TESTING AN INNOVATIVE METHOD TO COLLECT ADVERSE EVENTS DATA: A METHODOLOGICAL STUDY

A Thesis in
Nursing
by
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ABSTRACT

Title: Testing an Innovative Method to Collect Adverse Events Data: A Methodological Study

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Purpose: The Shift Coupon was designed to provide a more accurate measure of adverse events occurring in the hospital setting by eliminating the two overriding barriers to reporting adverse events: “[1] fear and [2] lack of belief that it [reporting the adverse event] results in improvement” (Leape, 1999, p. 1). Thus, the study purposes were to test the ability of the Shift Coupon to collect adverse events data and to explore the hospital work environment as it related to registered nurses’ reports of adverse events.

Methods: Design: Nonexperimental descriptive, comparative; Sample: 1,000 randomly selected registered nurses; Instruments: Shift Coupon and Blegen/Vaughn Work Environment Index; Procedure: Mailed registered nurses surveys following Dillman’s (2000) Tailored Design Method. Registered nurses completed Shift Coupons for 5 shifts and the Blegen/Vaughn Work Environment Index then returned completed instruments; Data Analysis: Descriptive statistics and chi-square.

Results: 355 registered nurses returned 1937 Shift Coupons (46.7% response rate), with 247 (69.6%) registered nurses returning 1369 coupons for shifts worked in a hospital. On the majority of Shift Coupons (70.9%) registered nurses reported that no adverse event occurred. The most commonly reported adverse events were: patient complaints (21.4%), medication errors (18.9%), family complaints (17.6%), and patient falls (12.1%). Registered nurses identified lack of staff (36.8%), lack of communication (30.5%), and work overload (29.5%) as the most frequent causes of adverse events. Shift Coupons did collect more adverse events data than incident reports (p<.001). Blegen/Vaughn Work Environment Index data supported the underreporting of adverse events and Shift Coupon findings and provided insights for future coupon studies.

Conclusion: The Shift Coupon is a viable method to collect adverse events data.

Implications: The Shift Coupon provides a method for collecting adverse events data in the hospital setting that attenuates barriers to reporting adverse events while placing front-line healthcare professionals in a position to identify direct and indirect adverse event cause(s). Shift Coupon data can be used to isolate areas needing quality improvement and to develop appropriate quality improvement initiative(s) to decrease the occurrence of adverse events.
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Chapter 1
Overview

According to the President’s Advisory Commission on Consumer Protection and Quality in the Health Care Industry (1998), “The purpose of the health care system must be to continuously reduce the impact and burden of illness, injury, and disability and to improve the health and functioning of the people of the United States” (p. 2). This purpose is accomplished through the provision of quality healthcare. However, in a time of financial constraints, organizational restructuring, and a shortage of nurses, the attainment of quality healthcare is questionable. Consequently, healthcare quality is a grave concern for healthcare stakeholders, such as healthcare professionals, policy makers, and healthcare consumers.

A standard definition of healthcare quality is elusive (Lanska & Hartz, 1998; Redfern & Norman, 1990), with healthcare stakeholders viewing this concept from various perspectives. For instance, Lynn and McMillen (1999) found a significant difference between nurses and patients in their perceptions of aspects of quality care, with nurses underestimating the value that patients place on the physical environment, psychological aspects of care, and professionalism. Yet, in an attempt to quantify this intangible concept, healthcare stakeholders are measuring quality care through quality indicators. One traditional quality indicator in the hospital is the occurrence of adverse events (Reed, Blegen, & Goode, 1998; Thomas et al., 2000b; Wolff, 1996).
While the interest of healthcare stakeholders in the occurrence of adverse events is not new, the attention this quality indicator has received is new. The publication of the Institute of Medicine’s (IOM) report *To Err is Human: Building a Safer Health System* (Kohn, Corrigan, & Donaldson, 2000) catapulted this quality indicator into the limelight through the publication of such statistics as preventable adverse events kill between 44,000 and 98,000 Americans per year, and the total national cost (including lost income, lost household production, disability, and healthcare costs) for adverse events was estimated to be between $37.6 billion and $50 billion. Since the publication of this report, both the academic and popular presses have paid increased attention to adverse events. For instance, the *British Medical Journal* (2000) dedicated an entire issue to adverse events, and television shows such as CBS’s *Eye on America* (Assuras, 12/28/00) and print media such as the *Chicago Tribune* (Berens, 1/10/00; 1/11/00; 1/12/00) have run stories on this quality indicator.

As a result of the publicity, all healthcare stakeholders are demanding improvements in the quality of patient care provided in hospitals, many calling for a reduction in the occurrence of adverse events. In the report *To Err is Human: Building a Safer Health System*, the IOM recommended a 50% reduction in the number of errors over five years (Kohn et al., 2000). However, some experts believe that meeting this recommendation will be difficult because of the lack of baseline data on the incidence of errors in the general medical population against which to compare future incident rates and the lack of reliable means to identify errors in the hospital setting (Brennan, 2000).
Studies of adverse events have used four major data sources: monitoring or screening patient clinical records, self-reported incidents by healthcare professionals, computer systems, and case studies (Walshe, 2000). Of these four data sources, no single data source is dominant in the research literature, with each of the four data sources prone to inherent threats to validity and reliability. In addition, the particular data source used appears to be discipline dependent (Kellogg & Havens, 2003).

In the first data source, when monitoring or screening patient clinical records to identify adverse events, data are abstracted from the patient clinical record in order to first determine if an adverse event occurred and then to classify the adverse event (Walshe, 2000). The Harvard Medical Practice Study (HMPS) and the Utah and Colorado Medical Practice Study (UCMPS), both large, multi-hospital studies prominently cited in the IOM report *To Err is Human: Building Safer Health System*, used this data source. The Quality in Australia Health Care Study (QAHCS) also used this method to identify adverse events. Limitations associated with monitoring or screening patient clinical records include deficient clinical records (Burnum, 1989; Neale, Woloshynowycz, & Vincent, 2001; Walshe, 2000), the summary nature of clinical records (Burnum, 1989; Walshe, 2000), and inter-rater reliability (Brennan, Localio, & Laird, 1989; Hayward & Hofer, 2001).

Self-reported incidents by healthcare professionals is a second adverse events data source. This data source relies on healthcare professionals to both recognize that an adverse event has occurred and then to report the adverse
event. The limitations associated with this data source result primarily from the reporting process and include: inability of healthcare professionals to recognize an adverse event, varying definitions used by healthcare professionals of what constitutes an adverse event, and varying commitments of healthcare professionals to report adverse events (Abramson, Wald, Grenvik, Robinson, & Synder, 1980; Elnitsky, Nichols, & Palmer, 1997; O'Neil et al., 1993; Stanhope, Crowley-Murphy, Vincent, O'Connor, & Taylor-Adams, 1999; Vincent, Stanhope, & Crowley-Murphy, 1999; Walshe, 2000).

The third adverse events data source identified by Walshe (2000) to discover adverse events is computer systems. Using this data source, adverse events are discovered through data queries. Restricted by the availability of technology (Walshe, 2000) and the accuracy of the data entered (Knight, Yardley, & Jones, 1991), this data source can currently identify only a limited number of adverse events (Walshe, 2000).

The final data source identified by Walshe (2000) is the use of case studies. Healthcare professionals using this source investigate a single adverse event or a related group of adverse events through predominately qualitative methods and analysis, most often critical incident technique. The limitations associated with the use of this method rest in the validity and reliability of the definitions used (Walshe, 2000).

This current study tested a new method for collecting adverse events data, the Shift Coupon. This reporting method allows healthcare professionals to report anonymously adverse events that occurred during their previous shifts and
to identify the direct and indirect cause(s) of the adverse events. Therefore, the data collected using this method could give healthcare stakeholders the ability to more accurately measure the occurrence of adverse events and to develop a preliminary understanding of the causal factors of the adverse event. Thus, this innovative method could provide healthcare stakeholders with the adverse events data necessary for identifying and implementing quality improvement initiatives, thereby improving the quality of patient care.

**Research Purposes**

Although adverse events have been extensively researched (Blegen, Goode, & Reed, 1998; Brennan et al., 1991; Kovner & Gergen, 1998; Leape et al., 1991; Thomas, Orav, & Brennan, 2000a; Thomas et al., 2000b), findings cannot be generalized for various reasons: the inherent validity and reliability threats associated with each of the four data sources, the diversity in terms and definitions used to describe adverse events, limited studies using large sample sizes, and diverse study purposes (Kellogg & Havens, 2003). Consequently, inconsistent research findings have contributed to confusion among healthcare stakeholders over which data source to use and may hamper the development and implementation of quality improvement initiatives.

The Shift Coupon employed in this study is a beginning step towards the elimination of conflicting findings, confused healthcare stakeholders, and delayed quality improvement initiatives. This instrument was designed to provide a more accurate measurement of adverse events occurring in a hospital by eliminating the two overriding barriers to adverse event reporting identified by Leape (1999):
“[1] fear and [2] lack of belief that it [reporting the adverse event] results in improvement” (p. 1). Nurses, the largest group of healthcare professionals (Maddox, Wakefield, & Bull, 2001) and the only healthcare professionals to provide continuous patient care, were the first group of healthcare stakeholders to test this method.

The second research purpose, to explore the work environment of registered nurses within the hospital setting as it related to adverse events, was included to provide support for the first research purpose. Using data collected on this topic, the researcher was able to gain a more in-depth understanding of the coupon data collected during this initial testing of the Shift Coupon.

Thus, this study had two purposes: to test the ability of the Shift Coupon to collect adverse events data and to explore the work environment within the hospital setting as it related to registered nurses’ reports of adverse events. The findings from this study were used to quantify the incidence of adverse events within the hospital setting, to determine the cause(s) of the adverse events, and to understand the current work environment as it related to adverse events within hospitals.

Research Questions

1. To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?

2. What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
3. What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

4. What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

5. Which adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?

6. What are the causes of the adverse events identified by the Shift Coupons as perceived by registered nurses?

7. What are the causes of medication administration errors as identified on the Blegen/Vaughn Work Environment Index?

8. What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

9. Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

10. How do registered nurses perceive quality management within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

11. How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

**Conceptual Framework**

The Quality Health Outcomes Model (QHOM) (Figure 1.1) provided the conceptual underpinning for this study. Developed by Mitchell, Ferketich, and
Jennings (1998) [members of the American Academy of Nursing Expert Panel on Quality Health Care], the model serves to guide research relevant to quality improvement and outcomes management. Because the model extends the work of Donabedian (1966) and Holzemer (1994), a brief discussion of each is presented prior to an explanation of the QHOM.

The first model extended in the development of the QHOM is Donabedian’s Structure-Process-Outcome Model. This model has been the gold standard in evaluating quality care since its inception in the 1960s. According to this model, structure is defined as “the physical and organizational properties of the setting in which care is provided” (Donabedian, 1992, p. 357); process is defined as “what is done for the patients” (Donabedian, 1992, p. 357); and outcome is defined as “what is accomplished for patients” (Donabedian, 1992, p. 357). Thus, in this linear model, the structure of the setting leads directly to the intervention performed by the healthcare professional, which leads directly to the results of the intervention. However, there is no feedback between the concepts of structure, process, and outcome.

Holzemer’s Primary Care Model (1994) extends the work of Donabedian by creating a grid for evaluating quality care. Along the horizontal axis are the concepts context, process, and outcomes; whereas along the vertical axis are client, provider, and setting concepts (Holzemer, 1994). Therefore, when evaluating the quality of care, a person would assess the impact of a horizontal axis concept with a vertical axis concept. For instance, when evaluating client from the horizontal axis with process from the vertical axis, a person would
examine both the impact of processes from the healthcare professionals and the processes from the client on the healthcare goals of the client (Holzemer, 1994). Again, like Donabedian’s Structure-Process-Outcomes Model, this model does not possess a feedback system for improving the healthcare system based on research findings.

The QHOM capitalizes on the traditional framework of Donabedian’s model and the multiple dimensionality of Holzemer’s model to create a dynamic model that recognizes the inherent reciprocal directions of the model’s concepts: system, interventions, client, and outcomes. System contains elements, such as hospital size, hospital ownership, skill mix, technology, and client demographics, traditionally classified under the structure and process concepts from Donabedian’s work (Mitchell et al., 1998). Interventions are the direct and indirect clinical processes (Mitchell et al., 1998). Client defines the individual, family, or community receiving the intervention. Included in this concept are the elements of client health, demographics, and disease risks (Mitchell et al., 1998). The concept of outcomes is the focus of this study. It is defined as “the end results of care as well as the foundation of professional accountability” (Jennings, 1995, p. 79). This concept can be operationally defined as patient safety and can be empirically tested through adverse events research (personal communication, P.H. Mitchell, January 17, 2001). The modes for measurement for error prevention (Leape, 1999) described below provided the operational framework for researching adverse events.
Operational Framework

The modes for measurement for error prevention described by Leape (1999) (Figure 1.1) supplied the operational underpinning for this study. Comprised of three modes, discovery, investigation, and monitoring, the purpose of the modes for measurement for error prevention is to provide a systematic approach to improve the quality of care provided to patients through organizational change. The data collection methods and data analysis techniques are unique for each of the modes (Leape, 1999). However, consistent with the continuous quality improvement process, the modes of measurement may not follow a linear process and may overlap (Leape, 1999).

According to Leape (1999), during the discovery mode two questions guide the investigator: “What is the extent of errors?” and “What is the nature of the problem?.” By answering these two questions the investigator will determine whether adverse events are a problem, which types of adverse events are a problem, and what the incidence rates are for adverse events at the conclusion of the discovery mode. The Shift Coupon is an innovative data collection method designed to equip the investigator with the data necessary to answer these questions.

Once the questions posed in the discovery mode are answered, the investigator moves to the second mode for measurement for error prevention, the investigation mode. The question posed during this mode is “What are the causes of the errors?” (Leape, 1999). The Shift Coupon provides the investigator with a starting point for answering this question. For each of the adverse events
identified, the nurse is asked to make a determination as to the cause(s) of the particular adverse event. Based on this information, the investigator can broaden the scope of the investigation to gain a broader perspective on the adverse event from all involved healthcare stakeholders.

Once the causes of the adverse events have been determined, specific evidenced-based quality improvement initiatives are designed and implemented to alleviate/minimize the identified causes of the adverse events. The objective for the third mode for the measurement for error prevention, the monitoring mode, is “to demonstrate improvement (or lack of it) after implementing” (Leape, 1999, p.3) a quality improvement initiative(s).
Figure 1.1
Conceptual Model

Adapted from the Quality Health Outcomes Model (Mitchell, Ferketich, & Jennings, 1998) and Modes for Measurement for Error Prevention (Leape, 1999)
Definitions of Terms

A major methodological issue surrounding the study of adverse events is the lack of a standardized definition (Brightling, 2002; Garcia-Martin et al., 1997; Hofer, Kerr, & Hayward, 2000; Lynch, 1991; Vinen, 2000). Additionally, terms such as “adverse events,” “adverse occurrences,” “adverse incidents,” “medical errors,” and “incidents” are used interchangeably within the literature (Kellogg & Havens, 2003; Vinen, 2000). After examining definitions of adverse events used in research and in the literature, Walshe (2000) identified common themes in the definitions of adverse events:

An adverse event is a happening, incident, or set of circumstances which exhibits three key characteristics to some degree:

1. Negativity – it must be an event which is, by its very nature, undesirable, untoward, or detrimental to the healthcare process or to the patient. This is a theme common to all definitions
2. Patient involvement/impact – it must in some way involve or have some negative impact or potential impact on a patient or patients. The wider definitions of adverse events include occurrences in which there is no actual effect on any patient, though there is the potential for harm. More restrictive definitions often only include events where the patient has suffered some definable and identifiable ill effect from the event
3. Causation – there must be some indication that the event is a result of some part of the healthcare process (either through commission or omission), rather than a result of events outside the healthcare process, such as the patient’s own actions or natural progression of the disease. Again, definitions vary, with some accepting events as adverse events with little or no evidence of causation, while others insist on strong and direct evidence of causation (p. 47-48).

For the purposes of this study, the term utilized was “adverse events.” Below are definitions for this term and other significant terms relative to this study.

Adverse event: “an untoward or undesirable occurrence in the healthcare process which has or potentially has some negative impact on a patient or
patients and results or may result from some part of the healthcare process” (Walshe, 1998, p. 74).

**Incident:** criteria used to classify adverse events into categories; examples of incidents are: medication error, patient fall, and nosocomial infection.

**Hospital:** location where a person is treated by multiple healthcare professionals for an episode of illness.

**Registered nurse:** an individual that has completed a course of study in nursing and has passed the National Council Licensure Examination (NLEX-RN).

**Assumptions of Study**

The following study assumptions had an influence on the analysis of the data and the conclusions drawn from the data.

1. Adverse events reflect a challenge in the healthcare system.
2. Healthcare providers, including registered nurses, make unintentional mistakes that influence patient outcomes.
3. Not all adverse events are caused by healthcare professionals.
4. Not all adverse events are caused by flaws in the healthcare system.
5. Not all adverse events are recognized by healthcare professionals.
6. Not all adverse events are reported by healthcare professionals.
7. Registered nurses will answer the questions on the instruments used in this study in a honest manner.

**Significance of Study to the Healthcare System**

Loosely defined, adverse events are “events which indicate (or may indicate) that a patient received poor quality care” (Walshe, Bennet, & Ingram,
Based upon research findings, adverse events are not an infrequent occurrence in healthcare. As stated previously, rooted in research findings for the HMPS and UCMPS, the IOM in its report *To Err is Human: Building a Safer Health System* quoted mortality rates from preventable adverse events of 44,000 to 98,000 Americans per year (Kohn et al., 2000). Using the lower estimate of 44,000 annual deaths, more people die as a result of preventable adverse events than motor vehicle accidents (43,458), breast cancer (42,297), or acquired immune deficiency syndrome (AIDS) (16,516) (Kohn et al., 2000). Using methodology similar to the HMPS and the UCMPS, the QAHCS, estimated 18,000 Australians died as a result of medical care in 1992 (Wilson et al., 1995). Additionally, in a pilot study performed in Britain to determine the feasibility of applying the research methods used in the studies conducted in the United States and Australia, the researchers concluded that the occurrence and consequences from adverse events were a problem in Britain, just as they are in the United States and Australia (Vincent, Neale, & Woloshynowych, 2001). Hence, the occurrence of adverse event is an international problem, not just an American problem.

In addition to the cost of human life, the IOM report *To Err is Human: Building a Safer Health System* estimated the total national costs of adverse events for Americans as between $37.6 billion and $50 billion each year (Kohn et al., 2000). Placed into perspective, the lower estimate of the total national costs associated with adverse events represented approximately 4% of the national health expenditures in 1996 (Kohn et al., 2000). In an initial effort to quantify the
economic cost of adverse events, the QAHCS determined that adverse events accounted for 3.3 million bed-days in 1992 (Wilson et al., 1995), and the pilot study in Britain estimated that preventable adverse events account for an additional 3 million bed-days a year costing approximately £1 billion a year (Vincent et al., 2001).

Statistics such as those cited above caused a frenzy in the popular press to inform the public of the “adverse events epidemic” in hospitals. Articles published by *U.S. News and World Report*: “Doctoring a sickly system: Deadly medical mistakes are rampant” (Shapiro, 12/13/99) and “Making sure you’re not the next mistake” (Fischman, 7/17/00) and *The Inquirer*: “Health care’s deadly secret: Accidents routinely happen” (Gerlin, 9/12/99) and “Mum is often the word when caregivers stumble” (Gerlin, 9/14/99), along with pieces on popular television show such as CBS’s *Eye on American* (Assuras, 12/28/00) have led to what Kadzielski and Martin (2001) call an erosion of public trust in the quality of healthcare. This erosion of public trust was seen in the results of a Kaiser Family Foundation/Agency for Health Care Research and Quality (2000) survey in which 47% of respondents were “very concerned” about an error resulting in injury happening to them or their family when receiving health care in general and 47% of respondents were “very concerned” about an error resulting in injury happening to them or their family when going to the hospital for care. In comparison, 32% and 30% of the respondents were “very concerned” about an error resulting in injury happening to them or their family when flying on U.S. commercial airliners and eating food purchased at the supermarket, respectively.
This study tested an innovative method for collecting adverse events data in the hospital setting that eliminates barriers to reported adverse events and places front-line healthcare professions (i.e., registered nurses) in a position to identify the direct and indirect cause(s) when an adverse event occurs. This information can be used to identify areas needing quality improvement and to develop and implement appropriate quality improvement initiative(s). As a result, it may by possible to reduce the occurrence of adverse events, allocate funds previously spent on the consequences of adverse events to other social causes, and regain the public’s trust in healthcare.

Significance of the Study to Nursing

In addition to the significance of this study within the global umbrella of the healthcare system, the significance of this study to the nursing profession also deserves attention since registered nurses were the first group targeted to test the Shift Coupon. The relevance of the study to the four components of the nursing profession is discussed in the following paragraphs.

Nursing Research

“Nursing care is the central reason for hospitalizing patients” (Blegen, 2001, p. 3). Yet, additional research is needed to strengthen the link between nursing care and patient outcomes. For instance, in the IOM report Nursing Staffing in Hospitals and Nursing Homes: Is It Adequate?, Wunderlich, Sloane, and Davis (1996) found inadequate research to support a link between nurse staffing and patient outcomes. Within the past few years, adverse events research published in nursing journals has focused both on adverse events as an
outcome measure and on the etiology and characteristics of adverse events, and all four data sources identified by Walshe (2000) have been used in conducting adverse events research (Kellogg & Havens, 2003). Therefore, adverse events research has been subject to limitations associated with the data sources. Likewise, the sample sizes used in nursing research on adverse events tended to be small and limited to a single hospital (Kellogg & Havens, 2003). One plausible reason for this limitation is the lack of data consistency across hospitals. For instance, Mark and Burleson (1995) found that only two classifications of adverse events (medication errors and patient falls) were consistently collected across hospitals.

The Shift Coupon represents a paradigmatic shift in collecting adverse events data that would likely decrease the methodological issues described above. The main objective of the Shift Coupon is to provide an open arena for healthcare professionals, especially nurses, to contribute to the reduction of adverse events through the identification of their causes using an anonymous and non-threatening collection method. Hence, this new data collection method may provide nurse researchers who are studying adverse events as an outcome measure with a more accurate gauge of the occurrence and classification of adverse events that are occurring within their sample population. Likewise, nurse researchers who are investigating the etiology and characteristics of adverse events will be able to view the cause(s) of the adverse events as identified by nurses who experienced the adverse events. Finally, the Shift Coupon was designed to be a fast and easy data collection method with standard
definitions; thereby making the data collection method a viable option for the collection of adverse event data across hospitals.

**Nursing Practice**

“Nurses are the largest single group of health professionals and represent one, if not *the* primary, clinical intervention in many institutional settings” (Aiken, Sochalski, Lake, 1997, p. N58). Nurses comprise the largest component of the healthcare workforce (Maddox et al, 2001) and are the only healthcare professionals who continuously monitor and care for patients. They are often the first healthcare professionals to observe and respond to a critical change in a patient’s condition. For this vigilance, nurses have been given the name “safety sentinels” (Foley, 2001). It is because of these reasons that statements such as “powerless to protect my patients, I began to wonder what I was doing as a nurse” (Bingham, 2002, p. 214) must end. The environment in which nurses practice must support quality nursing care in order to arrive at quality care. The Shift Coupon provides nurses with a new way to protect their patients by providing the mechanism to report anonymously adverse events and to identify the cause(s) of those adverse events for their front-line perspectives. Thus, nurses will be able to use their knowledge of the hospital and patient care practices to bring about improvements in one aspect of the quality of patient care.

Additionally, nurses are invaluable members of quality improvement committees. The Shift Coupon will first give nurses the opportunity to briefly identify cause(s) of the adverse event. Then, during quality improvement
meetings, nurses could utilize their knowledge and understanding of the patient care environment to guide the development and implementation of practice-based quality improvement initiatives.

**Nursing Education**

Nurses are taught to be patient advocates in their basic nursing education. The hospital is one setting that truly requires nurses to exercise and excel in this role. However, during this basic nursing education, there are few classes taught on continuous quality improvement. The Shift Coupon is a simple and time efficient tool that could easily serve as an introduction to a discussion on the need, benefits, and principles of continuous quality improvement. It would demonstrate the essential role nurses play and must continue to play if the quality of healthcare is to be improved.

Likewise, nurse educators may use this information to change the way nursing students are taught to view adverse events. Nurses are human. As such, it is likely that almost all nurses will cause or be part of an adverse event at least once during the course of their careers. The key is to admit an adverse event was committed, fully examine the causes, make professional and organizational changes to avoid similar adverse events, and share this experience so that others can learn from the adverse event to improve their nursing practice and practice environment. The Shift Coupon provides a non-threatening and safe outlet for nurses to report and examine the causes of adverse events. This information could then be discussed in formal and informal forums, thus assisting in reducing the occurrence of adverse events.
However, this new way of teaching about adverse events conflicts with the educational model from which the present cohort of nurses have all been trained, the “perfectibility model: if physicians and nurses could be properly trained and motivated, then they would make no mistakes” (Leape, 1994, p. 1852). It is often said that as a healthcare professional falls into the routine of blaming another healthcare professional for an adverse event, he/she silently wonders if he/she could have made the same mistake (Wu, 2000). Therefore, nurse educators may need to first change the way they view adverse events and then teach a continuous quality model focusing on the system and not the healthcare professional. Nurses tend to take responsibility for mistakes, with those nurses whose mistakes lead to serious patient outcomes internally blaming themselves more than nurses whose mistakes led to less serious patient outcomes; possibly leading to a decreased examination of systematic causes of adverse events (Meurier, Vincent, & Parmar, 1998). Therefore, nurse educators need to use the available research to adapt their teaching to lessen the risk of a nurse, or any healthcare professional, becoming what Wu (2000) called the second victim of an adverse event.

Nursing Administration

In an editorial Reinertsen (2000) asked: “What would it look like if leaders were to direct attention to the issue of medical error?.” The answer would be a personal commitment to reducing adverse events within the organization by making the reduction in the occurrence of adverse events an explicit organizational goal, working to remove a culture of blame surrounding the
occurrence and reporting of adverse events, and spending time discussing the issue at top management meetings (Reinertsen, 2000). In most hospitals, nurse administrators play a pivotal role in designing the strategic plan, delegating resources, and advocating for patients to provide quality care, especially quality nursing care. The Shift Coupon could provide nurse administrators with a more accurate measurement where the hospital is and where the hospital needs to go in terms of the quality of care it provides to patients. Second, nurse administrators have the ability to release the resources (financial and human) essential for the identification, development, and implementation of successful quality improvement initiatives. Lastly, since nursing is the primary intervention performed within a hospital (Aiken et al., 1997), nurse administrators are in the unique position to execute the hospital’s mission with a nursing bias. Thus, nursing administrators and non-nursing administrators will have the opportunity to create a hospital work environment that would be viewed by nurses as autonomous, supportive, and protective environments in which to practice nursing.

**Structure of Dissertation**

This dissertation was a methodological study to test the ability of the Shift Coupon to collect adverse events data and to explore the work environment within the hospital setting as it related to adverse events. Chapter 2 reviews the hallmark research studies on adverse events. Chapter 3 provides a detailed description of the study design and data analysis plan. Chapter 4 imparts the study findings. Chapter 5 offers an interpretation of the findings, connection of
the findings to the conceptual and operational models, discussion of the study limitations, and identification of areas for future research.
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Chapter 2
Overview

The purposes of this study were to test the ability of the Shift Coupon to collect adverse events data and to explore the hospital work environment setting as it relates to registered nurses’ reports of adverse events. The findings from this study will then be used to quantify the incidence of adverse events within the hospital setting, to determine the cause(s) of the adverse events, and to understand the current work environment as it relates to adverse events within hospitals. This chapter lays the foundation for the study by providing the reader with an understanding of the current state of the science and by identifying the gap in knowledge this study filled. The four sections that provide this foundation are: terms and definitions used to signify adverse events, data sources used to study adverse events, coupon methodology, and registered nurses’ contribution to healthcare.

Terms and Definitions Used to Signify Adverse Events

A standard definition of quality care is elusive (Attree, 1993; Lanska & Hartz, 1998; Redfern & Norman 1990). Quality care is a concept all healthcare stakeholders strive for but none have been able to fully achieve. For instance, since the inception of the nursing profession, this group of healthcare stakeholders has been trying to define, measure, and provide quality care. Nightingale has been credited as being the first nurse to study quality care by comparing mortality data of British soldiers fighting in the Crimean War to mortality data of the civilian population (Hogston, 1995). Yet, mortality rates may
not be the best measure of quality care or the only type of adverse events data for researchers to study.

So, without a common consistent definition some healthcare stakeholders have chosen to gauge quality care through the identification of “disquality” (Wolff, 1996). In other words, quality of care is judged by indictors measuring events that occurred and/or almost occurred that should not occur if quality care was present. Using this perspective to gauge the quality of care, one traditional quality indicator in the hospital is the occurrence of adverse events (Reed et al., 1998; Thomas et al., 2000a; Wolff, 1996). However, as with quality care, defining and measuring adverse events is a complex task (Walshe, 2000).

A host of terms was found in the literature to represent the concept of adverse events (Andrews et al., 1997; Kellogg & Havens, 2003). In an integrative review of adverse events literature, Kellogg & Havens (2003) found 21 terms were used to denote this concept in the 90 articles reviewed. The most prominent of these terms was adverse events (46.7%), followed by errors (7.8%), incidents (7.8%), and adverse patient occurrences (6.7%). When the articles were separated into disciplines (i.e., medical, health services, and nursing), the term adverse event was still more dominant in representing the concept in medical (57.4%) and health services (42.9%) articles but was tied in frequency at 13.3% with errors, adverse occurrences, and adverse patient outcomes in nursing articles.

Additionally, when Kellogg and Havens (2003) examined the percentage of articles in which the terms were defined, they discovered in only slightly more
than half (58.9%) of the articles that the term was used to signify the concept defined by the researcher. When the articles were divided by disciplines, the researchers found that those published in medical journals defined the terms signifying adverse events in 72.2% of the articles, followed by those published in health services journals (52.4%) and nursing journals (20.0%). Therefore, without this essential piece of information, it is impossible for healthcare stakeholders to compare adverse events findings across studies to determine whether the incidence of adverse events is raising or falling, and to know where to dedicate limited financial and human resource in efforts to improve the quality of care. This sentiment was shared by Scott in a statement she made in a Nursing Times (2002) article:

We need a better definition of an adverse event. There is no way of knowing how serious these incidents were – did they result in the patient being harmed, or was the patient simply inconvenienced? For all we know it could include patients complaining that they received their egg boiled instead of poached. We need a really good baseline so that we know what level of errors are or are not acceptable (Carlowe, 2002. p. 22).

Data Sources Used to Study Adverse Events

According to Walshe (2000), studies on adverse events have used four main data sources: monitoring or screening a patient clinical record, self-reported incident reports by healthcare professionals, computer systems, and case studies. A literature review of 90 adverse event articles by Kellogg and Havens (2003) found monitoring or screening a patient clinical record and self-reported incidents by healthcare professionals were the most widely used data sources. When these articles were divided by discipline (medical, health services, and nursing) according to journal type in which the article was published, it was
discovered that monitoring or screening a patient clinical record was the data source of choice for medical (57.4%) and health services (66.7%) articles. However, the data source preferred by researchers publishing in nursing journals was self-reported incidents by healthcare professionals (66.7%). Additionally, this literature review determined that 66.7% of published articles used one data source, 27.8% used two data sources, 4.4% used three data sources, and 1.1% used all four data sources. In the following subsections examples provided of research studies published using the data source will be discusses.

Monitoring or Screening a Patient Clinical Record

Researchers, using the data source of monitoring or screening a patient clinical record, abstract data from the patient clinical record to determine first whether an adverse event has occurred and then to classify the adverse event (Walshe, 2000). To date, this data source has been utilized predominately in articles reporting on adverse events as an outcome (Kellogg & Havens, 2003).

However, this data source is not without limitations. First, clinical records might be deficient – thus preventing the identification of adverse events (Walshe, 2000; Wilson et al., 1995). In the Quality in Australia Health Care Study, the researchers assessed the completeness of the medical records. They found 53% of the medical records were missing one or more essential medical record elements (Wilson et al., 1995). Likewise, the researchers discovered that the proportion of admissions association with the occurrence of an adverse event was highest in complete medical records and, as the number of essential elements missing increased, the proportion of medical records associated with
an adverse event decreased (Wilson et al., 1995). Similarly, in the study by Neale, Woloshynowych, and Vincent (2001) investigating the underlying causes of adverse events, the researchers found deficient medical records. Of the 103 patients identified with adverse events, only 50 (49%) of the medical records were reasonably clear and well-structured, while the remaining 53 cases exhibited missing information in the medical records. These researchers also experienced difficulty extracting data from 37 medical records because they were so poorly organized.

A second major limitation of medical records as a data source is that medical records are summaries of patient care; therefore, adverse events resulting from or during circumstances not routinely recorded in the medical record may be missed (Walshe, 2000). Additionally, medical records may be missing information because of error or the withholding of information by healthcare professionals and/or patients (Burnum, 1989; Thomas et al., 2000b). Examples of these are: healthcare professionals’ typing and filing mistakes, patients forgetting or deliberately withholding information (such as current medications or time spent in a psychiatric hospital), and physicians censuring charted information which may endanger a patient if the information were to become public or which patients may find objectionable (Burnum, 1989).

A third weakness associated with this data source is inter-rater reliability (i.e., when the same medical record is given to a different reviewer, the reliability with which the second reviewer would have the same results as the first reviewer). It has been “at best moderate to good” (Walshe, 2000, p. 50;
Weingart, 2000) with kappa scores ranging from $K=0.40$ (UCMPS) (Thomas, Studdert, & Brennan, 2002) to $K=0.57$ (HPMS) (Brennan, Localio, & Laird, 1989).

Four major studies have been conducted which use monitoring or screening a patient clinical record as the data source of choice: Medical Insurance Feasibility Study (MIFS), Harvard Medical Practice Study (HMPS), Utah and Colorado Medical Practice Study (UCMPS), and Quality in Australian Health Care Study (QAHCS). A description of each of these studies is presented below.

Medical Insurance Feasibility Study

The mid 1970s saw California in a medical malpractice crisis. One of the paths hypothesized to lessen or resolve the crisis was the development of a patient-disability compensation system. While such systems had been proposed, data concerning the frequency and severity of medically caused disabilities were not available to calculate reasonable cost estimates (California Medical Association & California Hospital Association, 1977). To fill this gap, the California Medical Association and the California Hospital Association co-sponsored The Medical Insurance Feasibility Study (California Medical Association & California Hospital Association, 1977). The purpose of this study was to “accumulate data adequate to determine the cost feasibility of almost any non-fault compensation system, [and] the reported data included the type, frequency and severity of patient-disabilities caused by health care management in California, without regard to legal fault” (California Medical Association &
California Hospital Association, 1977, p. 2). Three physicians (Mills, Boyden, and Rubsamen) served as principal investigators.

The term "potentially compensable events" (PCEs) was used to represent the concept of adverse events in this study. This term was described and included the following definition: a disability caused by health care management.

(1) A Disability is a temporary or permanent impairment of physical or mental function (including disfigurement) or economic loss in the absence of such impairment.
(2) Causation is established when the disability is more probably than not attributable to health care management.
(3) Health Care Management includes both affirmative actions (commission) and inactions (omissions) of any health care provider or attendant, whether or not such actions or inactions constituted legal fault. (California Medical Association & California Hospital Association, 1977, p. 8).

According to the California Medical Association and the California Hospital Association (1977) the universe (population) for the study was all patients discharged from nonfederal, short-term, general hospitals in California during 1974, and the proportionately stratified sample consisted of 20,864 medical records from a sample of 23 representative hospitals. The 23 hospitals participating in the study were selected by first stratifying hospitals in California according to hospital size, ownership, and affiliation with medical school teaching programs. Once the matrix was developed using these criteria, hospitals from each strata representing northern and southern parts of California were selected to participate in the study. A total sample size of 21,000 medical records was calculated based on two study assumptions: approximately 1,000 PCEs would be needed to estimate actuarial costs, and a six percent PCEs rate. The number of
medical records sampled from each of the 23 hospitals was proportional to that hospital’s contribution to all discharges among the participating hospitals. The medical records were selected in each hospital based on 16 strata created from four hospital service categories (general medical, surgical, pediatrics, and obstetrics/gynecology) and where the hospital also divided the year into four quarters.

Potentially compensable events were identified used a two-step process (California Medical Association & California Hospital Association, 1977). First, persons versed in medical auditing techniques were trained to screen the medical records using the Record Screening Form. Any medical record that screened positive for one or more of 20 criteria found on the form was held for the principal investigators to review. At least two of the principal investigators visited each of the 23 participating hospitals to review the positively screened medical records. At the hospital, the principal investigators were given access to the Record Screening Form, medical record, prior and subsequent admission records, and available clinic records. Principal investigators completed a Variation Analysis Form which recorded information on the presence or absence of a PCE. The principal investigators met to discuss each PCE for validity and coding.

Over the course of the study, three tests were conducted to check the data (California Medical Association & California Hospital Association, 1977). Test one (Data Retriever Performance Check) was used to determine the frequency with which the medical record screeners failed to identify a positive
screen (i.e., false negative). A total of 941 medical records previously screened negative were re-screened by medical record experts, and 112 (11.9%) were found to contain a variation. The purpose of the second test (Criteria Adequacy Check) was to determine the frequency with which the screening criteria failed to identify a PCE. The principal investigators reviewed 729 negatively screened medical records and determined 4 (.55%) contained a PCE that was not found using the screening criteria. The Principal Investigator Performance Check was the third test. This test was used to determine the frequency with which PCEs were missed by the principal investigator. Four hundred and fifteen medical records which had been reported negative for PCEs by another principal investigator were re-reviewed. A total of 10 PCEs (2.41%) were located with this test.

Of the 20,864 medical records reviewed, the principal investigators determined 970 PCEs were discoverable in 1974 for an incidence rate of 4.65% (California Medical Association & California Hospital Association, 1977). Inferred statewide, a total of 140,000 PCEs occurred in California in 1974. Of the 970 PCEs, 796 (82.1%) were adverse effects of treatment, 144 (14.8%) were effects of incomplete diagnosis or treatment, and 30 (3.1%) were effects of incomplete prevention or protection. The severity ratings of the PCEs discoverable in 1974 were: 776 (80%) resulted in temporary disability, 63 (6.5%) in minor permanent disability, 37 (3.8%) in major permanent disability, and 94 (9.7%) in death. Additionally, of the PCEs discoverable in 1974, those patients ranging from 50-79
years of age accounted for 46.5% of all PCEs and 71.3% of all PCE deaths, but this age group only constituted 32% of the sample.

Harvard Medical Practice Study

The need for medical malpractice reform was also the driving force behind the Harvard Medical Practice Study. Led by Howard Hiatt, investigators from Harvard University reviewed medical records from hospitals in New York to answer three questions: 1) How frequently do medical injuries occur in hospitals?, 2) What portion of hospital injuries result in litigation?, and 3) What are the economic consequences of medical injuries? (Studdert, Brennan, & Thomas, 2002). By answering these questions additional insight, such as whether the findings from the MIFS were still valid, would be gained in the continuing debate over tort reform (Hiatt et al., 1989).

The term adverse events was used to denote the concept of adverse events. It was defined as “an injury that was caused by medical management (rather than the underlying disease) and that prolonged the hospitalization, produced a disability at the time of discharge, or both” (Brennan et al., 1991, p. 370).

The sample for the study consisted of 30,121 medical records from 51 randomly selected hospitals in New York in 1984 (Brennan et al., 1991). To determine which medical records were reviewed, the researchers started by determining the hospitals that would participate. With the probability of being selected proportional to the number of hospital discharges, hospitals were stratified according to three criteria: ownership, teaching status, and geographic
location (Hiatt et al., 1989). Administrators at 51 hospitals were asked and all agreed to participate in the study (Hiatt et al., 1989). Within each hospital the sampling of medical records was determined by the number of discharges, the patient’s age, and the diagnosis-related group (DRG) (Hiatt et al., 1989). Undersampling of medical records occurred for normal deliveries and patients over the age of 70 years; oversampling of medical records occurred for births with complications and cases from high-risk specialties (Hiatt et al., 1989; Leape et al., 1991). Overall, the almost 31,000 medical records reviewed represented 1 in 84 hospital discharges in 1984 (Hiatt et al., 1989).

