Associate and Baccalaureate Degree Nursing Students' Knowledge of and Attitudes toward
Medication Errors and Reporting Medication Errors: Implications for Curriculum Development

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Abstract

       This paper evaluates senior nursing students' knowledge and attitudes of medication

errors and reporting errors. This study was conducted to evaluate a need for improvements to

nursing education on these two concepts. This mixed method study was conducted using a

modified version of the *Medication Administration Error Reporting Survey* by Wakefield, Uden-

Holman, and Wakefield (2005) and focus group sessions at four nursing programs in the

Southern United States. Medication errors continue to be a threat to patient safety and

underreporting exists due to the stigma surrounding admitting a mistake. Evaluating nursing

students' knowledge and attitudes on these concepts is a crucial step in evaluating their readiness

to administer medications. This study found that nursing students lack knowledge of the

definition of a medication error, types, and causes. This study also found that students do not

know how to report medication errors. This study validated the need for a change to nursing

education and a culture change encouraging reporting errors.

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CHAPTER ONE

INTRODUCTION

The notion of an "error" can imply issues that range from simple mistakes to extreme

events that may result in catastrophic consequences. Most people consider any error as an

example of poor judgment (i.e. displaying emotional outburst) or a lack of knowledge in practice

(i.e. medication error). Errors of all forms generally are common, but many are field-specific

and classified according to the industry in which they occur (Allchin, 2001). Although people

work hard to gain knowledge, practice, and safe skillsets, errors are inevitable and often

overshadow our capabilities and our limitations (Rescher, 2014).

Errors are not just of practical interest, historians and philosophers continue to explore

the concept (Allchin, 2001; Schickore, 2005). Their collective research has resulted in

classifications of the error type, cause, environment in which it occurred, and many more

components often referred to as human factors (Johannesen, Sarter, & Cook, 2017; Katsakiori,

Kavvathas, Athanassiou, Goutsos, & Manatakis, 2009; OGP, 2005). Another important factor

about errors is that they do not occur by themselves (Rescher, 2014; Zhao & Olivera, 2006), and

no single person in healthcare is capable of preventing all medication errors from occurring

(Benner, Malloch, & Sheets, 2010).

Of course, in nursing education we focus on particular types of errors such as those

related to delivery of medication. A medication error is as any preventable occurrence, including

the near miss that may lead to patient injury or death (National Coordinating Council for

Medication Error Reporting and Prevention, 2017). This occurrence is a result of human error,

on the part of the healthcare practitioner (Leape, 1994). Experts have shown that six hundred

near-miss events occur before the one event that leads to injury, which means that healthcare

professionals had six hundred chances to learn from and prevent the error (Gunderson, Granzyk, & Mayer, 2018).

The National Council of State Boards of Nursing is an agency that sets rules and standards to prepare future nurses. The council believes the best way to safeguard public safety is to make certain that nursing students entering practice have been presented with the knowledge and skills to practice (National Council of State Boards of Nursing, 2018). Within nursing programs, students learn how to administer medication safely using the *Six Rights of Medication Administration* and how to recognize and report errors through pharmacology exams and skills proficiency check-offs. Nursing students are required to learn vast amounts of information and most of it occurs through memorization, which is not beneficial to retention of knowledge. The act of medication administration involves being proficient in medical terminology, pathophysiology, pharmacology, and mastery of skills, but when providers focus on the tasks alone patients are at risk (Gunderson et al., 2018).

Communicating that an error has occurred may be lacking due to the potential stigma surrounding the admission of failure. Within a culture against admitting errors, these mistakes often result in *error-hiding* (Dunn, 2014). In healthcare, less than two percent of all reportable events that lead to patient harm or sentinel events are reported (The Joint Commission, 2018). During the 2018 report concerning the top ten most reported sentinel events, medication errors appeared seventh on the list, with only 17 events reported within the six-month data collection period. Across all levels of healthcare in the United States, statistics show that 1.3 million injuries occur every year leading to at least one death every day due to medication errors (Food and Drug Administration, 2016), which proves the data in the 2018 Joint Commission report to be grossly under-reported.

Patient safety remains in the spotlight, but most healthcare educational programs have not made significant changes to their curricula addressing the important concept (Gunderson et al., 2018). Changes to the healthcare system keep nurse educators and nursing programs current in how to teach students on new trends in practice. Nurse educators teach future nurses how to critically think and ensure the next generation of nurses is competent to provide care (Stoker, 2016). However, safeguarding patients against medical errors, including medication administration errors, is not new to nursing education.

Statement of the Problem

Most often, the nurse is the last line of defense before patients receive medication, yet errors still occur (Sulosaari, Kajander, Hupli, Huupponen, & Leino-Kilpi, 2012). Fear surrounding making and reporting medication errors increase the potential for an error in practice. Discussion of prevention strategies exist in didactic education and are the best environment to teach knowledge to prevent errors and reduce fear of reporting (Dunn, 2014). An examination of students' feeling regarding their educational preparation warrants an exploration of gaps in curriculum for both didactic and clinical.

Due to the complexity of nursing education and the extensive knowledge nurses must possess to practice efficiently, nursing students may lack complete knowledge and mastery of skills in medication administration. This lack of knowledge and skills may lead to the occurrence of errors following graduation. If students do not feel prepared in the importance of medication administration safety and reporting all errors, they may continue to under-report these events in practice. Therefore, it should be clear that the issue of how to improve nursing curricula, ensuring retention of knowledge, and how to report medication errors exists in the forefront of nursing faculty's curricular plans.

Purpose of the Study

The purpose of the study detailed here was to explore what senior nursing students understand about medication errors, reporting errors, and the implications for change to nursing curricula. Recent literature has shown that the number of medication errors continue to climb among practicing nurses. However, there is a paucity of knowledge in the literature regarding nursing students.

Nursing theorist Patricia Benner (1982) introduced the concept that expert nurses develop skills and understanding of patient care over time through a sound educational base as well as a multitude of experiences (Benner, 1982). She developed a model of nursing skill acquisition and clinical judgment based upon the Dreyfus Model of Skill Acquisition (Benner, 2001). Figure 1 shows the Dreyfus Model and the five stages students will pass through during the acquisition and development of skills: novice, advanced beginner, competent, proficient, and expert (Benner & Wrubel, 1982; Benner, 1982; Benner, 2004). The novice classification applies to first year nursing students who enrolled in pharmacology courses and foundational skills teaching. Advanced beginners are those students who have experienced the skill in real-life situations and are competent in the knowledge and steps to perform the skills (Benner, 1982). For purposes of this study, last semester senior nursing students (advanced beginners) from associate and baccalaureate nursing programs in the Southern United States were asked to respond.
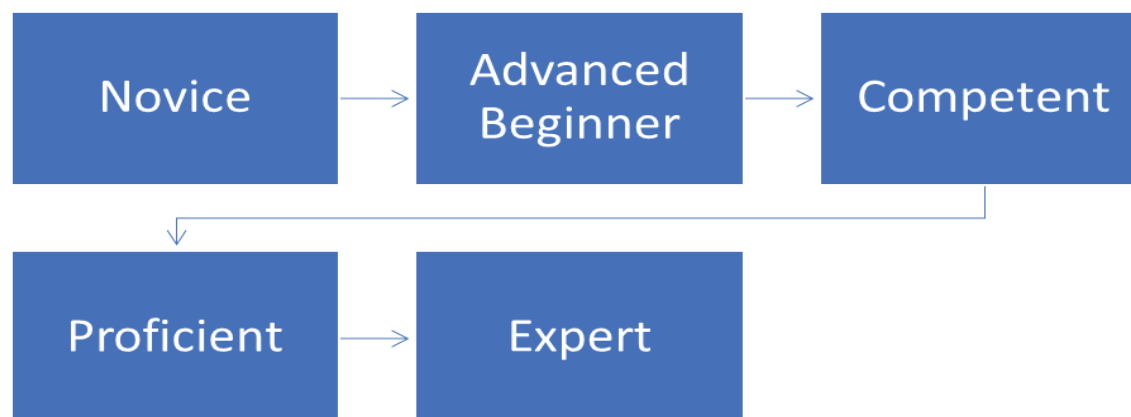
Figure 1. The Dreyfus Model of Skill Acquisition Applied to Nursing.

Significance of the Study

It is vital that nursing students understand their role in medication administration safety and their obligation to report all medication errors to increase patient safety outcomes (Kalantarzadeh & Hosseinnejad, 2014; Lukewich et al., 2015). Medication errors are the result of individual and systemic errors that can occur at any stage where medications are involved (Bush, Hueckel, Robinson, Seelinger, & Molloy, 2015).

