other methods, at the very least it will provide a significance level so the researcher can either reject or fail to reject the null hypothesis giving direction for further research (Carver & Nash, 2009).

Informed Consent

Prior to conducting the interviews, the researcher obtained permission from the Internal Review Board (IRB) for Gardner-Webb University. Permission was also attained from the IRB at the participating facility prior to any research being performed. The study was a retrospective review of documented incidents. No personally identifiable information was gathered therefore no written or verbal consent was necessary to gather the data. Actual data included the number of errors occurring over a one year period as well as the time of each occurrence. The factor of time was utilized to separate the errors into their prospective shifts of occurrence. Next, all documented medication administrations during a 24-hour period were attained. Once again the times of

administration were gathered so that the administration times could be divided into their prospective shifts of occurrence.

Design Type

In this study, data will be analyzed for frequency. A 2 X 2 table with weighted variables are evaluated. The data in the first column will be categorized by time of shift. The second column will contain the number of errors related to the corresponding time of shift. Since the chi-square assumes a fifty-fifty association, the weighted values needed to be changed. To increase accuracy the percentage of administration was associated with each total of errors. For instance, approximately 79% of the medications were administered in the first 8-hours of the shift. For a more clear representation the sixty-nine errors occurring in the same 8 hours were only associated with a percentage of the total number of medication administrations. Each category was evaluated with its corresponding percentages. The methodology will also involve analyzing the data using SPSS software (version 18). The chi-square statistic along with the degrees of freedom will aid in determining significance. For testing purposes p values less than .05 will be considered statistically significant.

Threats to Validity

This testing method will not support or prove that medications occur at a higher rate in the last 4 hours of a 12-hour nursing shift. Instead, it provides an opportunity to look at the association between the different categories of time as it relates to medication variance. Possibly a more in depth study would help to reveal different types of data leading to a more conclusive representation of the evidence. Several factors were revealed in this study that could lead to a better understanding of why these errors are

occurring. Related to the investigation of medication administration times, it was found that a large majority of medications were given at a few specific times throughout the shift. The larger number of medication administrations during specific times throughout the day may lead to a higher rate of error for those times ultimately skewing the results for this investigation. Furthermore, the data could be weakened if multiple incidents of medication errors resulted from staff other than nursing. Other contributors could be the physician, pharmacist, or even the patient while self-administering medications. Another consideration could be the overall experience level of the nursing staff. Years of practice and level of education could be factors in assessing reasons for error occurrence. One limiting factor for this specific study is that sample size was restricted to only those occurrences that were documented during a 12-hour shift. A better reasoning strategy could be to include all errors regardless of shift. However, this research is limited to the 12-hour nursing shift and the consideration of an increase in rate of error in the last 4 hours of that shift.

Chapter 4

Results

In this section, the results from the statistical analysis will be presented. Two main categories of data were collected. First, information from documented medication errors covering a time period from September, 2010 and August, 2011 were reviewed. This data was assessed for actual time of occurrence. The incidents were categorized into the specific hour of occurrence within a 12 hour shift. Incidents occurring within shifts that were less than 12 hours in duration were not considered for this research. No other information was collected or reviewed from the documented reports. It was found that a total of 96 errors were documented in the reviewed time frame. Sixty-nine errors occurred during the first 8 hours of the two 12-hour nursing shifts, and 27 occurred in the last 4 hours of the two 12-hour shifts combined. Shown in Table 1 the statistics were generated to show the division of errors between the shifts. In Figure 2 a graphic representation is shown to help better represent this data.