Adverse events were identified using a two-step process. First, nurses and medical record administrators were trained to screen the selected medical records using 18 criteria (Hiatt et al., 1989). If a medical record screened positive for one or more of the criteria, the medical record was given to two physician reviewers to review. Physician reviewers were local, board-certified internists and surgeons trained by the research staff to review the medical records using the Adverse Event Analysis Form (Hiatt et al., 1989). The physician reviewers were asked to describe the adverse events and the connection of the adverse event to medical care and to estimate the degree of impairment the adverse event caused the patient (Leape et al., 1991). If the physician reviewers identified different adverse events or disagreed about the presence of an adverse event, the medical record was reviewed by a physician supervisor (Hiatt et al., 1989). Judgment concerning the causation and negligence of the adverse event was determined by having the physician
reviewers rate their confidence on the determination of causation and negligence on a six point scale: 1 representing little or no evidence; 2 slight evidence; 3 not quite likely (less than 50:50 odds but a close call); 4 more likely than not (greater than 50:50, but a close call); 5 strong evidence; and 6 virtually certain evidence (Hiatt et al., 1989). Classification of the adverse event by type of injury was then performed by one investigator after reading the descriptions of the cases provided by the physician reviewers (Leape et al., 1991).

Pilot studies were conducted before the main study to evaluate the study design and the medical record review process (Hiatt et al., 1989). In the first pilot study, the researchers tested the efficacy of reviewing medical records to identify adverse events. In two hospitals, adverse events identified by a two-stage medical record review process were compared with risk management and litigation data (Brennan et al., 1990). The results indicated the medical record review process had a sensitivity of 80% for identifying adverse events (Brennan et al., 1990). In the second pilot study, multiple reviews of medical records from two teaching hospitals were conducted. Evaluating the first step of the process, medical record screens using the Hospital Record Screening Form completed by medical record administrators were compared with medical record screens using the same form completed by senior physicians (Brennan, Localio, & Laird, 1989). The results found the sensitivity for the medical record administrators was 84.5% and the specificity was 71.8% (Brennan et al., 1989). The second part of the pilot study compared the implicit reviews of positively screened medical records conducted by physician reviewers. The findings supported the reliability of the
medical record review (Spearman Brown Rm=0.78, m=2) and construct validity (Kappa=0.57) (Brennan et al., 1989).

Of the approximately 31,000 medical records screened, 7,743 (roughly 25%) medical records screened positive for one or more of the 18 criteria (Brennan et al., 1991; Hiatt et al., 1989). Physician reviewers identified 1,113 adverse events in hospital admissions in 1984 and 280 adverse events due to negligence during 1984 admissions (Brennan et al., 1991). Statewide, the researchers estimated a 3.7% incidence rate of adverse events and a rate of adverse events due to negligence of 1.0% (Brennan et al., 1991). Almost 28% (27.8%) of the adverse events were due to negligence (Brennan et al., 1991).

According to Brennan et al. (1991) the consequences of the adverse events on the patients were: 56.8% resulted in minimal impairment with recovery within one month, 13.7% moderate impairment lasting more than one month but less than six months, 2.8% moderate impairment lasting longer than 6 months, 6.5% permanent impairment, and 13.6% death (note: no judgment on impairment could have been made for 6.6% of the adverse events). Extrapolated to the state of New York in 1984, researchers estimated there were 98,609 adverse events resulting in 6,357 patients suffering permanent impairment and 13,451 patient deaths (Brennan et al., 1991).

Additionally, rates of adverse events increased as the age of the patient increased, with patients 65 years and older having more than double the risk of an adverse event than patients age 16 to 44 years (Brennan, et al., 1991), such that patients age 64 years and older represented 27% of the hospitalized
population in 1984 but accounted for 43% of the adverse events (Brennan et al., 1991; Leape et al., 1991). The rates of adverse events were also affected by the clinical specialty based on DRG groupings, with vascular surgery, thoracic and cardiac surgery, and neurosurgery having higher rates of adverse events (Brennan et al., 1991). However, negligence rates did not differ based on specialty (Brennan et al., 1991).

The types of adverse events were divided into two categories, operative and nonoperative. Examples of adverse events falling in the operative category were: wound infection, technical complication, and surgical failure. Examples of adverse events contained in the nonoperative category were: drug-related, diagnostic mishap, and fall (Leape et al., 1991). Almost 48% (47.7%) of the adverse events fell into the operative category, with wound infection the most common type of operative adverse event (accounting for 13.6% of the adverse events) (Leape et al., 1991). The remaining 52.3% of the adverse events fell in the nonoperative category, with drug-related complications the most common type of nonoperative adverse event (accounting for 19.4% of the adverse events) (Leape et al., 1991).

Researchers also determined that the location where care was provided related to the percentage of adverse events. Within the hospital, the highest percentage of adverse events occurred in the operating room (41.0%) followed by the patient’s room (26.5%) (Leape et al., 1991).
Quality in Australian Health Care Study

The Quality in Australian Health Care Study (QAHCS) followed the methods used in the HMPS; however the driving force behind the two studies was different. The HMPS was conducted to glean insight into tort reform, focusing on the concepts of adverse events and negligence. The QAHCS, on the other hand, was envisioned as a quality improvement study (Wilson et al., 1995). The purpose of the QAHCS was to determine the incidence rate of adverse events in Australian hospitals.

The term adverse event was used to signify the concept. The definition of the term as utilized in this study was: “(1) an unintended injury or complication which (2) results in disability, death, or prolongation of hospital stay, and is (3) caused by health care management rather than the patient’s disease” (Wilson et al., 1995, p. 461).

The population for the study was all patient admissions to public and private hospitals in Australia in 1992 (estimated to be 2.82 million admissions) (Wilson et al., 1995). The sample for the study was 500 medical records from 30 hospitals based on the assumptions of an adverse event incident rate of hospital admission of 3.5%, with the incident rate ranging from 2.8% to 4.2% for individual hospitals.

For convenience, the 28 hospitals which participated in the study were all located in two states in Australia. The hospitals were randomly selected based on six strata (teaching or principal referral hospitals, major referral hospitals, major rural base hospitals, district high activity level hospitals, district medium
activity level hospitals, and private hospitals) with the number of hospitals per stratum proportional to the total number of eligible admissions within that stratum (Wilson et al., 1995). A minimum of 520 admissions per hospital was then randomly selected.

A two-stage review process of the medical records was conducted in this study. The first stage consisted of registered nurses screening medical records using 18 criteria contained on the RF1 form (Wilson et al., 1995). Stage two comprised physicians completing the RF2 form after reviewing the RF1, the medical record, and any relevant previous admission(s) to determine whether an adverse event had occurred (Wilson et al., 1995). Each medical record was reviewed by two physician reviewers; disagreement concerning the presence of an adverse event, causation, type of adverse event, or preventability was handled by having the two physicians review the medical record again and present their RF2 forms to a third physician reviewer. Consensus was then obtained by the physician reviewers. A scale from 1-6 (1 representing virtually no evidence and 6 representing virtually certain evidence) was used to rate causation and preventability of the adverse event. A causation rating of 2 or higher was needed for an adverse event to be present.

The researchers examined each stage of the medical record review process. Stage one of the review process was assessed in two ways. First, agreement between registered nurses was determined by having 2,574 medical records reviewed a second time by another registered nurse. There was an 84% agreement for the presence of positive criterion (Wilson et al., 1995). Second,
the agreement between registered nurses and physician reviewers was ascertained by asking the physician reviewers whether they agreed with the registered nurse’s positive screen. There was complete agreement on 98.7% of the medical records. Additionally, the sensitivity of the first stage was determined by having the physician reviewers complete RF2 forms on 413 medical records screened negative by the registered nurses for any of the 18 criteria. Three adverse events were identified during this evaluation. The sensitivity of the stage was calculated to be 97.6% and the specificity to be 67.3%. Evaluation of the second stage of the review process was also conducted. The agreement between physician reviewers concerning the presence of an adverse event was 80%.

A total of 14,179 medical records from 1992 were reviewed in this study, 6,210 (43.7%) of which screened positive for one or more of the 18 screening criteria (Wilson et al., 1995). The study found 2,353 (16.6%) adverse events in the medical records reviewed. Nationwide, the study estimated 470,000 admissions were associated with adverse events. Almost half (46.6%) of the adverse events resulted in patient impairment of less than one month, 30.5% impairment of 1 to 12 months, 13.6% permanent impairment, and 4.5% death.

The proportion of admissions associated with adverse events increased in patients over the age of 30 years (Wilson et al., 1995). Additionally, admissions associated with patient impairment lasting longer than one month or death increased with age. Differences in the proportion of adverse events were also seen by medical specialties (as determined by major diagnostic category [MDC]).
There were lower proportions of adverse events associated with the following diagnoses: ear, nose, and throat; pregnancy; childbirth; and puerperium. Higher proportions were founded for the following diagnoses: infectious and parasitic diseases; injuries; poisonings and toxic effects of drugs; digestive system; circulatory system; and musculoskeletal system.

Utah and Colorado Medical Practice Study

A fourth large-scale medical record review study was conducted on medical records from two states (Utah and Colorado) from 1992. The study was designed to accomplish two purposes: to determine whether the findings from the HMPS were similar to findings from others states and other years, and to add to the adverse event prevention research base (Thomas et al., 2000). Additionally, this study would lend possible insight into the reasons for the vast difference in the adverse event incidence rates between the HMPS (3.7%) and the QAHCS (16.6%).

The term adverse events was used to denote the adverse events’ concept. The definition of the term as applied in this study was “an injury caused by medical management (rather than the disease process) that resulted in either a prolonged hospital stay or disability at discharge” (Thomas et al., 2000, p. 263).

The sample for the study consisted of 5,000 hospital discharges from Utah and 10,000 from Colorado. The hospitals, from which these medical records would be reviewed, were selected by first stratifying hospitals in each state according to size, location, teaching status, and ownership (Thomas et al., 2000; Thomas, Orav, & Brennan, 2000b). At least one hospital from each of the total of
11 strata in Utah and 15 strata in Colorado was selected, resulting in 13 hospitals in Utah and 15 hospitals in Colorado (Thomas et al., 2000; Thomas et al., 2000b). The number of medical records reviewed from each hospital was proportional to the number of discharges at each hospital to the total number of discharges of all hospitals in the study (Thomas et al., 2000; Thomas et al., 2000b).

The methods from the HMPS were followed in this study with three exceptions (Thomas et al., 1999; Thomas et al., 2000; Thomas et al., 2000b; Thomas, Studdert, & Brennan, 2002). First, each positively screened medical record was reviewed by one physician reviewer, instead of two physician reviewers as in HMPS. Second, the training process for nurse and physician reviewers was more standardized. All nurses and physician reviewers were medical record reviewers for peer review organizations within their own state. Both nurses and physicians all received one day of training from two of the study's investigators. Finally, the quality controls of the medical record review process were more extensive. One investigator re-reviewed 50 random, negative for adverse event medical records of physician reviewers who were two standard deviations below the group mean of reviewers in the state. If greater or equal to 10% of the medical records were classified as adverse events by this investigator, the medical records from the outlying physician reviewer were substituted with re-reviews from another physician reviewer blinded to the purpose of the re-review. Medical record reviews from three physicians (one physician in Utah and two physicians in Colorado) were replaced by re-reviews.
Additionally, two reviewers removed false-positive adverse events by confirming each adverse event identified by the physician reviewers which fulfilled the definition as applied in the study. Thirteen false positives were detected and removed from the study.

The reliability of the second stage of the medical record process was evaluated in this study; whereas, the first stage was not evaluated because it did not deviate from the process used in the HMPS (Thomas et al., 2000; Thomas et al., 2002). Five hundred medical records (400 judged to contain no adverse events and 100 judged to contain an adverse event) were re-reviewed, maintaining the 2:1 Colorado to Utah proportion by six physicians in Colorado and four physicians in Utah (Thomas et al., 2000). The percent agreement was 79% and the Kappa was 0.4 (Thomas et al., 2000; Thomas et al., 2002).

Of the medical records reviewed by nurses, 2,014 (20.6%) medical records in Colorado and 854 (17.3%) medical records in Utah were screened positive for one or more of the 18 criteria (Thomas et al., 2000). Four hundred and eighteen adverse events (21.1%) were identified in medical records from Colorado and 169 (20.1%) adverse events were identified in medical records from Utah by the physician reviewers (Thomas et al., 2000; Thomas et al., 2000b). The adverse event incidence rate was 2.9% for each state (Thomas et al., 2000). Statewide, it was estimated that 11,578 adverse events in Colorado and 5,614 adverse events in Utah occurred in 1992 (Thomas et al., 2000). Nationally, it was estimated that 976,404 adverse events and 64,809 deaths occurred in 1992 (Thomas et al., 2000). Adverse events associated with
operations comprised 44.9% of all adverse events identified (Thomas et al., 2000). The leading types of operative adverse events were technical (29.9%), bleeding (17.1%), and wound infections (11.4%) (Thomas et al., 2000). The leading cause of non-operative adverse events was related to adverse drug events (Thomas et al., 2000).

Hospital locations where the greatest percentage of adverse events occurred were the operating room (39.5%) and the patient’s room (21.6%) (Thomas et al., 2000). Surgery (46.1%), internal medicine (23.2%), and obstetrics/midwifery (9.2%) were associated with the largest percentage of adverse events (Thomas et al., 2000).

Differences between the Utah and Colorado Medical Practice Study and the Quality in Australian Health Care Study

There are many similarities between the UCMPS and the QAHCS studies. First, both studies used the same term (adverse events) and definition of adverse events. Next, each study investigated adverse events from approximately 15,000 medical records from 1992. Finally, the general methods utilized in the studies were the same, having roots in the CMIFS and the HMPS. A two-stage medical record review process was used. Stage one consisted of trained nurses screening medical records based on specified criteria. Any medical record screening positive for one or more of the criteria was further analyzed in stage two. In stage two, physician reviewers used forms designed to guide them in making decisions concerning the presence of adverse events, preventability of the adverse event, and negligence using a 1-6 confidence rating scale. The
reliability of the physician reviewers to detect adverse events was similar in both studies (K=0.40 for UCMPS and K=0.55 for QAHCS) (Thomas et al., 2000c).

Yet, the results of UCMPS and QAHCS were different. The UCMPS study found an incidence rate of adverse events of 2.9% (Thomas et al., 2000); whereas, the investigators from the QAHCS calculated an adverse events incidence rate of 16.6% (Wilson et al., 1995). Therefore, in an effort to understand this difference, researchers from both studies teamed up to conduct an investigation into the methods and characteristics of the studies. Three stages were used to study the differences: investigators from each study reviewed and discussed the research process of their counterpart’s study; Australian data (clinical summaries) were analyzed as if it were part of the UCMPS study; and comparison was made of casemix, population, patient, and hospital characteristics in each study.

Stage one examined the methodological differences between the two studies. Five primary variations were found: 1) nurse reviewers in the UCMPS used age-related time constraints for readmissions, whereas the QAHCS did not; 2) UCMPS used a higher confidence rating score for causation (≥ 4) compared to QAHCS (≥ 2); 3) UCMPS used one physician reviewer while QAHCS used two physician reviewers; 4) UCMPS counted only adverse events that caused or were caused during the index admission and discovered during the index admission while the QAHCS accepted adverse events that occurred before or during an index admission and were discovered before, during, or after the index admission; and 5) UCMPS did not include some types of adverse events
included in the QAHCS (Thomas et al., 2000c). The reason for these five methodological differences can be traced back to the general purposes of the studies: UCMPS related to medical malpractice reform; QAHCS related to quality improvement. Compensating for these five methodological differences, the investigators were able to close the gap in the incidence rates of the two studies from a five-fold difference (2.9% UCMPS vs. 16.6% QAHCS) to a three-fold difference (2.9% UCMPS vs. 10.6% QAHCS) (Thomas et al., 2000c).

Additionally, the analysis identified another five possible reasons for the continued three-fold difference in the incidence rates between the two studies: 1) physician reviewers used in the UCMPS were generalists, whereas the physician reviewers in the QAHCS were specialists; 2) differences in the patterns of diseases and co-morbidities in the United States and Australia; 3) variation in the information contained in medical records and how it was recorded; 4) reviewer behavior discrepancies; and 5) variation in the standards of care between the two countries (Thomas et al., 2000c). However, the statistical effect of these possible reasons was not determined in the study.

**Self-Reported Incident Reports**

A second source of adverse events data is self-reported incident reports by healthcare professionals (Walshe, 2000). Researchers using this data source analyze reported adverse events from healthcare professionals. Examples of the formats used to report this type of adverse events data are institutional incident reports and observational reports.
This data source is plagued by two major limitations. First, each healthcare professional possesses varying definitions of what constitutes an adverse event (Andrews et al., 1997; Schimmel, 1964; Wakefield, et al., 1999; Walshe, 2000; Walshe, Bennett, & Ingram, 1995; Vinen, 2000). Resultantly, an adverse event that one healthcare professional would report may not be reported by another healthcare professional. Second, the dedication and desire to report adverse events may differ among healthcare professionals (Andrews et al., 1997; Leape, 1999; Schimmel, 1964; Walshe, 2000; Walsh, et al., 1995; Vincent, Stanhope, & Crowley-Murphy, 1999). Hence, some healthcare providers may report adverse events more liberally than others.

Below are four examples of studies using this data source, starting with two classic studies published in the 1960s.

Due to medical progress around the 1960s, healthcare professionals started viewing negative results caused by medical advancements, known as the “Diseases of Medical Progress” (Barr, 1955). These “diseases” are reactions to medical interventions/treatments that are considered to be side-effects that may not be due to improper medical care. In an effort to determine the frequency of all adverse events, not just adverse events that cause major consequences for patients, Schimmel (1964) conducted an eight-month study in one hospital.

The term used to signify the concept of adverse events was episodes. This term was defined as “untoward events, complications, and mishaps” (Schimmel, 1964, p. 100). An adverse event was included in the analysis “if it resulted from acceptable diagnostic or therapeutic measures deliberately
instituted in the hospital" (Schimmel, 1964, p. 100) and it was excluded if it “arose from inadvertent errors by physicians or nurses, or if they occurred as postoperative complications or as nonspecific psychiatric disturbances” (Schimmel, 1964, p. 100). Adverse events were reported to the researcher by house officers. Data included in the house officers’ report of an adverse event were: signs, symptoms, laboratory results, suspected causes, duration, need for treatment, and progression of hospitalization.

Over the course of the eight-month study, 1,252 patients were admitted to the medical service (Schimmel, 1964). House officers reported 240 adverse events occurring in 198 different patients, resulting in an incidence rate of 20%. Reported adverse events were grouped into six categories: reactions to therapeutic drugs (49.6%), reactions to transfusions (12.9%), reactions to diagnostic procedures (12.1%), reactions to other therapeutic procedures (10.0%), acquired infections (9.6%), and miscellaneous hospital hazards (5.8%). The following are examples of adverse events that occurred in each of the categories: reactions to therapeutic drugs -- dose related hazards and allergic reactions; reactions to transfusions -- fever of at least 101 degrees Fahrenheit and development of jaundice; reactions to diagnostic procedures -- infection following cardiac catheterization and large hematomas at the puncture site of carotid arteriograms; reactions to other therapeutic procedures -- pneumothorax after thoracenteses and urinary tract infection after bladder catheterization; acquired infections -- bronchopneumonia and cutaneous abscess; and
miscellaneous hospital hazards -- patient falls and lacerations during the removal of adhesive tape.

Of the 240 adverse events reported, 45.8% resulted in minor harm to the patient (consequence of the adverse event was short and subsided without treatment), 34.2% in moderate harm (patient required treatment or required an extended hospitalization because of the adverse event), and 20% in major harm (adverse event was life threatening or contributed to the patient’s death) (Schimmel, 1964). The age of patients who suffered an adverse event were not significantly different than those patients who did not suffer an adverse event with the exception of two categories: patients with reactions to therapeutic procedures (mean age of 62 years for those who suffered an adverse event versus 53 years for those who did not suffer an adverse event) and miscellaneous hospital hazards (mean age of 65 years for those who suffered an adverse event versus 53 years for those who did not suffer an adverse event).

The average length of stay for patients experiencing an adverse event (28.7 days) was longer than patients not experiencing an adverse event (11.4 days) (Schimmel, 1964). However, the longer length of stay could not be attributed solely to the occurrence of the adverse event. In fact, the addition of a week to the length of stay because of an adverse event occurred in less than 12 patients suffering an adverse event. Conversely, it was suggested that the longer the patient stayed in the hospital, the more likely the patient was to experience an adverse event.
McLamb & Huntley (1967) conducted another study during the 1960s focusing on the impact of “Diseases of Medical Progress” (Barr, 1955). The purpose of the study was to determine the frequency, severity, and types of adverse events that occur to hospitalized patients on a medical service. The researchers conducted the study in one hospital for 30 days in 1965.

The term episode was used to denote the adverse event concept in this study. It was defined as “any response to medical care in the hospital that is unintended, undesirable, and harmful to the patient” (McLamb & Huntely, 1967, p. 469). Adverse events investigated in this study needed to have both resulted from and occurred during the index hospitalization.

Each day during the study, the investigators would contact the residents and ask them to report the occurrence of any adverse events on his/her service over the past 24 hours. Thus, each resident was responsible for identifying and reporting adverse events. Included in the resident’s report about an adverse event was the following information: signs, symptoms, laboratory data, suspected cause, duration, manifestation, need for treatment, and effect on patient’s hospitalization (McLamb & Huntley, 1967).

During the 30-day study period, 240 patients were admitted or transferred to the medical service (McLamb & Huntley, 1967). Sixty-three adverse events were identified in 47 patients, resulting in a 20% incidence rate. Of the 63 reported adverse events, 37 were classified as minor (adverse event did not require treatment and did not extend the patient’s hospitalization), 22 were moderate (adverse event did require treatment or extended the patient’s
hospitalization by one day or more), and 4 were major (adverse event caused the permanent disability or death of the patient).

Adverse events reported in this study were grouped into three categories: drug reactions, diagnostic and therapeutic procedures, and ward accidents. Almost half (45%) of the adverse events fell into the first category (drug reactions) (McLamb & Huntley, 1967). Ward accidents accounted for 28% of the adverse events. Examples of adverse events included in this category were medication errors, patient falls, and errors in transferring patients. Lastly, 27% of the adverse events were classified as belonging to the diagnostic and therapeutic procedures categories.

When comparing those patients who suffered an adverse event with patients who did not, the researchers found the only remarkable difference was the length of stay -- length of hospitalization of those patients suffering an adverse event was 17.2 days and the length of hospitalization of those patients not suffering an adverse event was 10 days (McLamb & Huntley, 1967). While the suffering of an adverse event prolonged the length of stay an average of 1.3 days, it was not the sole reason for the variance in the length of hospitalization. Other possible reasons included the patient acuity and length of stay related to diagnosis (i.e., patients who stay in the hospital longer are more prone to adverse events because of increased exposure to the healthcare process).

A third study using the data source of self-reported incidents by healthcare professionals was conducted by Andrews and colleagues (1997). This prospective observational study used trained ethnographers to record adverse
events identified by healthcare professionals during day-shift, weekday, regularly scheduled meetings, and shift changes. The study was conducted in one hospital on three units (two intensive care units and one surgical unit) and included patients admitted between July 1, 1989 and March 31, 1990.

The term adverse events was used to represent the concept of adverse events. An adverse event was defined as a “situation in which an inappropriate decision was made when, at the time, an appropriate alternative could have been chosen” (Andrews et al., 1997, p. 310).

A total of 2,183 adverse events were identified in this study, with an adverse event having been identified as occurring to 480 of the 1,047 patients (45.8%) admitted to the units (Andrews et al., 1997). The adverse events were grouped into 9 categories: monitoring and daily care (29.3%), complications (19.5%), treatment (13.4%), surgery (10.5%), drugs/medications (9.3%), diagnosis (7.5%), other (6.9%), nutrition (2.3%), and anesthesia (1.2%). The results of the adverse event on the patients were grouped into three categories: serious (21.2%), minor (1.8%), and no harm to patient (14.7%); for 62.3% of the adverse events there was no report as to the seriousness of the adverse event. Three categories were used to classify the causes of the adverse events: individual (e.g., poor technical performance and poor judgment), interactive (e.g., interaction between individuals and interaction between individual and hospital), and administration (e.g., defective equipment and inadequate staffing). For just over half of the adverse events, one or more of the causes were named: 37.8%
caused by individuals, 15.6% caused by interactions, and 9.8% caused by administration.

This study also investigated factors relating to the patient experiencing an adverse event. The average age of a patient suffering an adverse event was 48 years as opposed to 45.8 years of age for a patient not suffering an adverse event (Andrews et al., 1997). Patients with higher acuity levels were subjected to more adverse events than patients with lower acuity. Also, the likelihood of experiencing an adverse event increased by 6% for each day of hospitalization, with the average stay of 23.8 days for patients suffering an adverse event and 8.8 days for patients not suffering an adverse event. Therefore, the sicker the patient was and/or the longer the patient stayed in the hospital, the greater the chance the patient experienced an adverse event.

A fourth study focusing on the management of acute pain used self-reported incidents by healthcare professionals as the adverse events data source. Chen, Ma, Chan, and Oh (1998) conducted a 12-month investigation (May 1996 to April 1997) of an incident reporting program in one hospital in Hong Kong. All members of the anaesthetic staff, acute pain team, and the ward staff were encouraged to report adverse events relating to pain management using an incident questionnaire. Information collected on this questionnaire included: description of the adverse event, severity, contributory factors, and patient consequences.

The term used in this study to denote the adverse event concept was incident. The term was defined as “an incident that affected, or could have
affected, the safety and well-being of the patient whilst receiving a pain relief method that is supervised by the anaesthetist" (Chen et al., 1998, p. 731.).

A total of 1,275 patients received pain relief treatment over the course of the 12-month study, with 53 incidents in pain management being reported in 43 patients (3.4%) (Chen et al., 1998). Types of adverse events were grouped into the following categories: infusion delivery circuit (e.g., epidural catheter malposition and wrong route), pump (e.g., PCA programming and PCA not turned on), drug administration (e.g., wrong drug and overdose), clerical (e.g., incorrect pump program charted and pain observation chart not completed), and patient factors (e.g., confusion and inappropriate use of PCA). The most common adverse events based on these categories were infusion delivery circuit (26.4%), pump (26.4%), drug administration (22.6%), and patient factors (15.1%).

The severity/consequences of the adverse events were: no physiological change (39.6%), minor/transient change (30.1%), inadequate analgesia (26.4%), major physiological change (13.2%), and high dependency/intensive care (9.4%) (Chen et al., 1998). No patient deaths were reported. Adverse events usually occurred on the general wards, occurring mainly on general surgical, orthopedic, and gynecology units.

**Computer Systems**

Computer systems comprise the third data source identified by Walshe (2000). This data source uses hospital or national databases to identify adverse events. To date, this data source has been of restricted use because of the
limited availability of computer systems (especially within hospitals) and the controlled number of adverse events that are able to be identified using this data source (Walshe, 2000). And, while administrative data are more readily available (as compared to data from hospital computer systems), relatively inexpensive, and can provide insight into the characteristics of a large patient population (Best et al., 2002), the data do not have the ability to identify equally all types of adverse events (O’Hara & Carson, 1997). For instance, the structure of ICD-9 coding lends itself more to recognizing more surgical than medical adverse events (O’Hara & Carson, 1997).

Additionally, many researchers question the validity and reliability of these data to describe and identify adverse events (Best et al., 2002; Fisher et al., 1992; Hannan, Kilburn, Lindsey & Lewis, 1992). For instance, Knight, Yardley, and Jones (1991) conducted a study to investigate the accuracy of computer-based operative records by comparing computerized records to records kept by the operating surgeons in a log book. Over the 3 months, 662 cases were performed, however, only 642 (97%) cases were found in the database. A total of 173 errors were found in the medical records in the computerized system, with 139 of these errors being the recording of wrong operative details. These researchers concluded that computer systems do not necessarily improve current research because the data entered into the database may contain inaccuracies. Other problems related to the use of computer systems as a data source concern variations in coding caused by inconsistencies among hospital and/or hospital staff and the incorrect coding of hospital abstracts (Kovner &
Gergen, 1998). Below are accounts of three studies which used computer systems as the data source.

One study which used the data source of computer systems was conducted by O’Hara and Carson (1997). In this study, the researchers used the Victorian Inpatient Minimum Database to determine the nature and frequency of adverse events for the year 1994-1995. Within the Victorian Inpatient Minimum Database, information concerning a patient’s diagnostic and procedural information was coded using the International Classification of Diseases (ICD-9-CM) and each case was assigned an Australian National Diagnosis Related Group (AN-DRG). Australian National Diagnosis Related Groups associated with the occurrence of an adverse event were ranked to determine which contributed to the volume of adverse events and which were associated with the greatest risk. Through the querying of the database, the researchers were able to fulfill the purpose of the study.

The term adverse events was used to signify the concept; however, no definition for the term was given in the article. The researchers tested for the presence of adverse events through the classification of external causes of injury (E-code) used in ICD-9-CM codes (O’Hara & Carson, 1997). Three groups of E-codes were used in this study: 1) E870-E876-misadventures to patients during surgical and medical care; 2) E878-879-surgical and medical procedures as the cause of the abnormal reaction of patient or later complication, without mention of misadventure at the time of the procedure; and 3) E930-E949-drug, medicinal, and biological substances causing adverse effects in therapeutic use.
During 1994-1995, a total of 1,248,021 patient discharges were reported in the Victorian Inpatient Minimum Database, with 62,949 (5%) of these discharges containing one or more of the E-codes listed above for a total of 67,260 adverse events (O'Hara & Carson, 1997). Broken into the three groups of E-codes listed above, 80.8% of the adverse events were complications of medical and surgical procedures (85.7% of which were surgical complications); 19.3% were reactions caused by drugs; and 1.7% were related to medical and surgical care (76.0% of which were accidental cuts, punctures, perforations, or hemorrhages). Overall, 65% of all adverse events were related to surgical complications. The AN-DRGs associated with the highest volume of separations with adverse events were: other surgical procedures for injury without co-morbidity or complication (915 of the 1,462 [62.6%] separations were with an adverse event); major joint and limb reattachment procedure with co-morbidity or complication (2,448 of the 3,977 [61.6%] separations were with an adverse event); and major small or large bowel procedures with co-morbidity or complications (1,716 of the 2,792 [61.5%] separations were with an adverse event).

A second example of a study using the data source of computer systems was conducted by Kovner and Gergen (1998). The researchers used discharge data from 1993 to investigate the relationship between nurse staffing and surgical adverse events while controlling for hospital characteristics.

The term adverse events was used to denote the concept of adverse events. No definition was given for the term. However, the researchers did
classify the adverse events as either nurse-sensitive (e.g., venous thrombosis or pulmonary embolism after major surgery, urinary tract infections after major surgery, and pneumonia after an invasive vascular procedure) or non-nurse sensitive (e.g., pulmonary comprised after major surgery, acute myocardial infarction after major surgery, and mechanical complications because of devise, implant, or graft) (Kovner & Gergen, 1998).

Data from the American Hospital Association Annual Survey on hospital characteristics were matched by hospital identification number to discharge data from the Nationwide Inpatient Sample (Kovner & Gergen, 1998). Ten of the 17 states in the NIS were included in the sample. Data from a total of 506 hospitals from the 10 states were used in the final analysis. Nine HCUP QI relating to post-surgical outcomes were used to identify adverse events.

Significant inverse relationships were found to exist between full-time equivalent registered nurses per adjusted inpatient day and three of five nurse-sensitive adverse events (urinary tract infection after major surgery, pneumonia after major surgery, and thrombosis after major surgery) (Kovner & Gergen, 1998). No significant relationship was found between full-time equivalent registered nurses per adjusted inpatient day and two nurse-sensitive adverse events (pneumonia after an invasive vascular procedure and thrombosis after invasive vascular procedure). However, one of the four non-nurse-sensitive adverse events (pulmonary comprise) was found to have a significant inverse relationship with full-time equivalent registered nurses per adjusted inpatient day.
Another study by Kovner, Jones, Zhan, Gergen, and Basu (2002) investigated the impact of nurse staffing on adverse events between 1990 and 1996 while controlling for hospital characteristics. Like the above study by Kovner and Gergen (1998), the data sources for this study were the American Hospital Association Annual Survey of Hospitals for nurse staffing data and the National Inpatient Sample for the adverse events data. The sample consisted of 530-570 hospitals for each of the years between 1990 and 1996, with 187 hospitals included in the analysis for each of the seven years.

The term adverse events was used to signify the concept of adverse events. While no explicit definition was given for the term, four types of adverse events were used to measure the concept. These four types of post-surgical adverse events (i.e., venous thrombosis or pulmonary embolism after major surgery, pulmonary comprise after major surgery, urinary tract infections after major surgery, and pneumonia after major surgery) were described as being sensitive to nursing care. The results of the study showed that registered nurse hours per adjusted patient day were inversely related to all four of the adverse event types but were only statistically significant for pneumonia after major surgery (Kovner et al., 2002).

**Case Studies**

The fourth data source identified by Walshe (2000) was case studies. This data source involves the analysis of a case or a set of similar cases for the purpose of determining causal factors for why adverse event(s) occurred. Data collected are typically qualitative in nature but can be aggregated and converted
into rates, such as incidence rates of adverse events (Walshe, 2000). However, this utilization of the data is rarely seen in the literature. Instead, case studies that have been published typically analyze a single adverse event and the causes of the adverse event in order to provide the reader with a complete understanding of the adverse event. The critical incident technique provides an example of the data that is seen when using this data source. Two examples of studies using the case study data source are presented below.

An example of a study using the case study data source was conducted by Meurier (2000). Using Reason’s Organizational Model of Accident (Reason, 1990), Meurier investigated an adverse event which lead to the injury of a hospitalized patient after she jumped out of a hospital window. The term error was used to signify the concept of adverse event in the study. No definition for the term was given in the article.

The case under investigation involved a 34-year old woman who was admitted to a first floor, 19 bed medical unit following an overdose of tranquillizers mixed with alcohol (Meurier, 2000). The nursing staff for the day shift during which the adverse event occurred consisted of a registered nurse, an enrolled nurse, a health care assistant, and a second-year nursing student. This staffing level was typical for this shift, even though staff continually complained to management about the unit being understaffed to adequately care for patients.

During the shift in which the patient jumped, the patient continued to demand tranquillizing drugs, even after receiving the medically ordered dose during that shift (Meurier, 2000). She expressed hostility and verbally abused the
staff on multiple occasions during the shift. The nursing student was assigned to maintain discrete and continuous observation of the patient. The nursing student left the patient to assist the health care assistant change an incontinent patient on the same unit. When the nursing student returned, she did not see the patient she was assigned to observe. After searching the unit, she found the patient had jumped out of the window in the bathroom area and was lying on the ground conscious and injured.

The registered nurses sent the enrolled nurse and the nursing student to examine the patient while she paged the duty medical officer (Meurier, 2000). After five minutes a nurse from another unit called back to inform the registered nurse that the medical officer was busy with another patient. The registered nurse asked the nurse from the other unit to ask the medical officer again to come to the phone. Five minutes later the medical officer called the registered nurse and stated he would go down immediately and examine the patient. Within 20 minutes the enrolled nurse and nursing student returned to the unit and informed the registered nurse that the patient had sustained an open fracture of her tibia and fibula and possibly a fractured pelvis. The patient was transported to the emergency room for care.

The analysis of this adverse event was done in three stages according to Reason’s model: stage one -- identification of possible “active failures” of nursing management; stage two -- identification of local conditions that may have triggered the “active failures” and; stage three -- identification of the “latent failures” or organizational factors that contributed to the work conditions or the
“active failures” (Meurier, 2000). Some of the recognized problems found in stage one were: delegation of the patient to an inexperienced staff member (i.e., nursing student); registered nurse should have made the senior clinical nurse aware of the situation on the unit; registered nurse did not ask the physician to assess the patient the morning of the adverse event; and the patient’s potential suicidal intent should have been considered.

Analysis during stage two identified five preexisting work conditions that may have contributed to the adverse event (Meurier, 2000). Examples of these possible work conditions are: inadequate unit staffing to provide care, shortage of appropriately skilled or experienced staff on the unit, and the lack of safe windows (i.e., windows that would not open wide enough to permit a person to jump out). Lastly, stage three identified five areas that may have contributed to the adverse event: staffing of the unit (e.g., need for more staff on the unit); support of the management (e.g., perception of the nursing staff that the management expected them to perform regardless of the unit demands); communication (e.g., lack of communication during morning report between night-shift nurses and day-shift nurses regarding the patient’s condition); policies (e.g., absence of a policy regarding the management of a potentially suicidal patient); and training (e.g., staff did not possess that training or experience to care for the patient).

The study conducted by Stanhope, Vincent, Taylor-Adams, O’Connor, and Beard (1997) is another example of a study which used the case study data source. For this case study, the researchers investigated an adverse event that
occurred to an obstetrical patient by interviewing four members of the healthcare team within 48 hours of the event. Reason’s (1990, 1995) Organizational Accident Model guided the investigation. Incident was the term used to signify the adverse event concept in this analysis, but no definition was provided in the article.

The following is a summary of the case’s events. A 25-year old primiparous woman was admitted at 36 weeks for induction of labor due to signs and symptoms of pre-eclampsia (Stanhope et al., 1997). Of the four midwives managing patients on the obstetrical unit, two were pulled from another location, one was a new graduate, and one was from an outside agency. During the course of the induction, the fetus showed unprovoked early decelerations lasting 30 to 60 seconds. After a consultation between one of the midwives and the senior house officer, it was decided to perform a caesarean section. Following three unsuccessful attempts to place a spinal anesthetic, the decision was made to use a general anesthetic because of the further distress of the fetus. The baby was born bradycardic and in respiratory distress. Attempts to intubate the baby were unsuccessful and external respiratory support was given. An additional pediatrician and neonatal nurse were called in to care for the baby. Apgar scores were 2 at 1 minute and 8 at 5 minutes. The baby was admitted to the Special Care Baby Unit for observation and transfer to the postnatal unit four days after delivery.

Again, three stages of investigation following Reason’s (1990; 1995) model were used in the analysis (Stanhope et al., 1997). Stage one found active
failures which could be grouped into the following categories: failure of anticipation, errors in clinical judgment, instances of poor communication, poor co-ordination of care, and inadequate skills. Four areas of concern were identified during the second stage (i.e., examination of work conditions). These areas were: insufficient experience of the midwives, lack of midwives to care for patients, location and organization of equipment and supplies that created time delays, and no staff at nurse’s station to manage clinical and non-clinical unit matters. Finally, five issues were identified in the examination of organizational issues (i.e., stage three): communication (e.g., lack of formal change of staff caring for patient); staffing allocation (e.g., midwives did not institute policy requiring more staff to be placed on the unit); management support (e.g., presence of low morale and feeling unappreciated by management were felt by staff); training (e.g., lack of training and information of procedure and equipment); induction program (e.g., lack of familiarity with induction program by staff).

**Coupon Methodology**

The coupon method for collecting data was developed by Aiken and colleagues at the Center for Health Services and Policy Research at the University of Pennsylvania. To date, the only published study using this method was from an AIDS study in which Aiken, Sloane, and Klocinski (1997) investigated a nurse’s risk of blood exposure as a result of an injury from needles or sharps. The study, conducted on 40 inpatient units in 20 hospitals in 11 cities, involved nurses prospectively and retrospectively reporting blood exposure and comparing this data to data released from hospitals on the reported blood
exposure rates. The prospective data was gathered using the coupon methodology. Nurses working on the units completed a coupon indicating if he/she incurred a needle or sharp injury during the just completed shift for two periods of one month each. The response rate was 86% (14,379 shifts were worked and 12,349 coupons were returned). The retrospective data were collected using the same group of nurses. A questionnaire was distributed, asking whether the nurse had ever been injured by a needle or a sharp, how many times he/she had been injured, how many times he/she had been injured in the last month, and whether the incident was reported to the hospital. Of the 865 nurses who received the questionnaire, 732 returned the instrument (88% response rate). The hospital exposure rate data were provided by 15 of the 20 participating hospitals.