Research Questions

1. What do associate and baccalaureate program senior nursing students know about medication errors, types, and causes?

2. What do associate and baccalaureate program senior nursing students know about reasons for reporting or avoiding to report errors by licensed nurses?

3. What are associate and baccalaureate program senior nursing students' feelings about their education regarding and reporting medication errors?

Proposed Method

The design of this study is a mixed method, non-experimental, descriptive study to examine what senior nursing students have learned and retained about medication errors,

reporting errors, and their feelings about their education regarding medication errors. Last semester senior nursing students from four local universities in associate or baccalaureate degree programs participated following Institutional Review Board approval of this study.

For the purpose of assessing the knowledge level of medication errors and reporting in nursing students, a Likert item survey was developed. Focus group sessions assessed how students felt about their educational preparation and about reporting errors. The Medication Administration Error Survey (Wakefield et al., 2005) was used to develop a revised tool measuring student knowledge of medication errors and reporting errors. Specific aims include describing nursing students' understanding of why medication errors occur and why medication errors are not reported. Nurse educators and practicing nurses in the profession reviewed the items selected for the revised tool for content validity. A pilot study of the survey provided psychometric properties and established validity and reliability. Following institutional review board approval, the researcher visited each of the nursing programs to deploy the survey to a convenience sample of associate and baccalaureate senior nursing students.

Assumptions

The assumptions and interest of this study emerged from being a nurse educator who teaches and observed undergraduate nursing students in didactic and clinical environments. I have witnessed students make errors in skills lab settings and in the clinical environment. When approached about these errors, they often become fearful about disclosing and discussing the events. It is my belief that these fears would decrease with changes to the curriculum to increase knowledge of medication errors and when to report errors.

Recently, a peer of mine committed a medication error. When she realized her mistake, she immediately notified her supervisor. The supervisor never followed up regarding the error or

asked the nurse to complete any paperwork to document the mistake. My fear is that many healthcare workers are practicing, as the supervisor did, and with the same disregard for patient safety.

    Assumption 1: Respondents will answer honestly regarding their knowledge about making medication errors.

    Assumption 2: Respondents have witnessed or made an error in a skills lab, simulation lab, or clinical environment.

Limitations on Generalizability

This study could be generalizable to other undergraduate programs across the United States. This study included participants from associate and baccalaureate degree programs and should be applicable to licensed vocational programs, as well. The results of this study are beneficial to nurse educators for curriculum evaluation and community stakeholders, such as hospital administration.

Delimitations Regarding the Nature of the Study

Several factors exist as delimitations to this study. The use of convenience sampling and including nursing programs within 200 miles prove limiting. Honesty is a delimitation of this study related to their beliefs regarding a sensitive issue. Lastly, nursing students may not feel comfortable disclosing occurrences regarding medication errors for fear it will have an impact on their grades.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this chapter is to explore the topic of medication errors. This chapter begins with a current review of the literature regarding errors in varying industries. An exploration of MAEs in healthcare, in addition to a discussion of topics related to current research trends. In addition, a disclosure of gaps in knowledge related to errors is presented.

Review of Current Literature Regarding Errors in Industry and Healthcare

To gain an understanding of errors within industry, I conducted an extensive literature review on this topic to provide some background and context. An initial search using the term error in Cumulative Index for Nursing and Allied Health Literature (CINAHL), Education Resources Information Center (ERIC), Google Scholar, and Medical Literature Analysis and Retrieval System Online (MEDLINE) databases produced references. This search allowed for inclusion of subsets of industry, as well.

Thousands of books, articles, and other publications met the search criteria. At this point, it was best to restructure the search by subtopics (see Figure 2). An evaluation of applicability of each article occurred, while noting a wide variety of industries. In total, over 60 articles, websites, and books have become resources to provide a foundation for this study.

A gap in knowledge exists within the review of the literature. This gap relates to my inability to gather information from every industry. This limitation prevented a comprehensive review of each of the subcategories described in this paper.

Figure 2. Model of the search terms utilized for the review of the literature. Each of these terms links to the TPB constructs: types and causes link to norms, perception of errors links to behavioral attitudes, communicating errors and reactions to errors links to behavior control, and varying industries links to power.

Defining Characteristics of the Term Error

As mentioned earlier, the word error is a mistake, but varying industries have developed their own unique definitions. Table 1 contains a brief sample from the research regarding errors in a variety of industries. Another important characteristic is that an error is an opportunity to learn from the mistake and a way to prevent future mistakes from occurring (Johannesen et al., 2017; Rescher, 2014). Lastly, mistakes are often unavoidable and unintentional occurrences.

Based upon the defining characteristics of the term and the variations developed by industry, a new definition of the word exists. For this paper, the definition of error will be as

follows: *any unintentional act or near miss that deviates from the planned outcome but offers an opportunity for learning and prevention of future mistakes.*

Table 1.

Definition of the concept error by industry type

Source	Industry	Year	Definition
National Council of Teachers of English	Education	2012	Errors change over time, what is acceptable at one point in time may not be at a different point in time, errors depend on context (formal errors are unexpected, informal errors are allowed), errors have logic, and errors may occur until the writer becomes more familiar with the newer context
Zhao and Olivera	Sociology	2006	Results in an undesirable gap between expectations and a real state, which may lead to actual or potential negative consequences towards organizational functioning; an event that could be avoided
Business Dictionary	Business	2009	An act or decision which is wrong, or something that has been done wrong
Aronson	Healthcare	2009	A process that has fallen below the standard of care in the treatment of a patient that has the potential to cause harm
Lesk	Mechanical	2015	An inescapable and random event that often goes without punishment except for cases of gross negligence
Theophilus, Ekpenyong, Ifelebuegu, Arewa, Mensah, Ajare	Oil & Gas	2017	An event traced back to the structure, culture, or procedure of an organization
Briggs	Law	2009	An error is an action in which a person misinterprets an aspect of the law to a person seeking advice or information. Subsequently, the person seeking advice commits an error if enacting on erroneous information.
Allchin	Science	2001	Any mistaken determination or unplanned consequence in science or technology
Guo, Sun, Chen	Civil Aviation	2018	An event caused by a precondition for unsafe acts

Defining Characteristics of Medication Administration Errors

Medication errors continue to be an important concept worthy of investigation. Past research has provided few definitive answers to the concern regarding under reporting of medication errors. According to the National Coordinating Council for Medication Error Reporting and Prevention (2017), medication errors are:

> Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use (para 1).

Medication errors may have devastating, far-reaching consequences, not limited solely to patients and their families but also to healthcare workers and nursing students (Warholak, Queiruga, Roush, & Phan, 2011). Medication errors occur at an estimated rate of over one per day for each hospitalized patient. These errors have the potential to cause severe harm or even death and lead to increased costs to patients and hospitals (Bush et al., 2015).

Causes of Errors in Industry and Healthcare

Even though, errors by definition are unintentional, there are causes that lead to such mistakes. For years, errors occurred as part of a system, mechanical, or technology issue. Due to an investigation into the human factor, documentation exists that supports errors occurring because of human involvement in programming systems, mechanics, or technology and not the mechanism itself as an independent factor (Yundong, Youchao, & Si, 2018). One such tool, the Technique for Retrospective and Predictive Analysis of Cognitive Errors (TRACEr), analyzes errors made within the cognitive domain, including causes of internal errors and psychological errors (Theophilus et al., 2017).

Theophilus and colleagues (2017) report the TRACEr tool analyzes causes of errors occurring in the cognitive domain. The cognitive domain refers to such concepts as remote memory, recent memory, attention span, and judgment (Jarvis, 2016), all of which are essential to error prevention. The analysis broke it down even farther to include causes of external errors and internal errors. Subcategories of external errors include communication, selection/quality, and timing/sequence, while subcategories for internal errors include action (selection, timing, and information transmission) and decision-making (poor decisions/planning, late decision/planning, or no decision/planning). The study discovered 1326 errors occurred over a 14-year period by operators working within the oil and gas industry. Cognition errors ranked the highest at 77%.