Table 1

Error per Partial Shift Time

	Frequency	%
First 8 hours of shifts	69	71.9
Last 4 hours of shifts	27	28.1
Totals	96	100.0

Administrations seperated into partial shifts

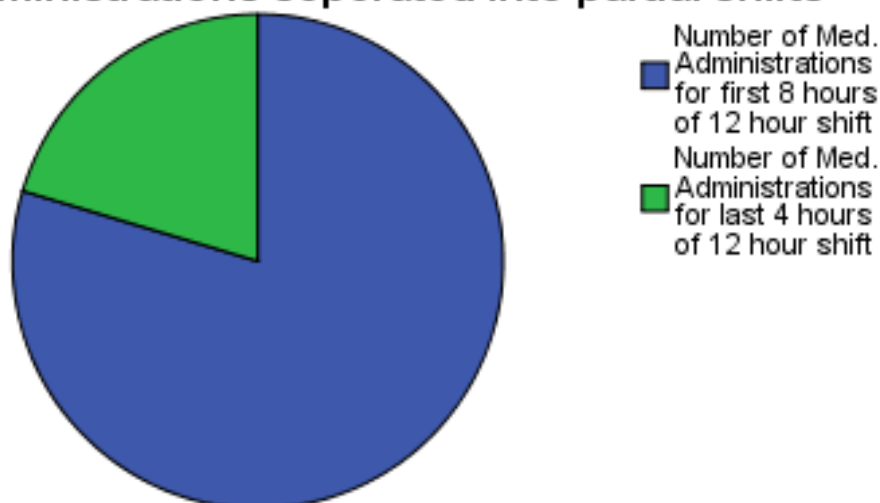


Figure 2. Graph of error per partial shift.

In order to strengthen the data, actual administration times were gathered. A 24-hour period was randomly selected. All medication administrations dispensed from a computerized system were organized. This data was attained to show a representation of the amount of medication that is dispensed in a 24-hour period. Specific data gathered was the number of administrations and the exact time of administration. The time of administration was needed so that the administrations could be divided into the first 8 hours of a 12-hour shift and the last 4 hours of a 12-hour shift. The intention was to compare the numbers of errors to the numbers of administration in the given time period.

The numbers of administration can be seen in Table 2.

Table 2

Number of Administrations

	Frequency	%
First 8 hours	2,196	79.6
Last 4 hours	563	20.4
Total	2,759	100.0

In the next graph, the numbers of errors for one year are arranged by the hour of occurrence (figure 3). Immediately following the next graph shows the number of administrations. This data can be compared to visualize the relationship between the number of medication errors and administrations (figure 4).