The results of the study showed “for the 732 staff nurses who contributed both prospective and retrospective data, that the difference between the prospectively reported injury rate (0.77 injuries per nurse-year) and the retrospectively reported injury rate (0.61 injuries per nurse-year) is small and nonsignificant (incidence rate ratio = 1.26, P = .33)” (Aiken et al., 1997, p. 104). In comparing the prospective data and retrospective data with the data provided by the 15 hospitals, the researchers discovered the hospital reports contained only a fraction of the actual number of blood exposures. Thus, this study demonstrated the viability of the coupon method for collecting data. However, the study did not investigate the nurse’s perceptions of the utility and trust in the coupon method.
Overall, the coupon method for collecting adverse events data represents a paradigmatic shift from the “train and blame” (Buerhaus, 1999) approach seen in the four currently used data sources for investigating adverse events. First, the anonymity of the healthcare professional provided by the coupon allows for an investigation of the adverse event to center around why the adverse event occurred and how the healthcare system can be redesigned to prevent the same adverse event from reoccurring. In other words, the focus of the adverse event investigation highlights the healthcare system since the antecedent of the majority of adverse events is the healthcare system rather than an individual healthcare professional (Buerhaus, 1999; McLaughlin, & Kaluzny, 1999).

Second, by asking every nurse to fill out a coupon at the conclusion of every shift, nurses are given the opportunity to be active participants in improving the quality of care provided to their patients. Finally, the method is economically feasible within hospitals because most hospitals already possess the infrastructure for self-reporting (Walshe, 2000; Hartwig, Denger, & Schneider, 1991; Williamson, & Mackay, 1991).

**Registered Nurses’ Contribution to Healthcare**

“Nurses are the largest single group of health professionals and represent one, if not the primary, clinical intervention in many institutional settings” (Aiken, Sochalski, & Lake, 1997, p. NS8). Nurses are the only healthcare professionals continually caring and monitoring patients. Therefore, nurses are often the first healthcare professionals to recognize changes in the patient’s condition and take appropriate action. Nurses have earned the name “safety sentinels” (Foley,
2001) for their role in protecting patients. To date, the majority of research has demonstrated the positive effect nursing care has on reducing the incidence of adverse events. Aiken, Smith, & Lake (1994) found a lower mortality rate in hospitals known for good nursing care (Magnet Hospitals) when compared to hospitals without the Magnet Hospital designation. Research conducted by Blegen and colleagues discovered that as the proportion of registered nurses on a unit increased to 85% of the nursing staff in one study (Blegen & Vaughn, 1998) and 87.5% of the nursing staff in another study (Blegen, Goode, & Reed, 1998), the rates of adverse events decreased. As seen in a study presented earlier by Kovner and Gergen (1998), the researchers found a significant inverse relationship between full-time equivalent registered nurses per adjusted inpatient day and urinary tract infections after major surgery, pneumonia after major surgery, thrombosis after surgery, and pulmonary comprise after surgery. Lichtig, Knauf, and Milholland (1999) reported significantly shorter patient stays in hospitals with higher nurse staffing and higher proportion of registered nurses and significantly lower adverse events rate in hospitals with a higher proportion of registered nurses. Likewise, surveys of nurses indicated inverse relationship between nursing care and the adverse events. For example, Sochalski (2001) discovered nurses who rated the nursing care on their unit as fair or poor reported a higher incidence of adverse events than nurses who described the nursing care on their unit as excellent or good.

Since nurses play such a vital role in patient outcomes, it seems only logical that nurses be the primary identifiers of adverse events in the hospital
setting. However, research has shown that the number of adverse events nurses report via incident reports may represent only a small percentage of the actual number of adverse events occurring in the hospital. Elnitsky, Nichols, and Palmer (1997) surveyed 424 nurses in 15 hospitals to determine nurses’ behaviors and beliefs concerning hospital incident reports. For the behaviors of nurses concerning the utilization of incident reports, the researchers found the number of incident reports nurses filled out per month ranged from 0 to 100, with a median of 4 incident reports and an interquartile range of 2 to 10 incident reports per nurse per month. The incident reporting beliefs of the nurses revealed: 20% believed incident reports were used against employees, 17% reported supervisors used incident reports against them in professional evaluations, 25% believed incident reports would have a negative impact on their supervisor’s impression of their skills, and 40% lacked trust in their colleagues to fill out an incident report.

Similarly, Jones and Arana (1996) found that nurses fear reporting adverse events with incident reports. Examples of nurses’ statements demonstrating this fear and reported by Jones and Arana (1996) included: “incident reports are used to find the bad apple,” “I knew I gave him the wrong dose, but I was afraid of losing my job,” and “incident reports used to be routine, now they are performance continuances” (p. 593).

Lastly, the fear of disciplinary action in the wake of an adverse event is very real for nurses, even more so than for physicians, since in many states nurses are disciplined at a higher rate than physicians. For instance, data from
the New York State Department of Health Board of Professional Medical Conduct and the New York State Education Department for 1992-1998 reported that the average annual number of complaints filed against physicians was nearly four times those filed against nurses (5,257 and 1,372 respectively), but the average number of disciplinary actions taken against physicians and nurses were almost identical (307 and 325 respectively) (LaDuke, 2000).

Researchers have also explored the causes of adverse events as experienced by the nursing profession. For instance, in a study by Meurier, Vincent, and Parmar (1997) of 129 nurses, the researchers found the most common causes of adverse events were lack of knowledge or information, work overload, stressful atmosphere, and lack of support from senior staff. Likewise, in a study investigating the relationship between nurse stress and adverse events, Dugan et al. (1996) found a strong relationship between a nurse’s level of stress and the occurrence of adverse events. Thus, there is ample evidence to suggest that nurses impact the quality of care provided to patients in the hospital setting. Therefore, registered nurses were the first group of healthcare providers to test the Shift Coupons.

In the next chapter, the methodology used to test the ability of Shift Coupons to collect adverse events data will be presented. Chapter 4 imparts the findings of the study and chapter 5 explains the implications of the findings, the limitations of the study, and the plan for future testing of the Shift Coupon.
References


Studdert, D.M., Brennan, T.A., & Thomas, E.J. (2002). What have we learned since the Harvard Medical Practice Study. In M.M. Rosenthal & Sutcliffe


Chapter 3
Overview

The purposes of this study were to test the ability of the Shift Coupon to collect adverse events data and to explore the work environment within the hospital setting as it related to registered nurses’ reports of adverse events. The findings from this study may be used to quantify the incidence of adverse events within the hospital setting, to explain the circumstances surrounding the adverse events, and to understand the current work environment as it relates to adverse events within hospitals. This chapter describes the methodology of this nonexperimental, descriptive, comparative study.

Research Questions

1. To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?
2. What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
3. What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
4. What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
5. Which adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?
What are the causes of the adverse events identified by the Shift Coupons as perceived by registered nurses?

What are the causes of medication administration errors as identified on the Blegen/Vaughn Work Environment Index?

What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

How do registered nurses perceive quality management within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

Data

The data for this study came from two sources. First, data were obtained from Shift Coupons completed by registered nurses for five shifts working as such in the hospital setting. The second data source came from the Blegen/Vaughn Work Environment Index completed by registered nurses working as such in the hospital setting.

This study represented the first time a coupon methodology has been used to identify adverse events occurring in the hospital setting; hence, one of the purposes of this study was to test the ability of the Shift Coupon to collect adverse events data in the hospital setting. The other purpose of this study, to
explore the hospital work environment as it related to registered nurses reports of adverse events, provided an understanding of the data collected on the Shift Coupons.

Due to the sensitive nature of the data collected, the shortage of registered nurses, and the possible legal issues associated with adverse events, hospitals contacted by this researcher were unwilling/unable to participate in this study. Therefore, a random sample of registered nurses from Pennsylvania was invited to participate in the study. These registered nurses were asked to anonymously participate in the study without identifying the hospital in which they were employed. A time frame of five shifts was selected for the Shift Coupon to provide adequate data to test the coupon without over burdening the registered nurses and causing a possible low response rate.

Sample

The sampling frame was all individuals possessing a registered nursing license in the State of Pennsylvania (189,510 registered nurses). The names and addresses of these individuals were purchased from the State Board of Nursing, Commonwealth of Pennsylvania, Department of State, Bureau of Professional and Occupational Affairs. The Pennsylvania State Board of Nursing does not collect data linking place of employment or position to an individual registered nurse. Thus, it was not possible to purchase or identify from the dataset those individuals employed as a registered nurse in the hospital setting. A random sample of 1,000 registered nurses from this list was selected to participate in the study.
The inclusion criteria for the study were: individual of at least 18 years of age, individual with a current Pennsylvania registered nursing license, and an individual with a current address within the state of Pennsylvania. Of the 189,510 registered nurses on the list from the State Board of Nursing, 32,689 were ineligible to participate in the study because their current addresses were located outside Pennsylvania, leaving 156,821 registered nurses eligible to participate. Each of the 156,821 registered nurses received a number from 1 to 156,821. A number between 1 and 156,821 was then selected at random. The individual assigned the selected number was the first individual invited to participate in the study. Then, every 157th individual on the list was included in the sample until 1,000 registered nurses were selected.

According to the Pennsylvania Department of Health’s 2002 report on the characteristics of the registered nurse population in Pennsylvania, 57.3% of all registered nurses in Pennsylvania are employed within the hospital setting (www.health.state.pa.us). Therefore, it was estimated that of the 1,000 randomly selected registered nurses invited to participate in the study, 573 individuals would be working within the hospital setting. To determine for the study which of the 1,000 registered nurses work in the hospital setting, data on the place of employment was collected from the first question on the Shift Coupon (i.e., “This shift was worked in a…”). Only those registered nurses who identified themselves as working the shift within a hospital were included in the analysis.
Definitions of Variables

According to Walshe (2000), an adverse event “is a happening, incident, or set of circumstances which exhibits three key characteristics to some degree: negativity…patient involvement/impact…causation” (p. 47-48). For the purpose of this study, an adverse event was operationally defined as “an untoward or undesirable occurrence in the healthcare process which has or potentially has some negative impact on a patient or patients and results or may result from some part of the healthcare process” (Walshe, 1998, p. 74). The variables used in this study to empirically measure adverse events on the Shift Coupon were: medication errors, patient falls, patient complaints, family complaints, unexpected patient deaths, new nosocomial infections, new skin breakdowns, and unplanned admission to intensive care unit. Below is a table containing the empirical definitions of these variables.
Table 3.1  
Empirical Definitions of Adverse Event Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication errors</td>
<td>Number of incidents involving a medication for a patient</td>
</tr>
<tr>
<td>Patient falls</td>
<td>Number of incidents involving a patient suddenly and involuntarily coming to rest on the floor or on an object</td>
</tr>
<tr>
<td>Patient complaints</td>
<td>Number of verbal and/or written complaints waged by a patient concerning his/her care</td>
</tr>
<tr>
<td>Family complaints</td>
<td>Number of verbal and/or written complaints waged by a patient’s family concerning the patient’s care</td>
</tr>
<tr>
<td>Unexpected patient deaths</td>
<td>Number of unforeseen, unexplainable, and/or procedure related deaths</td>
</tr>
<tr>
<td>New nosocomial infections</td>
<td>Number of first-time documentations in a patient’s chart by any member of the healthcare team of an infection occurring in a hospitalized patient that was not present or incubating at the time of admission</td>
</tr>
<tr>
<td>New skin breakdowns</td>
<td>Number of first-time documentations in the patient’s chart by any member of the healthcare team of a new incidence of skin breakdown because of pressure and/or exposure to urine or feces</td>
</tr>
<tr>
<td>Unplanned admission to the intensive care unit</td>
<td>Number of incidents involving a patient being unexpectedly admitted to the intensive care unit</td>
</tr>
</tbody>
</table>

The cause(s) of adverse events was defined as the human and/or healthcare system flaws that lead to an adverse event. The variables used to empirically measure the cause(s) of adverse events on the Shift Coupon were: lack of staff, lack of knowledge, lack of information, lack of supervision, lack of communication, lack of supplies and/or equipment, malfunctioning supplies and/or equipment, work overload, stressful atmosphere, faulty judgment, fatigue, failure to follow hospital policy, poor hospital policy, and a poorly designed hospital unit. Table 3.2 displays the empirical definitions of these variables
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of staff</td>
<td>Number of times an insufficient number of hospital staff were available to care for the needs of patient(s) contributed to the occurrence of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>Number of times an insufficient amount of training in the necessary skill(s) to care for a patient(s) contributed to the occurrence of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Lack of information</td>
<td>Number of times an insufficient amount of data to care for a patient(s) contributed to the occurrence of an adverse events as perceived by the registered nurse</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>Number of times an insufficient number of experienced healthcare staff were available to assist and provide supervision in caring for a patient(s) contributed to the occurrence of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Lack of communication</td>
<td>Number of times an insufficient exchange of ideas/information between the healthcare team, the patient, and/or the patient’s family to provide care for a patient(s) contributed to the occurrence of an adverse events as perceived by the registered nurse</td>
</tr>
<tr>
<td>Lack of supplies/equipment</td>
<td>Number of times an insufficient amount of supplies and/or equipment on the hospital unit to care for a patient(s) contributed to the occurrence of an adverse events as perceived by the registered nurse</td>
</tr>
<tr>
<td>Malfunctioning supplies/equipment</td>
<td>Number of times a failure of supplies and/or equipment on the hospital unit contributed to the occurrence of an adverse event as perceived by a registered nurse</td>
</tr>
<tr>
<td>Work overload</td>
<td>Number of times an excessive amount of work or the feeling of an excessive amount of work during a shift contributed to the occurrence of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Stressful atmosphere</td>
<td>Number of times feeling overwhelmed in caring for a patient(s) due to the work environment contributed to the occurrence of an adverse event as perceived by a registered nurse</td>
</tr>
<tr>
<td>Faulty Judgment</td>
<td>Number of times a flawed decision on the part of a healthcare provider(s) in caring for a patient(s) contributed to the occurrence of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Number of times being physically tired while caring for a patient(s) contributed to the occurrence of an adverse event as perceived by a registered nurse</td>
</tr>
</tbody>
</table>

Table 3.2
Empirical Definitions of Causes of Adverse Events
Variable | Definition
--- | ---
Failure to follow hospital policy | Number of times a deviation from hospital policy contributed to the occurrence of an adverse event as perceived by a registered nurse
Poor hospital policy | Number of times flawed hospital policy contributed to the occurrence of an adverse event as perceived by a registered nurse
Poorly designed hospital unit | Number of times the format of the hospital unit contributed to the occurrence of an adverse event as perceived by a registered nurse

The consequence of an adverse event was the physical result the adverse event had on the patient. It was measured by the physical impact on the life of the patient. The variables used to empirically measure the consequence of an adverse event on the Shift Coupon were: no harm to patient, temporary harm to patient, permanent harm to patient, death, and unknown. Below is a table containing the empirical definitions of these variables.

Table 3.3
Empirical Definitions of Adverse Event Results on a Patient

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm to patient</td>
<td>Number of times there was no physical injury to a patient as a result of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Temporary harm to patient</td>
<td>Number of times there was physical injury to a patient as a result of an adverse event that will resolve within six months of this patient’s discharge from the hospital facility as perceived by the registered nurse</td>
</tr>
<tr>
<td>Permanent harm to patient</td>
<td>Number of times there was physical injury to a patient as a result of an adverse event that will not resolve within six months of this patient’s discharge from the hospital facility as perceived by the registered nurse</td>
</tr>
<tr>
<td>Death of the patient</td>
<td>Number of times a patient expired as a result of an adverse event as perceived by the registered nurse</td>
</tr>
<tr>
<td>Unknown</td>
<td>Number of times the consequence of an adverse event was unable to be determined by the registered nurse</td>
</tr>
</tbody>
</table>
Level of nursing care required by a patient was defined as the level at which nursing care was required for the patient to perform activities of daily living. It was measured on the Shift Coupon by the percentage of the activities of daily living (i.e., eating, dressing, bathing, brushing the teeth, and grooming) the patient was able to independently complete. In this study, the registered nurse determined the level of nursing care for each patient he/she was assigned during the shift worked. The variables used to empirically measure level of nursing care were: minimal care, moderate care, and maximum care. Table 3.4 presents the empirical definitions of these variables.

Table 3.4
Empirical Definitions of Level of Nursing Care

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum care</td>
<td>On average the patient(s) the registered nurse was responsible for on shift just worked was able to perform 85-100% of activities of daily living as perceived by the registered nurse</td>
</tr>
<tr>
<td>Moderate care</td>
<td>On average the patient(s) the registered nurse was responsible for on the shift just worked was able to perform 35-84% of the activities of daily living as perceived by the registered nurse</td>
</tr>
<tr>
<td>Maximum care</td>
<td>On average of patient(s) the registered nurse was responsible for on the shift just worked who was able to perform less than 35% of the activities of daily living as perceived by the registered nurse</td>
</tr>
</tbody>
</table>

Instruments

The Shift Coupon

The Shift Coupon is an instrument developed by this researcher for the purpose of collecting adverse events data (Appendix 3.1). It was designed to provide a quick, easy, anonymous, and non-threatening method for registered nurses to report adverse events. The data collected in this study provides a
general insight on adverse events occurring within hospitals in the State of Pennsylvania as well as compares the instrument to the traditional incident report reporting system within hospitals.

Twelve items comprise the Shift Coupon. These twelve items are: 1) Location the shift was worked, 2) Unit type if the shift worked was in a hospital, 3) Hours of shift worked, 4) Whether the shift worked was on a weekend, 5) Whether the shift worked was on a holiday, 6) Total number of patients the registered nurses was assigned during the shift worked, 7) Identification of the level of nursing care required by each of the patients the registered nurse was assigned during the shift worked, 8) Identification of the incident that occurred during the shift worked, 9) Identification of the cause(s) of the incident identified that occurred during the shift worked, 10) Identification of the result of the incident on the patient that occurred during the shift worked, 11) Determination of whether the incident could have been prevented, and 12) Identification of whether an incident report was completed.

Validity of the Shift Coupon

According to Waltz, Strickland, and Lenz (1991), validity is the “determination of whether or not a device or method is useful for the purpose for which it is intended, that is, measures what it purports to measure” (p. 4). Due to the type of data collected and the nature of the instrument, content validity will be established for the Shift Coupon. Content validity is “not a statistical property; it is a matter of expert judgment” (Vogt, 1999, p. 54). In the case of the Shift Coupon, content validity was determined by how well the instrument matched the
objective (i.e., identification of adverse events in the hospital setting) for which it was designed to measure (Waltz et al., 1991). According to Nunnally and Bernstein (1994), there are two major standards to ensure content validity: “1. Representative collection of items, and 2. ‘Sensible’ method of testing construction” (p. 102). The first standard highlights the role a researcher’s values have on an instrument. It is the researcher’s values that will “determine the relative stress on different content areas” (Nunnally & Bernstein, 1994, p. 103). Hence, some variations among researchers’ opinions on the coverage of content areas are expected with this type of validity (Nunnally & Bernstein, 1994). The second standard speaks to the “adequacy with which important content has been sampled and cast into items” (Nunnally & Bernstein, 1994, p. 103).

Prior to its utilization in the study, the content validity of the Shift Coupon was measured by an expert panel of three adverse events researchers who judged the “quality and representativeness of the items” (Waltz et al., 1991, p. 238). Each expert was given a copy of the Shift Coupon, definitions of terms used on the coupon, and the purpose of the instrument. The experts were then asked to review the Shift Coupon to determine: 1) whether there is a link between the purpose of the instrument and the items on the instrument, 2) whether the items on the instrument address the purpose of the instrument, and 3) whether the items on the instrument represent the domain of interest (Waltz, et al., 1991). Each expert independently rated the Shift Coupon against the criteria on a 4 point scale (1-not relevant to 4–very relevant) (Appendix 3.2). An index of content validity was calculated (See Chapter 4).
Reliability of the Shift Coupon

Reliability is the “consistency with which a devise or method assigns scores to subjects” (Waltz et al., 1991, p. 4). Internal and external are two types of reliability. Internal reliability answers the question: “If the measure comprises subparts (as in a multiple-section test of some type), do these parts contribute to equivalent results?” (Williams & Monge, 2001, p. 29). External reliability answers the question: “If the measures were applied and reapplied under precise replication of conditions, would the same results to obtained?” (Williams & Monge, 2001, p. 29). Measuring the reliability of the Shift Coupon was not possible because of the data collected and the nature of the healthcare environment. The Shift Coupon did not have subparts; therefore, a measurement of internal validity was not possible. Likewise, the Shift Coupon cannot be reapplied under the same conditions to produce the same results because the healthcare environment is ever changing and the data collected represented a “snapshot” of the adverse events that occurred in Pennsylvania. Instead, the focus should be on the usability of the instrument. In other words, “Does the Shift Coupon collect data that provide a more accurate picture of the adverse events that are occurring?” An initial answer to this question was given when the data collected from Shift Coupons was compared with the adverse events data collected by incident reports (see chapters 4 and 5).

Blegen/Vaughn Work Environment Index

This 67-item instrument was developed by Dr. Mary Blegen from the University of Colorado Health Sciences Center, Dr. Thomas Vaughn from the
University of Iowa and colleagues to collect work environment data (Appendix 3.3). (Permission to use the instrument in the study was given by Dr. Blegen [Appendix 3.4] and all the information permitting to the instrument was from personal communications with Dr. Blegen: February 14, 2003; March 26, 2003; April 7, 2003; June 11, 2003; and June 12, 2003). It was created by reviewing existing instruments, brainstorming and modifying these existing instruments, and pilot testing the created instrument (n=284 registered nurses from 33 units in 11 hospitals). Modifications to the instrument were made based on the results of the pilot study, and the instrument was used in their study of nurse staffing and the quality of care. The results described below are from the national study with 1105 respondents from 25 hospitals.

The instrument gathers data on three areas: 1) patient safety, 2) worker safety, and 3) work environment and job satisfaction. A registered nurse in the patient safety area is first asked to check which of 10 types of medication administration errors (e.g., wrong route of administration) should be reported. Next, the registered nurse estimates the percentage of four categories of medication administration errors (i.e., oral and topical medication administration errors, intramuscular/subcutaneous medication errors, intravenous medication errors, and all medication errors) that he/she believes were reported in the last three months. The third part of the patient safety investigation has the registered nurse approximate the percentage of patient falls that were reported in the last three months for four categories (i.e., patient falls without injury, patient falls with minor injury, patient falls with major injury, and all patient falls). Lastly, the
registered nurse indicates his/her agreement with each of 11 items pertaining to why medication administration errors might not be reported on a 1-5 point scale, with 1 being strongly disagree and 5 being strongly agree (adapted from Wakefield and colleagues). These 11 items investigating reasons why medication administration errors might not be reported are divided into four reasons that concern administrative response to the medication error and seven reasons that correspond to personal fear. In the study testing the instrument, the total sample mean with standard deviation for the four administrative response reasons for not reporting was 3.17 (.87) and the mean and standard deviation for the seven personal fear reasons was 3.41 (.81). The Cronbach alpha for the administrative response reasons was .74 and the Cronbach alpha for the personal fear reasons was .84.

The next part of the instrument concerns worker safety. A registered nurse is asked to indicate whether, in the past three months, he/she has been exposed to a work-related back strain or injury, exposed to blood-borne pathogens via needlestick or sharps injury, exposed to blood-borne pathogens from other than needlestick or sharps injury, or has sustained any other type of work-related injury. If the answer to any of these items is yes, the registered nurse is asked to indicate whether he/she reported the injury.

The last section of the instrument investigates the work environment and job satisfaction. A registered nurse is asked to use a 5-point agreement scale (1 being strongly disagree and 5 being strongly agree) to rate 25 items. These 25 items were created from clinical and content experts, a review of the literature,
and a modification of 6 job satisfaction items from the Brayfield and Rothe tool. Factor analysis of the 19 items describing the work environment from the study led to 4 work-environment subscales: staffing resources (4 items), physical resources (3 items), peer relations (4 items), and unit quality management (8 items). The total sample mean and standard deviation for each of these subscales was: staffing resources: 2.58 (0.77), physical resources: 3.13 (0.81), peer relations: 3.91 (0.75), and quality management: 3.44 (0.61). The Cronbach alpha for each of these subscales was: staffing resources: 0.63, physical resources: 0.61, peer relations: 0.75, and quality management: 0.78. The second part of section three, job satisfaction, is measured using 6 items. Based on the results of the study, the total sample mean and standard deviation was 3.62 (0.68) and the Cronbach alpha was 0.83.

**Pilot Study: Testing the Shift Coupon**

**Pilot Study Design**

A descriptive pilot study was conducted to test the Shift Coupon using registered nurses working in the hospital setting (Kellogg, 2003). The specific aim of the pilot study was to identify areas for improving the Shift Coupon based on feedback from hospital registered nurses who used the Shift Coupon. It should be noted that during the pilot study, the instrument was called the Adverse Event Coupon. The name of the instrument was changed based on the recommendation of one of the members of the expert panel. However, in order to eliminate any confusion, the instrument will be called the Shift Coupon throughout the dissertation.
Pilot Study Sample

The sample consisted of 11 registered nurses who both worked in the hospital setting and were nursing students at a large university in Pennsylvania. Participants for the pilot study were drawn from registered nurses enrolled in nursing classes at 1 of 5 of the university’s campuses. To participate in the pilot study the participants had to be 1) A licensed registered nurse working in the hospital setting, 2) A student enrolled in a nursing class at the large university, and 3) Able to read, write, and understand English. The registered nurses were offered no financial incentives to participate in the pilot study. Likewise, participation in the pilot study did not affect the registered nurse’s grade/standing in the class(s) in which he/she was enrolled. Confidentiality and anonymity were assured. No identifying information was required/requested on either of the instruments, no tracking numbers were placed on the instruments to enable the researcher to link an instrument with a participant or a campus, and every registered nurse enrolled in the classes was given a pilot study package, regardless of whether the registered nurse met all the inclusion criteria. Registered nurses who did not meet all the inclusion criteria were asked to dispose of the pilot study package after the researcher left the class. Hence, the researcher was unaware of which, if any, registered nurses in the classes met all the inclusion criteria. The registered nurses were on the honor system to meet the inclusion criteria, complete the instruments honestly, and return the instruments via the mail to the researcher. The completion and return of the
instruments served as the informed consent for the pilot study to protect the identity of the registered nurses.

Pilot Study Instruments

Two instruments created by this researcher were used in the pilot study: the Shift Coupon (Appendix 3.5) and the Evaluating the Shift Coupon Survey (Appendix 3.6). The Shift Coupon used in the pilot study was an eight-item instrument based on findings from the adverse events literature. It was designed to collect adverse events data in the hospital setting. The eight items on the Shift Coupon used in the pilot study were: 1) Date of shift worked, 2) Hours of shift worked, 3) Unit type on which the shift was worked, 4) Registered nurse’s perception of patient acuity, 5) Identification of adverse event that occurred during the shift worked, 6) Identification of the cause(s) of the adverse event, 7) Identification of the consequence of the adverse event on the patient, and 8) Identification of whether an incident report was filled out. The terms used in the Shift Coupon were provided to the registered nurses in an Adverse Events Coupon Booklet (a booklet containing the terms used on the Shift Coupon and 15 Shift Coupons). The registered nurses were instructed to read the terms prior to completing the Shift Coupon.

On the Shift Coupon, when asked to identify the adverse event that occurred during the shift worked, one of the possible choices was “no error occurred.” Therefore, Shift Coupons were completed and returned to the researcher regardless of whether they reported the occurrence of an adverse event or no adverse event. Additionally, if more than one adverse event
occurred during a shift, the registered nurses were instructed to complete a separate Shift Coupon for each adverse event.

The second survey, Evaluating the Shift Coupon Survey, was created to collect feedback on how to improve the Shift Coupon prior to conducting the dissertation study. Six open-ended questions were used to collect these data: 1) How long did it take you to fill out a Shift Coupon at the end of your shift?, 2) I liked the Shift Coupon because…, 3) I disliked the Shift Coupon because…, 4) If I could change anything about the format of the Shift Coupon, I would change…, 5) If I could change any of the terms used on the Shift Coupon, I would change…, and 6) Suggestions for improving the Shift Coupon.

Both the Shift Coupon and the Evaluating the Shift Coupon Survey were reviewed by five doctorally prepared researchers prior to utilization in the pilot study. Based upon the feedback from these researchers, minor changes were made to the instruments.

Pilot Study Procedure

The researcher was granted permission to conduct the pilot study using registered nurses who were also students at a large university in Pennsylvania by the Institutional Review Board at the University (Appendix 3.7), Director of the nursing program at the university (Appendix 3.8), Professor-in-Charge of Graduate Studies at the university (Appendix 3.9), and Professor-in-Charge of Undergraduate Studies at the university (Appendix 3.10). Of the five classes from which registered nurses were chosen, four of the five classes were composed of registered nurses enrolled in the registered nurse to Bachelor in
Nursing Science program and one of the classes contained registered nurses enrolled in the Masters in Nursing Science program. The researcher was onsite to explain the pilot study to registered nurses of four of the five classes and via computer technology for one of the five classes (the class was conducted online).

Each registered nurse in the class received a pilot study package. The pilot study package contained: an informational sheet describing the pilot study (Appendix 3.11), instructions on how to fill out the surveys (Appendix 3.12), an Adverse Event Booklet containing 15 Shift Coupons (Appendix 3.5), an Evaluating the Shift Coupon Survey (Appendix 3.6), the researcher’s business card so that registered nurses could contact the researcher with questions/comments, and a posted envelope for returning the instruments to the researcher. The researcher discussed the information sheet in detail with every class and answered any questions from the registered nurses. All the classes were visited within one month by this researcher during the spring 2002 semester.

The registered nurses were asked to fill out a Shift Coupon(s) after working five shifts as a registered nurse in a hospital setting. Then, the registered nurses were instructed to fill out the Evaluating the Shift Coupon Survey. When all the instruments were completed, the registered nurses placed them in the posted envelopes provided by the researcher and mailed the envelopes to the researcher. After speaking to all five classes, the researcher contacted the professors of the classes and inquired of them how many of their
students met the inclusion criteria. The sole purpose of this inquiry was to ascertain a response rate. Below is a figure diagramming the procedure of the pilot study.

Figure 3.1
Pilot Study Procedure

- Researcher developed the Adverse Event Coupon based upon a review of the literature and the Evaluating the Adverse Event Coupon Survey.
- Adverse Event Coupon and Evaluating the Adverse Event Coupon Survey were sent to 5 doctorally prepared researchers for review.
- Researcher made appropriate changes to the Adverse Event Coupon and the Evaluating the Adverse Event Coupon Survey based on feedback from the 5 doctorally prepared researchers.
- Permission granted to conduct pilot study at a large university in Pennsylvania from Institutional Review Board, Director of the Nursing Program, Professor-in-Charge of Graduate Studies, and Professor-in-Charge of Undergraduate Studies.
- Researcher discussed pilot study with registered nurses enrolled in nursing classes at 5 different campuses of the large university in Pennsylvania.
- All registered nurses attending classes received pilot study package.
- Met inclusion criteria:
  1. Registered nurse working in acute care setting
  2. Nursing student at large university in Pennsylvania
  3. Able to read, write, understand English
- No
- Yes
- Registered nurse disposed of pilot study package after researcher left class.
- Registered nurse agreeing to participate in pilot study filled out an Adverse Event Coupon(s) after each shift for 5 shifts.
- Registered nurse filled out Evaluating the Adverse Event Coupon Survey.
- Registered nurse mailed Adverse Event Coupons & Evaluating the Adverse Event Coupon Survey back to researcher.
- Researcher coded and enter data.
- Data analyzed.
- Improvements made to Adverse Event Coupon.
Data Analysis

The data were coded and entered into a SPSS database. The data were then checked for accuracy by examining 20% of the inputted data and by running frequencies to inspect for irregularities in the data. Descriptive statistics were used to summarize the data. The end purpose of the analysis was to determine what changes to make to the Shift Coupon prior to the dissertation study.

Results

Shift Coupon

Forty-one registered nurses met the inclusion criteria for the pilot study and 11 registered nurses returned instruments to the researcher for a 26.8% response rate. A total of 84 Shift Coupons were returned for shifts worked between March 27, 2002 and August 20, 2002. Some of the registered nurses completed Shift Coupons for more than five shifts, thus the larger than expected number of returned Shift Coupons. Almost half (46.4%) of the Shift Coupons were completed for shifts worked on a medical/surgical unit (Figure 3.2). The most common category for hours worked on the Shift Coupons returned was 7am to 3pm (52.4%). Most registered nurses reported the average acuity of the patients they cared for as either moderate care (46.4%) or maximum care (41.7%).
No adverse event was reported on 53.6% of the Shift Coupons returned (Figure 3.3). Of the 39 Shift Coupons that did identify an adverse event, the most commonly reported were: other (example: patient left hospital with IV) (23.1 %), medication error (17.9%), patient falls (17.9%) and patient complaint (15.4%) (Figure 3.4). Remembering that registered nurses may have selected more than one cause of an adverse event, the most frequently captured causal categories were: other (example: “family was angry”) (41%), lack of staff (23.1%), and lack of knowledge (20.5%) (Figure 3.5). Over half (64.7%) of the adverse events reported resulted in no harm to the patient (Figure 3.6) and for a quarter (25.6%) of the adverse events captured by Shift Coupons no incident reports were completed.
Figure 3.3
Percentage of Adverse Events Reported using Shift Coupons (n=84)

Figure 3.4
Percentage of Adverse Event Types Reported Using Shift Coupons (n=39)
Figure 3.5
Percentage of Reported Causes of Adverse Events Reported Using Shift Coupons (n=39)

Note: More than one cause may have been selected for each adverse event

Figure 3.6
Percentage of the Type of Result on Patients Caused by Adverse Events Reported Using Shift Coupons (n=39)
Evaluating the Shift Coupon Survey

Ten of the participating eleven registered nurses returned the Evaluating Shift Coupon Survey. The amounts of time reported to complete a Shift Coupon ranged from 10 seconds to 5 minutes, with 40% of the registered nurses reporting a completion time of 2 minutes or less. Seventy percent of registered nurses reported the coupon was “easy” when asked what he/she liked about the Shift Coupon. Conversely, when asked to describe what he/she disliked about the Shift Coupon, 20% of the registered nurses reported that he/she did not agree with a cardiac arrest being classified as an adverse event and 20% felt the choices of adverse events and causes of adverse events on the Shift Coupon were not always specific to specialty hospital units. The most frequently reported suggestions for changing the format or terms used on the Shift Coupon were to change the term “error” to “incident” and to include more adverse events and cause choices.

Changes Made to the Shift Coupon

Based on the results of the pilot study and further conceptualization of the instrument, a number of changes were made to the Shift Coupon. First, the question asking the registered nurses to fill in the date of the shift worked was removed in order to eliminate the collection of any possibly identifying data. However, two dichotomous questions were added to determine whether the adverse event occurred either during a weekend shift or a holiday shift. Second, the number of selections for possible hours worked were deleted and a line added for each registered nurse to fill in the hours he/she worked. Third, when
asking the registered nurses to estimate the level of nursing care provided to their patient(s), the phrase “cared for” was changed to “responsible for” in order to eliminate confusion regarding the role of ancillary personnel (such as nursing assistants) who assisted the registered nurse in caring for the patient. Then, in addition to asking the registered nurses to estimate the level of nursing care required for the patient(s) they were responsible for during the shift worked, a question was add to clarify the number of patient(s) the registered nurses were responsible for during the shift. Fifth, the term “error” was changed to “incident,” such that the registered nurses are asked to check the incident that occurred during his/her shift (instead of check the error that occurred during his/her shift). Next, the adverse event options of cardiac arrest and pulmonary arrest were removed from the coupon and the adverse event choice of unplanned admission to the intensive care unit was added. The inclusion of an “other” option for the item “check the incident that occurred during the shift” provided registered nurses the ability to write in more hospital unit-specific adverse events. Therefore, adverse events relating to specific types of hospital units were not added for this first testing of the instrument. Seventh, the following possible causes were added: lack of supplies/equipment, malfunctioning supplies/equipment, fatigue, failure to follow hospital policy, poor hospital policy, and poorly designed unit. Next, the definitions for the temporary harm to patient and the permanent harm to patient options under the result of the adverse event item were changed to recovery within six months for temporary harm from this discharge and lack of recovery within six months from this discharge for permanent harm to patient.
This change reflects the ability of the patient to recover within a reasonable timeframe (i.e., six months) without being classified as having a permanent injury as a result of the adverse event. Finally, a question was added to judge the registered nurses’ perception of the preventability of the adverse event. These changes, along with suggestions/recommendations from the expert panel were used to develop the Shift Coupon used in the dissertation (Appendix 3.1).

**Procedure**

A mailed survey was conducted using Dillman’s (2000) Tailored Design Method. Permission to conduct this study was given by the Office for Research Protection, formerly the Office of Regulatory Compliance, at the Pennsylvania State University (Appendix 3.13 and Appendix 3.14). The names and addresses of all individuals holding a registered nurse license in the State of Pennsylvania were purchased from the State Board of Nursing, Commonwealth of Pennsylvania, Department of State, Bureau of Professional and Occupational Affairs. Those registered nurses who fulfilled the inclusion criteria listed above (i.e., 156,821 individuals) were assigned a number from 1 to 156,821. A random sample of 1,000 registered nurses was selected from the list to participate in the study. First a random starting place within the listing of registered nurses was selected. The registered nurse corresponding to the number was the first nurse selected to participate in the study. Then, every consecutive 157th registered nurse was selected to participate in the study until a total of 1,000 registered nurses were selected.
Dillman (2000) identified five elements that are useful in achieving high response rates: “(1) a respondent-friendly questionnaire, (2) up to five contacts with the questionnaire recipient, (3) inclusion of stamped return envelopes, (4) personalized correspondence, and (5) a token financial incentive that is sent with the survey request” (p. 150). Each of these elements was used in this study in an attempt to achieve the highest possible return rate. First, both instruments used in this study had been previously tested and reviewed by this researcher prior to the study. Next, the first four contacts described in the five contact system explained by Dillman (2000) were implemented. These four contacts were: 1) prenotice letter (Appendix 3.15), 2) first mailing of the instruments (Appendix 3.16), 3) thank you postcard (Appendix 3.17), and 4) replacement mailing of instruments (Appendix 3.18). Only the fifth contact, (i.e., third mailing of instruments) was not used because of financial constraints. Next, each mailing of the instruments included a posted envelope for the respondent to return the instruments to the researcher (Appendix 3.19). Fourth, each contact envelope and letter was personalized to each registered nurse through the use of Pennsylvania State University stationery, individual salutation, and real signature of the researcher. Finally, a token financial incentive of $2.00 was sent to each registered nurse in the initial mailing of the instruments.

For each of the two mailings of the instruments, a study package was sent to each participating registered nurse. This package consisted of the following items: cover letter following the Dillman (2000) format, letter describing the study containing all the standard parts of an informed consent (“About the Study”)
(3.20), instructional sheet for completing the Shift Coupon and the Blegen/Vaughn Work Environment Index (Appendix 3.21), Shift Coupon Booklet containing definitions of terms used on the Shift Coupon and 10 Shift Coupons (Appendix 3.1), Blegen/Vaughn Work Environment Index (Appendix 3.3), and a posted envelope (Appendix 3.19) to return the completed instruments to the researcher. The cover letters used with each of the two mailings were changed to reflect the number of the contact by following the format recommended by Dillman (2000). All study packages were sent to the registered nurses via first-class mail.