Several industries have opposing views regarding causes of errors. Ignorance or misinterpretation of law has never been an acceptable excuse for making an error that breaks the law (Briggs, 2009). Athletes often make errors and the causes include a lack of practice, repetition, or lack of paying attention to the task or training (van Ginneken et al., 2017). The scientific community determines causes of errors based upon several areas such as bias, measurement, instrumentation, and even include types of errors named for their role in conducting research (Allchin, 2001). Each of these industries has created their own terminology and descriptions, but each cause occurs because of a human factor component. The main components of human factors (facilities and equipment, people, and management systems) will be explored with identification and discussion of subcomponents for each.

The Human Factor: Components Leading to Error Making

We have long known that humans are prone to making errors (Gluyas & Morrison, 2014; Harvey, 2013; Sundholm, 2012). The likelihood of making an error never goes away

(Lesk, 2015), but can be reduced through education and prevention strategies. This possibility of making an error diminishes with knowledge of the human factors that lead to error making. Human factors are the interactions that occur between human beings and the environment or system in which they live or work (Merriam-Webster, 2003; OGP, 2005). Johannesen, Sarter, and Cook (2017) define human factors as "a specific variety of human performance that is so clearly and significantly substandard and flawed when viewed in retrospect that there is no doubt that it should have been viewed by the practitioner as substandard at the time the act was committed or omitted" (p.4). A model of these human factors occurs in Figure 3.
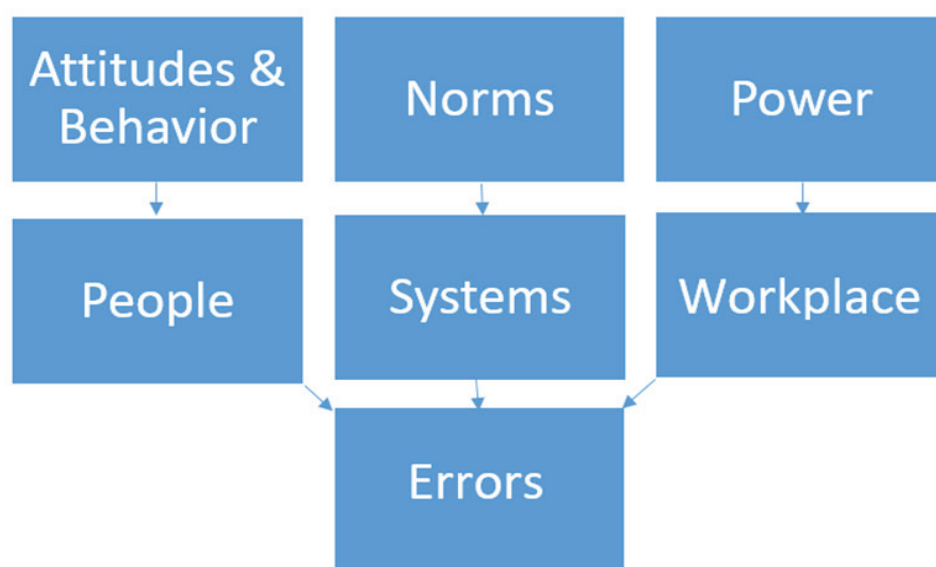
Figure 3. This model shows the complex interactions of human factors leading to error making.

Facilities and Equipment Factors: Factors Contributing to Error Making

Many elements of the work environment create situations that are prone to error based on ergonomics, workspace, design, and physical characteristics (noise, lighting, toxins) (OGP, 2005). Variations in work hours include 8-hour days, 12-hour days, part-time, PRN (as needed), and overnight shift work, to name a few. Design of the work environment can

produce negative outcomes for the worker, their co-workers, and other persons who may be directly involved, such as in transportation. These work environments can foster changes to personal health and mental processes, providing a link between multiple human factors.

Ergonomics and safety of the workplace are two areas often studied together. Ergonomics is the efficiency of how people work, and safety is an important component to prevent error or injury (Katsakiori et al., 2009; Naweed & Moody, 2015; OGP, 2005). In a study by Naweed and Moody (2015), the design of tram cabs for the Australian rail system influenced a desire to ensure the safety of the operators and travelers on the rail system. When operators were uncomfortable in their environment, poor safety outcomes could occur for the travelers. Poor environmental factors occurred as a lack of standardization in the design of the cab interface, sounds/alarms were masked or too loud in some designs, and the placement of buttons on the instrumentation panel was in different places. A lack of standardization could cause stress for operators as they work on different rail cars, for instance, putting passengers at risk. Risk for harm occurs due to changes within the cab design, entering/exiting the rail cars, and jerking motions exhibited by drivers unfamiliar with the instrumentation.

Work design contributes to changes in the way that work organization is determined and managed (Katsakiori et al, 2009). Work design refers to the detailed plan of training, education, safety, and ergonomics of the work environment and for employees. Design and ergonomics interconnect the details of work training, which is a human factor related to management systems. Training of equipment, the work environment, and processes of the job are essential to workplace safety. It is through the management of all connecting human factors that errors decrease in the workplace (Katsakiori et al., 2009).

People: The Physical and Mental Factors Contributing to Error Making

Worksite wellness is a component of human factor research and an area of concern for leaders in industry. Burnout, stress, and distractions are factors of worksite wellness that contribute to error making. A discussion of these factors occurs in the following sections.

Burnout. It is a well-known saying that healthcare workers make the worst patients, meaning they do a great job providing care for their patients, but they exhibit poor qualities in taking care of themselves. Symptoms of burnout include fatigue, emotional distance, decreased motivation, difficulty concentrating, and exhaustion (Golonka, Mojsa-Kaja, Gawlowska, & Popiel, 2017; Guo, Guo, Yang, & Sun, 2015; King & Beehr, 2017).

Burnout can lead to poor judgment making skills, distraction, substance abuse, and risk of injury in the workplace (Melnyk et al., 2018). Research into worksite wellness within the profession of nursing revealed numerous causes that can lead to making medication errors (Melnyk et al., 2018; Roth, Wieck, Fountain, & Haas, 2015). In a study by Melnyk and colleagues (2018), nurses in poor physical and mental health have between a 26% - 71% higher likelihood of performing a medical error.

Burnout occurs a symptom of certain physical characteristics related to the work environment, and it can cause certain health conditions that can be harmful if left untreated. In the steel and iron industry, workers are often subject to working with toxins and under very stressful conditions that often lead to burnout (Guo et al., 2015). These working environments can lead to problems in health such as types of cancer and pulmonary disease. When workers develop burnout, they may develop other health conditions such as hypertension, gastric disorders, depression, anxiety, and other mental health concerns.

Middle age workers and those with higher education levels in the steel/iron industry often suffer from burnout at higher rates on average. The results of the study noted that younger workers had higher self-efficacy, energy, and had less cynicism to their work environment, which correlated with results from previous studies. These factors related to burnout and the development of illness can lead workers to error making and should be of great interest to industry leaders and managers (Guo et al., 2015).

Stress. Each person experiences stress, whether positive or negative, and is difficult to define on a personal level. Defining the term is difficult due to the subjective nature surrounding perceptions of stress and coping mechanisms (Conrad, 2011). Stress is an internal effect to a turbulent external cause, known as the stressor (Kushnir, 1986). Stressors can occur in many situations ranging from the fear of making an error and harming someone (Alzayyat & Al-Gamal, 2014; Bagcivan, Cinar, Tosun, & Korkmaz, 2015; Boulton & O'Connell, 2017) to exhaustion and fatigue related to the work environment (Gibbons, Dempster, & Moutray, 2008; Reeve, Shumaker, Yearwood, Crowell, & Riley, 2013).

Stress has become a common factor in the workplace, whether based on meeting deadlines, training in a new area, staff shortage, or many other factors. Two of many professions that operate with high stress are healthcare and aviation. Due to these working conditions, the aviation field has taken great strides to improve training, developing checklists, and other methods to reduce the incidence of errors (Sexton, Thomas, & Helmreich, 2000). Medicine, on the other hand, has been reluctant to evolve. A culture still exists where errors are under-reported due to the potential for job loss, a decrease in confidence by peers, and the possibility of litigation (Haw, Stubbs, & Dickens, 2014).

Sexton and colleagues (2000) discovered that workers in medicine are more reluctant to admit to feelings of exhaustion or fatigue compared with workers in aviation. This closed environment leads to error concealment and missed opportunities for improved. The aviation, on the other hand, has created an open environment allowing workers to disclose dissect error occurrences, regardless of the human factor leading to the error commission.

Distraction. Distractions occur daily and increase the likelihood of an error or accident. Dealing with the stress of home, family, or personal health issues can increase personal stress to the point of distraction in the work environment (Boulton & O'Connell, 2017). According to Harvey (2013), a distraction is a separation from the task. This separation could be a result of a physical or a mental barrier.