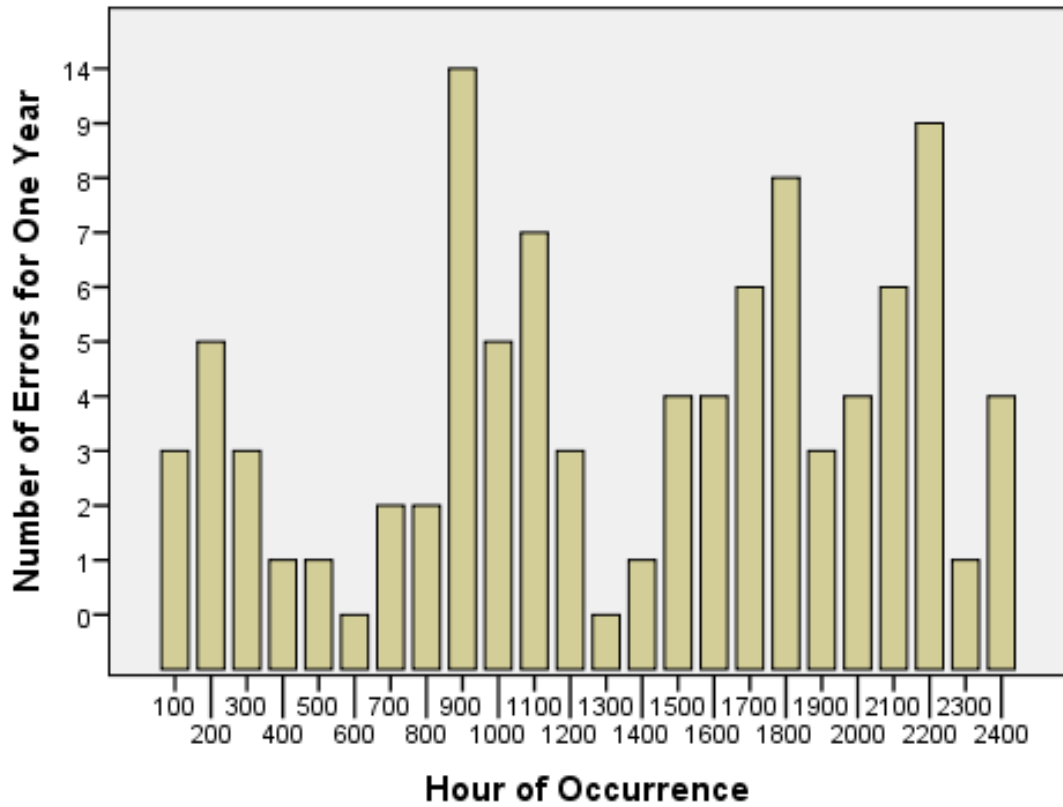


Figure 3. Error graph.

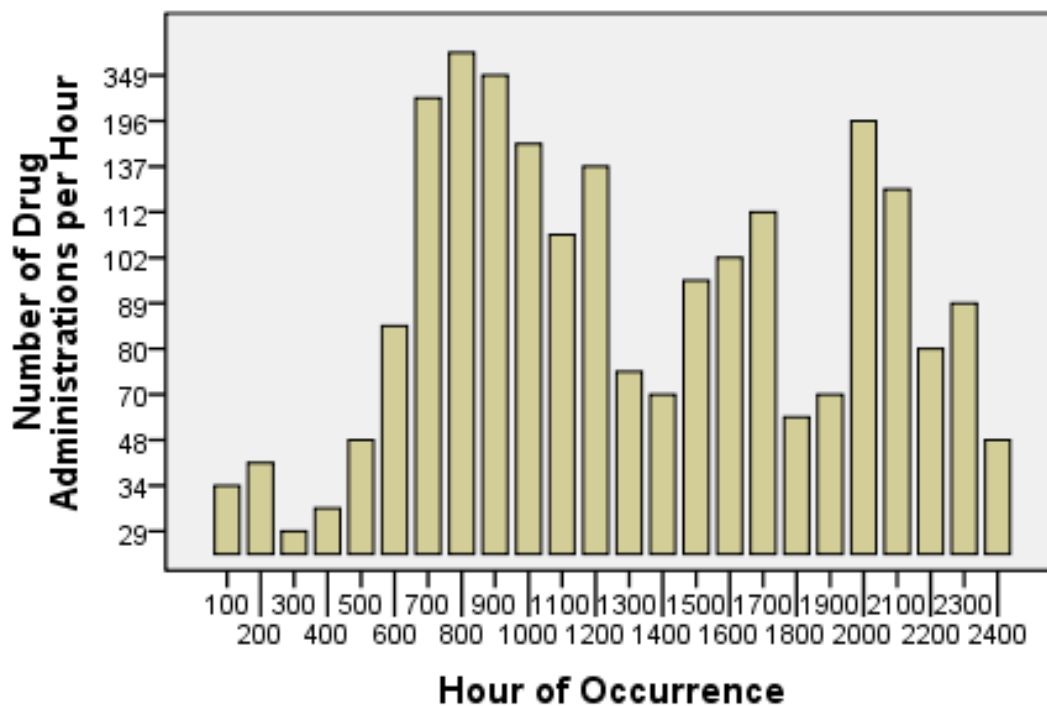


Figure 4. Administration graph.

Once the data had been entered and evaluated a statistical analysis was ran to determine the significance expressed in the alternative and null hypothesis. A chi-square distribution was examined to evaluate what type of relationship exists between the categorical variables. The results are listed in Tables 3 and 4.

Table 3

The Relationship of Categories

	Error		
	Observed <i>N</i>	Expected <i>N</i>	Residual
	27	19.6	7.4
	69	76.4	-7.4
Total	96		

Table 4

Chi-Square Statistic

	Errors
Chi-square	3.528 ^a
<i>Df</i>	1
Asymp. Sig.	.060

^a 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.6.