One week prior to the first mailing of the study package, a prenotice letter was sent to each of the 1,000 randomly selected registered nurses. The purpose of this prenotice letter was to inform the registered nurse that in a few days he/she would receiving the study package and that his/her response to the instruments would be greatly appreciated (Dillman, 2000). The format of the prenotice letter followed the example provided by Dillman (2000). The first mailing of the instruments in the study package occurred one week after the prenotice letter. This study package contained all the items described above. One week after the initial mailing of the instruments, a thank you post card was mailed to each of the 1,000 registered nurses. The function of this thank you post card was to thank those registered nurses who had responded and to remind those that had not about the study (Dillman, 2000). Three weeks after the initial mailing of the instruments in the study package, the fourth contact was sent to registered nurses who did not contact the researcher to state that he/she
could not or was not interested in participating in the study and wanted to be
removed from the mailing list. This contact consisted of a second study package
containing a more “insistent” cover letter (Dillman, 2000) for those that had not
responded and gratitude for those that had responded. No identification
numbers were used on the instruments in order to maintain the anonymity of the
registered nurses. By completing and returning the instruments to the
researcher, the registered nurses were consenting to participate in the study.
See the figure below for the mailing schedule.
Figure 3.7
Mailing Schedule

1. Mailing of prenotice letter to all registered nurses (contact one)

2. 1st mailing of study package to all registered nurses (contact two)

3. Mailing of thank you postcard to all registered nurses (contact three)

4. 2nd mailing of study package to all registered nurses (contact 4)
Data Collection Using the Shift Coupon

Each registered nurse study package consisted of an instructional sheet on how to complete a Shift Coupon as well as a Coupon Booklet. The Coupon Booklet contained the definition of all terms used on the Shift Coupon as well as 10 Shift Coupons. Registered nurses were asked to complete a Shift Coupon within 1 hour of working a shift within a hospital as a registered nurse for a total of 5 shifts. After filling out a Shift Coupon for the five shifts, the registered nurses were asked to return the completed coupons (as well as the Blegen/Vaughn Work Environment Index) to the researcher in the provided posted envelope. Again, returning completed instruments to the researcher signified consent to participate in the study.

Each Shift Coupon provided the registered nurse with the option to report no adverse event occurred during the shift. Hence, irrespective of whether an adverse event occurred during a shift, each registered nurse filled out a Shift Coupon at the end of the shift. If more than one adverse event occurred during the shift, the registered nurse completed a Shift Coupon for each adverse event. The adverse events reported on Shift Coupons were any adverse event(s) that the registered nurse observed or was aware of during the just worked shift for the patients in which he/she was assigned. Hence, the adverse events data collected represented adverse events that occurred to the patients the registered nurse was assigned during the shift, not just adverse events involving registered nurses.
Data Collecting Using the Blegen/Vaughn Work Environment Index

Each study package sent to registered nurses contained general instructions for completing the Blegen/Vaughn Work Environment Index as well as a copy of the instrument. On the instrument, itself, were the specific instructions for completing each of the sections. Registered nurses were asked to complete the questionnaire and return it (with the completed Shift Coupons) to the researcher in the posted envelope. By returning the completed instrument, the registered nurses were consenting to participate in the study.

Data Analysis

Descriptive Statistics

Data from the two instruments were coded and entered into a SPSS database. If a registered nurse selected more than one adverse event per Shift Coupon, that coupon was excluded from the analysis because the researcher was unable to determine which responses corresponded to which adverse event reported. Likewise, when asked on the Blegen/Vaughn Work Environment Index to select the two important reasons why the types of adverse events occur, the researcher excluded the answers to the item from registered nurses who selected more than two reasons. The databases were then checked for accuracy by examining 25% of the inputted data and by running frequencies to inspect for irregularities in the data.

Descriptive statistics were used to answer all research questions except research question number 9 (Table 3.5). Research question 9 was answered using inferential statistics (i.e., chi-square) to determine whether more adverse
events data were collected using Shift Coupons as opposed to incident reports. Meaningfulness of the results was interpreted from the perspective of clinical importance.

The term clinical importance is synonymous with the term clinical significance: the term clinical importance will be used in this study. According to Kazdin (1999), clinical importance generally “refers to the practical or applied value or importance of the effect of the intervention—that is, whether the intervention makes a real (e.g., genuine, palpable, practical, noticeable) difference in everyday life to the clients or to others with whom the clients interact” (p. 322). There was a two-fold rationale for interpreting the data based on clinical importance and not statistical significance. First, findings that are statistically significant may not always be clinically important (Estabrook & Hodgins, 1996; Jacobson, Roberts, Berns, & McGlinchey, 1999; Thompson, 1999; Turk, 2000). For instance, a study with a large sample size may produce statistically significant results but there may be no or minimal clinical importance of the results (Turk, 2000; Huck, 2000). Second, according to Estabrook and Hodgins (1996) clinically important research is needed to attain quality improvement.
Table 3.5
Summary of Data Analysis Procedures

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Source</th>
<th>Type of Data</th>
<th>Data Analysis Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?</td>
<td>Shift Coupons: question number 8</td>
<td>Ratio</td>
<td>Descriptive statistics – frequency and percentage</td>
</tr>
<tr>
<td>2. What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index: questions 12-15</td>
<td>Ratio</td>
<td>Descriptive statistics – percentage</td>
</tr>
<tr>
<td>3. What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index: questions 16-19</td>
<td>Ratio</td>
<td>Descriptive statistics – percentage</td>
</tr>
<tr>
<td>4. What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index: questions 20-30</td>
<td>Ordinal</td>
<td>Descriptive statistics – mean, frequency, and percentage</td>
</tr>
<tr>
<td>5. Which adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?</td>
<td>Shift Coupons: questions 8, 10</td>
<td>Ratio</td>
<td>Descriptive statistics – frequency and percentage</td>
</tr>
<tr>
<td>6. What are the causes of adverse events identified by Shift Coupons as perceived by registered nurses?</td>
<td>Shift Coupon: questions 8, 9</td>
<td>Ratio</td>
<td>Descriptive statistics – frequency and percentage</td>
</tr>
<tr>
<td>7. What are the causes of medication administration errors as identified on Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index</td>
<td>Ratio</td>
<td>Descriptive statistics – frequency and percentage</td>
</tr>
<tr>
<td>8. What are the causes of patient falls as identified on Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index</td>
<td>Ratio</td>
<td>Descriptive statistics – frequency and percentage</td>
</tr>
<tr>
<td>9. Is there a difference between the number of adverse events reported on the Shift Coupons and the number of adverse events reported on incident reports?</td>
<td>Shift Coupon: questions 8, 12</td>
<td>Nominal</td>
<td>Chi-square</td>
</tr>
<tr>
<td>10. How do registered nurses perceive the work environment within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?</td>
<td>Blegen/Vaughn Work Environment Index: questions 39-57</td>
<td>Ordinal</td>
<td>Descriptive statistics – mean, frequency, and percentage</td>
</tr>
<tr>
<td>Research Question</td>
<td>Data Source</td>
<td>Type of Data</td>
<td>Data Analysis Technique</td>
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<tr>
<td>11. How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index</td>
<td>Blegen/Vaughn Work Environment Index; questions 58-67</td>
<td>Ordinal</td>
<td>Descriptive statistics – mean, frequency, and percentage</td>
</tr>
</tbody>
</table>

The following subsections present a more detailed discussion of the data analysis procedure used for each research question.

**Research Question #1: To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?**

Descriptive statistics performed on data collected from item number 8 on the Shift Coupon (“Check the incident that occurred during your shift”) was used to answer this research question. The overall number of adverse events reported will be determined by summing the number of each type of adverse event reported on the Shift Coupons by registered nurses:

Total number of adverse events = number of medication errors + number of patient falls + number of new nosocomial infection documented + new skin breakdown documented + patient complaints + family complaints + unexpected patient death + unplanned admission to intensive care unit + other.

Next, the total number of each type of adverse event identified using Shift Coupons was determined. The total number of each type of adverse event was equal to the number of each type of adverse event reported. For instance, the total number of medication errors is equal to the total number of medication errors reported by registered nurses on Shift Coupons.
Research Question # 2: What percentage of medication administration errors are reporting in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

This research question was answered using items 12-15 on the Blegen/Vaughn Work Environment Index. Descriptive statistics were used to determine the percentage and frequency in which registered nurses identified the category representing the percentage of medication administration errors reported in the last three months. For example, for item #12, “Place a mark in the box corresponding to the percentage of all medication administration errors that you think was reported in the last 3 months: Oral and topical medication errors,” the frequency and percentage registered nurses marked each of the possible categories (i.e., 0-9%, 10-19%, 20-29%, 30-39%, 40-49%, 50-59%, 60-69%, 70-79%, 80-89%, and 90-99%).

Research Question # 3: What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

This research question was answered using items 16-19 on the Blegen/Vaughn Work Environment Index. Descriptive statistics were used to determine the percentage and frequency in which registered nurses identified the category representing the percentage of patient falls reported in the last three months. For example, for item #16, “Place a mark in the box corresponding to the percentage of all patient falls that you think was reported in the last 3 months: Patient falls without injury,” the frequency and percentage registered nurses
marked each of the possible categories (i.e., 0-9%, 10-19%, 20-29%, 30-39%,
40-49%, 50-59%, 60-69%, 70-79%, 80-89%, and 90-99%).

Research Question # 4: What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

Descriptive statistics for items 20-30 on the Blegen/Vaughn Work Environment Index were used to answer this research question. For items 20-30 on this instrument, registered nurses were asked to mark the extent of his/her agreement on a 5-point scale ranging from strongly disagree to strongly agree for each item. A mean rating and standard deviation for the four administrative fear response items and a mean rating and standard deviation for the seven personal fear response items was calculated following the instruction provided by Dr. Blegen. Then frequency and percentage for each of the items was determined from the data. For instance, for item 20, “Nurses could be blamed if something happens to a patient as a result of the medication error,” the frequency and percentage of responses for each of the possible categories (i.e., strongly disagree, disagree, neutral, agree, and strongly agree) were calculated.

Research Question # 5: Which type(s) of adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?

This question was answered using data collected from item number 8 on the Shift Coupon (“Check the incident that occurred during your shift”) and from item number 10 on the Shift Coupon (“What was the result of the incident”). First, the frequency and percentage of patient harm as categorized by the
choices on the Shift Coupon (i.e., no harm to patient, temporary harm to patient, permanent harm to patient, death, and unknown) were determined for the total number of adverse events reported. Next, the frequency and percentage of patient harm using the same five categories were ascertained for each type of adverse event.

Research Question # 6: What are the causes of adverse events identified by Shift Coupons as perceived by the registered nurses?

This research question was answered using data from item number 9 (“What caused the incident”) and item number 8 (“Check the incident that occurred during your shift”) on the Shift Coupon. First, the frequency and percentage of each cause for all reported adverse events were calculated. Then, the frequency and percentage of each cause for each type of adverse event were computed.

Research Question #7: What are the causes of medication administration errors as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index, registered nurses were asked to check the two most important reasons involved in medication administration errors based on their experience from the list of possible causes. The frequency and percentage for each cause listed were ascertained.

Research Question #8: What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to check the two most important reasons involved in patient falls based on
their experience from the list of possible causes. The frequency and percentage for each cause listed were established.

Research Question # 9: Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

This research question was answered using data collected by item number 8 on the Shift Coupon ("Check the incident that occurred during your shift") and item number 12 ("Was an incident report filled out for this incident"). Determination of whether Shift Coupons collected more data on adverse events than incident reports was decided using an independent-sample chi-square test.

Chi-square is a nonparametric inferential statistical test used to compare “the actual number (or frequency) in each group with the expected number” (Munro, 2001, p. 98). In this research question, the expected number was the number of adverse events reported using incident reports (i.e., reporting method already in place in the hospital facility) and the comparison was the number of adverse events reported using Shift Coupons (i.e., reporting method being tested in this study). In other words, was the number of adverse events reported using incident reports significantly different than the number of adverse events reported using Shift Coupons. A nonparametric statistical test was selected because the distributions of adverse events are unknown – with nonparametric tests there is no assumption of normal distribution as with parametric tests (Munro, 2001).

Below are examples of the contingency tables that were used to answer this research question. The upper left-hand box of the contingency table consists
of the number of adverse events reported using the Shift Coupons. The lower left-hand box contains the number of adverse events reported using incident reports. The upper right-hand box contains the number of Shift Coupons which reported no adverse event occurred during the shift. The lower right-hand box also consists of the number of Shift Coupons which reported no adverse event occurred during the shift.

Table 3.6
Examples of Contingency Tables Used to Answer Research Question 9

<table>
<thead>
<tr>
<th>Contingency Table</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Adverse Event</td>
<td>Shift Coupons</td>
<td>Incident Reports</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

According to Munro (2001), there are four underlying assumptions with chi-square: “1) frequency data; 2) adequate sample size; 3) measures independent of each other; 4) theoretical basis for the categorization of the variables” (p. 99). Assumption one was fulfilled because the data will be considered nominal level, a count of the number of adverse events, for this test. Assumption two, sample size, was tested when the data was collected. If the expected frequency (i.e., number of adverse events reported using incident reports) was less than five for any of the chi-square tests (Huck, 2000; Munro,
2001), than the more conservative Fisher’s Exact Test was used. Next, since the samples were independent of each other, the third assumption was met. The last assumption was satisfied by grouping the adverse events in accordance with categories found in adverse event literature (e.g., medication errors, patient falls, and unexpected patient deaths).

Because SPSS software was used to run the analyses of the data, there the probability level was set at the software’s default of 0.05 for a two-tailed test (personal communications, Steven M, August 21, 2003 [SPSS Support Representative] and Matt Mathison, August 27, 2003 [SPSS Statistical Support Representative]). However, there was no method of changing the effect size and no default effect size (personal communication, Matt Mathison, August 27, 2003 [SPSS Statistical Support]). Therefore, the researcher was unable to determine the power level.

As previously stated, hospital administrators were unwilling/unable to participate in this study due to a host of reasons. Therefore, data concerning the reporting of adverse events on incident reports came from registered nurse self-reports. The limitation of registered nurse self-report of incident report data is acknowledged by the researcher, but was unavoidable because of the lack of a corresponding hospital administrator willing/able to participate in the study.
Research Question # 10: How do registered nurses perceive the work environment within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

This research question was answered using descriptive statistics for data collected on items 39-57. Registered nurses were asked to indicate the degree to which they agree or disagree with the item using the 5-point scale ranging from “strongly disagree” to “strongly agree” for each of the items. The mean rating and standard deviation for the four subscale identified by Dr. Blegen (i.e., staffing resources, physical resources, peer relations, and quality management) were ascertained using the scoring procedure. Next, the frequency and percentage for each of the categories were determined for each of the items.

Research Question # 11: How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

This research question was answered using descriptive statistics for data collected on items 58-67. Registered nurses were asked to indicate the degree to which they agree or disagree with the item using the 5-point scale ranging from “strongly disagree” to “strongly agree” for each of the items. The mean rating and standard deviation for the six items of job satisfaction were ascertained using Dr. Blegen’s scoring procedure. The frequency and percentage for each of the items were calculated.

Limitations/Threats

As with any research, there were limitations in the study design that need to be acknowledged. This descriptive comparative study did not permit cause
and effect inferences. Rather the study permitted the researcher to examine the relationships between variables. For example, no cause and effect inferences should be made between the adverse event causes identified by the registered nurses and the occurrence of an adverse event. Rather, these identified causes need to be examined in terms of their relationship to the occurrence of adverse events.

There were two threats to internal validity history and possible low response rate. History was a threat because the popular or academic press has published features on the topics of adverse events and the work environment that may have affected the reporting behaviors or beliefs of the registered nurses. Additionally, employers of the registered nurses may have conducted educations programs during the study period that may have influenced the responses of the registered nurses. The second threat was the possibility of a low response rate. Because of the sensitive nature of the issue under investigation (i.e., adverse events) and the need for registered nurses to complete a Shift Coupon for five shifts, fewer nurses may have returned the surveys. To address this possible limitation, the researcher used Dillman’s (2000) Tailor Designed Method in an attempt to increase the response rate. Novelty effect was the threat to external validity. Because this was the first time the Shift Coupon was used to collect adverse events data and this was the first time the Blegen/Vaughn Work Environment Index was completed by registered nurses in Pennsylvania, the registered nurses may have been overly enthusiastic or skeptical about completing the instruments.
References


Thompson, B. (1999). If statistical significance tests are broken/misused, what practices should supplement or replace them?. Theory & Psychology, 9(2), 165-181.


Chapter 4

Overview

The purposes of this study were to test the ability of the Shift Coupon to collect adverse events data and to explore the hospital work environment as it related to registered nurses reports of adverse events. The findings from this study may be used to quantify the incidence of adverse events within the hospital setting, to explain the circumstances surrounding the cause(s) of the adverse events, and to understand the current hospital work environment related to adverse events in which registered nurses practice. This chapter presents the results of the data analysis and answers the following research questions:

1. To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?
2. What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
3. What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
4. What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?
5. Which adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?
6 What are the causes of the adverse events identified by the Shift Coupons as perceived by registered nurses?

7 What are the causes of medication administration errors as identified on the Blegen/Vaughn Work Environment Index?

8 What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

9 Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

10 How do registered nurses perceive quality management within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

11 How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

**Study Design**

The purposes of this study were accomplished by using a nonexperimental, descriptive, comparative study design. The data used in the analyses were drawn from two sources: Shift Coupons and the Blegen/Vaughn Work Environment Indices. The sample consisted of 1,000 randomly selected registered nurses from the State of Pennsylvania who met the inclusion criteria: individual at least 18 years of age, individual with a current Pennsylvania registered nursing license, and an individual with a current address within the State of Pennsylvania.
Validity of the Shift Coupon

Validity is the “determination of whether or not a device or method is useful for the purpose for which it is intended, that is, measures what it purports to measure” (Waltz, Strickland, and Lenz, 1991, p. 4). Content validity was established for the Shift Coupon through a three-person expert panel. Each member of the expert panel was asked to determine: 1) whether there is a link between the purpose of the instrument and the items on the instrument, 2) whether the items on the instrument address the purpose of the instrument, and 3) whether the items on the instrument represent the domain of interest (Waltz, et al., 1991) using a four-point scale (1-not relevant to 4-very relevant). As seen in Table 4.1, the calculated content validity index for the Shift Coupon was good, ranging from 3 (quite relevant) to 4 (very relevant), with the majority of items and options receiving a rating of 4 (very relevant).
<table>
<thead>
<tr>
<th>Item</th>
<th>Option</th>
<th>Expert panel member #1</th>
<th>Expert panel member #2</th>
<th>Expert panel member #3</th>
<th>Content validity index</th>
</tr>
</thead>
<tbody>
<tr>
<td>This shift was worked in</td>
<td>Hospital</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Home care agency</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Nursing home</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Physician office</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>If the shift was worked in a hospital, which type of unit</td>
<td>Medical/Surgical</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Emergency room</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Operating room/Recovery room</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Outpatient</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Intensive care unit</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Psychiatric unit</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Labor and Delivery</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Shift time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was this a weekend shift</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Was this a holiday shift</td>
<td></td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3.67</td>
</tr>
<tr>
<td>What was the total number of patients you were assigned during this shift</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Of the patients you were assigned, how many required</td>
<td></td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3.67</td>
</tr>
<tr>
<td>Minimal nursing care</td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Moderate nursing care</td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Maximum nursing care</td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Check the adverse event that occurred during your shift</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>No adverse event</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Unplanned admission to ICU</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Patient complaint</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Family complaint</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Event Description</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>---------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Patient fall</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Medication error</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**What caused the adverse event (check all that apply)**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of staff</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of information</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of communication</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of supplies/equipment</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Malfunctioning supplies/equipment</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Work overload</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Stressful atmosphere</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Faulty judgment</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Fatigue</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Failure to follow hospital policy</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Poor hospital policy</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Poorly designed unit</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

**What was the result of the adverse event**

<table>
<thead>
<tr>
<th>Result</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm to patient</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Temporary harm to patient</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Permanent harm to patient</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Death</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

**Could this adverse event have been prevented**

<table>
<thead>
<tr>
<th>Prevention</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Was an adverse event report filled out for this adverse event</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

1 – Not Relevant; 2 – Somewhat Relevant; 3 – Quite Relevant; 4 – Very Relevant
Reliability of the Shift Coupon

Reliability is the “consistency with which a devise or method assigns scores to subjects” (Waltz et al., 1991, p. 4). As stated in Chapter 3, it is not possible to measure the reliability of the Shift Coupon because of the data collected and the nature of the healthcare environment. Therefore, the focus should be on the usability of the instrument (i.e., “Does the Shift Coupon collect data that provide a more accurate picture of the adverse events that are occurring?”). The results found in this chapter (especially to research question number 9: Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?) are an initial step in testing the usability of this instrument.

Validity of the Blegen/Vaughn Work Environment Index

As stated in Chapter 3, the validity of the Blegen/Vaughn Work Environment Index came from its development (i.e., reviewing existing instruments, brainstorming and modifying these existing instruments, and pilot testing the created instrument). Modifications were made by the developers to the instrument based on results of the pilot study.

Reliability of the Blegen/Vaughn Work Environment Index

The following table compares the mean scores, standard deviations, and Cronbach alpha scores of the results of Blegen, Vaughn and colleagues pilot study with the results of this study. As can be seen in the table, the means and standard deviations, as well as the Cronbach alpha scores from this study, were very similar to the results of the Blegen/Vaughn study.
Table 4.2
Comparison of Subscale Means and Cronbach Alpha Score for Blegen/Vaughn Study with this Study

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mean (standard deviation) from Blegen/Vaughn study (n=1105)</th>
<th>Mean (standard deviation) from this study (n=225)</th>
<th>Cronbach alpha from Blegen/Vaughn study (n=1105)</th>
<th>Cronbach alpha from this study (n=225)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative response - reasons for not reporting medication errors</td>
<td>3.17 (0.87)</td>
<td>3.43 (0.83)</td>
<td>0.74</td>
<td>0.74</td>
</tr>
<tr>
<td>Personal fears - reasons for not reporting medication errors</td>
<td>3.41 (0.81)</td>
<td>3.57 (0.76)</td>
<td>0.84</td>
<td>0.83</td>
</tr>
<tr>
<td>Quality management</td>
<td>3.44 (0.61)</td>
<td>3.22 (0.59)</td>
<td>0.78</td>
<td>0.76</td>
</tr>
<tr>
<td>Staffing resources</td>
<td>2.58 (0.77)</td>
<td>2.53 (0.76)</td>
<td>0.63</td>
<td>0.63</td>
</tr>
<tr>
<td>Physical resources</td>
<td>3.13 (0.81)</td>
<td>3.24 (0.73)</td>
<td>0.61</td>
<td>0.59</td>
</tr>
<tr>
<td>Peer relations</td>
<td>3.91 (0.69)</td>
<td>3.70 (0.67)</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>3.62 (0.68)</td>
<td>3.61 (0.76)</td>
<td>0.83</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Sample

The names and addresses of individuals possessing a registered nursing license in the State of Pennsylvania were purchased from the State Board of Nursing, Commonwealth of Pennsylvania, Department of State, Bureau of Professional and Occupational Affairs. Of the 189,510 registered nurses who were listed, a total of 156,821 individuals met the inclusion criteria. From the 156,821 registered nurses, a random sample of 1,000 individuals was selected as the study sample. Table 4.3 shows the county in which the registered nurses in the sample lived as well as the county in which the eligible population of registered nurses lived. The table shows that the number and percentage of registered nurses drawn from each county for the sample mirrors the number and percentage of registered nurses in that county for the population.
Table 4.3
Comparison of Registered Nurses in the Population and the Sample by County

<table>
<thead>
<tr>
<th>County</th>
<th>Population N (%)</th>
<th>Sample n (%)</th>
<th>County</th>
<th>Population N (%)</th>
<th>Sample n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>687 (0.44)</td>
<td>0 (0.00)</td>
<td>McKeans</td>
<td>441 (0.28)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Allegheny</td>
<td>19419 (12.38)</td>
<td>135 (13.50)</td>
<td>Mercer</td>
<td>1527 (0.97)</td>
<td>11 (1.10)</td>
</tr>
<tr>
<td>Armstrong</td>
<td>885 (0.56)</td>
<td>4 (0.40)</td>
<td>Mifflin</td>
<td>329 (0.21)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Beaver</td>
<td>2310 (1.47)</td>
<td>19 (1.90)</td>
<td>Monroe</td>
<td>1197 (0.76)</td>
<td>12 (1.20)</td>
</tr>
<tr>
<td>Bedford</td>
<td>392 (0.25)</td>
<td>4 (0.40)</td>
<td>Montgomery</td>
<td>12315 (7.85)</td>
<td>6 (6.40)</td>
</tr>
<tr>
<td>Berks</td>
<td>4390 (2.80)</td>
<td>30 (3.00)</td>
<td>Montour</td>
<td>532 (0.34)</td>
<td>2 (0.20)</td>
</tr>
<tr>
<td>Blair</td>
<td>1808 (1.15)</td>
<td>12 (1.20)</td>
<td>Northampton</td>
<td>3480 (2.22)</td>
<td>20 (2.00)</td>
</tr>
<tr>
<td>Bradford</td>
<td>802 (0.51)</td>
<td>4 (0.40)</td>
<td>Northumberland</td>
<td>1131 (0.72)</td>
<td>8 (0.80)</td>
</tr>
<tr>
<td>Bucks</td>
<td>9472 (6.04)</td>
<td>67 (6.70)</td>
<td>Penobscot</td>
<td>1 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Butler</td>
<td>2868 (1.83)</td>
<td>18 (1.80)</td>
<td>Perry</td>
<td>393 (0.25)</td>
<td>3 (0.30)</td>
</tr>
<tr>
<td>Cambria</td>
<td>2421 (1.54)</td>
<td>10 (1.00)</td>
<td>Philadelphia</td>
<td>10220 (6.52)</td>
<td>58 (5.80)</td>
</tr>
<tr>
<td>Cameron</td>
<td>33 (0.02)</td>
<td>0 (0.00)</td>
<td>Pike</td>
<td>258 (0.16)</td>
<td>3 (0.30)</td>
</tr>
<tr>
<td>Carbon</td>
<td>711 (0.45)</td>
<td>9 (0.90)</td>
<td>Potter</td>
<td>166 (0.11)</td>
<td>2 (0.20)</td>
</tr>
<tr>
<td>Centre</td>
<td>1037 (0.66)</td>
<td>8 (0.80)</td>
<td>Schuykill</td>
<td>1794 (1.14)</td>
<td>18 (1.80)</td>
</tr>
<tr>
<td>Chester</td>
<td>6204 (3.96)</td>
<td>34 (3.40)</td>
<td>Snyder</td>
<td>346 (0.22)</td>
<td>1 (0.10)</td>
</tr>
<tr>
<td>Clarion</td>
<td>360 (0.23)</td>
<td>2 (0.20)</td>
<td>Somerset</td>
<td>907 (0.58)</td>
<td>7 (0.70)</td>
</tr>
<tr>
<td>Clearfield</td>
<td>942 (0.60)</td>
<td>3 (0.30)</td>
<td>Sullivan</td>
<td>47 (0.03)</td>
<td>1 (0.10)</td>
</tr>
<tr>
<td>Clinton</td>
<td>284 (0.18)</td>
<td>1 (0.10)</td>
<td>Susquehanna</td>
<td>426 (0.27)</td>
<td>1 (0.10)</td>
</tr>
<tr>
<td>Columbia</td>
<td>911 (0.58)</td>
<td>6 (0.60)</td>
<td>Tioga</td>
<td>338 (0.22)</td>
<td>5 (0.50)</td>
</tr>
<tr>
<td>Crawford</td>
<td>866 (0.55)</td>
<td>7 (0.70)</td>
<td>Union</td>
<td>414 (0.26)</td>
<td>5 (0.50)</td>
</tr>
<tr>
<td>Cumberland</td>
<td>2717 (1.73)</td>
<td>15 (1.50)</td>
<td>Venango</td>
<td>692 (0.44)</td>
<td>2 (0.20)</td>
</tr>
<tr>
<td>Dauphin</td>
<td>2941 (1.88)</td>
<td>13 (1.30)</td>
<td>Warren</td>
<td>509 (0.32)</td>
<td>4 (0.40)</td>
</tr>
<tr>
<td>Delaware</td>
<td>8881 (5.66)</td>
<td>65 (6.50)</td>
<td>Washington</td>
<td>3217 (2.05)</td>
<td>19 (1.90)</td>
</tr>
<tr>
<td>Elk</td>
<td>385 (0.25)</td>
<td>3 (0.30)</td>
<td>Wayne</td>
<td>690 (0.44)</td>
<td>8 (0.80)</td>
</tr>
<tr>
<td>Erie</td>
<td>3615 (2.31)</td>
<td>26 (2.60)</td>
<td>Westmoreland</td>
<td>5914 (3.77)</td>
<td>31 (3.10)</td>
</tr>
<tr>
<td>Fayette</td>
<td>1781 (1.14)</td>
<td>5 (0.50)</td>
<td>Wyoming</td>
<td>323 (0.21)</td>
<td>3 (0.30)</td>
</tr>
<tr>
<td>Forest</td>
<td>51 (0.03)</td>
<td>0 (0.00)</td>
<td>York</td>
<td>3330 (2.12)</td>
<td>17 (1.70)</td>
</tr>
<tr>
<td>Franklin</td>
<td>1001 (0.64)</td>
<td>4 (0.40)</td>
<td>No County Given</td>
<td>4325 (2.76)</td>
<td>32 (3.20)</td>
</tr>
<tr>
<td>Fulton</td>
<td>92 (0.06)</td>
<td>0 (0.00)</td>
<td>Total</td>
<td>156,821 (100)</td>
<td>1,000 (100)</td>
</tr>
<tr>
<td>Greene</td>
<td>370 (0.24)</td>
<td>3 (0.30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huntingdon</td>
<td>357 (0.23)</td>
<td>1 (0.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indiana</td>
<td>891 (0.57)</td>
<td>8 (0.80)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jefferson</td>
<td>451 (0.29)</td>
<td>1 (0.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juniata</td>
<td>177 (0.11)</td>
<td>3 (0.30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lackawanna</td>
<td>2957 (1.89)</td>
<td>15 (1.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lancaster</td>
<td>5069 (3.23)</td>
<td>37 (3.70)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawrence</td>
<td>1455 (0.93)</td>
<td>6 (0.60)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lebanon</td>
<td>1385 (0.88)</td>
<td>9 (0.90)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lehigh</td>
<td>4023 (2.57)</td>
<td>29 (2.90)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luzerne</td>
<td>4905 (3.13)</td>
<td>36 (3.60)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lycoming</td>
<td>1253 (0.80)</td>
<td>11 (1.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Of the 1,000 registered nurses selected to participate in the study, 231 registered nurses (23.1%) contacted the researcher by mail, phone, or email to state he/she was not eligible to participate or desired not to participate in the
study. Table 4.4 presents the reasons the registered nurses reported for not participating in the study.

Table 4.4
Reasons Why Registered Nurses did not Participate in Study

<table>
<thead>
<tr>
<th>Reason</th>
<th>Registered nurses n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No direct patient care</td>
<td>56 (24.2)</td>
</tr>
<tr>
<td>No reason given</td>
<td>52 (22.5)</td>
</tr>
<tr>
<td>Retired from nursing</td>
<td>42 (18.2)</td>
</tr>
<tr>
<td>Employed in other than healthcare field</td>
<td>24 (10.4)</td>
</tr>
<tr>
<td>Address discrepancy in the State Board of Nursing database</td>
<td>14 (6.1)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>11 (4.8)</td>
</tr>
<tr>
<td>Nurse practitioner</td>
<td>9 (3.9)</td>
</tr>
<tr>
<td>Disabled due to work-related injury</td>
<td>7 (3.0)</td>
</tr>
<tr>
<td>Maternity leave</td>
<td>5 (2.2)</td>
</tr>
<tr>
<td>Student</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Inactive registered nurse</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Traveling nurse working outside Pennsylvania</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Moved outside Pennsylvania</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Too busy to complete instruments</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Did not like token gift of $2.00</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Felt answering the instruments would not be helpful to the nursing profession</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Family illness</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Felt he/she did not work enough hours to honestly answer the questions</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Total</td>
<td>231 (100.0)</td>
</tr>
</tbody>
</table>

The reasons given by the registered nurses who stated they were not eligible or did not desire to participate in the study were compared to the results of the Special Report on the Characteristics of the Registered Nurse Population in Pennsylvania, conducted by the Pennsylvania Department of Health (available at http://www.dsf.health.state.pa.us/health/lib/health/RNDATABOOK_1002.pdf). The sample for the Pennsylvania Department of Health study consisted of individuals renewing their Pennsylvanian registered nursing licenses in either
April or October 2002. As seen in Table 4.5, only the percentage of students in the present study mirrors the percentage of students in the Pennsylvania Department of Health study. One possible reason to explain the discrepancies between the two studies is that registered nurses in the present study may have been less likely to contact the researcher to report these reasons for not participating than the registered nurses who reported their employment status with the license renewal application. Additionally, 22.5% of the registered nurses in this study who were not eligible or did not want to participate did not give a reason for their non-participation.

Table 4.5
Comparison of Present Study with the Pennsylvania Department of Health Study

<table>
<thead>
<tr>
<th></th>
<th>Present Study (%) n=1,000</th>
<th>Pennsylvania Department of Health study (%) n= 83,058</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retired</td>
<td>18.2</td>
<td>10.2</td>
</tr>
<tr>
<td>Employed in other than healthcare</td>
<td>10.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Student</td>
<td>0.9</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Of the remaining 769 registered nurses who did not respond as to their eligibility or desire to participate in the study, 355 registered nurses returned Shift Coupons to the researcher, for a response rate of 46.2%. Of the 355 registered nurses who returned Shift Coupons, 247 (69.6%) registered nurses returned at least one Shift Coupon for a shift worked in the hospital setting. From all 355 registered nurses a total of 1937 Shift Coupons were returned, with the majority (70.7%) of the coupons representing shifts worked in the hospital setting (Table 4.6). Only surveys returned from registered nurses who worked in the hospital setting were included in the data analysis. When the Shift Coupons reporting a
shift worked in the hospital setting were analyzed by type of hospital unit, almost a third (32.8%) of the coupons represented shifts worked on a medical/surgical unit (Table 4.7).

Table 4.6 Setting Where the Registered Nurses Worked the Shift

<table>
<thead>
<tr>
<th>Setting Where the Shift was Worked</th>
<th>Number of coupons returned by registered nurses n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>1369 (70.7)</td>
</tr>
<tr>
<td>Nursing home</td>
<td>230 (11.9)</td>
</tr>
<tr>
<td>Other</td>
<td>132 (6.8)</td>
</tr>
<tr>
<td>Home care agency</td>
<td>112 (5.8)</td>
</tr>
<tr>
<td>Physician office</td>
<td>94 (4.9)</td>
</tr>
<tr>
<td>Total</td>
<td>1937 (100.0)</td>
</tr>
</tbody>
</table>

Table 4.7 Unit in Hospital Where Registered Nurses Worked the Shift

<table>
<thead>
<tr>
<th>Hospital Unit Where the Shift was Worked</th>
<th>Number of Coupons returned by registered nurses n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical/Surgical unit</td>
<td>457 (33.4)</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>243 (17.8)</td>
</tr>
<tr>
<td>Operating room/Recovery room</td>
<td>129 (9.4)</td>
</tr>
<tr>
<td>Other</td>
<td>117 (8.5)</td>
</tr>
<tr>
<td>Psychiatric unit</td>
<td>94 (6.9)</td>
</tr>
<tr>
<td>Outpatient unit</td>
<td>83 (6.1)</td>
</tr>
<tr>
<td>Labor and Delivery unit</td>
<td>75 (5.5)</td>
</tr>
<tr>
<td>Rehabilitation unit</td>
<td>70 (5.1)</td>
</tr>
<tr>
<td>Pediatric unit</td>
<td>58 (4.2)</td>
</tr>
<tr>
<td>Emergency room</td>
<td>43 (3.1)</td>
</tr>
<tr>
<td>Total</td>
<td>1369 (100.0)</td>
</tr>
</tbody>
</table>

Of the 1,369 coupons returned by registered nurses for shifts worked in the hospital setting, the most commonly reported shift hours reported were: 7am-3pm (21.6%), 3pm-11pm (13.7%), 7am-7pm (11.8%), and 7pm-7am (11.7%). Almost a fifth (19.2%) of the coupons returned were for shifts worked during a weekend, and 4.4% of the coupons returned represented a shift worked on a
holiday. (Since the first mailing of the surveys to the registered nurses was June 30, 2003, and last date data were accepted for inclusion in this analysis was August 31, 2003, July 4\textsuperscript{th} represents the only possible holiday that could have been worked by the registered nurses.)

Of the 1,369 Shift Coupons returned for shifts worked in the hospital setting, the most frequently reported number of patients assigned to the registered nurses for a shift were: 2 (12.8\%), 6 (12.6\%), 8 (9.1\%), and 7 (8.8\%). However, the range of patients assigned to the registered nurses during a shift varied from 0 patients to 60 patients. As seen in Table 4.8, the number of patients assigned to a registered nurse during a shift and the range of patients assigned to a registered nurse during a shift appeared to be a function of the hospital unit on which the shift was worked. Registered nurses who worked the shift on an outpatient unit or a medical/surgical unit generally reported the highest number of patients assigned to them during a shift, with 8 patients and 7 patients per shift respectively. Whereas, registered nurses who worked the shift in an intensive care unit or in an operating room/recovery room reported being assigned the least number of patients during the shift, with 2 and 3 patients, respectively. The widest range of patients assigned to a registered nurse during a shift was reported for shifts worked on a psychiatric unit (2 to 60 patients) and on an outpatient unit (3 to 52 patients).
Table 4.8
Most Commonly Reported Number of Patients Assigned to Registered Nurse and Range of Patients Assigned to Registered Nurse by Hospital Unit Type

<table>
<thead>
<tr>
<th>Hospital unit</th>
<th>Most commonly reported number of patients assigned to a registered nurse during a shift n (%)</th>
<th>Range of patients assigned to a registered nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical/Surgical unit</td>
<td>7 patients 84 (18.4) 6 patients 83 (18.2) 8 patients 68 (14.9)</td>
<td>2 to 33 patients</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>2 patients 139 (57.2) 3 patients 47 (19.3) 1 patient 38 (15.6)</td>
<td>0 to 6 patients</td>
</tr>
<tr>
<td>Operating room/Recovery room</td>
<td>3 patients 18 (14.0) 4 patients 18 (14.0) 6 patients 16 (12.4)</td>
<td>1 to 25 patients</td>
</tr>
<tr>
<td>Other</td>
<td>6 patients 21 (17.9) 3 patients 14 (12.0) 5 patients 12 (10.3) 8 patients 12 (10.3)</td>
<td>2 to 40 patients</td>
</tr>
<tr>
<td>Psychiatric unit</td>
<td>5 patients 20 (21.3) 6 patients 11 (11.7) 4 patients 10 (10.6)</td>
<td>2 to 60 patients</td>
</tr>
<tr>
<td>Outpatient unit</td>
<td>8 patients 13 (15.7) 10 patients 8 (9.6) 7 patients 6 (7.2)</td>
<td>3 to 52 patients</td>
</tr>
<tr>
<td>Rehabilitation unit</td>
<td>4 patients 15 (21.4) 10 patients 11 (15.7) 12 patients 6 (8.6)</td>
<td>1 to 29 patients</td>
</tr>
<tr>
<td>Labor and Delivery unit</td>
<td>6 patients 11 (14.7) 5 patients 11 (14.7) 3 patients 7 (13.3)</td>
<td>1 to 15 patients</td>
</tr>
<tr>
<td>Pediatric unit</td>
<td>6 patients 14 (24.1) 8 patients 9 (15.5) 7 patients 5 (8.6) 4 patients 5 (8.6)</td>
<td>1 to 20 patients</td>
</tr>
<tr>
<td>Emergency room</td>
<td>6 patients 11 (25.6) 9 patients 4 (9.3) 5 patients 4 (9.3)</td>
<td>4 to 33 patients</td>
</tr>
</tbody>
</table>
Results

The following subsections present the answers to the 11 research questions.

Research Question #1: To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?