Nurses report several causes for distraction that may occur in the workplace such as talking with peers, patients, and family members, alarms, retrieving supplies not stocked, and stopping to ask questions about orders (Hughes Cooper, Tupper, & Holm, 2016). Distractions during medication administration is a concept that warrants further studies in the hopes of lowering such events (Boulton & O'Connell, 2017; Hughes Cooper et al., 2016; Jeffcott, Ibrahim, & Cameron, 2009; Melnyk et al., 2018; Roth et al., 2015). In a study by Cooper and colleagues during 30 observed medication passes (2016), no interruptions occurred in 37% of the time, 33% reported one or two interruptions, and 30% reported three to five interruptions.

Management Systems: Factors Contributing to Error Making

Human factors related to management systems incorporate leadership, change management, a commitment from management, incident investigation, the discovery of workplace hazards, policy/procedure development, enough job training, and a risk

assessment of the work environment (OGP, 2005). Workers view management as policymakers, responsible for hiring/firing, and those responsible for improving working conditions. When errors happen, employees are prone to hide errors or leave them unreported due to fear of failure, loss of employment, or retaliation from co-workers or management (Dunn, 2014; Zhao & Olivera, 2006).

Policies and procedures are often in place to help control for human factors, but if these policies are unmet, errors will continue to occur (Roth et al., 2015). Reasons policies and procedures go unmet can be related to fatigue, job dissatisfaction, lack of appropriate training, and lack of organizational support from management (Bargelis, Cikotiene, & Ramonas, 2014). It is up to management system leaders to recognize stress of employees, hazards in working environments, and other cues that can result in errors. Risk assessments conducted periodically prevent human factors leading to errors.

Assessment of existing policy, the working environment, and other human factors are necessary to prevent error and injury to workers. Unfortunately, management conducts risk assessments, leaving out worker input. Due to this deficiency, risk assessments are superficial and void of the most important details, the worker's assessment (Katsakiori et al., 2009). The benefits of including workers' perspectives include a reduced chance of error, lower possibilities of injury, increased efficiency, and a more productive workforce, according to the Oil & Gas Industry (2005).

Training and education about employment are applicable to the worker and every member of management. Training for the workers increases productivity and maintains safety, while training for management is for accountability, communication, and an increased awareness of their employees' needs (OGP, 2005). Effective training can eliminate human

factor errors related to facilities and equipment (work design, ergonomics, space, and environmental factors) and the personal factors (reducing stress, anxiety, fatigue, and burnout). Ineffective training can lead to workplace hazards, decreased job satisfaction, and the potential for errors leading to including injury.

Engaging in hazard investigation is crucial to identify error causes, development of safety protocols, and potentially the prevention of future errors (OGP, 2005). According to one study in Greece evaluating the manufacturing industry, it is a basic job of labor inspectors to investigate accidents (Katsakiori et al., 2009). This study evaluated 40 accidents, each involving personal injuries of workers in a variety of manufacturing settings. Their results included findings related to poor training, unsafe equipment, and inefficient work design, which all can lead to errors and accidents. Another finding of the study was "factors, such as frequent disturbances and interruptions, inexistent working instructions, and poorly designed working environments can lead to a more difficult job and less reliable human performance" (Katsakiori et al., 2009, p. 6). It was their recommendation to include workers in the risk assessment process, leading to hazard identification, errors, and risks, thus eliminating the need for investigations of worker-related injuries.

Types of Errors in Industry and Healthcare

According to the literature, there are many different types of errors. Knowledge-based error, rule-based error, and action (skill) based error are well-known causes of errors within the healthcare industry (Aronson, 2009; Gluyas & Morrison, 2014; World Health Organization, 2016). According to philosopher Nicholas Rescher (2014), three main categories of error are cognitive, practical, and axiological. Practical error (the quality of competence) and axiological error (related to evaluation and judgment) are also rooted in

cognitive error (Rescher, 2014). Allchin (2001) reported four types of errors (material, observational, conceptual, and discoursive) related to the field of science. An exploration of each errors type with examples from a variety of industries is located in Table 2. These examples are fictitious in nature, based upon the industry involved, and created exclusively for this paper.

Knowledge-Based Errors

Knowledge-based errors occur when there is a lack of knowledge or the wrong application of knowledge occurs in any given situation (Henneman et al., 2010). Workers must rely upon critical thinking abilities, analysis, and recall of stored information to solve issues (Biron, Loiselle, & Lavoie-Tremblay, 2009). The development of practice and expertise in any given industry supersedes the need for a knowledge-based application (Leape, 1994). With the development of skill, comes expertise, thus lessening the chance of error.

Rule-Based Errors

Rule-based performances encompass training of a skill and attention to detail. An example of a rule-based error would incorporate a lack of compliance to policy or inability to follow standardized procedures. Another example occurs when a person is unfamiliar with a new task and cannot discern how to complete a process (Gluyas & Morrison, 2014). These errors can also occur as systematic planning issues and can be predictable (Henneman et al., 2010), allowing learning to take place through education and retraining.

Action Based Errors

Action based errors are skill-based errors in the literature. These types of errors may occur due to becoming complacent with verifying technique or skills (Biron et al., 2009).

These types of errors occur because the procedure is not new to the practitioner and it has become routine (Henneman et al., 2010). The World Health Organization (2016) report on medication errors refers to this type of error as a "slip." According to Leape (1994), these slips occur as an "unconscious glitch to an automatic activity" (p. 1853).

Cognitive Errors

Cognition, based upon many components, can fluctuate throughout the course of life. This term encompasses orientation, judgment, memory, attention span, visuospatial skills, decision-making, and language (Gluyas & Morrison, 2014; Jarvis, 2016). In other opinions, such characteristics of perception and intellect are components of the description (Rescher, 2014; Theophilus et al., 2017).

Practical Errors

Practical errors stem from a link between failures in relating the objectives of the action to a task (Rescher, 2014). In other words, this is the result of a failure, incompetence, or wrongdoing. Rescher (2014) further believes that a practical error is more serious and often referred to as a "fatal error" (p. 4). This conclusion exists because of "harm or other types of misfortune" (p. 4).

Axiological Errors

Axiological errors are mistakes regarding evaluation (Rescher, 2014). The theory of value is another way of acknowledging axiology in the sciences (Biedenbach et al., 2016).

Material Errors

Allchin (2001) believes that material errors are often the first thing evaluated in the research process. Material errors relate to evaluating whether the physical components are

correct related to the phenomena in question. He also noted that we observe material errors through a higher level of the analytical process.

Observational Errors

Methods of perception and data collection are examples of observational error types (Allchin, 2001). Observing is a quality that will need practice and skill development just as any other would. If observational skills are lacking, this could result in misinterpretations that lead to error (Allchin, 2001).

Conceptual Errors

Conceptual errors in science relate to the ability to delineate and manipulate the research process (Allchin, 2001). Interpretation errors also fall into this concept and may be hard to prevent from occurring. Working together and evaluating the observations made by partners is one such way to avoid conceptual errors as a work product (Allchin, 2001).

Discoursive Errors

"Discoursive errors encompass aspects of discourse—namely communicating, assessing, and regulating conceptual maps among a community of researchers, as well as to others who hope to rely on scientific knowledge" (Allchin, 2001, p. 44). The remedy for any of these error types relate to a change in the concept. These types of errors stem from a personal view such as prejudice, competition, gender, and/or beliefs.

Table 2

Possible errors by a variety of different industries organized by error type

Error Type	Industry	Example
Knowledge-based	Healthcare	A novice nurse does not to understand how to mix medications.
	Aviation	A pilot does not understand the sequential protocols for landing.
Rule-based	Healthcare	A nurse is unfamiliar with the method to mix a new medication.
	Manufacturing	An employee did not understand the safety protocols when working with toxic chemicals.
Action based	Healthcare	A nurse forgets to check the patient's armband before administering medications.
	Aviation	A pilot fails to initiate pre-flight checklists due to complacency.
Cognitive	Healthcare	A worker fails to select the appropriate procedure or equipment for a task.
	Oil & Gas	A worker fails to select the appropriate procedure or equipment for a task.
Practical	Healthcare	A nurse did not complete the Time-out procedure prior to surgery. This action led to an amputation of the wrong leg.
	Engineering	A lack of teamwork leads to a poor design choice, which causes a system failure.
Axiological	Healthcare	Companies promote medications that have not passed FDA approval to recoup financial expenditures in development of the product.
	Civil service	A police officer makes an error in judgment related to the culture of a potential suspect.
Material	Healthcare	A phlebotomist draws a blood sample using the wrong tube, rendering it useless and results in another needlestick for the patient.
	Chemists	A chemist uses the wrong chemical in a mixture, resulting in a chemical reaction
Observational	Healthcare	A nursing student fails to notice a change in patient status.
	Gaming Development	A gaming designer fails to notice a problem in the coding of game.
Conceptual	Healthcare	An observance made in between two nurses leads to opposing views of how to proceed with the care of the patient
	Education	A novice teacher does not understand the components of an assignment, leading to an inability to teach students correctly.
Discoursive	Healthcare	A physician refuses to treat a patient because he/she does not agree with lifestyle choices of the patient.
	Manufacturing	Management refuses to offer promotions to a worker based upon dislike of their culture (prejudice).