Chapter 5

Discussion

With the chi-square statistic the hypothesis represents an idea that a difference exists between two categories. In this study the two categories are numbers of errors occurring in the first 8 hours and numbers of errors occurring in the last 4 hours of a 12-hour shift. The actual data is then compared to the anticipated or expected data of each category. The chi-square analysis predicts an expected number for each data category and then compares that data to the actual number. The chi-square test assumes that each category of data represents 50% of the data.

Medication administration data was obtained to represent of a typical amount of administrations for one day. After reviewing the 24-hour period of randomly chosen data, it was found that the errors occurring in the first 8 hours of the shift represented 79.6% of the data and the administrations for the last 4 hours represented 20.4% of the total administrations. Therefore, the weights of the categories were adjusted in the chi-square calculation to obtain a more realistic representation of the data.

In completing the comparison of observed number of errors versus the anticipated number of errors it was found that there were 7.4 less errors occurring in the 8-hour observed data then the anticipated calculation. Also, at the same time, there were 7.4 more errors occurring in the last 4-hours of the shift then were anticipated. It could be extrapolated at this point that errors were occurring at a higher rate in the last 4 hours of a 12-hour shift.

The next step in the statistical analysis provides a level of significance for the findings. For this study a p value of less than .05 is considered statistically significant. A

value of .06 was derived from the data. At this point the study has failed to reject the “null” hypothesis. In other words the study cannot reject the statement of no difference exists between the two categories. Since the chi-square statistic is 3.528 and the chi-square distribution table shows that a statistic of 3.85 has a p value of .05. Looking at the table the figures statistic can be seen in close relation to significance (Fields, 2009).

Implications for Nursing

In healthcare organizations, the nurse works hard at the frontline providing care to the sick and injured. As inflation continues to push costs higher, meeting healthcare demands are becoming more expensive. “As budget cuts occur, workers feel depersonalized and suffer from battle fatigue. The problem is that staff does not feel valued” (Dunham-Taylor & Pinczuk, 2010, p. 69). Finding creative ways to elicit a positive change in the client’s health may help to re-empower nursing staff. Nursing administrators and nurse educators need to articulate prevention through in-service education. Nurses need to further seek out evidence to support practice that will lead to a reduction in medication errors.

Limitations of Study

The study is limited. It did not provide appropriate significance to reject the “null” hypothesis. The “null” hypothesis states there is no difference between the rates of error in each category. Furthermore, a larger sample of days representing medication administration times would have provided a better representation of actual numbers of administrations. In this study the numbers of medication administrations were limited to one 24-hour period. Even though the day was randomly sampled it may have been more beneficial to average data from several days out of the year. The study did not signify

how many medications each patient received. It assumed that each administration was separate from one another. Another factor that could have been considered is when a patient is receiving a large numbers of medications at one time this patient may be at higher risk for error. Furthermore, according to the data more medications are administered to patients early in each shift. Could this condition combined with the idea that a nurse may not be as familiar with a patient early in the shift result in a higher rate of error? It could benefit the study to look at the problem through a broader scope possibly allowing for more significant findings.

Importance of Findings Related to the Theoretical Framework

Nola J. Pender's health promotion model is based on positive outcomes that can promote a more healthy practice. As a nurse strives to improve care and to improve outcomes they become empowered. Working towards zero medication errors is not only beneficial for the clients but the nurse as well. "Spirit comes from our belief that we are doing meaningful work" (Dunham-Taylor & Pinczuk, 2010, p. 70). Through the implementation of actions, such as seeking to reduce untoward events, the nurse is exhibiting behavior-specific actions leading to health promotion. Even though the evidence did not reach a desired level of significance, the research did support of the theory. Self-efficacy was established through the direction provided by the research. Several options were discovered that could broaden the studies parameters suggesting the necessity for further research. The inspiration to look closer at the idea of error reduction with the desire for error elimination not only would lead to promotion of health but could increase nursing job satisfaction as well.