Registered nurses were asked to report on a Shift Coupon whether or not an adverse event occurred during the shift just worked. Table 4.9 shows the distribution of adverse events reported on all 1,369 coupons returned for shifts worked in the hospital setting. For the majority (70.9%) of the Shift Coupons, registered nurses reported no adverse event occurred during that shift. On the remaining 397 Shift Coupons, nurses reported the occurrence of an adverse event. The most commonly reported adverse events overall were: patient complaints (21.4%) (e.g., patient’s sedation had worn off due to delay in OR – patient cried loudly that her arm with blood pressure cuff was excruciatingly tight and no one did anything about it, delay in patient service/procedure, and information released without patient consent), medication errors (18.9%), family complaints (17.6%) (e.g., patient received medications late, patient needed to change room because of room too noisy, and MD did not spend enough time with patient), and patient falls (12.1%) (Table 4.10).
Table 4.9
Distribution of Adverse Events Reported for Shift Coupons Returned for Shifts Worked in the Hospital Setting

<table>
<thead>
<tr>
<th>Adverse event</th>
<th>Coupons reporting adverse event n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adverse event occurred</td>
<td>970 (70.9)</td>
</tr>
<tr>
<td>Patient complaint</td>
<td>85 (6.2)</td>
</tr>
<tr>
<td>Medication error</td>
<td>75 (5.5)</td>
</tr>
<tr>
<td>Family complaint</td>
<td>70 (5.1)</td>
</tr>
<tr>
<td>Patient fall</td>
<td>48 (3.5)</td>
</tr>
<tr>
<td>Unplanned admission to intensive care unit</td>
<td>36 (2.6)</td>
</tr>
<tr>
<td>Other</td>
<td>36 (2.6)</td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>18 (1.3)</td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>16 (1.2)</td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>13 (0.9)</td>
</tr>
<tr>
<td>Missing data</td>
<td>2 (0.1)</td>
</tr>
<tr>
<td>Total</td>
<td>1369 (100.0)</td>
</tr>
</tbody>
</table>

A total of 457 Shift coupons were returned for shifts worked on a medical/surgical unit. On 289 of the 457 coupons (63.2%), registered nurses reported the occurrence of no adverse event during the shift. On the remaining 166 coupons, the most frequently reported adverse events were: medication errors (22.9%), patient complaints (22.3%), family complaints (16.3%), and patient falls (15.7%) (Table 4.10). Two coupons representing shifts worked on a medical/surgical unit lacked the identification of an adverse event and therefore were excluded in the data analysis.

Two hundred and forty-three coupons were returned by registered nurses for shifts worked on an intensive care unit. The most commonly reported adverse events on the 57 Shift Coupons on which registered nurses identified an adverse event were: family complaints (28.1%), unplanned admission to intensive care unit (17.5%), medication errors (15.8%), and other (12.3%) (e.g.,...
uncapped needle found in patient bed, blister found at IV site, and patient extubated self) (Table 4.10). Registered nurses did not report the occurrence of any patient falls during shifts worked on an intensive care unit.

A total of 117 coupons were returned for a shift worked on a unit which did not fall into a traditional hospital unit category, in other words the other category. Examples of other units included: burn unit, inpatient endoscopy unit, inpatient acute dialysis unit, and transitional care. Of the 117 Shift Coupons, 48 coupons reported adverse events that occurred during the shift. The most frequently reported adverse events were: patient complaints (18.8%), unplanned admissions to the intensive care unit (16.7%), others (16.7%) (e.g., cardiac catheterization resulted in open heart surgery and patient not turned every 2 hours as ordered) and medication errors (14.6%) (Table 4.10).

Table 4.10 displays the adverse events registered nurses most often reported for shifts worked in the operating room or recovery room. Patient complaints (34.8%), others (26.1%) (e.g., unexpected change in anesthesia from sedative to general and intake worker marked the wrong hand for surgery), medication errors (13.0%), and family complaints (13.0%) were the most commonly reported adverse events on the 23 of 129 Shift Coupons in which registered nurses reported an adverse event occurring during the shift. The following adverse events were not reported: new nosocomial infections documented, unexpected patient deaths, and new skin breakdowns documented.

Of the 83 Shift Coupons returned by registered nurses working on an outpatient unit, a total of 23 (27.7%) reported an adverse event. Patient
complaints (47.8%), family complaints (21.7%), and others (13.0%) (e.g.,
unplanned admission to hospital) were the most commonly reported adverse
events (Table 4.10). The following adverse events were not reported by any
registered nurse working on an outpatient unit: unexpected patient deaths and
new skin breakdowns documented.

Registered nurses working on psychiatric units returned a total of 94 Shift
Coupons. On 22 (23.4%) of these coupons registered nurses reported the
occurrence of an adverse event during the shift worked. The adverse events
most often reported were: medication errors (45.5%), patient falls (22.7%),
patient complaints (13.6%), and others (13.6%) (e.g., patient assaulted another
patient) (Table 4.10). However, no unexpected admissions to the intensive care
unit, new nosocomial infections documented, unexpected patient deaths, or new
skin breakdowns documented were reported by registered nurses.

Table 4.10 also presents the adverse events reported by registered
nurses on Shift Coupons for shifts worked on a rehabilitation unit. Of the 70
coupons returned, adverse events were reported on 19 (27.1%) Shift Coupons.
Patient falls (26.3%), medication errors (21.1%), patient complaints (15.8%), and
family complaints (15.8%) were the adverse events most often reported by the
registered nurses. The adverse events that were not reported by the registered
nurses were: unexpected patient deaths and others.

Table 4.10 displays the adverse events reported by registered nurses for
shifts worked on pediatric units. A total of 58 coupons were returned and
registered nurses reported the occurrence of an adverse event on 17 (29.3%)
Shift Coupons. The most frequently reported adverse events were: family complaints (29.4%), new nosocomial infections documented (17.6%), unplanned admissions to the intensive care unit (17.6%), and medication errors (11.8%). No registered nurse reported the occurrence of an adverse event that would fall in the other category.

A total of 43 Shift Coupons were returned by registered nurses for shifts worked in the emergency room. Of the 43 Shift Coupons, registered nurses identified the occurrence of an adverse event on 14 (32.6%) coupons. Patient complaints (42.9%), family complaints (28.6%), and patient falls (14.3%) were the most frequently reported adverse events (Table 4.10). Registered nurses did not report the occurrence of the following adverse events: unexpected admissions to the intensive care unit, new skin breakdowns documented, new nosocomial infections documented, and others.

Seventy-five Shift Coupons were returned by registered nurses for shifts worked on a labor and delivery unit. Of the 75 coupons, registered nurses reported an adverse event on 8 (10.6%) coupons, with others (37.5%) (e.g., transfer patient to another facility) and family complaints (25.0%) being the most commonly reported adverse events (Table 4.10). The following adverse events were not reported by the registered nurses: new nosocomial infections documented, unexpected patient deaths, new skin breakdowns documented, and medication errors.

Thus, as seen in Table 4.10, the most frequently reported adverse events by registered nurses in the hospital setting were patient complaints, medication
errors, family complaints, and patient falls. However, when the data were
analyzed according to hospital unit type, there appeared variations in which types
of adverse events were most frequently reported and which adverse events were
not reported.
Table 4.10
Most Commonly Reported Adverse Events Reported on Shift Coupons Returned by Registered Nurses by Hospital Unit

<table>
<thead>
<tr>
<th>Adverse event</th>
<th>All units n (%)</th>
<th>Medical/Surgical unit n (%)</th>
<th>Intensive care unit n (%)</th>
<th>Other unit n (%)</th>
<th>Operating room/Recovery room n (%)</th>
<th>Outpatient unit n (%)</th>
<th>Psychiatric unit n (%)</th>
<th>Rehab unit n (%)</th>
<th>Pediatric unit n (%)</th>
<th>Emergency room n (%)</th>
<th>Labor and delivery unit n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient complaint</td>
<td>85 (21.4)</td>
<td>37 (22.3)</td>
<td>6 (10.5)</td>
<td>9 (18.8)</td>
<td>8 (34.8)</td>
<td>11 (47.8)</td>
<td>3 (13.6)</td>
<td>3 (15.8)</td>
<td>1 (5.9)</td>
<td>6 (42.9)</td>
<td>1 (12.5)</td>
</tr>
<tr>
<td>Medication error</td>
<td>75 (18.9)</td>
<td>38 (22.9)</td>
<td>9 (15.8)</td>
<td>7 (14.6)</td>
<td>3 (13.0)</td>
<td>1 (4.3)</td>
<td>10 (45.5)</td>
<td>4 (21.1)</td>
<td>2 (11.8)</td>
<td>1 (7.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Family complaint</td>
<td>70 (17.6)</td>
<td>27 (16.3)</td>
<td>16 (28.1)</td>
<td>4 (8.3)</td>
<td>3 (13.0)</td>
<td>5 (21.7)</td>
<td>1 (4.5)</td>
<td>3 (15.8)</td>
<td>5 (29.4)</td>
<td>4 (28.6)</td>
<td>2 (25.0)</td>
</tr>
<tr>
<td>Patient fall</td>
<td>48 (12.1)</td>
<td>26 (15.7)</td>
<td>0 (0.0)</td>
<td>6 (12.5)</td>
<td>1 (4.3)</td>
<td>1 (4.3)</td>
<td>5 (22.7)</td>
<td>5 (26.3)</td>
<td>1 (5.9)</td>
<td>2 (14.3)</td>
<td>1 (12.5)</td>
</tr>
<tr>
<td>Unplanned admission to intensive care unit</td>
<td>36 (9.1)</td>
<td>10 (6.0)</td>
<td>10 (17.5)</td>
<td>8 (16.7)</td>
<td>2 (8.7)</td>
<td>1 (4.3)</td>
<td>0 (0.0)</td>
<td>1 (5.3)</td>
<td>3 (17.6)</td>
<td>0 (0.0)</td>
<td>1 (12.5)</td>
</tr>
<tr>
<td>Other</td>
<td>36 (9.1)</td>
<td>6 (3.6)</td>
<td>7 (12.3)</td>
<td>8 (16.7)</td>
<td>6 (26.1)</td>
<td>3 (13.0)</td>
<td>3 (13.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (37.5)</td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>18 (4.5)</td>
<td>9 (5.4)</td>
<td>2 (3.5)</td>
<td>4 (8.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (10.5)</td>
<td>1 (5.9)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>16 (4.0)</td>
<td>8 (4.8)</td>
<td>2 (3.5)</td>
<td>1 (2.1)</td>
<td>0 (0.0)</td>
<td>1 (4.3)</td>
<td>0 (0.0)</td>
<td>1 (5.3)</td>
<td>3 (17.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>13 (3.3)</td>
<td>5 (3.0)</td>
<td>5 (8.8)</td>
<td>1 (2.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (5.9)</td>
<td>1 (7.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Total</td>
<td>397 (100.0)</td>
<td>166 (100.0)</td>
<td>57 (100.0)</td>
<td>48 (100.0)</td>
<td>23 (100.0)</td>
<td>23 (100.0)</td>
<td>22 (100.0)</td>
<td>19 (100.0)</td>
<td>17 (100.0)</td>
<td>14 (100.0)</td>
<td>8 (100.0)</td>
</tr>
</tbody>
</table>
Research Question # 2: What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index, registered nurses were asked to identify the percentage of medication errors in four categories that occurred in the last 3 months that should have been reported and that were actually reported to the hospital. Table 4.11 presents the results of the registered nurses’ identification of the percentage. More than a quarter (28.8%) of the registered nurses reported that less than 20% of the oral and topical medication errors that had occurred and should have been reported within the past three months were actually reported; whereas almost 17% reported that 80% or more of the oral and topical medication errors that occurred were reported. A quarter (25%) of the registered nurses identified less than 20% of the intramuscular and subcutaneous medication errors that occurred and should have been reported were reported, while over a fifth (21.6%) identified that 80% or more of these type of medication errors were reported. When asked to check the percentage of intravenous medication errors, 27.9% of the registered nurses reported that 80% or more of the intravenous medication errors that occurred in the past three months were reported as opposed to 19.5% of the registered nurses who reported less than 20% of the errors were reported to the hospital. When considering all medication errors that occurred on the unit that should have been reported, almost a fourth (23.7%) of the registered nurses identified less than 20% were actually reported; while, 19.1% of the nurses reported 80% or more of
all medication errors that occurred in the past three months that should have been reported were actually reported to the hospital. Thus, examining the two extremes of medication errors reported by the registered nurses (i.e., less than 20% or 80% or greater of the medication errors that occurred that should have been reported to the hospital and were actually reported), more nurses identified that oral and topical medication errors were less likely to be reported to the hospital, while, intravenous medication errors were more likely to be reported.

When the data were divided into medication errors that occurred in the past three months that should have been reported into those medication errors reported less than 50% of the time and those medication errors reported more than 50% of the time, oral and topical medication errors that occurred in the past three months that should have been reported to the hospital were reported least frequently, with 59.7% of registered nurses identifying less than 50% of the oral and topical medication errors that occurred in the past three months being reported to the hospital. Similarly, medication errors involving intravenous medications were again more likely to be reported, with 50.8% of the registered nurses identifying that over 50% of the intravenous medication errors that occurred were reported to the hospital. Therefore, even when the data were divided into the upper and lower halves, oral and topical medication errors were still more likely not to be reported by registered nurses if they occurred, and intravenous medication errors were more likely to be reported by registered nurses if they occurred.
Table 4.11
Percentage of Medication Errors that Occurred in the Past Three Months that Should have been Reported that were Actually Reported to the Hospital

| Percentage of medication errors that occurred in the last 3 months that should have been reported and were actually reported to the hospital | 0-9% n (%) | 10-19% n (%) | 20-29% n (%) | 30-39% n (%) | 40-49% n (%) | 50-59% n (%) | 60-69% n (%) | 70-79% n (%) | 80-89% n (%) | 90-99% n (%) | Not applicable n (%) | Missing n (%) | Total n (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oral and topical medication errors | 41 (17.4) | 27 (11.4) | 20 (8.5) | 27 (11.4) | 26 (11.0) | 18 (7.6) | 13 (5.5) | 10 (4.2) | 13 (5.5) | 26 (11.0) | 1 (0.4) | 14 (5.9) | 236 (100.0) |
| Intramuscular and subcutaneous medication errors | 41 (17.4) | 18 (7.6) | 17 (7.2) | 24 (10.2) | 16 (6.8) | 24 (10.2) | 17 (7.2) | 12 (5.1) | 14 (5.9) | 37 (15.7) | 1 (0.4) | 15 (5.8) | 236 (100.0) |
| Intravenous medication errors | 32 (13.6) | 14 (5.9) | 18 (7.6) | 18 (7.6) | 15 (6.4) | 27 (11.4) | 11 (4.7) | 16 (6.8) | 27 (11.4) | 39 (16.5) | 3 (1.3) | 16 (6.8) | 236 (100.0) |
| All medication errors | 33 (14.0) | 23 (9.7) | 15 (6.4) | 17 (7.2) | 26 (11.0) | 32 (13.6) | 15 (6.4) | 19 (8.1) | 17 (7.2) | 28 (11.9) | 1 (0.4) | 10 (4.2) | 236 (100.0) |
Research Question # 3: What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to check the percentage of patient falls in four categories that occurred in the past three months that should have been reported and were actually reported. According to the data in Table 4.12, 26.7% of the registered nurses responded that less than 20% of all patient falls without injury that occurred in the last three months were reported, as compared to the 37.3% of registered nurses who reported 80% or more of the patient falls without injury that occurred in the past three months were reported. However, as the severity of the patient injury increased, registered nurses were more likely to report the patient fall. For instance, 14.4% of registered nurses identified less than 20% of patient falls with minor injury that occurred in the past 3 months that should have been reported were reported to the hospital, while 9.7% of registered nurses responded that less than 20% of patient falls with major injury were reported to the hospital. Conversely, almost half (45.3%) of registered nurses identified 80% or more of patient falls with minor injury within the past three months were reported, and over half (61.0%) of the registered nurses responded that 80% or more of patient falls with major injury were reported to the hospital. In terms of all patient falls that occurred in the past three months that should have been reported to the hospital, 13.9% of registered nurses identified less than 20% of all falls were reported; whereas, 42.8% of the registered nurses reported 80% or more of the patient falls were reported to the hospital.
When the data were divided into halves according to registered nurses who identified less than 50% of patient falls that occurred in the past three months that should have been reported to the hospital that actually were reported with and those who reported more than 50%, registered nurses identified that 50% or more of patient falls from all four categories were reported to the hospital: 53.4% of patient falls without injury, 63.9% of patient falls with minor injury, 73.0% of patient falls with major injury, and 62.3% of all patient falls. So, again, when the data were divided in this manner, falls were more likely to be reported as the seriousness of patient injury increased; hence, a larger percentage of patient falls with major injury that occurred in the past three months appeared to have been reported to the hospital.
Table 4.12
Percentage of Patient Falls that Occurred in the Past Three Months that Should have been Reported and were Actually Reported to the Hospital

<table>
<thead>
<tr>
<th>Percentage of patient falls that occurred in the last 3 months that should have been reported and were actually reported</th>
<th>0-9% n (%)</th>
<th>10-19% n (%)</th>
<th>20-29% n (%)</th>
<th>30-39% n (%)</th>
<th>40-49% n (%)</th>
<th>50-59% n (%)</th>
<th>60-69% n (%)</th>
<th>70-79% n (%)</th>
<th>80-89% n (%)</th>
<th>90-99% n (%)</th>
<th>Not applicable n (%)</th>
<th>Missing n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient falls without injury</td>
<td>48 (20.3)</td>
<td>15 (6.4)</td>
<td>12 (5.1)</td>
<td>7 (3.0)</td>
<td>9 (3.8)</td>
<td>14 (5.9)</td>
<td>9 (3.8)</td>
<td>15 (6.4)</td>
<td>28 (11.9)</td>
<td>60 (25.4)</td>
<td>4 (1.7)</td>
<td>15 (6.4)</td>
<td>236 (100.0)</td>
</tr>
<tr>
<td>Patient falls with minor injury</td>
<td>23 (9.7)</td>
<td>11 (4.7)</td>
<td>10 (4.2)</td>
<td>8 (3.4)</td>
<td>12 (5.1)</td>
<td>6 (2.5)</td>
<td>17 (7.2)</td>
<td>21 (8.9)</td>
<td>25 (10.6)</td>
<td>82 (34.7)</td>
<td>5 (2.1)</td>
<td>16 (6.8)</td>
<td>236 (100.0)</td>
</tr>
<tr>
<td>Patient falls with major injury</td>
<td>21 (8.9)</td>
<td>2 (0.8)</td>
<td>5 (2.1)</td>
<td>8 (3.4)</td>
<td>6 (2.5)</td>
<td>12 (5.1)</td>
<td>4 (1.7)</td>
<td>11 (4.7)</td>
<td>20 (8.5)</td>
<td>125 (53.0)</td>
<td>5 (2.1)</td>
<td>17 (7.2)</td>
<td>236 (100.0)</td>
</tr>
<tr>
<td>All patient falls</td>
<td>23 (9.7)</td>
<td>10 (4.2)</td>
<td>18 (7.6)</td>
<td>9 (3.8)</td>
<td>15 (6.4)</td>
<td>13 (5.5)</td>
<td>14 (5.9)</td>
<td>19 (8.1)</td>
<td>31 (13.1)</td>
<td>70 (29.7)</td>
<td>4 (1.7)</td>
<td>10 (4.2)</td>
<td>236 (100.0)</td>
</tr>
</tbody>
</table>
Research Question # 4: What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index, registered nurses were asked to check their level of agreement on a scale from 1 (strongly disagree) to 5 (strongly agree) on 11 items examining why medication administration errors are not reported. The 11 items comprised two subscales: personal reasons why medication errors are not reported (7 items) and administrative reasons why medication errors are not reported (4 items). As previously stated, the Cronbach alpha for the personal reasons subscale was 0.83 and the Cronbach alpha for the administrative reasons subscale was 0.74. For the personal reasons for not reporting medication errors, the item mean and standard deviation were 3.57 (0.76) for the sample of 228 registered nurses. The item mean and standard deviation for the administrative reasons for not reporting medication errors were 3.43 (0.83) for the sample of 230 registered nurses. Consequently, for both personal and administrative reasons as to why registered nurses do not report medication errors, registered nurses tended to be to the agreement side of neutral for these 11 items. Table 4.13 displays frequency, mean, and standard deviation values for each of the seven items in the personal reasons subscale why medication errors were not reported. Table 4.14 presents the data for the administrative reasons subscale items.

With the exception of one item, “Patients might develop negative attitudes,” over 50% of the registered nurses either agreed or strongly agreed
with the item regarding personal reasons why medication errors were not reported. The following two items, “Nurses fear adverse consequences from reporting medication errors” and “Nurses could be blamed if something happens to a patient as a result of a medication error,” received the strongest agreement level from registered nurses, with 80.5% and 80.1% either agreeing or strongly agreeing with the item, respectively. For the item “Patients might develop negative attitudes,” almost half (47.5%) of the registered nurses responded that they agreed or strongly agreed with the item as compared to the 23.3% of the registered nurses who disagreed or strongly disagreed with the item. The two items that received the largest percentage of neutral responses were: “Patients might develop negative attitudes” (28.0%) and “Nurses want to avoid potential publicity of medication errors in the media” (21.2%). The means for all seven items in the personal reasons for not reporting medication errors subscale ranged from 3.26 to 3.95, with the standard deviations of the items ranging from 1.0 to 1.1. Hence, the average responses to the seven items in this subscale were to the agreement side of neutral.

Looking at the four items comprising the administrative reasons for not reporting medication errors, over half of the registered nurses either agreed or strongly agreed with two items: “Nursing administration focuses on the person rather than looking at the system as a potential cause of the error” (65.7%) and “No positive feedback is given for passing medications correctly” (53.0%). For the remaining two items, 49.2% of registered nurses agreed or strongly agreed with the statement “The responses by nursing administration do not match the
severity of the error” as compared to 22.5% of registered nurses who either disagreed or strongly disagreed with the statement; and 38.2% of the registered nurses either agreed or strongly agreed with the item “Too much emphasis is placed on medication errors as a measure of the quality of care” as contrasted to 35.6% of registered nurses who either disagreed or strongly disagreed with the item. The item with the highest percentage of neutral responses was: “No positive feedback is given for passing medications correctly” (28.8%). The means of the four items in the administration reasons for not reporting medication errors ranged from 3.07 to 3.73, with the standard deviations ranging from 1.0 to 1.2. Therefore, the average response to the four items was to the agreement side of neutral.
<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly disagree n (%)</th>
<th>Disagree n (%)</th>
<th>Neutral n (%)</th>
<th>Agree n (%)</th>
<th>Strongly agree n (%)</th>
<th>Missing n (%)</th>
<th>Total</th>
<th>Mean (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses could be blamed if something happens to a patient as a result of a medication error</td>
<td>14 (5.9)</td>
<td>18 (7.6)</td>
<td>12 (5.1)</td>
<td>121 (51.3)</td>
<td>68 (28.8)</td>
<td>3 (1.3)</td>
<td>236</td>
<td>3.91 (1.1)</td>
</tr>
<tr>
<td>Nurses believe that other nurses will think they are incompetent if they make medication errors</td>
<td>14 (5.9)</td>
<td>32 (13.6)</td>
<td>33 (14.0)</td>
<td>116 (49.2)</td>
<td>38 (16.1)</td>
<td>3 (1.3)</td>
<td>236</td>
<td>3.57 (1.1)</td>
</tr>
<tr>
<td>Nurses fear adverse consequences from reporting medication errors</td>
<td>13 (5.5)</td>
<td>11 (4.7)</td>
<td>18 (7.6)</td>
<td>123 (52.1)</td>
<td>67 (28.4)</td>
<td>4 (1.7)</td>
<td>236</td>
<td>3.95 (1.0)</td>
</tr>
<tr>
<td>Patients might develop negative attitudes</td>
<td>13 (5.5)</td>
<td>42 (17.8)</td>
<td>66 (28.0)</td>
<td>96 (40.7)</td>
<td>16 (6.8)</td>
<td>3 (1.3)</td>
<td>236</td>
<td>3.26 (1.0)</td>
</tr>
<tr>
<td>Nurse fear reprimand by physicians</td>
<td>12 (5.1)</td>
<td>34 (14.4)</td>
<td>49 (20.8)</td>
<td>97 (41.1)</td>
<td>42 (17.8)</td>
<td>2 (0.8)</td>
<td>236</td>
<td>3.53 (1.1)</td>
</tr>
<tr>
<td>Nurses fear losing their license if a medication error is reported</td>
<td>8 (3.4)</td>
<td>49 (20.8)</td>
<td>28 (11.9)</td>
<td>109 (46.2)</td>
<td>38 (16.1)</td>
<td>4 (1.7)</td>
<td>236</td>
<td>3.52 (1.1)</td>
</tr>
<tr>
<td>Nurse want to avoid potential publicity of medication errors in the media</td>
<td>16 (6.8)</td>
<td>49 (20.8)</td>
<td>50 (21.2)</td>
<td>92 (39.0)</td>
<td>27 (11.4)</td>
<td>2 (0.8)</td>
<td>236</td>
<td>3.28 (1.1)</td>
</tr>
</tbody>
</table>

Scale: 1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree
Note: Summated item mean= 3.57 with standard deviation= 0.76
Table 4.14  
Administrative Reasons for Not Reporting Medication Errors

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly disagree n (%)</th>
<th>Disagree n (%)</th>
<th>Neutral n (%)</th>
<th>Agree N (%)</th>
<th>Strongly agree n (%)</th>
<th>Missing n (%)</th>
<th>Total</th>
<th>Mean (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No positive feedback is given for passing medications correctly</td>
<td>16 (6.8)</td>
<td>23 (9.7)</td>
<td>68 (28.8)</td>
<td>75 (31.8)</td>
<td>50 (21.2)</td>
<td>4 (1.7)</td>
<td>236</td>
<td>3.52 (1.1)</td>
</tr>
<tr>
<td>Nursing administration focuses on the person rather than looking at</td>
<td>6 (2.5)</td>
<td>38 (16.1)</td>
<td>35 (14.8)</td>
<td>89 (37.7)</td>
<td>66 (28.0)</td>
<td>2 (0.8)</td>
<td>236</td>
<td>3.73 (1.1)</td>
</tr>
<tr>
<td>the system as a potential cause of the error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too much emphasis is placed on medication errors as a measure of</td>
<td>17 (7.2)</td>
<td>67 (28.4)</td>
<td>59 (25.0)</td>
<td>62 (26.3)</td>
<td>28 (11.9)</td>
<td>3 (1.3)</td>
<td>236</td>
<td>3.07 (1.2)</td>
</tr>
<tr>
<td>the quality of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The responses by nursing administration of not match the severity</td>
<td>8 (3.4)</td>
<td>45 (19.1)</td>
<td>64 (27.1)</td>
<td>88 (37.3)</td>
<td>28 (11.9)</td>
<td>3 (1.3)</td>
<td>236</td>
<td>3.36 (1.0)</td>
</tr>
<tr>
<td>of the error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scale: 1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree
Note: Summated item mean= 3.43 with standard deviation= 0.83
Research Question # 5: Which type(s) of adverse events resulted in patient injury as identified on Shift Coupons?

On the Shift Coupons registered nurses were asked to identify the patient result of the identified adverse event. Of the 397 Shift Coupons on which registered nurses reported the occurrence of an adverse event during the shift just worked, the majority (67.5%) reported that the adverse events resulted in no harm to that patient, followed by 20.7% of the adverse events causing temporary harm to the patient (Table 4.15). Registered nurses reported that almost five percent (4.9%) of the adverse events resulted in patient death. When the data were analyzed according to the type of adverse event that occurred, the majority of the following adverse events were associated with no harm to the patient: patient complaints (90.6%), family complaints (90.0%), medication errors (74.7%), patient falls (56.3%), others (50.0%), and unplanned admissions to the intensive care unit (47.2%). The majority (72.2%) of the new skin breakdowns documented caused temporary harm to the patient, followed by no harm to the patient (16.7%). The data for new nosocomial infections documented showed an almost even division between temporary harm to patients (50.0%) and no harm to patients (43.8%).

When registered nurses were determining the result of the adverse event on the patient, unplanned admissions to the intensive care unit appeared to be the most difficult for them to measure, accounting for 36.4% of all adverse events in which registered nurses selected the unknown harm to patient category as the adverse event result. After unplanned admissions to the intensive care unit,
adverse events in the others category (22.7%) and medication errors (18.2%) were the next two adverse event types that registered nurses had the most problematic time in determining the results on patients.
Table 4.15
Result of Adverse Events to Patients

<table>
<thead>
<tr>
<th></th>
<th>All adverse events n (%)</th>
<th>Patient complaint n (%)</th>
<th>Medication error n (%)</th>
<th>Family complaint n (%)</th>
<th>Patient fall n (%)</th>
<th>Unplanned Admission to Intensive Care Unit n (%)</th>
<th>Other n (%)</th>
<th>New skin breakdown documented n (%)</th>
<th>New nosocomial infection documented n (%)</th>
<th>Death n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm to patient</td>
<td>268 (67.5)</td>
<td>77 (90.6)</td>
<td>56 (74.7)</td>
<td>63 (90.0)</td>
<td>27 (56.3)</td>
<td>17 (47.2)</td>
<td>18 (50.0)</td>
<td>3 (16.7)</td>
<td>7 (43.8)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Temporary harm to patient</td>
<td>82 (20.7)</td>
<td>6 (7.1)</td>
<td>15 (20.0)</td>
<td>2 (2.9)</td>
<td>20 (41.7)</td>
<td>8 (22.2)</td>
<td>10 (27.8)</td>
<td>13 (72.2)</td>
<td>8 (50.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Permanent harm to patient</td>
<td>3 (0.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (2.8)</td>
<td>1 (5.6)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>18 (4.5)</td>
<td>1 (1.2)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (8.3)</td>
<td>1 (2.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>13 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Unknown harm to patient</td>
<td>22 (5.5)</td>
<td>1 (1.2)</td>
<td>4 (5.3)</td>
<td>3 (4.3)</td>
<td>0 (0.0)</td>
<td>8 (22.2)</td>
<td>5 (13.9)</td>
<td>1 (5.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>4 (1.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (2.9)</td>
<td>1 (2.1)</td>
<td>0 (0.0)</td>
<td>1 (2.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>397 (100.0)</td>
<td>85 (100.0)</td>
<td>75 (100.0)</td>
<td>70 (100.0)</td>
<td>48 (100.0)</td>
<td>36 (100.0)</td>
<td>36 (100.0)</td>
<td>18 (100.0)</td>
<td>16 (100.0)</td>
<td>13 (100.0)</td>
</tr>
</tbody>
</table>
Research Question # 6: What are the causes of adverse events as perceived by the registered nursing staff as identified by Shift Coupons?

On the Shift Coupons registered nurses were asked to check all the cause(s) of the adverse event from the list of possible causes on the coupon. Therefore, registered nurses may have selected more than one cause for the adverse event identified on the coupon. Table 4.16 displays the causes of all adverse events, as well as the causes of each type of adverse event reported by registered nurses. For all 397 adverse events identified on the Shift Coupons, the most commonly reported causes were: lack of staff (36.8%), lack of communication (30.5%), work overload (29.5%), and other (28.2%) (e.g., lack of patient double check [adverse event – medication error], pharmacist did not speak English [adverse event – medication error], and patient medications [adverse event – patient fall]). For patient complaints, the most frequently reported adverse event, lack of staff (40.0%), lack of communication (36.5%), work overload (32.39%), and stressful atmosphere (29.4%) were the causes most identified by registered nurses. According to the registered nurses, the following causes most often contributed to medication errors: work overload (42.7%), lack of staff (38.7%), stressful atmosphere (33.3%), and lack of communication (29.3%). For family complaints, the third most often reported adverse event, registered nurses checked the following as the most frequent causes: lack of communication (55.7%), lack of information (27.1%), lack of staff (24.3%), and stressful atmosphere (22.9%). For the fourth most common adverse event type, patient fall, lack of staff (56.3%), other (29.2%), work
overload (25.0%), and stressful atmosphere (25.0%) were the most identified causes by registered nurses.

Upon examination of the data for all adverse events reported and the four types of adverse events registered nurses most often reported (i.e., patient complaints, medication errors, family complaints, and patient falls), lack of staff was the most frequently reported reason for all adverse events, patient complaints, and patient falls. Likewise, lack of staff was the second most reported cause of medication errors and the third most frequently reported cause of family complaints. Lack of communication, work overload, and stressful atmosphere were repeatedly selected as widespread causes for the occurrence of adverse events. Lack of communication appeared as a leading cause of all adverse events, as well as the leading cause of patient complaints, medication errors, and family complaints. For all adverse events, patient complaints, medication errors, and patient falls, work overload was named as one of the four principal causes. Lastly, stressful atmosphere played a central role as one of the four top causes of patient complaints, medication errors, family complaints, and patient falls.
### Table 4.16
Causes of Adverse Events as Perceived by Registered Nurses

<table>
<thead>
<tr>
<th>Factor</th>
<th>All adverse events n (%)</th>
<th>Patient complaint n (%)</th>
<th>Medication error n (%)</th>
<th>Family complaint n (%)</th>
<th>Patient fall n (%)</th>
<th>Unplanned Admission to Intensive Care Unit n (%)</th>
<th>Other n (%)</th>
<th>New Skin Breakdown Documented n (%)</th>
<th>New nosocomial infection documented n (%)</th>
<th>Unexpected patient death n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of staff</td>
<td>146 (36.8)</td>
<td>34 (40.0)</td>
<td>29 (38.7)</td>
<td>17 (24.3)</td>
<td>27 (56.3)</td>
<td>10 (27.8)</td>
<td>10 (27.8)</td>
<td>11 (61.1)</td>
<td>4 (25.0)</td>
<td>4 (30.8)</td>
</tr>
<tr>
<td>Lack of Communication</td>
<td>121 (30.5)</td>
<td>31 (36.5)</td>
<td>39 (55.7)</td>
<td>6 (12.5)</td>
<td>6 (16.7)</td>
<td>5 (13.9)</td>
<td>6 (33.3)</td>
<td>4 (25.0)</td>
<td>2 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Work overload</td>
<td>117 (29.5)</td>
<td>28 (32.9)</td>
<td>32 (42.7)</td>
<td>15 (21.4)</td>
<td>12 (25.0)</td>
<td>7 (19.4)</td>
<td>10 (27.8)</td>
<td>6 (33.3)</td>
<td>2 (12.5)</td>
<td>5 (38.5)</td>
</tr>
<tr>
<td>Other</td>
<td>112 (28.2)</td>
<td>22 (25.9)</td>
<td>13 (17.3)</td>
<td>11 (15.7)</td>
<td>14 (29.2)</td>
<td>21 (58.3)</td>
<td>15 (41.7)</td>
<td>6 (33.3)</td>
<td>4 (25.0)</td>
<td>6 (46.2)</td>
</tr>
<tr>
<td>Stressful atmosphere</td>
<td>104 (26.2)</td>
<td>25 (29.4)</td>
<td>25 (33.3)</td>
<td>16 (22.9)</td>
<td>12 (25.0)</td>
<td>9 (25.0)</td>
<td>7 (19.4)</td>
<td>3 (16.7)</td>
<td>1 (6.3)</td>
<td>6 (46.2)</td>
</tr>
<tr>
<td>Lack of information</td>
<td>67 (16.9)</td>
<td>15 (17.6)</td>
<td>12 (16.0)</td>
<td>19 (27.1)</td>
<td>3 (6.3)</td>
<td>5 (13.9)</td>
<td>5 (13.9)</td>
<td>2 (11.1)</td>
<td>4 (25.0)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Faulty judgment</td>
<td>52 (13.1)</td>
<td>8 (9.4)</td>
<td>20 (26.7)</td>
<td>4 (5.7)</td>
<td>5 (10.4)</td>
<td>5 (13.9)</td>
<td>2 (5.6)</td>
<td>4 (22.2)</td>
<td>2 (12.5)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>45 (11.3)</td>
<td>6 (7.1)</td>
<td>10 (13.3)</td>
<td>4 (5.7)</td>
<td>9 (18.8)</td>
<td>5 (13.9)</td>
<td>4 (11.1)</td>
<td>1 (5.6)</td>
<td>3 (18.8)</td>
<td>3 (23.1)</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>45 (11.3)</td>
<td>7 (8.2)</td>
<td>17 (22.7)</td>
<td>5 (7.1)</td>
<td>3 (6.3)</td>
<td>7 (19.4)</td>
<td>4 (11.1)</td>
<td>1 (5.6)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>35 (8.8)</td>
<td>7 (8.2)</td>
<td>8 (10.7)</td>
<td>7 (10.0)</td>
<td>5 (10.4)</td>
<td>2 (5.6)</td>
<td>2 (5.6)</td>
<td>2 (11.1)</td>
<td>0 (0.0)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Lack of supplies/equipment</td>
<td>24 (6.0)</td>
<td>8 (9.4)</td>
<td>5 (6.7)</td>
<td>4 (5.7)</td>
<td>2 (4.2)</td>
<td>1 (2.8)</td>
<td>1 (2.8)</td>
<td>2 (11.1)</td>
<td>0 (0.0)</td>
<td>1 (7.7)</td>
</tr>
<tr>
<td>Poorly designed unit</td>
<td>21 (5.3)</td>
<td>6 (7.1)</td>
<td>1 (1.3)</td>
<td>0 (0.0)</td>
<td>4 (8.3)</td>
<td>3 (8.3)</td>
<td>0 (0.0)</td>
<td>1 (5.6)</td>
<td>2 (12.5)</td>
<td>3 (23.1)</td>
</tr>
</tbody>
</table>
Table 4.16 Continued
Causes of Adverse Events as Perceived by Registered Nurses

<table>
<thead>
<tr>
<th>Category</th>
<th>All adverse events n (%)</th>
<th>Patient complaint n (%)</th>
<th>Medication error n (%)</th>
<th>Family complaint n (%)</th>
<th>Patient fall n (%)</th>
<th>Unplanned Admission to Intensive Care Unit n (%)</th>
<th>Other n (%)</th>
<th>New Skin Breakdown Documented n (%)</th>
<th>New nosocomial infection documented n (%)</th>
<th>Unexpected patient death n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor organization al policy</td>
<td>18 (4.5)</td>
<td>3 (3.5)</td>
<td>1 (1.3)</td>
<td>1 (1.4)</td>
<td>3 (6.3)</td>
<td>4 (11.1)</td>
<td>6 (16.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Wrong supplies/equipment</td>
<td>12 (3.0)</td>
<td>1 (1.2)</td>
<td>4 (5.3)</td>
<td>0 (0.0)</td>
<td>2 (4.2)</td>
<td>0 (0.0)</td>
<td>1 (2.8)</td>
<td>2 (11.1)</td>
<td>0 (0.0)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Malfunctioning supplies/equipment</td>
<td>14 (3.5)</td>
<td>4 (4.7)</td>
<td>2 (2.7)</td>
<td>1 (1.4)</td>
<td>2 (4.2)</td>
<td>1 (2.8)</td>
<td>1 (5.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Failure to follow organization al policy</td>
<td>11 (2.8)</td>
<td>0 (0.0)</td>
<td>7 (9.3)</td>
<td>0 (0.0)</td>
<td>1 (2.1)</td>
<td>1 (2.8)</td>
<td>1 (2.8)</td>
<td>0 (0.0)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Missing</td>
<td>5 (1.3)</td>
<td>0</td>
<td>0</td>
<td>1 (1.4)</td>
<td>0</td>
<td>3 (8.3)</td>
<td>3 (8.3)</td>
<td>0</td>
<td>1 (6.3)</td>
<td>0</td>
</tr>
</tbody>
</table>
Research Question #7: What are the causes of medication administration errors as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to select from a list of causes two of the most important reasons why medication errors occur based on their nursing experience. The results of the 236 registered nurses who responded are displayed in Table 4.17. The most frequently reported causes of medication administration errors were: distractions (35.2%), registered nurse to patient ratio (33.5%), many medications on multiple patients (25.4%), and medication not delivered or wrong dose delivered from pharmacy (19.5%). On the other hand, other (4.2%), lack of sufficient information about the medication (4.2%), patient allergy information (3.8%), malfunctioning equipment (1.3%), and unavailability of IV pump or other equipment (0.4%) were the least selected causes of medication errors, based on the registered nurses’ experience.
### Table 4.17

Causes of Medication Errors Based on Registered Nurse’s Experience

<table>
<thead>
<tr>
<th>Cause of medication administration errors</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distractions</td>
<td>83 (35.2)</td>
</tr>
<tr>
<td>Registered nurse to patient ratio</td>
<td>79 (33.5)</td>
</tr>
<tr>
<td>Many medications on multiple patients</td>
<td>60 (25.4)</td>
</tr>
<tr>
<td>Medication not delivered or wrong dose delivered from pharmacy</td>
<td>46 (19.5)</td>
</tr>
<tr>
<td>Not double checking doses</td>
<td>46 (19.5)</td>
</tr>
<tr>
<td>Poorly designed medication administration record</td>
<td>33 (14.0)</td>
</tr>
<tr>
<td>Long shifts/overtime</td>
<td>18 (7.6)</td>
</tr>
<tr>
<td>Unit or patient crisis when administering medications</td>
<td>13 (5.5)</td>
</tr>
<tr>
<td>Unclear packaging and labeling</td>
<td>12 (5.1)</td>
</tr>
<tr>
<td>Lack of adequate information about the patient</td>
<td>12 (5.1)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (4.2)</td>
</tr>
<tr>
<td>Lack of sufficient information about the medication</td>
<td>10 (4.2)</td>
</tr>
<tr>
<td>Patient allergy information not available</td>
<td>9 (3.8)</td>
</tr>
<tr>
<td>Malfunctioning equipment</td>
<td>3 (1.3)</td>
</tr>
<tr>
<td>Unavailability of IV pump or other equipment</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Missing</td>
<td>16 (6.9)</td>
</tr>
</tbody>
</table>

Research Question #8: What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

Registered nurses were asked on the Blegen/Vaughn Work Environment Index to check, from a list of 11 possible causes, the two most important causes for patient falls based upon their experience as a registered nurse. Table 4.18 presents the results of the 236 registered nurses who responded. The five most commonly identified causes were: patient cognitive condition (48.3%), patient medical/physical condition (42.4%), registered nurse to patient ratio (31.8%), no sitter (16.9%), and medications the patient is taking (16.5%). Conversely, the four least selected causes for patient falls were: other (5.5%), clutter, equipment (3.0%), faulty beds, bed alarms or side rails (2.5%), and wet floors (1.3%).
Research Question # 9: Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

Registered nurses were asked on the Shift Coupons to identify whether or not an incident report was completed for adverse events reported on the coupons. Table 4.19 displays the frequency with which incident reports were completed for adverse events. For the majority (70.5%) of all adverse events reported on Shift Coupons, registered nurses identified no incident reports were completed. When the data were analyzed by the type of adverse events, the majority of the following adverse event types reported on Shift Coupons were not reported to the hospital via an incident report: family complaints (92.9%), patient complaints (90.6%), medication errors (68.0%), new skin breakdowns documented (66.7%), new nosocomial infections documented (62.5%), unplanned admissions to intensive care unit (61.1%), and others (55.6%). The
The majority of unexpected patient deaths (69.2%) and patient falls (60.4%) reported on Shift Coupons were also reported on incident reports.