Errors Specific to Medication Administration

The pharmaceutical industry develops, combines, and replaces medications each year.

There are over 8000 medications commonly available for administration (Hewitt, Tower, &

Latimer, 2015). By developing such abundance of medications to treat illness, we are improving

health but also increasing the likelihood of making a medication error.

Types of Medication Errors

Look-alike/sound-alike medication errors have one of the highest potential rate of harm

because look-alike/sound-alike errors can occur during any stage of the medication

administration process, from prescribing the medication to monitoring the patient (Rash-Foanio

et al., 2017). Rash-Foanio and colleagues (2017) developed a computer algorithm to catch

LASA errors before they could occur. Their study revealed a 69% error rate of

cycloserine/cyclosporine administration due to LASA. These errors were prescribing and

documentation errors, which could have resulted in patient fatalities if not caught by their

algorithm design.

Calculation errors can occur by the prescriber or the nurse during administration.

Nursing students practice math calculations, but these errors still occur during clinical days and

after graduation due to errors in decimal placement, using the wrong formula, and simple

mathematic calculation error (Coyne, Needham, & Rands, 2013). Differences in curricula allow

students to learn how to calculate medications based upon the various method taught including

dimensional analysis, ratio and proportion, and formula method (Morris, 2014). The skills of the

instructor may also influence student learning by allowing students to use electronic devices,

such as calculators, palmtop computer (PDA), or phone, compared to traditional methods of

paper and pencil.

The near miss medication error is the least reported medication error and quite possibly the missing piece solving why errors still occur today. The near miss error is as an error discovered before any harm could come to the patient but has the potential to cause harm if not discovered (Haw et al., 2014). These events are grossly under-reported by health care workers, which prevent the capturing of valuable information that could enhance development of error prevention strategies per Williamson in 2009 (as cited in Haw, Stubbs, & Dickens, 2014).

Reactions to and Perceptions of Errors in Industry and Healthcare

Mixed reactions to errors occur due to differing emotions and personalities. These emotions relate to how close they are to the event. Outcomes of the error may also influence their reaction. Dependent upon the outcome of the error, judgment will bias the situation and hinder teaching (Johannesen et al., 2017).

Since humans are fallible, every person has experienced or witnessed an error in their lifetime. Their perception of errors exists through childhood teachings from family, teachers, and peers. These perceptions may change over time and growth into adulthood, allowing for the development of new standards of ethics related to their chosen profession. According to the literature, errors are negative or positive events. These viewpoints also vary by gender, role within an organization, and follower perceptions (Thoroughgood, Sawyer, & Hunter, 2013).

Deciding how to recover from an error is often out of the person's control. Owning up to an error is an individual's decision and often requires coping skills or education on how to overcome feelings of failure. King and Beehr (2017) believe error management is what people believe about errors, how to handle them, and the act of learning from the mistake. Error management is a theory "proposing three main ideas: 1) errors will occur, 2) there are

positive and negative effects of errors, and 3) efforts should be made to increase positive effects of errors such as learning from errors" (King & Beehr, 2017, p. 21).

Negative effects occur when people experience a poor outcome related to an error event. Often hidden or unreported events lead to missed opportunities to learn from the mistake (King & Beehr, 2017). Error hiding is a new concept in research that suggests behaviors of non-disclosure of errors may begin during education into professional programs of study (Dunn, 2014). Since all humans are fallible, we understand that people in leadership roles make errors, as well. Leadership errors can have a negative effect on the working environment and far-reaching implications related to the overall production of the industry (Thoroughgood et al., 2013).

Stereotypes of errors by gender exist and elicit negative effects. Employers, peers, and employees may judge female leaders more harshly. This judgment leads to a lack of respect, poor evaluations, and subsequent changes to the team element (Thoroughgood et al., 2013).

Positive effects of errors may sound oxymoronic but something positive occurs through culture change and acceptance of admitting errors. Positivity from an error occurs if the person can work through it and/or feel comfortable in disclosing it (King & Beehr, 2017). Learning from our mistakes can also be a positive outcome to an otherwise bad event (de Bruijn, de Lange, von Cramon, & Ullsperger, 2009; Huelser & Metcalfe, 2012; Metcalfe, 2017; Ownsworth et al., 2017). One study regarding people suffering from traumatic brain injury showed that making errors is an important part of rehabilitation (Ownsworth et al., 2017). This study also noted the error-based learning (EBL) allowed patients to recall more actions from their long-term memories when compared with error-less learning (ELL).

The consequences of committing a medication error influence the patient and the nurse. The patient can suffer from complications such as short-term side effects, long-term complications, and even death (Reid-Searl, Moxham, & Happell, 2010). Professionally, the nurse becomes the "second victim" left with a feeling of failure in recognizing the medication error (Jones & Treiber, 2012). Since errors are often unintentional, there is support for the thought that the ordinarily, conscientious nurse who makes an error has punished himself/herself in the realization of the error (McDowell, Ferner, & Ferner, 2009).

Communication and Disclosure of Errors in Industry and Healthcare

Admitting a mistake in writing or verbally is most often the hardest task to accomplish when an error occurs. In most professions, we have a moral and ethical duty to disclose any error (Liang, 2007). Fear of reporting exists following any error, but disclosure opens doors to communication and fosters an environment of trust (Zhao & Olivera, 2006). When fear trumps reporting, the organization loses due to missed opportunities to measure events and develop interventions for prevention of re-occurrence (Yung, Yu, Chu, Hou, & Tang, 2016).

Verbal reporting is one such option for admitting an error has occurred. By stating verbally that an error exists, no incriminating forms or reports exist. One study exploring nursing attitudes toward reporting revealed 90% of the reported errors exist unofficially through verbal communication to senior staff (Yung et al., 2016). The study also reported only 11% of those interviewed would admit an error to a patient or family and 10% would place documentation in the patient's chart regarding full disclosure of the error. This further supports that a lack of full disclosure eliminates the ability to create safety mechanisms addressing all error possibilities.

Other explored factors regard outcomes of reporting errors. Besides the personal factors, such as loss of reputation or fear of repercussions related to employment, material, economic, and effort costs come into view (Zhao & Olivera, 2006). Material costs of errors relate to monetary compensation for the individual admitting failure. An employee passed over for a raise due to the timing of the error disclosure is an example of a monetary concern. Economic concerns tie to organizations. Many organizations, such as manufacturing and construction, may offer yearly incentives for zero accidents, and these would not pay out if an error in safety occurred. Lastly, effort costs exhibit the time it will take to correct the error, training to prevent future errors, as well as physical and cognitive effort (Zhao & Olivera, 2006).

Communication and Disclosure of Errors in Nursing

Reporting medication errors is not an easy task for a student nurse or seasoned professionals. This admission of fault not only leaves the health care provider with a sense of failure, but also burdens the health care system financially. The consequences of committing a medication error affect both patient and nurse. The patient can suffer from complications such as short-term side effects, long-term complications, and even death (Reid-Searl et al., 2010). Professionally, the nurse becomes the "second victim" left with a feeling of failure in recognizing the medication error (Jones & Treiber, 2012). Since errors are unintentional, there is support for the thought that the ordinarily, conscientious nurse who makes an error has punished himself/herself in the realization of the error (McDowell et al., 2009).