Recommendations for Further Research

Expansion of this work could provide evidence encouraging a reduction in the occurrence of medication error. Replication of this study using a larger data set may help to reveal significant evidence related to the research question. For instance, data sets from a variety of healthcare facilities utilizing a larger sample size may be found beneficial. Also, further research including an examination of the facilitators and barriers of understanding related to the incident of medication error could be used to provide better clarification of the research question. Factors such as work load, level of education, and experience could be compared to fatigue as causes of error. Next, an evaluation tool such as a questionnaire might be used to evaluate how nurses individually define what a medication error is or what type of incidents should be documented as a medication error. The results could provide clarification showing the possibility that occurrence of error may go unreported. Therefore, expansion of this work could be found beneficial to the provision of better care.

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Appendix A

Institutional Review Board Certification From Gardner-Webb University



THE INSTITUTIONAL REVIEW BOARD of GARDNER-WEBB UNIVERSITY

This is to certify that the research project titled
Medication Errors: Is it a matter of Time?
being conducted by Thomas D. Smith Jr
has received approval by the Gardner-Webb University IRB. Date 10/14/11

Exempt Research

Signed Cindy Miller
Department/School/Program IRB Representative
Shirley Beck-Ruble
Department/School/Program IRB Member

Expedited Research

Signed _____
Department/School/Program IRB Representative

Department/School/Program IRB Member

IRB Administrator or Chair or Institutional Office

Non-Exempt (Full Review)

Signed _____
IRB Administrator

IRB Chair

IRB Institutional Officer

Expiration Date _____

IRB Approval:

Exempt Expedited Non-Exempt (Full Review)

Appendix B

Institutional Review Board Certification From Facility

Copy of initial email requesting IRB Certification sent to the director of Critical Care Services [REDACTED]

[REDACTED]:

Data Analysis

Smith, Thomas

Thank you so much [REDACTED]. I have connected with [REDACTED] and she has referred me to [REDACTED]. I will let you know what happens. Thomas Smith

9/7/2011

[REDACTED]

Thomas, It is exciting to see you grow and expand your knowledge base. I would have to consult [REDACTED] on whether this data collection is acceptable or not. [REDACTED] would you please take a moment and read the e-mail below and share if this is feasible for 9/7/2011

From: Smith, Thomas

Sent: Wednesday, September 07, 2011 10:41 AM

To: [REDACTED], [REDACTED]

Hello [REDACTED],

I was wondering if you could lend me your advice. I am trying to research percentages of medication errors related to work hours. Does a higher percentage of "nursing" medication errors occur during the first eight hours of a twelve hour shift as opposed to the last four hours? Do you think it would be possible for me to gather this information?

Since this is a research project for my thesis I was going to contact [REDACTED] [REDACTED] about IRB approval but at the same time I was interested in hearing your opinion related to this idea.

Thank You,
Thomas Smith

Reply from [REDACTED] [REDACTED] (Director of Critical Care Services) to Thomas Smith and [REDACTED] [REDACTED] (Quality Manager):

From: [REDACTED], [REDACTED]

Actions.....

To: Smith, Thomas; [REDACTED], [REDACTED]

Sent: Wednesday, September 07, 2011 9:47 AM

Thomas,

It is exciting to see you grow and expand your knowledge base. I would have to consult [REDACTED] [REDACTED] on whether this data collection is acceptable or not. [REDACTED] would you please take a moment and read the e-mail below and share if this is feasible for [REDACTED] or not.

Thank you.

[REDACTED] [REDACTED], RN, BSN, MBA | Director of Critical Care Services |

Reply from Quality Manager [REDACTED] [REDACTED] to [REDACTED] [REDACTED] (Director of Critical Care Services) and Thomas Smith:

From: [REDACTED], [REDACTED]

To: [REDACTED], [REDACTED]; Smith, Thomas

Wednesday, September 07, 2011 10:14 AM

[REDACTED] - I sent Tom to [REDACTED] since I don't have any of this info. Other staff members have done "studies" similar to this for advanced degrees, according to administration this does not require any IRB involvement.

Hope your day is going well.

[REDACTED]

[REDACTED] [REDACTED], RN, BSPA, CPHQ | Quality Manager