Table 4.19
Number of Adverse Events Reported on Shift Coupons that were Reported on an Incident Report

<table>
<thead>
<tr>
<th>Event Category</th>
<th>An incident report was completed for the adverse event n (%)</th>
<th>No incident report was completed for the adverse event n (%)</th>
<th>Unknown whether an incident report was completed for the adverse event n (%)</th>
<th>Missing n (%)</th>
<th>Total number of adverse events reported on Shift Coupons n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All adverse events</td>
<td>103 (25.9)</td>
<td>280 (70.5)</td>
<td>8 (2.0)</td>
<td>6 (1.5)</td>
<td>397 (100.0)</td>
</tr>
<tr>
<td>Patient complaints</td>
<td>7 (8.2)</td>
<td>77 (90.6)</td>
<td>1 (1.2)</td>
<td>0 (0.0)</td>
<td>85 (100.0)</td>
</tr>
<tr>
<td>Medication errors</td>
<td>23 (30.7)</td>
<td>51 (68.0)</td>
<td>1 (1.3)</td>
<td>0 (0.0)</td>
<td>75 (100.0)</td>
</tr>
<tr>
<td>Family complaints</td>
<td>2 (2.9)</td>
<td>65 (92.9)</td>
<td>0 (0.0)</td>
<td>3 (4.3)</td>
<td>70 (100.0)</td>
</tr>
<tr>
<td>Patient falls</td>
<td>29 (60.4)</td>
<td>19 (39.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>48 (100.0)</td>
</tr>
<tr>
<td>Unplanned admission to intensive care unit</td>
<td>10 (27.8)</td>
<td>22 (61.1)</td>
<td>3 (8.3)</td>
<td>1 (2.8)</td>
<td>36 (100.0)</td>
</tr>
<tr>
<td>Other</td>
<td>12 (33.3)</td>
<td>20 (55.6)</td>
<td>2 (5.6)</td>
<td>2 (5.6)</td>
<td>36 (100.0)</td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>6 (33.3)</td>
<td>12 (66.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>18 (100.0)</td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>5 (31.3)</td>
<td>10 (62.5)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
<td>16 (100.0)</td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>9 (69.2)</td>
<td>4 (30.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>13 (100.0)</td>
</tr>
</tbody>
</table>
Table 4.20 presents the results of the Chi-square test to determine if there was a significant difference/association in the number of adverse events reported using Shift Coupons and the number of adverse events reported using incident reports. For none of the Chi-square tests were the expected frequencies less than five in the 2x2 table; therefore, a Fishers Exact test was not used in place of the Chi-square for any of the tests of significant difference/association. For four of the Chi-square tests, all adverse events, patient complaints, medication errors, and family complaints, there was a significant difference at the p<0.01 level between the number of adverse events reported on Shift Coupons and the number of incident reports that the registered nurses reported were completed for the adverse events. There was a significant difference at the p<0.05 level for unplanned admission to the intensive care unit reported on Shift Coupons compared with the number of incident reports completed. There were more incidents reported on Shift Coupons than reported on incident reports at a minimum of p<0.05 level for the following adverse events: all adverse events, patient complaints, medication errors, family complaints, and unplanned admissions to the intensive care unit. For five types of adverse events, patient falls, others, new skin breakdowns documented, new nosocomial infections documented, and unexpected patient deaths, there was no significant difference between the number of adverse events reported on Shift Coupons and the number of incident reports completed.
Table 4.20
Chi-Square Results

<table>
<thead>
<tr>
<th>Event</th>
<th>An incident report was completed</th>
<th>An incident report was not completed</th>
<th>Chi-square</th>
<th>Degrees of freedom</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All adverse events</td>
<td>103</td>
<td>280</td>
<td>81.799</td>
<td>1</td>
<td>0.000**</td>
</tr>
<tr>
<td>Patient complaints</td>
<td>7</td>
<td>77</td>
<td>58.333</td>
<td>1</td>
<td>0.000**</td>
</tr>
<tr>
<td>Medication errors</td>
<td>23</td>
<td>51</td>
<td>10.595</td>
<td>1</td>
<td>0.001**</td>
</tr>
<tr>
<td>Family complaints</td>
<td>2</td>
<td>65</td>
<td>59.239</td>
<td>1</td>
<td>0.000**</td>
</tr>
<tr>
<td>Patient falls</td>
<td>29</td>
<td>19</td>
<td>2.083</td>
<td>1</td>
<td>0.149</td>
</tr>
<tr>
<td>Unplanned admission to intensive care unit</td>
<td>10</td>
<td>22</td>
<td>4.500</td>
<td>1</td>
<td>0.034*</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>20</td>
<td>2.000</td>
<td>1</td>
<td>0.157</td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>6</td>
<td>12</td>
<td>2.000</td>
<td>1</td>
<td>0.157</td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>5</td>
<td>10</td>
<td>1.667</td>
<td>1</td>
<td>0.197</td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>9</td>
<td>4</td>
<td>1.923</td>
<td>1</td>
<td>0.166</td>
</tr>
</tbody>
</table>

* significant at p<0.05  
** significant at p<0.01

Research Question #10: How do registered nurses perceive quality management within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

As stated previously, the quality management subscale of the Blegen/Vaughn Work Environment Index consists of eight items. For each of the eight items, the registered nurses were asked to check their level of agreement on a 1 (strongly disagree) to 5 (strongly agree) scale. (One was
negatively worded on the survey and had to be reversed coded for the data analysis.) The mean for the subscale was 3.22 with a standard deviation of 0.59 and a Cronbach alpha of 0.76. Thus, registered nurses tended to respond to the items in the subscale with slightly more than a neutral agreement.

Table 4.21 presents a summary of the registered nurses’ responses to each of the items. The largest percentage of registered nurses either agreed or strongly agreed with the following items: “The managers and supervisors consider patient safety a high priority” (71.6%), “The main use of adverse event report data is not to identify poorly functioning nurses” (56.8%), and “The adverse event report data are used to improve systems for patient safety” (51.2%). On the other hand, the following three items had the greatest percentage of registered nurses responding that they strongly disagreed or disagreed with the statements: “Information about the number of adverse events (medication errors, patient falls, decubiti) is regularly shared with staff nurses” (47.1%), “Nursing staff, supervisors, and managers work together to insure the highest quality of care” (34.3%), and “Nurses are supported for reporting patient occurrences” (33.5%). The following statements: “Quality improvement processes (e.g., TQM/CQI) are used to improve patient safety” (38.1%) and “Nurses are supported for reporting patient occurrences” (33.1%) had the highest percentage of neutral responses by registered nurses. The means for the items in the subscale ranged from 2.83 to 3.77, with standard deviations ranging from 0.86 to 1.1.
Table 4.21
Registered Nurses’ Responses to the Quality Management Subscale on the Blegen/Vaughn Work Environment Index

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly disagree n (%)</th>
<th>Disagree n (%)</th>
<th>Neutral n (%)</th>
<th>Agree n (%)</th>
<th>Strongly agree n (%)</th>
<th>Not applicable n (%)</th>
<th>Missing n (%)</th>
<th>Total n (%)</th>
<th>Mean (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing staff, supervisors, and managers work together to insure the highest quality of care</td>
<td>17 (7.2)</td>
<td>64 (27.1)</td>
<td>63 (26.7)</td>
<td>77 (32.6)</td>
<td>14 (5.9)</td>
<td>0 (0.0)</td>
<td>1 (0.4)</td>
<td>236 (100.0)</td>
<td>3.03 (1.10)</td>
</tr>
<tr>
<td>Incident report data are used mostly to identify problems with patient care systems</td>
<td>7 (3.0)</td>
<td>51 (21.6)</td>
<td>74 (31.4)</td>
<td>92 (39.0)</td>
<td>10 (4.2)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
<td>236 (100.0)</td>
<td>3.20 (0.93)</td>
</tr>
<tr>
<td>The main use of incident report data is not to identify poorly functioning nurses [both the wording of the item and the data are reversed coded]</td>
<td>7 (3.0)</td>
<td>45 (19.1)</td>
<td>47 (19.9)</td>
<td>109 (46.2)</td>
<td>25 (10.6)</td>
<td>0 (0.0)</td>
<td>3 (1.3)</td>
<td>236 (100.0)</td>
<td>3.43 (1.02)</td>
</tr>
<tr>
<td>Quality improvement processes (e.g., TQM/CQI) are used to improve patient care</td>
<td>7 (3.0)</td>
<td>33 (14.0)</td>
<td>90 (38.1)</td>
<td>95 (40.3)</td>
<td>9 (3.8)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
<td>236 (100.0)</td>
<td>3.28 (0.86)</td>
</tr>
<tr>
<td>The incident report data are used to improve systems for patient safety</td>
<td>3 (1.3)</td>
<td>48 (20.3)</td>
<td>61 (25.8)</td>
<td>111 (47.0)</td>
<td>10 (4.2)</td>
<td>0 (0.0)</td>
<td>3 (1.3)</td>
<td>236 (100.0)</td>
<td>3.33 (0.89)</td>
</tr>
<tr>
<td>Information about the number of adverse occurrences (medication errors, patient falls, decubiti) is regularly shared with staff nurses</td>
<td>15 (6.4)</td>
<td>96 (40.7)</td>
<td>47 (19.9)</td>
<td>63 (26.7)</td>
<td>10 (4.2)</td>
<td>1 (0.4)</td>
<td>4 (1.7)</td>
<td>236 (100.0)</td>
<td>2.83 (1.10)</td>
</tr>
<tr>
<td>The manager and supervisors consider patient safety a high priority</td>
<td>4 (1.7)</td>
<td>20 (8.5)</td>
<td>41 (17.4)</td>
<td>129 (54.7)</td>
<td>40 (16.9)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
<td>236 (100.0)</td>
<td>3.77 (0.89)</td>
</tr>
<tr>
<td>Nurses are supported for reporting patient occurrences</td>
<td>12 (5.1)</td>
<td>67 (28.4)</td>
<td>78 (33.1)</td>
<td>64 (27.1)</td>
<td>11 (4.7)</td>
<td>0 (0.0)</td>
<td>4 (1.7)</td>
<td>236 (100.0)</td>
<td>2.98 (0.98)</td>
</tr>
</tbody>
</table>

Scale: 1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree
Note: Summated item mean= 3.22 with standard deviation= 0.59
Research Question # 11: How do registered nurses perceive job satisfaction in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

As stated above, the job satisfaction subscale of the Blegen/Vaughn Work Environment Index contains six items, with three requiring reversed coding because of negative wording on the survey. The mean, standard deviation, and Cronbach alpha scores for this subscale are: 3.61, 0.77, and 0.88 respectively. Therefore, on average, registered nurses responses were more likely to agree with the item.

Table 4.22 shows the results of the registered nurses’ responses for each of the individual items in the subscale. Over half of all registered nurses who responded either agreed or strongly agreed with all six items, with “Most of the time I do not have to force myself to go to work” (66.9%) and “I am satisfied with my job for the time being” (64.8%) receiving the highest percentage of agreement. Conversely, the items with the largest percentage of strongly disagree or disagree were: “I feel that I am happier in my work than most people” (17.4%) and “Each day of work seems like it will end” (16.5%). Between 19.9% and 30.1% of registered nurses responded neutrally, with “I find real enjoyment in my work” (30.1%) and “Each day of work seems like it will end” (27.5%) receiving the highest percentage of neutral responses from registered nurses. The means for the items in the job satisfaction subscale ranged from 3.42 to 3.77, with standard deviations ranging from 0.88 to 1.04.
### Table 4.22
Registered Nurses' Responses to the Job Satisfaction Subscale on the Blegen/Vaughn Work Environment Index

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly disagree n (%)</th>
<th>Disagree n (%)</th>
<th>Neutral n (%)</th>
<th>Agree n (%)</th>
<th>Strongly agree n (%)</th>
<th>Not applicable n (%)</th>
<th>Missing n (%)</th>
<th>Total n (%)</th>
<th>Mean (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not disappointed that I ever took this job [both the wording of the item and the data are reversed coded]</td>
<td>6 (2.5)</td>
<td>20 (8.5)</td>
<td>61 (25.8)</td>
<td>82 (34.7)</td>
<td>65 (27.5)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
<td>236 (100.0)</td>
<td>3.77 (1.03)</td>
</tr>
<tr>
<td>I find real enjoyment in my work</td>
<td>6 (2.5)</td>
<td>18 (7.6)</td>
<td>71 (30.1)</td>
<td>97 (41.1)</td>
<td>41 (17.4)</td>
<td>0 (0.0)</td>
<td>3 (1.3)</td>
<td>236 (100.0)</td>
<td>3.64 (0.95)</td>
</tr>
<tr>
<td>Each day of work seems like it will end [both the wording of the item and the data are reversed coded]</td>
<td>5 (2.1)</td>
<td>34 (14.4)</td>
<td>65 (27.5)</td>
<td>117 (49.6)</td>
<td>12 (5.1)</td>
<td>0 (0.0)</td>
<td>3 (1.3)</td>
<td>236 (100.0)</td>
<td>3.42 (0.88)</td>
</tr>
<tr>
<td>Most of the time I do not have to force myself to go to work [both the wording of the item and the data are reversed coded]</td>
<td>5 (2.1)</td>
<td>25 (10.6)</td>
<td>47 (19.9)</td>
<td>123 (52.1)</td>
<td>35 (14.8)</td>
<td>0 (0.0)</td>
<td>1 (0.4)</td>
<td>236 (100.0)</td>
<td>3.67 (0.93)</td>
</tr>
<tr>
<td>I am satisfied with my job for the time being</td>
<td>8 (3.4)</td>
<td>26 (11.0)</td>
<td>47 (19.9)</td>
<td>122 (51.7)</td>
<td>31 (13.1)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
<td>236 (100.0)</td>
<td>3.61 (0.97)</td>
</tr>
<tr>
<td>I feel that I am happier in my work than most people</td>
<td>7 (3.0)</td>
<td>34 (14.4)</td>
<td>60 (25.4)</td>
<td>91 (38.6)</td>
<td>43 (18.2)</td>
<td>0 (0.0)</td>
<td>1 (0.4)</td>
<td>236 (100.0)</td>
<td>3.55 (1.04)</td>
</tr>
</tbody>
</table>

Scale: 1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree

Note: Summated item mean= 3.61 with standard deviation= 0.77
References

Chapter 5
Overview

The purposes of this study were to test the ability of the Shift Coupon to collect adverse events data and to explore the hospital work environment as it related to registered nurses’ reports of adverse events. The findings from this study may be used to quantify the incidence of adverse events within the hospital setting, determine the cause(s) of the adverse events, and to understand how contextual features of the hospital work environment might be associated with adverse events. This chapter presents a discussion of the study findings, relates the study findings to the conceptual and operational frameworks, describes the study limitations, and provides recommendations for future research.

Discussion of Study Findings

Overall, this early testing of the Shift Coupon suggested that it was a viable method for collecting adverse events data, with the majority of the data collected on the Blegen/Vaughn Work Environment Index supporting this finding. However, further development and testing of the Shift Coupon are essential to increasing its usability. The following subsections will discuss the study findings for each research question.

1. To what extent do adverse events occur in the hospital setting as identified by Shift Coupons?

All Adverse Events Identified

A total of 1,369 Shift Coupons were returned by registered nurses during the summer of 2003 for shifts worked in the hospital setting. Of the 1369
coupons returned, registered nurses reported the occurrence of no adverse events on 970 (70.9%) coupons. On the 397 Shift Coupons on which registered nurses did report an adverse event, the most frequently reported adverse events were: patient complaints (21.4%), medication errors (18.9%), family complaints (17.6%), and patient falls (12.1%). Compared with the results of the pilot study, registered nurses reported the occurrence of no adverse events on a higher percentage of coupons returned (70.9% in this study vs. 53.9% in the pilot study). The smaller number of Shift Coupons returned in the pilot study (84 coupons) as opposed to the 1,369 coupons returned for shifts worked in the hospital setting in this study and the pilot study’s in-person explanation compared with the mailed explanation in this study may explain some of the variance between the two studies’ results.

When examining the types of adverse events reported by registered nurses on Shift Coupons, others (23.1%), medication errors (17.9%), patient falls (17.9%), and patient complaints (15.4%) were the most frequently reported adverse event types in the pilot study. By using the data collected in the pilot study, the researcher was able to adjust the adverse event options on the Shift Coupon to decrease the percentage of coupons identifying any other type of adverse event in this study (the other type of adverse events went from being the most commonly reported adverse event in the pilot study to being tied with unplanned admissions to the intensive care unit in this study as the fifth most commonly reported adverse events). Yet, medication errors, patient falls, and patient complaints remained in the top four, most-reported adverse event types in
this study: medication errors remained the second most frequently identified adverse event type, patient falls went from the third to the fourth most-reported adverse event type, and patient complaints moved from the fourth most-reported adverse event type in the pilot study to the most reported adverse event type in this study. Moreover, family complaints moved from being tied with new skin breakdown documented as the sixth most frequently identified adverse event type in the pilot study to the third most-reported adverse event type in this study.

The consistent presence of medication errors and patient falls as two of the most frequently reported types of adverse events is supported by the literature. In an international study by Aiken and colleagues (2001), the researchers reported American registered nurses (with Pennsylvanian registered nurses serving as the representative group) along with Canadian registered nurses were more likely to report that medication errors and patient falls occurred with regularity in the past year as compared to their European counterparts. In particular, 15.7% of American registered nurses reported that patients receiving the wrong medication or dose was not an infrequent occurrence in the past year (as compared to only 5.1% of German registered nurses), and 20.4% of American registered nurses reported that patient falls with injuries was not an infrequent occurrence in the past year (versus 15.0% of German registered nurses) (Aiken et al., 2001). In the Harvard Medical Practice Study (HMPS), researchers screening patient medical record data sources, found medication errors (19.4%) was the adverse event type most often identified by the reviewers (Leape, et al., 1991). Likewise, using methodology similar to the HMPS,
researchers from the Utah and Colorado Medical Practice Study (UCMPS) found that medication errors represented 19.3% of all adverse events and was the leading type of non-operative adverse events found in the patient medical record (Thomas et al., 2000). Next, using self reported incidents by healthcare professionals as the data source, Wolff, Bourke, Campbell, and Leembruggen (2001) found patient falls were the most commonly reported adverse event followed by medication errors. Thus, the findings from several other studies support the findings garnered from this study using coupons--the frequent occurrence of medication errors and patients falls in the hospital setting.

Likewise, the presence of patient complaints and family complaints as two of the most frequently reported adverse event types was not surprising. In the international study conducted by Aiken and colleagues (2001), almost half (49.1%) of American registered nurses (with registered nurses in Pennsylvania serving as the representative group) reported that the occurrence of complaints from patients or family members was not infrequent.

The clinical significance of identifying the most commonly reported adverse event types (i.e., patient complaints, medication errors, family complaints, and patient falls) is considerable. First, adverse event studies have not shown a strong improvement in medication errors and patient falls over time. For instance, the data used in the HMPS came from patient medical records from 1984 (Leape et al., 1991), and the UCMPS used data from patient medical records from 1992 (Thomas et al., 2000). In both of these studies, medication errors were the leading cause of non-operative adverse events and accounted
for approximately 19% (19.4% in the HMPS; 19.3% in the UCMPS) of all adverse
events reported (Thomas, et al., 2000; Leape, et al., 1991). So, in almost a
decade between the two studies, there has been limited decrease in the
occurrence in this type of adverse event. The continued high frequency with
which these two types of adverse events (i.e., medication errors and patient falls)
were reported in this study suggests the continued failure of the healthcare
system to reduce the occurrence of these adverse event types. Consequently,
both individual units and entire hospitals should view the reduction of the
occurrence of these two adverse event types as a standard quality improvement
challenge to be met with specifically designed quality improvement initiatives.

Similarly, the large percentage of patient and family complaints reported
has significance for the healthcare system. The findings from this study support
the observation made by Aiken and colleagues (2001), “the current climate of
care in hospitals is as unsatisfying to patients and their families as it is to nurses,
and the resulting frustration is likely to compromise the civility of the work
environment and contribute to the high rates of nurse burnout” (p. 50). The
impact of this statement may be felt by both registered nurses (i.e., Who will want
to continue to practice nursing? or Who will want to be in a professional where
there is an unpleasant work environment and high rates of burnout?) and by
patients (i.e., If the shortage of nurses continues, who will be left to care for
patients?). Consequently, if patient and family complaints can be identified and
their cause(s) lessened or eradicated through the implementation of quality
improvement initiatives, then the possibility exists to improve the work environment and the quality of patient care.

Adverse Event Identified by Unit

The most commonly reported adverse event types identified by registered nurses who worked the shift on a medical/surgical unit were: medication errors (22.9%), patient complaints (22.3%), family complaints (16.3%), and patient falls (15.7%). The reporting of the same, top four most-reported adverse event types for this unit type on Shift Coupons as compared with all Shift Coupons returned for a shift worked in the hospital demonstrates the need for medical/surgical hospital units (the majority of units in hospitals) to target efforts to improve the quality of patient care towards these frequently reported types of adverse events.

Registered nurses in intensive care units reported the occurrence of three of the four most commonly reported adverse event types: family complaints (28.1%), medication errors (15.8%), and patient complaints (10.5%). Therefore, the data support the need to change the environment of the intensive care units to provide for the healthcare needs of patients as perceived by patients and families. The identification of medication errors as a frequently occurring adverse event may be associated with the increased use of medications and medication administration routes (such as oral, intravenous, intramuscular, etc.) used in intensive care units. Likewise, the reporting of no patient falls was not surprising because of the type of patient typically admitted to an intensive care unit (i.e., bedridden) and the traditionally higher level of registered nurse to patient ratio.
The unexpected finding was the number of registered nurses who reported unplanned admissions to the intensive care unit (17.5%). This type of adverse event was included on the coupon to collect data on patients from other units who were admitted unexpectedly to the intensive care unit. It was not expected that registered nurses working in the intensive care unit would report patients that they would not have usually seen admitted to the unit. This finding highlights an area for future instrument modifications.

The other unit type was comprised of different non-traditional hospital units (such as in-patient dialysis and step-down units). The inability to specify a unit type, along with having other (16.7%) as the second most commonly reported adverse event type, made understanding the significance of the adverse events reported more difficult. Consequently, these units may have to look beyond the adverse event types frequently occurring on conventional hospital unit types by first examining the daily operations of the unit, the patient population, and the most commonly reported adverse event types identified for the individual units.

The most commonly reported adverse events reported by registered nurses working in the operating room/recovery room included three of the four most commonly reported adverse event types (patient complaints [34.8%], medication errors [13.0%], and family complaints [13.0%]). The small frequency of patient falls (4.3%) was not surprising given the type of patients typically seen in this unit (i.e., bedridden) and the increased level of required patient care and surveillance. The identification of others (26.1%) as the second most commonly
reported adverse event type again points to the need for further investigation into the types of adverse events that are specific to the operating room and recovery room and the continued development of the Shift Coupon to meet the specific needs of those working and being cared for in these units.

The adverse events reported on Shift Coupons by registered nurses working the shift on an outpatient unit suggested the need for quality improvement in the areas of patient and family complaints, which accounted for 69.5% of all adverse events reported. Additionally, the identification of others (13.0%) as the third most commonly reported adverse event type represents the need to develop more unit-specific adverse event options on the Shift Coupon.

Medication errors accounted for nearly half (45.5%) of all adverse events reported on Shift Coupons by registered nurses working on psychiatric units. This finding points to the need to focus quality improvement initiatives on these units in the area of preventing medication errors. Similarly, quality improvement initiatives on psychiatric units might focus on the reduction of patient falls, because this adverse event was the second most frequently reported adverse event type (22.7%) on psychiatric units. This finding was not expected given the ambulatory status of most patients on this type of unit.

The four most commonly reported adverse events on rehabilitation units corresponded with the four most commonly reported adverse events, but in a different order: patient falls (26.3%), medication errors (21.1%), patient complaints (15.8%), and family complaints (15.8%). Consequently, reducing the
occurrence of these four adverse event types is a good starting point for healthcare professionals on rehabilitation units.

The frequency of unplanned admissions to the intensive care unit (17.6%) and new nosocomial infections documented (17.6%) were two unpredicted findings for the adverse event types reported by registered nurses working on pediatric units. Further investigation is needed to determine why registered nurses reported the higher than expected occurrence of these adverse event types on these units. However, the finding of family complaint (29.4%) being the most commonly identified adverse event type was not surprising given the concern and stress faced by sick children and their families.

Registered nurses working in the emergency room identified the four most commonly reported adverse event types for all adverse events, but in a different order: patient complaint (42.9%), family complaint (28.6%), patient falls (14.3%), and medication errors (7.1%). Thus, the data suggest that healthcare professionals working in emergency rooms might focus attention on reducing patient and family complaints, since these two adverse event types represented 71.5% of all adverse events reported for this unit.

Registered nurses working on labor and delivery units submitted the least number of Shift Coupons reporting an adverse event (n=8), thus offering little information on the adverse events occurring on this unit. Additionally, since others (37.5%) was the most commonly reported adverse event type reported, little insight was gained from the Shift Coupons returned. Therefore, further investigation of adverse events on labor and delivery units and, perhaps, further
development of the instrument to use in these units is needed to collect data helpful in improving patient care.

As described, the most commonly reported adverse event types reported for each type of hospital unit varied by unit type. This finding was supported by the work of Sochalski (2001), who found that the frequency of three adverse event types (medication errors, nosocomial infections, and patient falls with injuries) varied by the unit type, with registered nurses working on a medical/surgical unit reporting the greatest frequency of medication errors and tying with registered nurses working on rehabilitation units for the largest percentage of patient falls reported. Similarly, registered nurses in this current study who worked the shift on a medical/surgical unit reported the highest percentage of the medication errors (50.7%) and patient falls (54.2%) identified on the coupons. (However, it should be noted that Shift Coupons returned by registered nurses who worked the shift on a medical/surgical unit accounted for 41.8% of all coupons returned.)

There are many plausible causes for the variation in the frequency of adverse events by unit. First, a patient’s age, history, and severity of illness on admission are variables that influence the occurrence of an adverse event (Silber, Williams, Krakauer, & Schwartz, 1992). For instance, Leape et al., (1991) found the rate for adverse event for patients over the age of 64 years were more than double the rate for patients under the age of 45 years. Possible reasons for this difference in adverse event rates were that elderly patients were more likely to have complicated diseases, underlying degenerative conditions, and coexisting
conditions (Brennan et al., 1991; Leape, et al., 1991). Hence, the patient population served on each unit influences the occurrence of adverse events on the unit. A second cause of the variation is the opportunity for each adverse event type to occur (Sochalski, 2001). The medical nature of the interventions required for the patients results in some specialties having a higher occurrence of adverse events than others (Brennan et al., 1991; Leape et al., 1991). In other words, the more complex the treatments provided to the patient, the more likely an adverse event will occur. Thus, units which provide more complex patient care may be more prone to higher occurrences of adverse events.

2 What percentage of medication administration errors are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

Medication administration errors occur “when the patient is actually or supposed to have been given a medication” (Wakefield et al., 1999a, p. 73). In the majority of hospitals, reporting medication administration errors is a nonautomatic and voluntary activity of healthcare professionals (Wakefield et al., 1999a). On the Blegen/Vaughn Work Environment Index registered nurses were asked to check off 1 of 10 options (ranging from 0-9% to 90-99%) corresponding to the percentage of all medication administration errors that he/she thought were reported in the last three months for four items: oral and topical medication errors, intramuscular and subcutaneous medication errors, intravenous medication errors, and all medication errors. Intravenous medication errors were more likely to be reported compared to oral and topical medication errors and
intramuscular medication errors, with 27.9% of registered nurses identifying that 80% or more of intravenous medication errors were reported. Oral and topical medication errors were the least likely to be reported, with 28.8% of registered nurses reporting that less than 20% of these medication errors were reported. Examining all medication errors, registered nurses were divided on the percentage of medication errors reported, with 23.7% of registered nurses indicating that less than 20% of all medication errors were reported versus 19.1% of registered nurses indicating that 80% or more were reported. Similarly 48.3% of the registered nurses indicated that less than 50% of medication errors were reported compared to 47.2% of registered nurses reporting more than 50% of the medication errors were reported.

Also, it appears that registered nurses were more likely to report medication errors from routes which provide the quickest medication absorption rate (i.e., intravenous, intramuscular, and subcutaneous) than for slower, non-invasive medication administration routes (i.e., oral and topical). Yet, for all medication administration errors, registered nurses were divided on the percentage of medication errors that were reported, demonstrating the potential underreporting of at least one type of adverse event. This underreporting may hinder the quality improvement process because the data necessary to develop and implement quality improvement initiatives designed to reduce the occurrence of medication administration errors is incomplete.

The findings from this research question are supported by other studies which found medication administration errors were underreported. For instance,
Wakefield et al. (1999a) found that nurses estimate that only about 60% of medication administration errors were reported to the hospital. Likewise, Walters (1992) discovered that the mean number of medication errors registered nurses reported making in the past 12 months was 0.95 with a standard deviation of 1.5; however, few medication errors were reported on incident reports (mean=.60, standard deviation = 1.10). Then, Cullen and colleagues (1995) compared medication errors discovered by a nurse investigator with incident reports filed by healthcare professionals working on the participating five units or the pharmacy over a six-month study period. Of the 54 medication errors uncovered by the nurse investigator, only 3 (6%) had been reported on an incident report. Therefore, the findings from this study and others suggest that medication errors are underreported in hospitals.

Based on the results of this research question, it can be assumed that the 75 medication errors reported on the Shift Coupons underestimated the actual number of medication errors that actually occurred. However, the Shift Coupon data also demonstrated the ability of the coupon to collect more medication error data than hospital incident reports (of the 75 coupons which reported medication errors, nurses indicated that 23 [30.7%] were reported to the hospital using incident reports, whereas 51 [68.0%] were not reported to the hospital using incident reports). So, while the Shift Coupon did collect more medication error data, further research is needed to determine how many medication errors are still not reported.
What percentage of patient falls are reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to identify the percentage of patient falls in four categories (i.e., patient falls without injury; patient falls with minor injury; patient falls with major injury; and all patient falls) that were reported to the hospital in the last three months. According to the data collected, registered nurses were more likely to report patient falls as the severity of the injury increased: 37.3% of registered nurses reported 80% or more of patient falls without injury were reported, 45.5% of registered nurses reported 80% or more of patient falls with minor injury were reported, and 61.5% of registered nurses reported 80% or more of patient falls with major injury were reported. Overall, almost half (42.8%) of registered nurses reported that 80% or more of all patient falls were reported. When the finding that 42.8% of registered nurses reported 80% or more of all patient falls were reported is compared to the 19.1% of registered nurses who reported 80% or more of all medication errors were reported, it would seem that registered nurses were more apt to report patient falls than medication errors. One possible rationale for this difference is the belief that medication administration errors are committed solely by a registered nurse (i.e., only one person can be blamed) as opposed to patient falls were many individuals (including the patient) can be blamed for its occurrence. Another possible reason is that patient falls are often witnessed by others, whereas, medication errors frequently take place in the privacy of a patient room. Lastly, patients may not be aware a medication error
has occurred; however, they would, most likely, be conscious of a fall, thereby, making them more inclined to discuss the adverse event with others.

By examining the patient falls reported on Shift Coupons, two conclusions can be drawn: it would appear that the coupons were able to collect more data on patient falls than incident reports, and the data support the earlier statement that registered nurses are more likely to report patient falls than medication errors. First, of the 48 patient falls reported on the coupons, registered nurses reported that 29 (60.4%) were reported to the hospital using incident reports, while 19 (39.6%) were not reported to the hospital on incident reports. Thus, Shift Coupons were able to collect data on almost 40% more patient falls, data that could be used to add insight into reducing the occurrence of one important quality improvement issue. Next, the finding that registered nurses were more willing to report patient falls than medication errors opens an area for further research – Which adverse event types are registered nurses more willing to report and why?

4 What are the reasons why medication administration errors may not be reported in the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

The process for reporting the occurrence of a medication administration error has four steps: 1) recognizing that a medication administration error occurred, 2) determining the need to report the medication administration error, 3) completing some type of incident report, and 4) following up with the person/department receiving the incident report (Wakefield et al., 1999b). When this process is not
completed, the potential to cut the occurrence of future adverse events is reduced (Wakefield, et al., 1999b). So, determining the reason(s) why registered nurses failed to report adverse events provided insight into the barriers preventing adverse event reporting.

The Blegen/Vaughn Work Environment Index collected data on two aspects of why registered nurses do not report medication administration errors: personal fears of reporting and fears about administrative repercussions of reporting. The mean and standard deviations for both subscales showed that registered nurses were slightly to the agreement side of neutral for the subscale items (personal fears = 3.57 [0.76] and administrative fears = 3.43 [0.83]). When the original instrument, which Blegen/Vaughn modified, was tested the researchers found similar means and standard deviations (the original instrument asked nurses to indicate his/her extent of agreement with an item on a 1 (strongly disagree) to 6 (strongly agree) scale; the modified instrument used in this study used a 1 (strongly disagree) to 5 (strongly agree) scale) (Wakefield, et al., 1999b). The rationale for the slightly to the agreement side of neutral means given by Wakefield and colleagues (1999b) was the lack of one most important reason for not reporting medication administration errors; rather a researcher should expect variation in the responses because of different units of analysis, depending on the factor content.

Upon examination of the data for the personal fear reasons for not reporting medication administration errors, the two items that received the highest percentage of agree or strongly agree responses were: “Nurses fear
adverse consequences from reporting medication errors” (80.5%), and “Nurses could be blamed if something happens to a patient as a result of a medication error” (80.1%). On the other hand, the two items which received the lowest percentage of registered nurses agreeing or strongly agreeing were: “Patients might develop negative attitudes” (47.5%) and “Nurses want to avoid potential publicity of medication errors in the media” (50.4%). Based on this personal fears subscale data, it can be suggested that registered nurses were more likely to not report medication administration errors because of the fear that reporting will cause them unfavorable consequences personally and/or professionally. Additionally, these data imply that registered nurses were least fearful of the impressions patients or society in general have or will develop because of the reporting of a medication administration error.

Hospital administration can learn general lessons based on the results of personal fears for reporting medication administration errors subscale. First, there is a need to examine the organizational culture surrounding the reporting of medication administration errors - do registered nurses fear reprisals for reporting adverse events? For example: Are registered nurses blamed by the organization and/or an employee when a medication errors?; Do registered nurses get fired when they make a medication error?; and, Is the occurrence of medication administration errors used as an evaluation criterion? Second, while the impressions made on patients and society by reporting a medication administration error are important, registered nurses are more concerned with the impression that reporting the medication administration error will have on
their standing with other nurses and physicians. Third, hospital administration should consider anonymous reporting of not only medication administration errors but all adverse events. This would allow all healthcare professionals to report adverse events without fear of being identified as the "reporter" or the "snitch." Lastly, based on these results, hospital administrators have a guideline for investigating registered nurses' fears of reporting all types of adverse events in their hospital.

The second subscale of the Blegen/Vaughn Work Environment Index investigated the reasons categorized as administrative fear for registered nurses to not report medication administration errors. According to the results of the study, “Nursing administration focuses on the person rather than looking at the system as a potential cause of the error” was the item the largest percentage of registered nurses (65.7%) either agreed or strongly agreed with. Thus, the majority of the registered nurses still perceive that a “train and blame” (Buerhaus, 1999) culture exists within their organizations. Conversely, the smallest percentage of registered nurses (38.2%) agreed or strongly agreed with the item: “Too much emphasis is placed on medication errors as a measure of quality of care.” Therefore, the majority of registered nurses support the continued use of medication errors as a measure of quality care.

The responses in the category “administrative reasons for not reporting medication errors” provide general information for hospital administrators to develop guidelines for investigating and handling the reporting of not only medication administration errors, but all adverse events. For instance, hospital
administrators should focus on systematic reasons and preventive strategies for adverse events instead of focusing on investigating individuals. Also, hospital administrators should supply positive feedback “for a job well done,” in place of only offering criticism when mistakes are made. Lastly, rather than having hospital administrators develop consequences for poor work performance, representatives from all healthcare professions might join with hospital administrators to develop the consequences and determine when to enforce them.

The findings from RN responses to the two subscales investigating registered nurses fear of reporting medication administration errors were supported by other research findings. For instance, the findings from Elnitsky, Nichols, and Palmer’s (1997) study suggested that nurses perceived that nursing supervisors (i.e., hospital administrators) use the reporting of an incident (completing an incident report) against the employee. In particular, the researchers found that 40.8% of nurses perceived nursing supervisors were unaware of circumstances surrounding the error; a quarter (25.2%) of the nurses reported that nursing supervisors would have negative views of their skills if the errors was reported; almost a fifth (19.1%) of the nurses reported incident reports would be used against employees; and 16.7% of the nurses identified that nursing administration uses incident reports against them in their evaluation. Therefore, in the eight years since the Elnitsky, Nichols and Palmer (1995) data were collected, the work environment has not improved to support the reporting of adverse events; if anything, the work environment has made registered nurses
more fearful of reporting. In a study by Vincent, Stanhope, and Crowley-Murphy (1999), investigating reasons why physicians and midwives do not report adverse events, the researchers found that 36% of the respondents believed that junior staff could be unfairly blamed, and 23% worried about legal consequences of reporting. The subject’s comments about reasons for not reporting an adverse event were just as telling: “Embarrassment. Fear of not being taken seriously”; “Witchhunting”; “…Creates inter-colleague animosity/suspicion…”; and “Senior staff are not sympathetic and supportive” (Vincent et al., 1999, p. 19). Finally, focus groups of nurses conducted by Walker and Lowe (1998) exploring nurses’ beliefs about reporting medication errors using incident reports also supported the findings from this study. One of the major themes identified for why nurses do not report medication errors was “self-preservation” - the fear of reprimand for reporting medication errors. Examples of nurses’ comments made demonstrating this theme were: “it was the way you were treated when you reported an incident in the past”; and “people need to know that they are not going to get into trouble” (Walker & Lowe, 1998, p. 99).