Student Perspectives on Reporting Medication Errors

Barriers to reporting medication errors among nursing students are a relatively new field of research according to the literature. Student perspectives have been researched evaluating

patient safety of medication administration and supervision of nursing students in clinical with little focus on barriers as a concept. In a study on patient safety, students reported concerns regarding their abilities on performing skills, medication calculations, use of technology, and a lack of knowledge in pharmacology (Orbaek, Gaard, Fabricius, Lefevre, & Moller, 2015). The off-campus setting is the first experience for students to perform medication administration on real patients. This environment creates feelings of stress, fear, and anxiety resulting from the potential to cause harm from medication errors (Reid-Searl, Moxham, Walker, & Happell, 2008).

Barriers to Reporting Medication Errors in Nursing

Research into medication errors within nursing and other related disciplines continues today. Barriers are still present in how and when reporting errors occurs, as well as concerns from health care workers about consequences of reporting. Researchers have noted the number of errors committed annually are significantly lower than the numbers of errors reported (Haw et al., 2014; Kalantarzadeh & Hosseinnejad, 2014; Yung et al., 2016), which relates to under reporting and error hiding. Due to a lack of transparency in reporting all medication errors, the medical profession is unable to capture MAEs and near miss errors. The profession could develop reliable tools to identify error causation, determine links in prevalence, examine consequences, and increase patient safety based upon the collection of better statistics (Yung et al., 2016).

Significant barriers in reporting medication errors among licensed nurses exist in the literature. There is a large stigma associated with reporting an error based upon fear of the consequences. These fears have been associated with creation of conflict within the interdisciplinary team, fear of official sanction on their license, fear of loss of employment, and legal or financial consequences (Haw et al., 2014). Nursing students who work with licensed

nurses have these fears during clinical practice and this may shape their thought regarding the reporting of errors.

Nursing Education: Preventing Medication Administration Errors

Medication administration safety is a skill taught in both didactic and clinical courses throughout nursing education. These concepts and skills must be taught be faculty who are prepared to teach and have explored their own feelings, related to their clinical practice experience. Influences of the healthcare system lead to the creation of medication errors (Bush et al., 2015; Leape, 1994), but despite this, nursing curricula may alter student retention of knowledge and understanding based on their exposure to the curricula.

The Six Rights of Medication Administration

One stable content area related to medication errors is the *Six Rights of Medication Administration*. *The Six Rights of Medication Administration* is a topic taught in every pharmacology and clinical course discussing medication skills. The six rights include the right patient, right medication, right dose, right route, and right time (Young, Cochran, Mei, & Adkins-Bley, 2015).

Each of the components of the six rights, if utilized, can assist nurses in preventing medication errors from occurring. By verifying two patient identifiers, the nurse can ensure the right patient gets the medication (Young et al., 2015). Verification of the ordered dose ensures the medication is correct, dispensed, and placed in the patient's medication drawer or automated dispensing system. Verification of the right dose ensures the patient is not overdosed or under-dosed. Medications need a correct route of administration to ensure the medication can work properly. Lastly, ordering the medication on a schedule with time intervals is an important aspect of correct administration.

Nursing Curriculum Regarding Medication Errors

Nursing educators are tasked with designing curricula that promotes knowledge and confidence in medication administration (Cooper, 2014), which is fundamental to safe administration of all medications by nursing students (Koohestani & Baghcheghi, 2009). Most nurse educators begin their careers as clinicians and may not feel prepared to transition to a role in academia (Blush, Mason, & Timmerman, 2017; Melnyk, 2013; Smeltzer et al., 2015). Depending upon the program of study, the educator may only have a bachelor's degree in nursing and lack any formal educator courses to prepare them to teach or strong clinical experience.

Differences in nursing educator backgrounds may influence information retained by nursing students. Factors contributing to these differences relate to the number of years in clinical practice and teacher preparedness. If the educator does not have a strong clinical background, they may lack first-hand experience with errors and practical applications of reporting. A lack of consensus in how to teach medication error content occurs through the adoption of different textbooks and the judgment used defining how much teaching on the subject is appropriate, as noted in the course syllabi.

In many nursing schools, transparency in reporting medication errors may not exist (Cooper, 2012). *Error hiding* is a new researched concept that suggests that behaviors of not disclosing medication errors may begin in nursing school (Dunn, 2014). Dependent upon their own level of comfort with clinical practice, educators may differ in their views when it comes to disclosure and reporting of medication errors. A supportive environment by educators is necessary for students to gain self-confidence and perspective on the importance of disclosing all medication administration errors (Dunn, 2014).

In an ideal educational setting, faculty teach medication errors throughout the curriculum and in clinical. For most nursing programs, the concept exists in a pharmacology course and during medication skills practice. Newer editions of pharmacology textbooks are devoting a chapter to safety, including medication errors, the National Patient Safety Goals, Quality and Safety Education for Nurses (QSEN), and other concerns related to medication administration (McCuistion, DiMaggio, Winton, & Yeager, 2018; Visovsky, Zambroski, & Hosler, 2019).

A review of the most popular pharmacology textbooks shows changes and an increase in topics covered related to medication errors and safety during medication administration. In *Pharmacology: A patient-centered nursing process approach* (McCuistion et al., 2018)*,* the authors have incorporated new features addressing safe medication administration practices. In addition to a chapter on safety and quality, the authors have added features such as patient safety boxes, QSEN icons in text, and realistic case studies. In *Introduction to clinical pharmacology* (Visovsky et al., 2019), the authors emphasized avoiding medication errors in the description of the book and throughout. The addition of safety alerts teaches nursing consideration of the concept. This textbook also comes with video clips of safe medication administration for visual learners. New components to this edition include tips for safety and clinical care, drug and intravenous calculation practice, and dose ranges/drug tables (Visovsky et al., 2019). In reviewing course syllabi of nursing programs, it appears as if they have not caught up with the changes made to textbooks. While the words "safety" and "medication errors" are often included, these are not good indicators of the actual time spent on these topics during lecture or skills labs.

Gaps in the Literature

A limitation noted in the review section relates to a lack of representation of all types of industry. Articles utilized were specific to one or more types of industry, while others regarded the nature of errors. Exploring viewpoints into differing industries allows for exploring the concept, but a further exploration of differing industries could benefit future studies. A paucity of research regarding nursing student's understanding of medication errors exists in the current literature.

As errors continue to trend upward, it is imperative we examine nursing education to explore causes and solutions of this problem. Testing of nursing students' knowledge and skills occur during school, but an overshadowing of knowledge exists through attitudes and beliefs in practice. It is my hope that my research can provide some answers to these questions as I explore nursing students' and nurse educators' understanding on these issues.

Chapter Summary

Errors are complex processes occurring from commission to omission. Due to the existence of the many causes and types of errors, standardized tools are lacking in reporting and investigating. Human factors are the most common precursor to errors committed, resulting from a shift in the belief that organization or system failure led to error making.

The culture surrounding errors has remained negative. People's perceptions skew toward the expectation of negative outcomes when discussing error making and error reporting. Slight changes in the culture have allowed for a positive view when reporting errors because of the recognition of opportunities for learning. These positive views are limited but productive in preventing future occurrences of errors and the development of safety protocols.

This chapter provided a thorough review and discussion of the literature related to definitions of errors in industry and healthcare, causes, types, and communication or reporting of errors. Gaps in the literature are evident and recorded. Since it is evident that all humans are fallible and will make an error at some point in their life, research in this area must continue. It is clear that no one likes to admit their mistakes but benefits to making errors exist. Exploring nursing students' and nurse educators' understandings on errors may provide new insight into the continued creation of medication errors in practice. Furthermore, these findings will lead to implications for nursing program curricula change and improvements to patient safety.

CHAPTER THREE

METHODOLOGY

This chapter provides details of the method of inquiry that guided this proposed study. An introduction and background of the methodology are included along with a rationale for the choice of methodology. Additional information regarding the subjects, instrument, procedure, time line, data reduction, reliability, validity, and results of the pilot study are included.

Research Questions

1. What do associate and baccalaureate program senior nursing students know about medication errors, types, and causes?

2. What do associate and baccalaureate program senior nursing students know about reasons for reporting or avoiding to report errors by licensed nurses?

3. What are associate and baccalaureate program senior nursing students' feelings about their education regarding and reporting medication errors?

Nature of the Study

The design of this study was a mixed method, non-experimental, descriptive study to examine what senior nursing students have learned and retained about medication errors, reporting errors, and their feelings about their education regarding medication errors. Modification of The *Medication Administration Error Reporting Survey* by Wakefield, Uden-Holman, and Wakefield (2005) allowed for collection of quantitative data through Likert items and the addition of focus groups allowing for a qualitative evaluation. The validity and reliability of the modified survey occurred during the pilot study, and the data appears later in this chapter. The modification of this survey made it applicable to the nursing student population. For purposes of this study, the data were collected through a written survey and

small focus groups, recording the participants' knowledge of and attitudes toward medication errors and reporting medication errors.