Therefore, based on the results of this study and others, Leape’s (1999) assessment that the reasons for not reporting adverse events can be divided into two general categories – “fear and lack of belief that it [reporting an adverse event] results in improvement” (p. 1) was correct. The Shift Coupon tested in this study was specifically designed to overcome both of these barriers to adverse event reporting. And even though this study did not test registered nurses’ perceptions of the degree to which the coupon overcame these barriers to
reporting, the anonymity and immediate participation in quality improvement activities (i.e., identification of the adverse event causes) provided by the coupon offered a viable means to overcome the reporting barriers. For example, because registered nurses did not identify themselves on the Shift Coupons and the inability to determine who did or did not report an adverse event because a coupon was completed whether or not an adverse event occurred, personal fears such as: nurses could be blamed if something happens to a patient; nurses fear negative consequences for reporting an adverse event (such as losing a promotion, firing, or losing their license); nurses worry of how other healthcare professionals will view their skills if an adverse event is reported; as well as administrative reasons for not reporting, such as: registered nurses fear adverse event investigations will focus on the individual involved or who reported the adverse event; and registered nurses fear for their employment status if an adverse event is reported, are lessened or eliminated.

5 Which adverse events resulted in patient injury in the hospital setting as identified on Shift Coupons?

On Shift Coupons registered nurses were asked to identify the consequences of the adverse event on the patient. According to the results, the majority of all adverse events (67.5%) resulted in no harm to the patient. Another 20.7% of all adverse events reported resulted in temporary harm to the patient (defined as the patient consequence resolving within six months of the patient’s discharge). When the data were examined by type of adverse event, no harm to patient was the most frequently reported patient result for the following types of adverse
events: patient complaints (90.6%), medication errors (74.7%), family complaints (90.0%), patient falls (56.3%), unplanned admissions to the intensive care unit (47.2%), and others (50.0%). Temporary harm to patient was the predominate patient result for new skin breakdowns documented (72.2%) and new nosocomial infections documented (50.0%). Then, not surprisingly, all unexpected patient deaths resulted in the death of the patient.

Exploring the distribution of the adverse event results on the patient found the results for patient falls and new nosocomial infections documented were close for the options no harm to patient and temporary harm to patient; for patient falls, 56.3% of registered nurses reported no harm to patient versus 41.7% who reported temporary harm to patients and for new nosocomial infections documented, 43.8% of registered nurses reported no harm to patient compared to 50.0% who reported temporary harm to patient. Additionally, an examination of the data revealed that registered nurses had the most difficulty determining the result of the adverse event type unplanned admissions to the intensive care unit (22.2%).

Even though the process of determining the result of the adverse event on a patient was different for this study (self-reported by registered nurses) versus the HMPS and the Quality in Australian Health Care Study (QAHCS) (reviewer determined based on screening and monitoring the patient’s clinical record), the results are similar for all adverse events. In the present study, according to respondents, 88.2% of all adverse events resulted in either no patient harm or patient harm that resolved within six months of the patient’s discharge. In the
HMPS, Brennan et al. (1991) found 70.5% of adverse events caused patient harm lasting less than six months. Wilson and colleagues (1995) in the QAHCS reported that 77.1% of adverse events resulted in patient harm that resolved within one year. So, while the present study findings were slightly higher than the results of the other two studies, this difference may have been the result of the data source used and/or the definition/timeframe of the patient harm.

The significance of the Shift Coupon data rests in its ability to provide hospital administrators with the data necessary to assist in determining where to use limited resources to reduce the number of adverse events based on which adverse event caused the greatest percentage of patient harm. For instance, hospital administrators may decide to spend resources to develop and implement quality improvement initiatives to reduce or prevent the occurrence of patient falls, new skin breakdowns, and nosocomial infections because these adverse event types resulted in significant temporary harm to patients. Then, once quality improvement initiatives are implemented, Shift Coupon data could be used to determine not only if there was a significant decrease in the number of adverse events but also to determine the severity of patient harm from the adverse event.

6 What are the causes of the adverse events identified by the Shift Coupons as perceived by registered nurses?

On the Shift Coupons registered nurses were asked to identify the cause(s) of the identified adverse event. If the registered nurses felt more than one factor led to the occurrence of the adverse event, they were instructed to report all the contributing causes. Of the 397 coupons on which registered nurses reported an
adverse event, the causes more often cited were: lack of staff (36.2%), lack of communication (30.5%), work overload (29.5%), other (28.2%) and stressful atmosphere (26.2%).

When the data were examined according to adverse event types, lack of staff was one of the two top causes of every adverse event type, except unexpected patient death when it was the third most frequently reported cause. Next, work overload was identified as one of the top four causes of seven of the adverse event types: patient complaints (32.9%), medication errors (42.7%), patient falls (25.0%), unplanned admissions to the intensive care unit (19.4%), others (27.8%), new skin breakdowns documented (33.3%), and unexpected patient deaths (38.5%). For another seven adverse event types, patient complaints (29.4%), medication errors (33.3%), family complaints (22.9%), patient falls (25.0%), unplanned admissions to the intensive care unit (25.0%), others (19.4%), and unexpected patient deaths (46.2%), stressful atmosphere was one of the four most frequently reported adverse event causes. For patient complaints (36.5%), medication errors (29.3%), family complaints (55.7%), new skin breakdowns documented (33.3%), and new nosocomial infections documented (25.0%), lack of communication was one of the four most commonly reported causes of the adverse event type. Finally, for the following five adverse event types, other was reported as one of the four most frequently cited causes: patient falls (29.2%), unplanned admission to the intensive care unit (58.3%), others (41.7%), new skin breakdowns documented (33.3%), new nosocomial infections documented (25.0%), and unexpected patient deaths (46.2%).
The results of the pilot study found that the most frequently reported causes of all adverse events were other, lack of staff, and lack of knowledge. The results of this study demonstrate that the addition of more cause options reduced the registered nurses dependence on the other option. Consequently, the other option went from being the most reported cause in the pilot study to the fourth most frequently reported cause in this study. Lack of staff, however, remained as one of the most reported adverse event causes in both the pilot study (second most frequently reported cause) and this study (most frequently reported cause); thus, highlighting the need for healthcare stakeholders to evaluate how the shortage of registered nurses impacts patient care and to develop plans for prompting the use of more registered nurses in hospitals.

Comparing the results of this study to other studies is difficult because of the lack of a common list of adverse event causes. One possible reason for this difficulty is the data source used in the investigation of the adverse event. For example, researchers in the QAHCS used monitoring or screening patient clinical records to study adverse events. To determine the cause(s) of the adverse event identified, researchers first devised adverse event cause categories with the assistance of clinical epidemiologists and qualitative researchers (Wilson, Bernadette, Gibberd, & Hamilton, 1999). Next, the adverse events identified on the clinical record review forms were assessed by three senior medical specialists who had been originally involved in the clinical record reviews (Wilson et al., 1999). In the end, the causes of the adverse events were divided into four overriding categories: human error (e.g., failure to synthesize, decide and/or act
on available information; failure to continue established management; and lack of attention, failure to attend), delay (e.g., diagnostic delay, treatment delay, or administrative delay), treatment (e.g., no or inadequate treatment, wrong/inappropriate treatment, or missed treatment), and investigation (e.g., investigation not performed, investigation not acted on, or investigation inappropriate) (Wilson et al., 1999). However, these categories may or may not have been the categories or causes the healthcare professionals with knowledge of the adverse event would have identified if given the opportunity. Hence, a strength of the Shift Coupon data is that the cause(s) are identified by healthcare professional(s) with working knowledge of the adverse event immediately following its occurrence. Additionally, if the adverse event cause(s) is not listed as an option, the healthcare professional is free to add supplemental causes under the other option.

Furthermore, the most frequently reported adverse event causes identified by registered nurses on the Shift Coupon were not unexpected. For instance, with many recent studies investigating the nursing shortage, the presence of lack of staff as the most frequently reported cause for all adverse events (36.8%) and the first or second most commonly identified cause for all the adverse event types except unexpected patient death (when lack of staff was the third most commonly reported) was not surprising. According to Aiken and colleagues (2001), only 34.4% of American registered nurses reported “There are enough registered nurses to provide high-quality care,” and only 33.4% identified “There are enough staff to get the work done” (p. 47). Additionally, in this same study,
83.2% of American registered nurses reported an increase in the number of patients they were assigned in the past year (Aiken et al., 2001). Then, in studies utilizing computer systems as the data source, Kovner and Gergen (1998) found a significant inverse relationship between full-time-equivalent registered nurses per adjusted inpatient day and urinary tract infections after major surgery, pneumonia after major surgery, thrombosis after surgery, and pulmonary compromise after major surgery. Next, in studies by Blegen and colleagues, the researchers found that as the proportion of registered nurses increased to 85% (Blegen & Vaughn, 1998) in one study and 87.5% (Blegen, Goode, & Reed, 1998) in another study, the rates of adverse events decreased. Lastly, Beckmann, Baldwin, Durie, Morrison, and Shaw (1998), using incident reports as the data source, found that inadequate staffing in the intensive care unit resulted in incidents (such as problems with drug administration/documentation, and accidental extubations) and undesirable patient outcomes (such as major physiological changes and patient/relative dissatisfaction). Hence, while the ability to directly compare the adverse event causes on the Shift Coupon with other studies investigating the causes of adverse events was limited, it was possible to support causes identified on the coupon with other studies.

The Shift Coupon data gathered on the adverse event causes may be used to reduce the occurrence of adverse events, thereby improving the quality of care provided to patients. First, by having registered nurses identify the cause(s) of an adverse event, the registered nurses become active participants
in the quality improvement process. This active participation assists in
overcoming one of the two overriding barriers to reporting adverse events
identified by Leape (1999), the lack of a belief that reporting an adverse event will
result in improved quality of care, because registered nurses become vested in
the quality improvement process. Then, the coupon data provide a foundation
for the further examination of the adverse event causes(s). For instance, when
investigating the causes of medication errors, healthcare professionals can begin
the examination by investigating why registered nurses reported work overload
and lack of staff as the top two most-reported causes and how these causes may
have contributed to the occurrence of medication errors.

7 What are the causes of medication administration errors as identified on
the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were
asked to identify the two most important reasons for medication administration
errors based on their experience. While the cause options on the
Blegen/Vaughn Work Environment Index were not identical to the cause options
on the Shift Coupon, the results of the Blegen/Vaughn Work Environment Index
are useful in supporting the results of Shift Coupons and in identifying areas for
improving the cause options on the coupon.

When the causes of medication administration errors reported by
registered nurses on Shift Coupons were compared with the results of the
Blegen/Vaughn Work Environment Index, there were many similarities. For
instance, the three most commonly reported causes of medication administration
errors on the Blegen/Vaughn Work Environment Index (i.e., distractions [35.2%], registered nurse to patient ratio [33.5%], and many medications on multiple patients [25.4%]) were similar in meaning to the three most frequently reported causes of medication errors identified on the Shift Coupons (i.e., work overload (42.7%), lack of staff (38.7), and stressful atmosphere (33.3%)). Likewise, the least reported causes for medication administration errors identified on the Blegen/Vaughn Work Environment Index were also some of the least identified causes of medication errors on the Shift Coupon. For example, on the Blegen/Vaughn Work Environment Index, unavailability of an IV pump or other equipment (0.4%), malfunctioning equipment (1.3%), and patient allergy information not available (3.8%) were the least reported causes. While on Shift Coupons, lack of supplies/equipment (6.7%), malfunctioning supplies/equipment (2.7%), and lack of information (16.0%) were some of the least commonly reported medication error causes. (Note the higher percentage of lack of information on Shift Coupons versus patient allergy information not available on the Blegen/Vaughn Work Environment Index was most likely due to the broader definition of the Shift Coupon cause.)

Also, the data collected on the Blegen/Vaughn Work Environment Index provided insight on adverse event cause options to add to the Shift Coupon to improve its usability. The following are examples of adverse event cause options that will be considered for further versions of the Shift Coupon, with the options taken from the Blegen/Vaughn Work Environment Index in parenthesis: lack of medication or treatment (medication not delivered or wrong dose delivered from
pharmacy), poorly designed paperwork (poorly designed medication administration record), overtime/mandatory overtime (long shifts/overtime), unclear packaging/labeling (unclear packaging/labeling). Therefore, the results of the Blegen/Vaughn Work Environment Index not only assisted in supporting the data collected on the causes of medication errors reported by registered nurses on Shift Coupons, but provided ideas for additional adverse event cause options to add to future versions of the coupon.

8 What are the causes of patient falls as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to identify the two most important reasons for patient falls based on their experience. These data were compared with the causes of patient falls reported by registered nurses on Shift Coupons. While this comparison did support some of the findings from the Shift Coupon, it also supplied areas for improving the Shift Coupon.

According to the Shift Coupon data, the predominant cause of patient falls was lack of staff (56.3%). This result was supported with the presence of registered nurse to patient ratio (31.8%) and no sitter (16.9%) ranking as the third and fourth most importance causes of patient falls on the Blegen/Vaughn Work Environment Index, respectively. In addition, two of the least frequently reported causes on the Blegen/Vaughn Work Environment Index (i.e., faulty beds, bed alarms, or side rails [2.5%] and clutter, equipment [3.0%]) were also two of the
least reported patient fall causes on Shift Coupons (i.e., malfunctioning supplies/equipment [4.2%] and poorly designed unit [8.3%]).

Then, because of the definition of adverse events used in this study, some of the cause options on the Blegen/Vaughn Work Environment Index would not have been included on the Shift Coupon. According to the definition, an adverse event is “an untoward or undesirable occurrence in the healthcare process which has or potentially has some negative impact on a patient or patients and results or may result from some part of the healthcare process” (Walshe, 1998, p. 74). Following this definition, a patient’s own actions or the natural progression of the disease may not cause an adverse event. As such, the two most commonly reported patient fall causes reported on the Blegen/Vaughn Work Environment Index (i.e., patient cognitive condition [48.3%] and patient medical/physical condition [42.4%]) did not adhere to this study’s adverse event definition and will not be added to the coupon as cause options.

Finally, from the comparison of the Blegen/Vaughn Work Environment Index and Shift Coupon data, the researcher discovered additional adverse event cause options to be added to the Shift Coupon. The following are the suggested cause options for improving the Shift Coupon by using cause options from the Blegen/Vaughn Work Environment Index: patient medication (medication the patient is taking), improper technique (improper technique), and poorly maintained unit (wet floors).
Is there a difference between the number of adverse events reported on Shift Coupons and the number of adverse events reported on incident reports?

On the Shift Coupon registered nurses were asked identify whether an incident report was completed for the adverse event reported on the coupon. For all but patient falls and unexpected patient deaths, registered nurses reported a larger percentage of times when no incident report was completed for the adverse event reported on the Shift Coupon. For instance, for 70.5% of all adverse events, 68.0% of medication errors, and 66.7% of new skin breakdowns identified on the Shift Coupon, no incident report was completed. Conversely, for 60.4% of patient falls and 69.2% of patient deaths an incident report was completed for the adverse event reported on the Shift Coupon. So, while the percentage of adverse events reported on Shift Coupons for which there was no incident report was completed varied from 92.9% (family complaints) to 30.8% (unexpected patient deaths), the Shift Coupon did collect more data on adverse events than did the incident reports.

Then, using Chi-square, the researcher determined there were significantly more Shift Coupons completed than incident reports for the following: all adverse events, patient complaints, medication errors, family complaints, and unplanned admissions to the intensive care unit. However, for patient falls, others, new skin breakdowns documented, new nosocomial infections documented, and unexpected patient deaths there was no significant difference between the number of adverse events reported on Shift Coupons and the number of adverse
events reported on incident reports. Therefore, while more adverse events data were collected on Shift Coupons than incident reports, the significance of this data depended on the type of adverse event.

The pilot study of the Shift Coupon was strictly descriptive in nature, with no inferential statistical test used to determine if there was a difference between the number of adverse events collected on Shift Coupons compared to incident reports. So, when the descriptive results of the pilot study were compared with this study, this study demonstrated a higher percentage of adverse events being reported on Shift Coupons than incident reports. In the pilot study, for 25.6% of all adverse events reported on Shift Coupons, no incident reports were completed compared to 70.5% of all adverse events in this study. Possible explanations for the differences in the findings is the smaller sample size in the pilot study (n=39) versus this study (n=397) and the distribution/explanation of the study (researcher explained and answered questions about the pilot study to the registered nurses in person versus mailing the instructions and instruments in this study).

Yet, one must keep in mind the following issues when interpreting these data. First, because the researcher was unable to conduct the study within a hospital, registered nurses were contacted to participate in the study via the United States mail. Therefore, the registered nurses who returned instruments most likely were employed in different hospitals throughout Pennsylvania which may have different policies/procedures for reporting adverse events. For instance, it was conceivable that not all hospitals in which the registered nurses
were employed required completion of an incident report for patient or family complaints or for adverse events in which there was no patient harm. Similarly, there may have been differences between hospitals in the forms used for reporting adverse events or the level of anonymity supplied to the person reporting the adverse event.

Second, because the researcher was unable to conduct the study in a hospital, there was no access to institutional incident report data. Hence, all the data were self-reported data from registered nurses on Shift Coupons. As a result, it was very unlikely that the number of adverse events reported on Shift Coupons would not have been greater than the number of adverse events reported on incident reports.

Lastly, the small sample size of some of the adverse events reported may have contributed to inadequate power to detect a difference in the number of adverse events identified by this reporting method. For example, with the exception of patient falls, the types of adverse events with the smallest sample sizes (i.e., others, new skin breakdowns documented, new nosocomial infections documented, and unexpected patient deaths) were not significant. So, it is possible that in future studies of the Shift Coupon that are conducted in a hospital for a time period greater than five shifts, there may be a significant difference between the number of adverse events reported on Shift Coupons compared to the number of adverse events reported on incident reports because of the ability to gather a larger sample size and, therefore, attain a higher power level.
10 How do registered nurses perceive quality management within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to rate their level of agreement from 1 (strongly disagree) to 5 (strongly agree) on eight items concerning their perception of quality management within the hospital in which they are employed. For the following two items the largest percentage of registered nurses responded that they agreed or strongly agreed with the item: “The managers and supervisors consider patient safety a high priority” (71.6%) and “The main use of incident report data is not to identify poorly functioning nurses” (56.8%). Whereas, the following two items received the highest percent of registered nurses responding that they disagreed or strongly disagreed with the items: “Information about the number of adverse occurrences (medication errors, patient falls, decubiti) is regularly shared with staff nurses” (47.1%) and “Nursing staff, supervisors, and managers work together to insure the highest quality of care” (34.3%). Overall, the results suggest that registered nurses perceive that hospital administration (i.e., nursing supervisors, managers, etc.) deem the provision of quality healthcare a management priority and that systems and processes within the hospital (e.g., incident reports and total quality management) are used to improve the quality of care provided. However, the results also indicate that staff nurses often feel “out of the loop” on quality improvement issues, demonstrated by the low percentage of registered nurses who see hospital administration and staff nurses as a team in providing patients with quality healthcare, the reported lack of communication between hospital
administration and staff nurses concerning the status of quality improvement indicators, and the percentage of registered nurses who felt unsupported when reporting adverse events.

The results of this subscale of the Blegen/Vaughn Work Environment Index highlighted areas important to the success of the Shift Coupon in collecting adverse events data. First, since registered nurses generally identified quality improvement systems and processes within their hospitals as means to improve patient care, it can be implied that, if introduced and explained appropriately, the implementation of the Shift Coupon as an instrument to collect adverse event data will be viewed as a vehicle to improve patient care and not a vehicle for identifying poorly functioning healthcare professionals. Second, registered nurses need to be kept informed about the progress of quality improvement on their unit and within their hospital. Hence, data collected on the Shift Coupons concerning the occurrence, types, and results of adverse events need to be regularly shared and discussed with staff nurses. Finally, staff nurses and hospital administration need to work together to insure the provision of quality care. Therefore, there must be open lines of communication between the two parties strong enough to both celebrate areas where the quality of care has improved and to discuss the development and implementation of mutually agreed upon quality improvement initiative(s) to enhance areas where the quality of care could be better.
How do registered nurses rate job satisfaction within the hospital setting as identified on the Blegen/Vaughn Work Environment Index?

On the Blegen/Vaughn Work Environment Index registered nurses were asked to rate their level of agreement to six job satisfaction items on a 1 (strongly disagree) to 5 (strongly agree) scale. Overall, the results demonstrated registered nurses were satisfied with their jobs, with over 50% of registered nurses either agreeing or strongly agreeing with each of the six items. The two statements with the highest level of agreement or strong agreement were: “Most of the time I do not have to force myself to go to work” (66.9%) and “I am satisfied with my job for the time being” (64.8%). And, even the two statements that received the lowest levels of agreement or strong agreement: “I feel that I am happier in my work than most people” (56.8%) and “Each day of work seems like it will end” (54.7%), demonstrated the registered nurses’ positive feelings towards their jobs.

Two research studies using Pennsylvania registered nurses as the study sample have been conducted to examine job satisfaction. Both of these studies used a mailed survey approach and a single question to investigate job satisfaction (versus the job satisfaction subscale of the Blegen/Vaughn Work Environment Index used in this study). In one study, Aiken and colleagues asked registered nurses to rate their level of job satisfaction in a single item on a four point scale ranging from very dissatisfied to very satisfied (Sochalski, 2001). Based on the approximately 13,000 usable surveys returned, researchers found
that 41% of registered nurses reported being moderately or very dissatisfied with their jobs (Sochalski, 2001).

The other study, conducted by the Pennsylvania Department of Health (2003), asked registered nurses who were renewing their nursing license in either April 2002 or October 2002 (representing half of all registered nurses in Pennsylvania) to complete a mailed survey. One of the items on the survey asked the registered nurses to rate their level of job satisfaction on a four-point scale from very dissatisfied to very satisfied (http://www.dsf.health.state.pa.us/health/lib/health/RNDATABOOK_1002.pdf). From the total of 83,058 usable surveys returned, only 15.8% of registered nurses reported being very dissatisfied or dissatisfied with their job (http://www.dsf.health.state.pa.us/health/lib/health/RNDATABOOK_1002.pdf). Possible reasons for the difference in the results are the difference in sample sizes (13,000 in the Aiken’s study [Sochalski, 2001] versus 83,000 in the Department of Health Study [http://www.dsf.health.state.pa.us/health/lib/health/RNDATABOOK_1002.pdf]), the variation in response rates (52% in the Aiken study [Sochalski, 2001] versus 89% in the Department of Health Study [http://www.dsf.health.state.pa.us/health/lib/health/RNDATABOOK_1002.pdf]), and the possibility that registered nurses would rate their job satisfaction higher on a survey conducted in conjunction with renewing their license rather than a study conducted by researchers at a university. So, while the present study used a job satisfaction subscale rather than a single item, the results of this study were
more aligned with the results of the Pennsylvania Department of Health Study, finding that registered nurses are generally satisfied with their jobs.

The results of this subscale offer some optimism for successful utilization of the Shift Coupon on hospital units. With the majority of registered nurses satisfied with their jobs, there is a decreased likelihood of registered nurses resigning and taking positions within another hospital or in another field. Therefore, if the Shift Coupons can be appropriately explained and utilized, the consistency of the registered nursing staff will provide a more stable environment for longitudinal data collection to identify both strengths and weaknesses in the patient care provided.

**Study Findings Related to Conceptual and Operational Framework**

This study was guided by a model that combined the Quality Health Outcomes Model (QHOM) (Mitchell, Ferketich, & Jennings, 1998), the conceptual framework, and the Modes for Error Prevention (Leape, 1999), the operational framework (Figure 5.1). The instrument tested in their study, the Shift Coupon, was developed to provide data to study the Outcomes concept of the QHOM (Mitchell et al., 1998). According to a personal communication with Dr. Pamela Mitchell (January 17, 2001), this concept of Outcomes can be operationally defined as patient safety and empirically tested through adverse events’ research. The questions associated with each mode of the Modes for Error Prevention (Leape, 1999) supplied a framework for investigating an empirical definition of the Outcomes concept. The data collected using Shift Coupons provided answers to the questions proposed in each mode.
Three modes, the discovery mode, the investigation mode, and the monitoring mode, comprise the Modes for Error Prevention (Leape, 1999). Consistent with the quality improvement process, these modes do not follow a linear process but may overlap with each other. The discovery mode focuses on two questions: 1) What is the extent of adverse events? (i.e., Are adverse events a problem? How many adverse events occur?); and 2) What is the nature of the problem? (i.e., Which types of adverse events are the most serious?) (Leape, 1999). Using data collected on the Shift Coupon, these questions can be answered. First, the extent of adverse events can be determined by examining the number and types of adverse events that are reported by healthcare professionals on the coupons. Similarly, the adverse events types that result in the greatest degree of patient harm can be identified from Shift Coupon data by examining the results of the adverse event on the patient as reported by the healthcare professional. Thus, by collecting and analyzing Shift Coupon data, healthcare stakeholders have the opportunity to answer the discovery mode questions – to determine whether adverse events are occurring, which adverse event types are occurring, and which adverse event types are resulting in the most patient harm; thereby providing guidelines for where to target quality improvement initiatives.

The second Mode for Error Prevention (Leape, 1999), the investigation mode, seeks to determine the causes of the adverse events. The data collected on Shift Coupons provide a starting point for exploring adverse event cause(s), both direct and indirect, because healthcare professionals are asked on the
coupon to identify the cause(s) of the adverse event while the adverse event is still fresh in their minds. After an in-depth analysis of the adverse event and the cause(s), healthcare stakeholders will be able to develop quality improvement initiatives to prevent or severely decrease the chance of the adverse event reoccurring.

The monitoring mode attempts to determine whether the quality improvement initiative was successful in improving the quality of care provided to patients (i.e., reduced occurrence of adverse events), such that, if Shift Coupon data were collected before and after a quality improvement initiative was enacted, healthcare stakeholders would have the data necessary to determine whether the quality improvement initiative was successful in reducing the occurrence of adverse events or whether further analysis of the adverse event(s) was needed.

Thus, this initial testing of the Shift Coupon has demonstrated the viability of the instrument to answer the questions asked in each of the Modes of Error Prevention (Leape, 1999). The insights from the modes provide understanding into an empirical method for testing the concept of Outcomes from the QHOM (Mitchell et al., 1998); hence, increasing the understanding into the provision of quality patient care.
Figure 5.1
Conceptual Model

Adapted from the Quality Health Outcomes Model (Mitchell, Ferketich, & Jennings, 1998) and Modes for Measurement for Error Prevention (Leape, 1999)
Study Limitations

While this study does demonstrate the viability of the Shift Coupon for collecting adverse events data and does identify areas for future research (discussed below), there are limitations to the study that need to be acknowledged. First, this was a descriptive comparative study. Therefore, the study design did not permit the researcher to make cause and effect inferences, but rather allowed for the investigation of relationships between variables. For instance, the study established relationships between adverse events and adverse event causes, but the study does not support statements that link an adverse event cause(s) with an adverse event in a cause and effect relationship.

Second, because the researcher was unable to secure a hospital in which to conduct the study, a mailed survey approach was used to collect the data from registered nurses. This approach lacked institutional data (i.e., incident report data and/or complaint data) to compare with data collected on Shift Coupons. So, with the mailed survey approach, registered nurses self-reported both the occurrence of the adverse event and the completion of an incident report. Hence, the quality of the data was determined by the willingness of the registered nurse to report the adverse event and his/her knowledge level concerning the completion of an incident report for the adverse event.

Likewise, the mailed survey approach introduced variability in the hospitals' cultures, policies, definitions, and paperwork required for reporting adverse events. For example, the organizational culture of some hospitals in which the participating registered nurses work may be more pro-active in
reporting adverse events. Registered nurses may be supported/encouraged to report all adverse events, and the hospital may take a systems approach towards investigating the adverse events. However, other participating registered nurses may work in hospitals were the organizational culture penalizes/marginalizes registered nurses who report adverse events while investigating individuals rather than the system in an attempt to lay blame. Then, hospital policies may differ on which and when to report adverse events and what constitutes an adverse event. For instance, some hospitals may require registered nurses to report all patient/family complaints, while others may require the reporting of some or none of these complaints. Similarly, there were most likely some inconsistencies of adverse event definitions between hospitals, with some hospitals including near-miss adverse events while others excluded these adverse events. Lastly, the diversity in the type and amount of paperwork required to report an adverse event may have impacted the reporting behaviors of the registered nurses. As such, registered nurses who work in hospitals with longer, more time-consuming form(s) may have been less likely to complete an incident report than those registered nurses who work in hospitals with shorter, less intense form(s).

A third possible limitation to this study was the timing of the survey mailing. With the data having been collected during the summer months, the impact of the July phenomenon is unknown. Antedotally, many healthcare professionals report an increase in the occurrence of adverse events when inexperienced new housestaff being working in July. Yet, many studies have
been published finding no evidence to support the July phenomenon (Barry & Rosenthal, 2003; Claridge, Schulman, Sawyer, Ghezel-Ayagh, & Young, 2001; Shulkin, 1995). Therefore, the influence of the July phenomenon on the data is unknown, but the possibility of the data containing a higher occurrence of adverse events than would have been seen if the data were collected later in the academic year must be acknowledged.

Next, the number of adverse events reported in this study most likely still under estimated the actual number of adverse events that occurred during the shifts worked by registered nurses. One possible reason for the underreporting is the lack of identification of the adverse event by the registered nurse, either because the adverse event happened on a previous shift or in the presence of another healthcare professional. Then, each registered nurse possessed an individual definition and commitment for reporting adverse events, independent from the hospital(s) definitions or policies for reporting adverse events.

Next, threats to internal and external validity discussed in Chapter 3 must be revisited in terms of their impact on this study. The two internal validity threats were history and possible low-response rate. The threat of history is recognized but could not have been controlled or estimated in this study with a state-wide mailing. For instance, the researcher is unaware of which hospitals ran quality improvement and/or adverse event reporting workshops during the study period or which local media outlets (i.e., newspapers, radio, television) ran adverse event pieces during the study. Next, while the response rate for this study (46.2%) was acceptable for a mailed survey, it was slightly lower than the
52% response rate Aiken and colleagues received in their study (Sochalski, 2001). One feasible explanation for this difference is the extra amount of time and effort required of the registered nurses to participate in the study: the Aiken study consisted of a nine-page survey that registered nurses completed and mailed back (Sochalski, 2001); whereas, this study asked registered nurses to complete both a Shift Coupon after five shifts and the five-page Blegen/Vaughn Work Environment Index and mail them back.

Novelty was the one external validity threat identified in Chapter 3 that may impact on the ability of the study to be generalized outside the sample because of the inability to control for its effect. Since this was the first testing of this innovative method to collect adverse events data, it was unknown whether newness of the instrument impacted the results of this study. Therefore, future testing of the Shift Coupon will assist in determining the impact of the instrument’s novelty.

Finally, there are the study limitations related to four sources of survey error: coverage error, sampling error, non-response error, and measurement error. Coverage error “results from every unit in the survey population not having a non-zero chance of being included in the sample” (Dillman, 2000, p. 196). According to Dillman (2000), all surveys have some amount of coverage error which cannot be precisely specified. Yet, Dillman (2000) developed five questions a researcher should use prior to selecting a sampling list to reduce coverage error: 1. “Does the list contain everyone in the survey population?” (p. 198); 2. “Does the list include names of people who are not in the study
population?” (p. 199); 3. “How is the list maintained and updated?” (p. 199); 4. “Are the same sample units included on the list more than once?” (p. 200); and 5. “Does the list contain other information that can be used to improve the survey?” (p. 200). Based upon answers to this list of questions, the researcher determined the coverage error resulted primarily from the small percentage of inaccurate addresses from the listing of registered nurses purchased from the Pennsylvania State Board of Nursing, Commonwealth of Pennsylvania, Department of State, Bureau of Professional and Occupational Affairs. In other words, the 6.1% of registered nurses whose mailed contacts were returned to the researcher because of an address discrepancy in the purchased listing of registered nurses represented the largest proportion of coverage error in this study.

Sampling error is “the result of collecting data from only a subset, rather than all, of the members of the sample frame” (Dillman, 2000, p. 196). This type of survey error is highly dependent on sample size (Dillman, 2000). In the current study, the random sample of 1,000 registered nurses was selected because of economic limitations; whereas, the data collection using the Shift Coupon for 5 shifts was chosen to gather as much data as possible from the registered nurses without decreasing the response rate because of an excessive amount of work required to participate in the study. As stated previously, the response rate of 46.2% was considered good for a mailed survey and was only slightly lower than the response rate received by Aiken and colleagues (Sochalski, 2001). But, when the data were analyzed to determine whether there
was a significant difference between the number of adverse events reported on Shift Coupons compared to the number of adverse events reported on incident reports, the small occurrence of some types of adverse events (i.e., 13 unexpected patient deaths and 15 new nosocomial infections were reported by registered nurses) may not have provided the sufficient power to detect the difference between the variables. Hence, if this study were to be repeated, the researcher would recommend using a larger sample and collecting Shift Coupon data for more than five shifts.

Next, non-response error “occurs when a significant number of people in the survey sample do not respond to the questionnaire and have different characteristics from those who do respond” (Dillman, 2000, p. 10). Due to the need to provide anonymity to the registered nurses, no demographic information on the registered nurses was collected. Thus, it is difficult to determine if there was a difference between those registered nurses who did respond and those who did not.

Finally, measurement error “occurs when a respondent’s answer to a survey question is inaccurate, imprecise, or cannot be compared in any useful way to other respondents’ answers” (Dillman, 2000, p. 9). It is caused by poor survey wording and construction (Dillman, 2000). Upon reviewing the instruments, there were only a scant number of instruments where the responses to particular sections were unusable. On the Shift Coupon, there were a couple of instances were the registered nurse identified family complaint and patient complaint on the same coupon rather than reporting each type of adverse event
on a separate Shift Coupon, as instructed both in the study instructions and on the coupon itself. Consequently, the researcher omitted the coupons from the study because of the inability to determine which responses to the other items corresponded with which adverse event. Then, on the Blegen/Vaughn Work Environment Index, where the registered nurses were asked to identify the two most important reasons for medication administration errors, patient falls, exposure to blood-borne disease, and back injuries, a few registered nurses identified more than two options. Therefore, the registered nurses’ responses to this section were omitted because the researcher was unable to determine the two primary reasons. Other than these two areas, other problems with the survey wording or construction were nominal. Also, additional support for a low estimation of measurement error was found with the mean, standard deviations, and Cronbach alpha scores for the Blegen/Vaughn Work Environment Index subscales that mirrored the scores calculated by Blegen and colleagues (Table 4.2).

**Recommendations for Future Research**

“Adverse events do not, of course, necessarily signal poor-quality care; nor does their absence necessarily indicate good quality of care” (Brennan et al., 1991, p. 372). However, the identification of adverse events is essential if quality improvement initiatives are going to be developed and implemented with the intention of improving the quality of patient care. While this study does support the viability of the Shift Coupon to collect adverse event data, it represents the
initial testing of the Shift Coupon. Hence, further development and testing of the instrument is needed.

As stated in Chapter 3, the researcher was unable to locate a hospital willing to participate and/or share incident report data for a number of reasons, such as the fear associated with the reporting of adverse events, the shortage of healthcare professionals to provide care (especially registered nurses), and the litigious societal nature. After conducting and publishing the results of this study, the researcher hopes to continue testing the instrument by locating a hospital(s) willing to use the instrument within the hospital(s) for the primary purpose of improving the quality of care within the institution(s). It would then be the decision of the hospital(s) whether to share the knowledge learned with other healthcare stakeholders so that others may also improve the quality of care provided to patients.

Next, testing of the instrument needs to be conducted using other healthcare professionals in addition to registered nurses. These healthcare professionals should include all those involved in providing patient care, whether that care is direct or indirect. Thus, data from direct patient care healthcare professionals, such as registered nurses, physicians, respiratory therapists, and nursing assistants, would be examined along with the data reported from those not involved in “hands-on” care, for instance, hospital administrators, pharmacists, housekeepers, and dietary aids. Consequently, an examination of care provided to patients from all vantage points can only contribute to a fuller understanding of ways to continually improve quality.
Finally, the Shift Coupon needs to be continually developed in order to differentiate a specific Shift Coupon relevant to each type of hospital unit. For instance, in this present study the second most commonly reported adverse event type identified by registered nurses who worked the shift on an intensive care unit was unplanned admission to the intensive care unit (17.9%). Yet, it can be assumed that the reason(s) for the admission to the intensive care unit, whether patient condition, adverse event, or a combination of both, occurred prior to the admission to the intensive care unit. Therefore, this adverse event option has minimal benefit for the identification of intensive care unit-specific adverse events and the development of quality improvement initiatives. So, through further studies (both quantitative and qualitative) and conceptualization of the instrument, it is anticipated that unit-specific Shift Coupons will permit the identification of unit-specific adverse events and cause(s), thus, providing the data necessary for individual units to improve the quality of patient care provided through the implementation of individualized quality improvement initiatives.
References


Appendix 3.1
Shift Coupon Booklet

Definition of Terms

Minimal care: patient is able to perform 85-100% of activities of daily living without assistance
Moderation care: patient is able to perform 35-84% of activities of daily living without assistance
Maximum care: patient is able to perform less than 35% of activities of daily living without assistance
Incident: any action or inaction that had an adverse or potentially adverse consequence for a patient
Medication error: any error involving a medication for a patient
Patient fall: patient suddenly and involuntarily comes to rest on the floor or on an object
New nosocomial infection documented: 1st documentation in the patient’s chart by any member of the healthcare team of an infection occurring in a patient that was not present or incubating at time of admission, examples: urinary infections, respiratory infections, and post-operative infections
New skin breakdown documented: 1st documentation in the patient’s chart by any member of the healthcare team of a new incidence of skin breakdown because of pressure or exposure of skin to urine or feces
Patient complaint: verbal or written complaint waged by a patient concerning his/her care
Family complaint: verbal or written complained waged by a patient’s family concerning the patient’s care
Unexpected patient death: unforeseen, unexplainable, or procedure related death
Unplanned admission to ICU: unforeseen transfer or admission of a patient to the intensive care unit
Lack of staff: insufficient number of staff available to care for the needs of patient(s)
Lack of knowledge: insufficient training in the necessary skills to care for a patient(s)
Lack of Information: insufficient information to care for a patient(s)

OVER
Lack of supervision: insufficient number of experienced healthcare staff to assist and provide supervision in caring for a patient(s)
Lack of communication: insufficient communication between the healthcare team, the patient, and/or the patient’s family to provide care for a patient(s)
Lack of supplies/equipment: insufficient number of supplies/equipment available to care for a patient(s)
Malfunctioning supplies/equipment: failure of supplies/equipment to work in caring for a patient(s)
Work overload: excess amount of work or the feeling of excess amount of work during a shift
Stressful atmosphere: feeling overwhelmed in care for a patient(s) due to the work environment
Faulty judgment: mistake in judgment by healthcare provider(s) in caring for a patient(s)
Fatigue: feeling physically tired in caring for a patient(s)
Failure to follow organizational policy: deviation from organizational policy in caring for a patient(s)
Poor organizational policy: flawed organizational policy used during caring for a patient(s)
Poorly designed unit: inappropriate floor plan unit to care for a patient(s)
No harm to patient: no physical consequences from the incident to the patient
Temporary harm to patient: consequence from the incident for the patient will resolve within 6 months of the patient’s discharge
Permanent harm to patient: consequence from the incident for the patient will not resolve within 6 months of patient’s discharge
Death: patient expired as a result of the incident

SHIFT COUPON

1. This shift was worked in a:
   - [ ] Hospital
   - [ ] Home care agency
   - [ ] Nursing home
   - [ ] Physician office
   - [ ] Other

2. If the shift was worked in a hospital, which type of unit:
   - [ ] Medical/surgical unit
   - [ ] Emergency room
   - [ ] Rehabilitation
   - [ ] Operating room/recovery room
   - [ ] Outpatient
   - [ ] Intensive care unit
   - [ ] Psychiatric unit
   - [ ] Labor and delivery unit
   - [ ] Pediatrics
   - [ ] Other

3. Shift hours (ex. 7am-3pm; 7pm-7am):

4. Was this a weekend shift: [ ] Yes [ ] No

5. Was this a holiday shift: [ ] Yes [ ] No

6. What was the total number of patients you were assigned during this shift:

7. Of the patients you were assigned, how many required:
   - [ ] Minimal nursing care
   - [ ] Moderate nursing care
   - [ ] Maximum nursing care

8. Check the incident that occurred during your shift:
   - [ ] No incident occurred (Stop, Coupon complete)
   - [ ] Unplanned admission to ICU
   - [ ] Patient complaint
   - [ ] Family complaint
   - [ ] New nosocomial infection documented
   - [ ] New patient fall
   - [ ] Unexpected patient death
   - [ ] New skin breakdown documented
   - [ ] Medication error
   - [ ] Other
(Not: complete a separate coupon for each incident)

OVER
9. What caused the incident: (Check ALL that apply)
   - Lack of staff
   - Work overload
   - Lack of knowledge
   - Stressful atmosphere
   - Lack of information
   - Faulty judgment
   - Lack of supervision
   - Fatigue
   - Lack of communication
   - Failure to follow organizational policy
   - Lack of supplies/equipment
   - Poor organizational policy
   - Wrong supplies/equipment
   - Poorly designed unit
   - Malfunctioning supplies/equipment
   - Other _______________________________

10. What was the result of the incident:
    - No harm to patient
    - Death
    - Temporary harm to patient
    - Unknown
    - Permanent harm to patient

11. Could this incident have been prevented?  
    - Yes  
    - No  
    - Unknown
    If Yes, how: _______________________________

12. Was an incident report filled out for this incident:
    - Yes  
    - No  
    - Unknown
Appendix 3.2
Content Validity Instrument

**Directions:** Please rate each of the following items below on a scale of 1-4 with 1 being not relevant, 2 being somewhat relevant, 3 being quite relevant, and 4 being very relevant. Feel free to offer editorial comments. (Note: Definitions of key terms are located in the accompanying booklet.)

**Shift Coupon**

<table>
<thead>
<tr>
<th>Item</th>
<th>Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check hours worked</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>2. Was this a weekend shift</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>3. Was this a holiday shift</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>4. How many patients were you responsible for during this shift</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>5. How would you classify the patient(s) you were responsible for this shift</td>
<td></td>
</tr>
<tr>
<td>Minimal care</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>Moderate care</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>Maximum care</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>
6. Check the incident that occurred during your shift

<table>
<thead>
<tr>
<th>Item</th>
<th>Not Relevant</th>
<th>Somewhat Relevant</th>
<th>Quite Relevant</th>
<th>Very Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>No incident occurred</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Medical error</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Patient fall</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>New nosocomial infection documented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>New skin breakdown documented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Patient complaint</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Family complaint</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Unexpected patient death</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Unplanned admission to ICU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Comments:

7. What caused the incident (Check ALL that apply)

- Lack of staff
  - 1 2 3 4
- Lack of knowledge
  - 1 2 3 4
<table>
<thead>
<tr>
<th>Item</th>
<th>Not Relevant</th>
<th>Somewhat Relevant</th>
<th>Quite Relevant</th>
<th>Very Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of communication</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of supplies/equipment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Malfunctioning supplies/equipment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Work overload</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Stressful atmosphere</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Faulty judgment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Fatigue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Failure to follow hospital policy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Poor hospital policy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Poorly designed unit</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Comments:
<table>
<thead>
<tr>
<th>Item</th>
<th>Choice</th>
<th>Not Relevant</th>
<th>Somewhat Relevant</th>
<th>Quite Relevant</th>
<th>Very Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. What was the result of the incident</td>
<td>No harm to patient</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Temporary harm to patient</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Permanent harm to patient</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Could this incident have been prevented</td>
<td>Yes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for taking the time to complete this questionnaire.
Appendix 3.3
Blegen/Vaughn Work Environment Index

**Instructions:** Please complete the following survey based on your expertise as a registered nurse. **Thank you** for taking the time to complete this survey.

**Medication Administration Error Policy**
*Place a check mark in the box for each type of error that you are supposed to report.*

- 1. Wrong route of administration
- 2. Wrong time of administration
- 3. Wrong patient
- 4. Wrong dose
- 5. Wrong drug
- 6. Medication is omitted
- 7. Medication given, but not ordered by physician
- 8. Medication given after order to discontinue has been written
- 9. Medication given to patient with known allergy
- 10. Near Miss: Errors that are caught before they reach the patient
- 11. Other- Please list:

**Reporting Medication Administration Errors**
Considering the medication errors that occurred in the last 3 months and should have been reported, *place a check mark in the box corresponding to the percentage of all medication administration errors that you think was reported.* Give your best estimate.

<table>
<thead>
<tr>
<th>Percent of All Medication Administration Errors that were Reported</th>
<th>0-9%</th>
<th>10-19%</th>
<th>20-29%</th>
<th>30-39%</th>
<th>40-49%</th>
<th>50-59%</th>
<th>60-69%</th>
<th>70-79%</th>
<th>80-89%</th>
<th>90-99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Oral and topical medication errors</td>
<td></td>
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</tr>
<tr>
<td>13. IM and SQ medication errors</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14. Intravenous medication errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. All medication errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

**Reporting Patient Falls**
Considering the patient falls that occurred in the last 3 months, *place a check mark in the box corresponding to the percentage of all patient falls that you think was reported.* Give your best estimate.

<table>
<thead>
<tr>
<th>Percent of All Patient Falls that were Reported</th>
<th>0-9%</th>
<th>10-19%</th>
<th>20-29%</th>
<th>30-39%</th>
<th>40-49%</th>
<th>50-59%</th>
<th>60-69%</th>
<th>70-79%</th>
<th>80-89%</th>
<th>90-99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Patient Falls without Injury</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>17. Patient Falls with Minor Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Patient Falls with Major Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. All Patient Falls</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Reasons why Medication Errors are not reported.

Please indicate the extent to which you agree or disagree with each reason that medication errors may not be reported by placing a checkmark in the box below the level of agreement.

<table>
<thead>
<tr>
<th>Medication Administration Errors are not reported because:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Nurses could be blamed if something happens to a patient as a result of the medication error</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>21. Nurses believe that other nurses will think they are incompetent if they make medication errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Nurses fear adverse consequences from reporting medication errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Patients might develop negative attitudes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Nurses fear reprimand by physician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. No positive feedback is given for passing medications correctly</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>26. Nursing administration focuses on the person rather than looking at the system as a potential cause of the error</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>27. Too much emphasis is placed on medication errors as a measure of the quality of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>28. The responses by nursing administration do not match the severity of the error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Nurses fear losing their license if a medication error is reported</td>
<td></td>
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</tr>
<tr>
<td>30. Nurses want to avoid potential publicity of medication errors in the media</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Occurrence and Reporting of Occupational Injuries

Healthcare workers occasionally suffer injuries or exposure to body fluids that may contain pathogens. The first step in understanding worker safety is learning the frequency of injuries and the extent to which injuries are reported. Please indicate whether you have sustained any occupational injuries and whether you reported these to your employee health office.

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

31. During the past 3 months, did you sustain a work related back strain or injury? | 32. If yes, did you report this back strain or injury to the employee health office? |
33. During the past 3 months, did you sustain any needlestick or other sharps injuries? | 34. If yes, did you report these injuries to the employee health office? |
35. During the past 3 months, were you exposed to body fluids other than sharps injuries? | 36. If yes, did you report this exposure to the employee health office? |
37. During the past 3 months did you sustain any other type of occupational injury? Please describe: | 38. If yes, did you report it? |
Reasons that Adverse Occurrences Happen
In your nursing experience, you most likely have made at least one medication error or had one of your patients fall. Likewise, you or a colleague may have experienced an occupational injury or a blood borne pathogen exposure. From the list of potential reasons that each type of adverse event occurred, check the two (2) most important reasons involved in your experience of adverse events. If the primary reason involved in your experience is not listed, please write that reason in the other category. Please check only 2 reasons for each type of adverse occurrence.

**Reasons that Medication Administration Errors Occur**
- Lack of sufficient information about the medication
- Lack of adequate information about the patient
- Patient allergy information not available
- Poorly designed medication administration record
- Medication not delivered or wrong dose delivered from pharmacy
- Unclear packaging and labeling
- Unavailability of IV pump or other equipment
- Malfunctioning equipment
- Many medications on multiple patients
- Not double-checking doses
- Unit or patient crisis when administering medications
- Long shift / overtime
- RN to patient ratio
- Distractions and interruptions
- Other

**Reasons for Exposures to Blood-borne disease**
- Lack of needle-less systems
- Poor accessibility of disposal units
- Sharps container full or malfunctioning
- Stress, crisis on unit
- Increased IV medications
- Chaotic conditions
- Not following standard precautions
- Other

**REASONS FOR BACK INJURIES**
- Lack of equipment for lifting
- Not enough people to help move patients
- Increase in total care patients
- Improper transfer techniques
- Patient cognitive condition
- Patient obese, unable to assist
- Other

Please write below any additional comments about adverse occurrences.
Your Work Environment and Your Job
Nurses' work environment is an important factor in understanding the quality of care. For each of the next 19 items, please indicate the degree to which you agree or disagree by checking one of the five boxes.

<table>
<thead>
<tr>
<th>The following statements characterize my work environment.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>39. The staffing level here is sufficient to care adequately for patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. The amount of paperwork I have to do interferes with patient care.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. My unit has the equipment I need to give the best care to patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. I have so many patients that I cannot give each one the care he or she needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Nursing staff, supervisors, and managers work together to insure the highest quality of care.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>44. I feel comfortable asking nurses for assistance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Incident report data are used mostly to identify problems with patient care systems.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>46. Compromises and shortcuts by management reduce the quality of care.</td>
<td></td>
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</tr>
<tr>
<td>47. The main use of incident report data is to identify poorly functioning nurses.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>48. Nurses cooperate to help one another care for individual patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Quality improvement processes (e.g. TQM/COQ) are used to improve patient care.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. I have adequate space to safely provide patient care.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>51. The incident report data are used to improve systems for patient safety.</td>
<td></td>
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</tr>
<tr>
<td>52. The availability of supplies prevents me from giving the best care to my patients.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>53. I can openly discuss my opinions about patient care problems with peers and supervisors.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>54. Information about the number of adverse occurrences (medication errors, patient falls, decubiti) is regularly shared with staff nurses.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>55. The manager and supervisors consider patient safety a high priority.</td>
<td></td>
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</tr>
<tr>
<td>56. I have a strong feeling of trust in the people with whom I work.</td>
<td></td>
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</tr>
<tr>
<td>57. Nurses are supported for reporting patient occurrences.</td>
<td></td>
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</tr>
</tbody>
</table>
The opinions that nurses hold about their jobs are important to understanding health care quality. *For each of the next 10 items, please indicate the degree to which you agree or disagree by checking one of the five boxes.*

<table>
<thead>
<tr>
<th>The following statements describe my feelings about my job.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>58. I'm willing to put extra effort into helping this organization be successful.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>59. If I had to decide again, I would still choose nursing as my career.</td>
<td></td>
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</tr>
<tr>
<td>60. I am disappointed that I ever took this job.</td>
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<tr>
<td>61. I find real enjoyment in my work.</td>
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</tr>
<tr>
<td>62. Each day of work seems like it will never end.</td>
<td></td>
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</tr>
<tr>
<td>63. I will probably look for a new job in the next year.</td>
<td></td>
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</tr>
<tr>
<td>64. I rarely think about quitting.</td>
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</tr>
<tr>
<td>65. Most of the time I have to force myself to go to work.</td>
<td></td>
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</tr>
<tr>
<td>66. I am satisfied with my job for the time being.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>67. I feel that I am happier in my work than most people.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Thank you for completing this survey
Appendix 3.4
Permission to Use Blegen/Vaughn Work Environment Index

Email from Dr. Blegen
Sent 3/26/03

Vicki

Attached is the Questionnaire and a table that displays some of the Work Environment Subscales. Working from the table you should be able to place most of the items from the work environment and job attitudes sections of the questionnaire. I do not yet have a neat package to send to people regarding this questionnaire. There are also some "left-over" items in the job attitudes section. These include one career satisfaction item and several that were supposed to form a job commitment subscale. The factor analysis did not find that factor, so for the moment we are not reporting it.

You have our permission to use the tool and modify it as needed for your dissertation research.

Mary Blegen
Appendix 3.5
Shift Coupon Booklet Used in the Pilot Study

Adverse Events Coupons

Definitions of Terms

**Error:** any action or inaction that had an adverse or potentially adverse consequence for the patient

**Minimal care:** patient is able to perform 85-100% of activities of daily living without assistance

**Moderation care:** patient is able to perform 35-84% of activities of daily living without assistance

**Maximum care:** patient is able to perform less than 35% of activities of daily living without assistance

**Medication error:** any error involving a medication for a patient

**Patient fall:** patient suddenly and involuntarily comes to rest on the floor or on an object

**Patient complaint:** verbal or written complaint waged by a patient concerning his/her care

**Family complaint:** verbal or written complained waged by a patient’s family concerning the family member’s care

**Cardiac arrest:** cessation of cardiac activity

**Pulmonary arrest:** cessation of pulmonary activity

**Unexpected patient death:** unforeseen, unexplainable, or procedure related death

**DNR:** Do not resuscitate

**New nosocomial infection documented:** 1st documentation in the patient’s chart by any member of the healthcare team of an infection occurring in a hospitalized patient that was not present or incubating at time of admission, examples: urinary infections, respiratory infections, and post-operative infections

**New skin breakdown documented:** 1st documentation in the patient’s chart by any member of the healthcare team of a new incidence of skin breakdown because of pressure or exposure of skin to urine or feces

**Nurse:** individual who has completed a course of study in nursing and has passed the National Council Licensure Examination
**Physician:** individual whom has completed a course of study in medicine and has passed the National Board Examinations in Medicine

**Pharmacist:** individual whom has completed a course of study in the formulation and dispensing of drugs

**Patient:** person receiving healthcare

**Technician:** a person with training in performing technical tasks, examples: nursing assistants, nurse extenders, pharmacy technicians, x-ray technicians, and phlebotomists

**Lack of staff:** insufficient number of hospital staff available to care for the needs of patient(s)

**Work overload:** excess amount of work or the feeling of excess amount of work during a shift

**Lack of supervision:** insufficient number of experienced healthcare staff to assist with caring for a patient(s)

**Stressful atmosphere:** feeling overwhelmed in care for a patient(s) due to the work environment

**Lack of knowledge:** insufficient training in the necessary skills to care for a patient(s)

**Lack of information:** insufficient information to care for a patient(s)

**Lack of communication:** insufficient communication between the healthcare team, the patient, and/or the patient family to provide care for a patient

**Faulty judgment:** mistake in judgment in caring for a patient(s)

**No harm to patient:** no physical consequences from the error to the patient

**Temporary harm to patient:** consequence from the error for the patient will resolve prior to the patient’s discharge

**Permanent harm to patient:** consequence from the error for the patient will not resolve prior to the patient’s discharge

**Death:** patient expired as a result of the error

---

1. Fill in the date: __________ __________ __________

2. Check hours worked:
   - 7a-3p
   - 7a-7p
   - 8a-4p
   - 8a-8p
   - Other __________
   - 3p-7p
   - 5p-7a
   - 4p-12a
   - 8p-8a
   - 12a-8a

3. This shift I worked in:
   - Medical/surgical unit
   - Emergency room
   - Psychiatric unit
   - Operating room/recovery room
   - Labor and delivery unit
   - Intensive care unit
   - Other __________

4. I would classify the patient(s) I cared for this shift as:
   - Minimal care
   - Moderate care
   - Maximum care

5. Check the error that occurred during your shift:
   - No error occurred (Coupon complete)
   - Medication error
   - Patient fall
   - Patient complaint
   - Unexpected patient death
   - Cardiac arrest
   - Pulmonary arrest
   - New nosocomial infection documented
   - New skin breakdown documented
   - DNR: Yes
   - No
   - Stressful atmosphere
   - Family complaint
   - Other __________

6. What caused the error: (Check all that apply)
   - Lack of staff
   - Lack of supervision
   - Lack of knowledge
   - Lack of information
   - Lack of communication
   - Faulty judgment
   - Stressful atmosphere
   - Work overload
   - New skin breakdown documented
   - Other __________

7. What was the result of the error:
   - No harm to patient
   - Temporary harm to patient
   - Permanent harm to patient
   - Death
   - Unknown

8. Was a hospital incident report filled out for this error:
   - Yes __________
   - No __________
   - Unknown __________
Appendix 3.6
Evaluating the Shift Coupon from the Pilot Study

Evaluating the Shift Coupon

Directions: Please answer the following questions about the Shift Coupons in the space provided.

1. How long did it take you to fill out an Shift Coupon at the end of your shift?

________________________________________________________________

2. I liked the Shift Coupon because: ___________________________

________________________________________________________________

________________________________________________________________

3. I disliked the Shift Coupon because: ________________________

________________________________________________________________

________________________________________________________________

4. If I could change anything about the format of the Shift Coupon, I would change: _________________________________________________________

________________________________________________________________

________________________________________________________________

5. If I could change any of the terms used on the Shift Coupon, I would change: _________________________________________________________

________________________________________________________________

________________________________________________________________

6. Suggestions for improving the Shift Coupon: ___________________

________________________________________________________________

________________________________________________________________

________________________________________________________________
Date: March 8, 2002

From: Candice A. Yekel, Director of Regulatory Affairs

To: Victoria Kellogg

Subject: Results of Review of Proposal - Expedited (IRB #02B0231-00)

Approval Expiration Date: March 8, 2003

"Pilot Testing an Innovative Method for Collecting Adverse Events Data in Hospitals"

The Behavioral and Social Sciences Committee of the Institutional Review Board has reviewed and approved your proposal for use of human subjects in your research. This approval has been granted for a one-year period.

Approval for use of human subjects in this research is given for a period covering one year from today. If your study extends beyond this approval period, you must contact this office to request an annual review of this research.

Subjects must receive a copy of any informed consent documentation that was submitted to the Compliance Office for review.

By accepting this decision you agree to notify the Compliance Office of (1) any additions or procedural changes that modify the subjects' risks in any way and (2) any unanticipated subject events that are encountered during the conduct of this research. Prior approval must be obtained for any planned changes to the approved protocol. Unanticipated subject events must be reported in a timely fashion.

On behalf of the committee and the University, I thank you for your efforts to conduct your research in compliance with the federal regulations that have been established for the protection of human subjects.

CAY/slk

cce: D. Havens
     S. H. Guedner
     J. Iliger
     K. Newell

An Equal Opportunity University
Appendix 3.8
Director of Nursing School Support Letter

February 6, 2002

Review Committee
Sigma Theta Tau International
Beta Sigma Chapter
201 Health & Human Development East
University Park, PA 16802

Dear Members of the Review Committee:

Pending approval from the Institutional Review Board, I hereby give my support for Victoria A. Kellogg to conduct a pilot study testing a method for reporting adverse events using registered nurses enrolled in the School of Nursing at The Pennsylvania State University. All participation will be voluntary, with the understanding that participation or non-participation will not affect the student’s grades in any way.

The data obtained from this pilot study will be used to improve the instruments before utilization in Ms. Kellogg’s dissertation.

Sincerely,

Sarah Hall Gueldner, DSN, FAAN
Director

College of Health and Human Development
Appendix 3.9
Professor-In-Charge of Graduate Studies Support Letter

February 14, 2002

Victoria Kellogg, MSN, MBA, RN
131 Birchtree Court
State College, PA 16801

RE: Accessing graduate students for the conduct of a pilot study

Dear Ms. Kellogg:

I am pleased to give you access to graduate nursing students to invite them to participate in your pilot study entitled, “Testing an Adverse Events Coupon.” You are aware that this support is offered pending PSU IRB approval.

I understand that graduate student participation is voluntary, and that their academic progression will not be affected should they choose not to participate or decide not to continue in the study. Please let me know when you anticipate accessing graduate classes so that I can apprise graduate faculty of your undertaking. Doing so should facilitate your data collection.

Sincerely,

Karen H. Morin, DSN, RN
Professor of Nursing
Professor in Charge of Graduate Programs

College of Health and Human Development
An Equal Opportunity University
February 8, 2002

Dear Sigma Theta Tau International, Beta Sigma Chapter,

With IRB approval, I hereby give my support for Victoria A. Kellogg to conduct a pilot study evaluating a method for reporting adverse events using registered nurses enrolled in the undergraduate (RN/BS) program in the School of Nursing at The Pennsylvania State University. The data obtained from this pilot study will be used to improve the instruments before utilization in Ms. Kellogg’s dissertation.

Sincerely,

Raymonde Brown
PhD, RN, CS
Professor-in-Charge
Undergraduate Nursing
Appendix 3.11
Information Sheet Describing Pilot Study

PENNSATE
School of Nursing
The Pennsylvania State University
University Park, PA 16802-6508

Pilot Testing: An Innovative Method for Collecting Adverse Event Data in Hospitals
About the Pilot Study

Purpose: To improve the Adverse Event Coupon and the Reporting Adverse Events Survey based on responses from registered nurses working in hospitals prior to conducting a larger study using these surveys. This larger study will track adverse events that occur in a hospital by having the registered nurses fill out an Adverse Event Coupon at the end of each shift.

Description: This pilot study will test two surveys: the Adverse Event Coupon and the Reporting Adverse Events Survey. The answers from a third survey, the Evaluating the Adverse Event Coupon and the Reporting Adverse Events Survey, will be used to improve these two surveys. Individuals working as registered nurses in a hospital are asked to fill out an Adverse Event Coupon within 1 hour of completing a shift for 5 shifts. Each Adverse Event Coupon will take approximately 5 minutes to fill out. After the 5 shifts, the Reporting Adverse Events Survey and the Evaluating Adverse Event Coupon and the Reporting Adverse Events Survey will be filled out in this order. The Reporting Adverse Events Survey will take approximately 15 minutes to fill out and the Evaluating the Adverse Event Coupons and the Reporting Adverse Events Survey will take approximately 15 minutes to fill out. Once all three surveys are completed, they will be mailed back to the researcher in the envelope provided by the researcher.

Eligibility: Individuals currently enrolled in the School of Nursing at the Pennsylvania State University, licensed as a registered nurse, and working as a registered nurse in a hospital are eligible to participate in the pilot study. A total of approximately 25 registered nurses will participate in this pilot study.

Approval: Approval to conduct this pilot study was given by the IRB of Pennsylvania State University, the Director of the School of Nursing at Pennsylvania State University, the Professor-in-Charge of Undergraduate Studies at Pennsylvania State University, and the Professor-in-Charge of Graduate Studies at Pennsylvania State University.

Confidentiality/Anonymity: Every effort will be made to protect your privacy and anonymity. No identifying information will be gathered on any of the three surveys. The researcher will not be able to trace any survey back to a registered nurse through information collected on any of the three surveys. The researcher will not be able to determine who did or did not returned the surveys. All surveys mailed back to the researcher will be kept in a locker file in a locker office for a period of 5 years. After the 5-year period, the surveys will be destroyed by fire. Data from the surveys will be entered into a computer database. This database will only be accessible by knowing the security code to open the database. The computer in which the database is saved is in a locked office. After the 5-year period, the database will be erased from the computer.

Participation: Participation in this pilot study is completely voluntary. You have the right to refuse to answer specific question(s) on the three surveys. By returning the surveys by mail to the researchers, you are agreeing to participate in the study. Participating in the pilot study will not affect your grade in the class(s) you are presently taking in the school of nursing. Any risks from participating in this pilot study are very minimal.

Questions/Concerns: If you have any questions or concerns about the pilot study, please contact:
Victoria A. Kellogg, RNC, CRNP, MBA, PhD(c)
307B Health and Human Development East
University Park, Pa 16802
Phone: 814-865-9337
IRB/02B0231
Appendix 3.12
Instructions for Filling Out Shift Coupon in Pilot Study

Instructions for the Pilot Study: Testing the Shift Coupon

1. The envelope provided by the researcher contains: an information sheet about the pilot study, this sheet of directions for the pilot study, a Adverse Event Booklet containing 15 Shift Coupons, a Reporting Adverse Events Survey, an Evaluating the Shift Coupons and the Reporting Adverse Events Survey, and the researcher’s business card.

2. Read the information sheet “About the Pilot Study” before completing any survey.

3. Within 1 hour of completing a shift as registered nurse within a hospital, fill out the Shift Coupon(s) using a black or blue pen
   a. Read “Definitions of Terms,” the first two pages in the Adverse Events Booklet to become familiar with the terms used on the Shift Coupons
   b. Read question # 1, fill in the date as of the start of the shift
   c. Read question # 2, check the box of the hours of the shift just worked; if checking “other”, write the hours worked on the line after the “other” option
   d. Read question # 3, check the box of the type of unit you just worked; if checking “other,” write the type of unit on the line after the “other” option
   e. Read question # 4, check the box that best represents the overall acuity of the patients you cared for on the shift just worked
   f. Read question # 5, check the box of  the error that occurred during shift just worked – Remember, check the box of any error you were aware of during the shift just worked, not just an error you might have been involved with
      i. If no error occurred, check the option “no error occurred,” you are finished filling out the Shift Coupon
      ii. If more than 1 adverse event occurred during the shift you just worked, fill out a separate Shift Coupon for every error that occurred
   g. Read question # 6, check all the box(s) that apply for the cause(s) of the error check in question # 5.
   h. Read question # 7, check the end result of the error check in question #5 on the patient
   i. Read question # 8, check whether a hospital incident report was filled out by any member of the healthcare team for the error check in question # 5
   j. Repeat steps a-i for a total of 5 shifts worked as a registered nurse in a hospital.
4. After filling out Shift Coupons for 5 shifts, fill out the **Reporting Adverse Events Survey** using a blue or black pen
   a. Read each statement and fill in the circle that best represents your opinion

5. After filling out Adverse Events Coupons for 5 shifts and the Reporting Adverse Events Survey, fill out the **Evaluating the Shift Coupons and the Reporting Adverse Events Survey** using a blue or black pen
   a. Read each question and write your answer to the question in the space provided

6. Return the Adverse Event Booklet containing the Shift Coupons, Reporting Adverse Events Survey, and the Evaluating the Shift Coupons and Reporting Adverse Events Survey to the envelope provided by the researcher

7. Seal the envelope and mail the envelop using the United States Postal Service
Appendix 3.13
Office for Regulatory Compliance Approval Letter for Dissertation Study

Date: May 5, 2003
From: Jodi L. Mathieu, IRB Administrator
To: Victoria A. Kellogg
Subject: Results of Review of Proposal - Expedited (IRB #15875)

Approval Expiration Date: May 4, 2004

"Testing an Innovative Approach to Collect Adverse Events Data: A Methodological Study"

The Social Science Committee of the Institutional Review Board has reviewed and approved your proposal for use of human participants in your research. This approval has been granted for a one-year period.

**COMMENT:** Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for this research.

Approval for use of human participants in this research is given for a period covering one year from today. **If your study extends beyond this approval period, you must contact this office to request an annual review of this research.**

Subjects must receive a copy of any informed consent documentation that was submitted to the Office for Research Protections for review.

By accepting this decision you agree to notify the Office for Research Protections of (1) any additions or procedural changes that modify the participants' risks in any way and (2) any unanticipated subject events that are encountered during the conduct of this research. Prior approval must be obtained for any planned changes to the approved protocol. Unanticipated participant events must be reported in a timely fashion.

On behalf of the committee and the University, I thank you for your efforts to conduct your research in compliance with the federal regulations that have been established for the protection of human participants.

JLM/slk
Enclosure

cc: Donna S. Havens
Department Head, Nursing
Research Dean, Health and Human Development
Jerome Ittinger
Appendix 3.14
Office for Regulatory Compliance Approval of Changes to Dissertation Study

Date: June 16, 2003
From: Jodi Mathieu, IRB Administrator
To: Victoria A. Kellogg
Subject: Research Proposal - Modification (IRB #15875)
Approval Expiration Date: May 4, 2004
(Note: This date reflects the anniversary date of the actual submission approval date.)

"Testing an Innovative Approach to Collect Adverse Events Data: A Methodological Study"

The revisions to the above-referenced study, outlined in your June 12, 2003 e-mail message, do not increase risks to human participants. You may proceed with your study.

COMMENT: Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for this research.

Please continue to notify this office of any further modifications.

JLM/slk
Enclosure
cc: Donna S. Havens
    Department Head, Nursing
    Research Dean, Health and Human Development
    Jerome Itinger
June 24, 2003

{Name}
{Address}
{City}, {State}  {Zip}

Dear {Name},

A few days from now you will receive in the mail a request to fill out two surveys for an important research project being conducted by Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c) from the Pennsylvania State University. This research is being conducted as her doctoral dissertation.

The two surveys used in this research project will gather data on the occurrence and causes of adverse events as well as the work environment in which registered nurses practice.

I am writing in advance because many people like to know ahead of time that they will be contacted. This study is important because it will provide information about the quality of care patients are receiving and about the work environment in which registered nurses are being asked to provide care.

Thank you for your time and consideration. It is only with the generous help of registered nurses like you that the research project can be successful.

Sincerely,

Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c)
Pennsylvania State University
307B Health and Human Development East
University Park, PA16802

P.S. I will be enclosing a small token of appreciation with the surveys as a way of saying thanks.
Appendix 3.16
First Mailing of the Questionnaires

June 30, 2003

"Name"
"Address"
"City", "State" "Zip"

Dear "Name",

I am writing to ask for your help in a research study. The purposes of this study are to test the ability of an instrument to collect adverse events data and to explore the work environment in which registered nurses practice. The findings from this study may be used to determine the incidence and cause(s) of adverse events and to understand the current work environment in which registered nurses provide care.

I am contacting a random sample of 1,000 registered nurses in Pennsylvania to participate in this study. The names and addresses of all registered nurses in Pennsylvania were purchased from the State Board of Nursing in the Commonwealth of Pennsylvania. From this listing of all registered nurses, you are one of the 1,000 registered nurses randomly selected to take part in the study.

The findings from this study will provide insight into the quality of care patients receive by looking at the occurrence, types, and causes of adverse events. Additionally, the results of the study will offer a glimpse of the current work environment in which registered nurses practice.

Your answers are completely anonymous. There is no way for the researcher to link a survey to a registered nurse, to determine which registered nurses return surveys, or to determine where a registered nurse is employed. There are no identification numbers on any of the surveys.

I have enclosed a small token of appreciation of $2.00 as a way of saying thanks for your help.

If you have any questions or comments about this study, please do not hesitate to contact me by phone at (814) 865-9337 or email at vak107@psu.edu.

Thank you for helping with this important study.

Sincerely,

Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c)
Pennsylvania State University
307B Health and Human Development East
University Park, PA 16802

College of Health and Human Development
Appendix 3.17
Thank You Postcard

Date

Dear name of RN,

Last week surveys were mailed to you for a study to test the ability of an instrument to collect adverse events data and to explore the work environment in which registered nurses practice.

If you have already completed and returned the surveys, please accept my sincere thanks. If not, please complete the surveys. I am especially grateful for your help because it is only by asking registered nurses about these issues that changes can be made to improve patient care and the work environment.

Again, thank you for helping with this important study.

Sincerely,

Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c)
Pennsylvania State University
307B Health and Human Development East
University Park, PA 16802
Appendix 3.18  
Replacement Mailing of Questionnaires

July 21, 2003

«Name»
«Address»
«City», «State» «Zip»

Dear «Name»,

About three weeks ago, I sent you two surveys for a research study to test the ability of an instrument to collect adverse events data and to explore the work environment in which registered nurses practice. If you have not returned the surveys, please complete and return the surveys as soon as possible.

The responses of the registered nurses who have already responded will help to improve patient care and the work environment in which registered nurses practice. However, your response would greatly improve the study. Therefore, I am writing because of the importance of your responses on the surveys.

Again, your answers on the surveys are completely anonymous. There is no way for the researcher to link a survey to a registered nurse, to determine which registered nurses return surveys, or to determine where a registered nurse is employed. There are no identification numbers on any of the surveys.

I hope that you will fill out and return the surveys as soon as possible. If you have any questions or comments about this study, please do not hesitate to contact me by phone at (814) 865-9337 or email at vak107@psu.edu.

Thank you for helping with this important study.

Sincerely,

Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c) 
Pennsylvania State University 
307B Health and Human Development East 
University Park, PA16802
Appendix 3.19
Posted Envelope
Appendix 3.20
About the Study (Informed Consent)

ABOUT THE STUDY

Title of Project: Testing an Innovative Method to Collect Adverse Events Data: A Methodological Study

Principal Investigator: Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c), The Pennsylvania State University, School of Nursing, 307 Health and Human Development East, Phone: (814) 865-9337; Fax: (814) 861-4474; Email: vak107@psu.edu

Advisor: Donna S. Havens, PhD, RN, The Elouise Ross Eberly Professor of Nursing, The Pennsylvania State University School of Nursing, 307 Health and Human Development East, Phone: (814) 863-2220; Fax: (814) 865-6625; Email: dsh13@psu.edu

This is to certify that I hereby agree to participate as a volunteer in a program of investigation under the supervision of Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c). This study is being conducted by a Pennsylvania State University School of Nursing doctoral candidate as her dissertation.

1. **Purpose of study:** The purposes of this study are to test the ability of the Shift Coupon to collect adverse events data and to explore the work environment experienced by registered nurses.

2. **Procedures to be followed:** This study will use two surveys: 1) the Shift Coupon and 2) the Blegen/Vaughn Work Environment Scale. Individuals working as registered nurses are asked to fill out a Shift Coupon within 1 hour of completing a shift for 5 shifts. The purpose of the survey is to collect adverse events data. Each Shift Coupon will take about 2 minutes to fill out. Registered nurses are also asked to fill out the Blegen/Vaughn Work Environment Scale. The purpose of this survey is to collect data on the work environment. The Blegen/Vaughn Work Environment Scale will take about 15 minutes to complete. Registered nurses are asked to return both surveys to researcher via mail in the posted envelope provided.

3. **Eligibility:** Individuals who are currently 18 years of age or older, currently possess a registered nursing license in Pennsylvania, and reside in Pennsylvania are eligible to participate. A total of 1,000 individuals will participate in the study.

4. **Discomforts and risks:** Any risks from participating in this study are very minimal.

5. **Potential benefits:** The benefits to myself include the possibility of improving the quality of patient care by anonymously identifying incidents and the causes of incidents as well as exploring the work environment experienced by registered nurses. The benefits to society include the possibility of improved the quality of care patients receive.

6. **Period of time of the procedures and study:** Data collection will take place over 5 shifts. Within 1 hour of completing a shift registered nurses are asked to complete a Shift Coupon. Registered nurses are also asked to complete a Blegen/Vaughn Work Environment Scale at his/her
earliest convenience. Both surveys will then be mailed back to the researcher in the provided envelope.

7. **Costs of Participation:** Refusing to participate in the study will not effect my status as a registered nurse. Each registered nurse will receive $2.00 irrespective of whether he/she returns the surveys.

**CONFIDENTIALITY:** Every effort will be made to protect my privacy and anonymity. No identifying information will be gathered on any of the two surveys. The researcher will not be able to trace any survey(s) back to a registered nurse. The researcher will not be able to determine where any registered nurse is employed. The researcher will not be able to determine which registered nurses did or did not return the survey(s). All surveys returned to the researcher will be kept in a locked file in a locked office for a period of 5 years. Data from the surveys will be entered into a database. The database will have an access code to view the data and the computer will be kept in a locked office. After a 5-year period, all surveys will be destroyed by fire and the database will be deleted from the computer.

**QUESTIONS:** If I have questions that I desire to address to anyone other than the principal investigator I should contact the Office for Research Protections at The Pennsylvania State University at 814-865-1775.

**TERMINATION OF PARTICIPATION:** I can withdraw from the study at any time. I can decline to answer specific question(s) from any survey(s). By returning the survey(s) to the researcher, I am agreeing to participate in the study.
Appendix 3.21
Instruction Sheet

Title: Testing an Innovative Approach to Collecting Adverse Events Data: A Methodological Study

Principal Investigator: Victoria A. Kellogg, RN, MSN, CRNP, MBA, PhD(c)
Pennsylvania State University, School of Nursing
307 Health and Human Development East
University Park, PA 16802-6509
Phone: (814) 865-9337, Fax: (814) 861-4474; Email: vak107@psu.edu

Instructions for Completing the Shift Coupon

1. Read the information sheet “About the Study” before completing any survey.

2. Within 1 hour of completing a shift as a registered nurse, fill out the Shift Coupon(s)
   a. Read “Definitions of Terms,” the first two pages in the Coupon Booklet to become familiar with the terms used on the Shift Coupon
   b. Read question #1, check where the shift was worked
   c. Read question #2, if the shift was worked in the hospital, check the type of unit
   d. Read question #3, write in the shift hours (i.e. 7am-3pm)
   e. Read question #4, check whether the shift was worked during a weekend
   f. Read question #5, check whether the shift was worked during a holiday
   g. Read question #6, write in the total number of patients you were assigned during the shift, including patients that were admitted, discharged, transferred, or expired
   h. Read question #7, write in the total number of patients you were assigned who required minimal, moderate, and maximum nursing care
   i. Read question #8, check the box of the incident that occurred during the shift just worked – Remember, check the box of any incident you were aware of for the patients you were assigned, not just an incident you might have been involved with
      i. If no incident occurred, check the option “no incident occurred,” you are finished filling out the Shift Coupon
      ii. If more than 1 incident occurred during the shift you just worked, fill out a separate Shift Coupon for each incident that occurred
   j. Read question #9, check all the box(s) that apply for the cause(s) of the incident checked in question #8
   k. Read question #10, check the result of the incident checked in question #8 on the patient
   l. Read question #11, check whether the incident could have been prevented
      i. If the incident could have been prevented, write on the line how the incident could have been prevented.
   m. Read question #12, check whether an incident report was completed for the incident

3. Repeat steps a-m for a total of 5 shifts.

4. Return the Shift Coupons in the Coupon Booklet and the Blegen/Vaughn Work Environment Scale to the researcher in the posted envelope provided.

Instructions for the Blegen/Vaughn Work Environment Scale

1. Read the information sheet “About the Study” before completing any survey.

2. Complete the Blegen/Vaughn Work Environment Scale based on your expertise as a registered nurse using the instructions given at the beginning of each section.

3. Return the Blegen/Vaughn Work Environment Scale and the Shift Coupons in the Coupon Booklet to the researcher in the posted envelope provided.

Thank you for participating in this study
Vita - Victoria A. Kellogg

Education

2000-2003  PhD  Pennsylvania State University, School of Nursing  
Focus: Health Services Research

1997-2000  MBA  Pennsylvania State University  
Concentration: Health Care Administration

1996-1998  MSN  University of Pennsylvania, School of Nursing  
Focus: Women's Health Nurse Practitioner

1993-1996  BSN  University of Pennsylvania, School of Nursing

Research

Testing an innovative method for collecting adverse events data: A methodological study, 
Pilot testing an innovative method for collecting adverse events data in hospitals. 
Kellogg, V.A., PI. Funded 2002 - Sigma Theta Tau International, Beta Sigma Chapter, $615.

Publications

Kellogg, V.A. An innovative method of collecting adverse events data. Outcomes 
Management, 7(4), 174-180.

Kellogg, V.A. & Havens, D.S. Adverse events in acute care: An integrative literature 
review. Research in Nursing and Health, 26(5), 398-408.

Paper Presentations

Kellogg, V.A. The Adverse Event Coupon: An Innovative Method of Collecting Adverse 
Events Data in the Acute Care Setting. (Juried) Accepted: Tenth National Nursing Administration 
Research Conference, Chapel Hill, NC, October 10, 2003.

Havens, D.S., & Kellogg, V.A. Hospital Ratings: Quality Measures or Mere Puffery?. 
(Juried) Tenth National Nursing Administration Research Conference, Chapel Hill, NC, October 

Kellogg, V.A. Testing an Innovative Method of Collecting Adverse Events Data: A Pilot 
Study. (Juried) Eastern Nursing Research Society 15 Annual Scientific Sessions, New Haven, 
CT, March 27-29, 2003.

Havens, D.S., & Kellogg, V.A. Hospital ratings: Quality measures or mere puffery?. 
(Juried) Eastern Nursing Research Society 15 Annual Scientific Sessions, New Haven, CT, 

Poster Presentations

Kellogg, V.A. The Evolution of an Innovative Method to Collect Adverse Events 
Data: The Adverse Event Coupon. (Juried) Accepted: Academy Health Annual Meeting, 

Kellogg, V.A. & Havens, D.S. Integrative Review of Nursing and Health Services 
Literature on Adverse Events. (Juried) Academy for Health Services Research and Health Policy 

Kellogg, V.A., & Havens, D.S. Adverse Events: How They are Defined and What Their 
Data Sources Are. (Juried) The American Academy of Nursing Annual Meeting and Conference, 

Havens, D.S., Vasey, J., Orkin, F., Hollenbeak, C., Sharp-King, T., & Kellogg, V.A. Using 
HCUP QIs to evaluate the “Best” and the “Rest”: A Pilot Study. (Juried) The Academy for Health 