Research Procedure

Convenience sampling was used to recruit last semester senior nursing students from two associate degree programs and two-baccalaureate degree from the southern United States. An information session was held with senior level faculty from each program to discuss the study and answer any questions. First year nursing students were not be included in the study, as they may not have completed a course in pharmacology.

The researcher attended a course with the senior students and explained the study. The survey did not take longer than ten minutes to complete, and all answers were kept as confidential as possible to the extent of the law and university policy. Students were given an opportunity to ask questions and were allowed to opt out of the study without fear of penalty. Once all questions had been addressed, the researcher excused herself from the room and allowed the course instructor to pass out the surveys.

Inclusion criteria is defined as 1) being enrolled in the nursing program as a senior nursing student 2) academically in good standing, 3) enrolled in a clinical course, and 4) achieved a passing grade in their pharmacology course. Exclusion criteria are 1) failure of a clinical course and 2) enrollment in didactic courses only. Criteria guidelines enhance the richness of the sample, enhance generalizability, and reduce bias.

The survey consisted of eighteen Likert items and five open-ended questions (see appendix A). The Likert scoring for each item occurs as follows: *1-strongly disagree, 2-moderately disagree, 3-slightly disagree, 4-slightly agree, 5-moderately agree, and 6-strongly*

agree. Upon completion, the course instructor collected the surveys and returned them to the

researcher. The survey took participants less than ten minutes to complete.

The course instructor asked students to volunteer to participate in a focus group following

the survey. One focus group per campus occurred with a minimum of eight students. Within

these sessions, the researcher asked questions regarding *1) how their education has prepared*

them to administer medications safely, 2) how they learned about medication administration

errors, 3) how they were taught to report medication errors, 4) discuss a time when they

observed or made a medication error, and 5) suggestions for improving nursing education about

medication errors and reporting errors. The full interview guide is in Appendix B. The focus

groups were recorded in audio format for transcription. The audio recordings were erased upon

evaluation of transcript for accuracy. Research question three was answered by student

responses collected during the focus group sessions.

Quantitative and qualitative data was entered into an excel spreadsheet without any

personal or identifying information about each participant and upon collection from each nursing

program. Quantitative data was analyzed using SPSS® statistical software and qualitative data

was coded by themes. Protection of the data was of the utmost importance. Participants were

de-identified and assigned a number. The bottom section of the last page of the survey asking

for personal contact information was detached from the survey and stored separately in a locked

file cabinet in the researcher's office. All files, such as transcribed interviews, demographic

data, and consent forms, will be locked and secured. Computer files will be secured, and

password protected, and only the researcher will have access to the above information.

Human Subjects Consideration

Researchers are faced with many ethical considerations when beginning any research study. IRB approval will be achieved, and the characteristics of the study will be defined including the protection of participants. Prior to obtaining informed consent, the study was explained to each participant, eliminating the possibility of deception. Informed consent was established with completion of the survey. Items presented to each participant included the purpose of the study, risks and benefits, confidentiality, ethical considerations, and potential bias of the researcher (Creswell, 2013).

Due to the nature of the study, each participant was allowed to remove him/herself from the study. Participation was voluntary, and refusing to participate did not adversely affect any other relationship with the University or the researchers. Although there is no chance of physical pain in this study, emotional pain/stress could occur.

Time Line

Tasks	2018												2019											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Establish face validity										▮														
Pilot Study											▮													
Information Session with faculty											▮													
Deploy survey with students												▮												
Analyze data													▮											
Write Findings														▮										
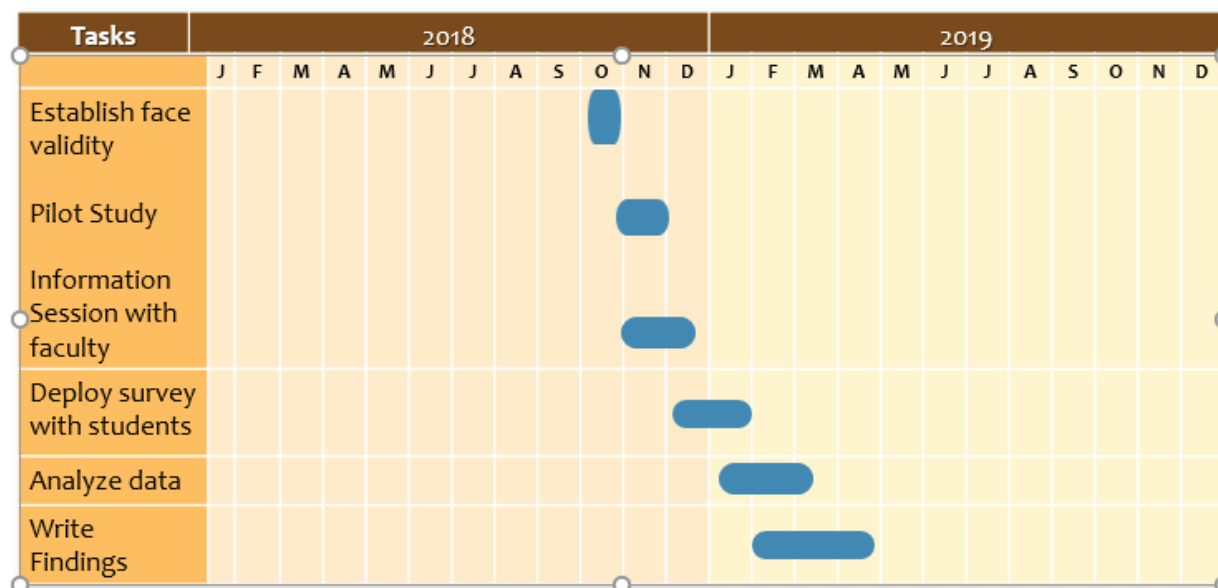
Data Reduction

Only the researcher had access to the surveys. These items were de-identified and secured via password. The quantitative data was analyzed using SPSS® statistical software to prepare the descriptive findings. Open coding was used to qualitatively evaluate the focus group interviews. Coding began with the completion of the first group. The researcher read the transcript to identify key terms and concepts. After review of the first group, the data was shared with the dissertation co-chairs to verify accuracy.

Validity

To establish validity of the modified survey, the researcher worked with nurse educators to evaluate face validity. Face validity is a measurement that evaluates the extent to which an item or instrument measures what it is described or proposed to measure (Privitera, 2017). This process allowed the researcher to determine if the tool will measure what was intended. The survey, with the title and headings omitted, was shown to ten nurse educators to assess their opinion of validity. Each of the educators defined the survey as a tool to evaluate or assess knowledge of medication errors and reporting errors.

Reliability

Subscale reliability using Cronbach's alpha will be assessed during the pilot study. Cronbach's alpha is a measurement of internal consistency to evaluate how multiple items measuring the same content are related (Privitera, 2017). Part A consists of questions 1-10 regarding why medication errors occur, and Part B consists of questions 11-19 regarding reasons why medication errors go unreported. The questions in Part A address research question one, questions in Part B address research question two, and the open-ended questions address research question three.

Trustworthiness

Many techniques will be incorporated into the study to improve the trustworthiness of the qualitative data. Trustworthiness will be achieved when the researcher proves the research is authentic and credible (Carlson, 2010). By incorporating quotes from the student and educator perspective, the researcher can provide perceptions that can be generalized across cohorts of nursing students and educators experiencing similar situations. The use of coding systems facilitated analysis of the data and improved the reliability of the study. The identification of common themes allowed the researcher to determine when saturation of the data had been reached. Intercoder agreement checks were used to improve the reliability of the coding process.

Psychometrics of the Medication Administration Error Reporting Survey

This study used a modified version of the *Medication Administration Error Reporting Survey* by Wakefield, Uden-Holman, and Wakefield (2005). The survey was developed and pilot tested with licensed nurses across four levels; licensed practical nurses, associate degree nurses, baccalaureate degree nurses, and advanced degree nurses. The original survey contained questions in three content areas including why medication errors occur, why they are not reported, and the estimated percentage of errors actually reported (Wakefield et al., 2005). Since this survey was developed for practicing nurses, it was determined that some questions would not apply to nursing students, and therefore omitted from the modified version.

Validity and reliability were established during the pilot test of the survey. Face validity, construct validity, and criterion-related validity were evaluated. During this process, five subscales for why medication errors occur and four subscales for why they are not reported emerged. Cronbach's alpha was used to establish reliability for each subscale and is presented in Table 3. The authors presented possible uses for this survey including to determine interventions

for improving medication administration/reporting and to assess the culture of patient safety, both of which align with the ideals of this study.

Table 3

Cronbach's alpha per subscale of the Medication Administration Error Reporting Survey

Why errors occur	1996	1998	2001
Physician Communication	.83	.85	.83
Medication Packaging	.82	.83	.81
Transcription-related	.90	.92	.88
Pharmacy processes	.89	.89	.91
Nurse Staffing	.73	.74	.62
Why not reported			
Disagreement over error	.77	.76	.76
Reporting effort	.86	.84	.82
Fear	.86	.87	.87
Administrative response	.74	.78	.69

(Wakefield, et al., 2005, p. 483)

Pilot Study

Pilot testing of the modified survey occurred with last semester senior nursing students at a nursing program in the southern United States. Recruitment of students occurred through class and simulation lab. The researcher explained the purpose of the survey and allowed time for any questions or concerns. Participation was optional and had no effect on their grades or evaluations. The researcher excused herself from the room, and the students left their surveys on a table to be collected. The sample size for the pilot study was 20 students.

The researcher combined Likert items into subscales resembling the original classification by Wakefield, Uden-Holman, and Wakefield (2005). Cronbach's alpha, mean, and standard deviation were calculated using SPSS ® statistical software. The results are in Table 4 listing Cronbach's alpha per subscale and Table 5 for questions means and standard deviations.

Table 4

Cronbach's alpha per subscale

Why errors occur	Items included in subscale	Cronbach's alpha
Communication	1, 2, 3, and 6	.73
Medication Resources	4 and 5	.81
Nurse Staffing	7 and 8	.75
Medication Administration Protocol	9 and 10	.73
Why not reported	Items included in subscale	Cronbach's alpha
Fear	12, 13, and 19	.86
Effort of reporting	11, 14, 15, 17, and 18	.63

Note. Item 16 was removed from statistical analysis due to low scoring. Description noted in improvements section.

Table 5

Means and standard deviations of survey items

Item-Why errors occur	Mean	Standard deviation
The names of many medications are similar	4.75	.85
Nurses are interrupted during medication administration	4.15	1.18
Nurses are assigned too many patients, delaying medication administration times	4.10	1.37
Poor communication between providers and nurses exist	3.75	1.21
There is not enough time to look up medications on the floor	3.50	1.40
Nurses use the Five Rights of Medication Administration	3.50	1.19
Providers' medication orders are unclear	3.50	1.15
Nurses check the patient's ID band before medication administration	2.80	1.44
Medication administration skills change often	2.50	.95
There is no easy way to look up medications on the floor	2.20	1.20
Item-Why errors are not reported		
All medication errors should be reported	5.70	.57
Nurses fear they will look incompetent to their peers	4.50	1.43
Nurses fear negative consequences when reporting medication errors	4.30	1.49
The patient or family might sue the nurse if a medication error is reported.	4.15	1.14
Nurses may not think the error was important enough to report	3.55	1.54
Filling out an incident form to report an error takes too much time	3.40	1.10
Contacting a provider to report an error takes too much time	3.25	1.07
No harm came to the patient, so no error occurred	3.00	1.65
Nurses do not know how to report a medication error	2.10	.91

Qualitative Findings from the Pilot Study

Of the twenty students in the pilot study, three reported making a medication error and four reported witnessing errors in clinical that were unreported. One student reported, "The nurse took patient's meds because she was sick." Another reported, "There were 2 different doses of the same drug given to a patient, one was supposed to be d/c. It was not reported." Several students opted to omit these questions by reporting N/A or leaving it blank.

Five open-ended questions were included in the survey to answer the third research question about nursing students' feelings about their education. In response to the first question on has their education prepared them, the responses were mixed. Most stated they were taught the six rights of medication during their first semester. One student who reported, "I don't feel like I have learned about medication errors, gave a differing opinion. I have no idea the steps to report if a med error has occurred." For question two, most of the students felt the only time they learned about medication errors was in their Foundations clinical (first semester of nursing school at this program). Question three regarding how were they prepared to report errors were also mixed. Most students reported they have not been taught how to report errors or have never had the opportunity to practice this skill. Question four regarding the observation of an error or making an error received two primary responses. The first response was "n/a" or "I have never made an error" with the second being an omission of making an error in clinical or observation of an error. Lastly, suggestions for curriculum improvement received the most detailed responses. One student reported, "More open discussions about how they occur and what happens when they do." Another reported, "I think they should devote one day (class period) to teaching about how to report medication errors. Show students a form and what the process looks like."

Improvements to the Survey based upon the Pilot Study Findings

Several changes were made to the final draft of the survey based upon the pilot study results. Item 16 "*all medication errors should be reported*" was removed from the final draft of the survey. This item showed no relevance to the concept of why errors are not reported. The effort of reporting subscale resulted in a Cronbach's alpha of .628. This could have been resolved with a large sample size of participants. The decision was made to remove the five open-ended questions and use focus groups at each school to capture the qualitative data. Lastly, changes to the wording on the first page were required for IRB approval (addition of the researcher's name and contact information, supervisor's name and contact information, contact information about the IRB process, and how personal information of the participant would be stored).

CHAPTER FOUR

RESEARCH FINDINGS

This study explored last semester senior nursing students' knowledge of medication errors, reporting errors, and the implications for change to nursing education within associate and baccalaureate degree programs. With continuing upward trends of injury or death caused by medication errors, nursing students need more exposure to content on this important topic. This mixed methods study captured students' quantitative responses representing their knowledge about medication errors and reporting errors along with qualitative data on their opinions for necessary improvements to nursing education. The study was conducted on four campuses representing students from an LPN to RN Bridge Program, a Traditional Associate Degree Program, and In-state Baccalaureate Program, and an Out-of-State Baccalaureate Program.

The quantitative analysis conducted was comprehensive and shows how the analysis ties back to the research questions. This chapter provides sample demographics and descriptions of each nursing program. Deployment of the survey occurred in a classroom on each of the four campuses. The researcher gave a description of the research study and read aloud the instructions for the survey. Participants were given time to ask questions about the study and participation was voluntary. SPSS® was used to analyze quantitative data collected through completion of Likert style surveys. There were two subscales on the survey. The first lists items related to why errors occur in practice and the second relates to why errors are not reported. Scoring for the items range from *1-strongly disagree to 6-strongly agree.* Tables present the quantitative findings from all four schools with mean and standard deviation. Participant numbers varied by school with 103 total participants ($N = 24$ for case one, $N = 30$ for case two, $N = 20$ for case three, and $N = 30$ for case four).

Analysis of the qualitative data occurred through open coding of responses collected during focus group sessions at each of the four nursing schools. Detailed codes from the focus group interviews emphasize key themes related to the research questions. Recruitment of focus group participants occurred on a voluntary basis prior to the collection of the quantitative data. The focus group sessions occurred immediately following the quantitative data collection. Each focus group met in a classroom on their respective campus and faculty was excluded from attending without the participants' permission (only case 1 allowed faculty to stay). The researcher recorded each session and transcribed the notes for each focus group. Subject statements were labeled according to the nursing program (ex. A2 is case 1 student 2) and known only to the researcher. Participant numbers varied by school with forty total in the focus groups (*N = 9* for case one, *N = 8* for case two, *N = 8* for case three, and *N = 15* for case four).

Case 1: An LPN to RN Bridge Program

The LPN to RN Bridge program investigated is located in the southern United States and enrolls students who are licensed practical nurses with practice experience. Enrollment was at twenty-four senior students during data collection. Clinicals take place in long-term care and hospitals. The program also has several skills labs and a simulation lab for clinical practice.

It is important to note several important characteristics of this program. First, the majority of students in this program are non-traditional in age, some with 20+ years of nursing experience. Next, these students take three semesters of coursework in pharmacology as part of their two-year program. Students also commented that some of their courses were co-taught by faculty. Last, their content is aligned between the courses (i.e. when discussing cardiac medications, they discuss cardiac diseases in pathophysiology, how to assess for cardiac complications, and how to provide care in fundamentals).

Survey Results for Case 1

Why Errors Occur

In order to analyze the quantitative data, the use of descriptive statistics calculated means and standard deviations for each item, as shown in Table 6. For items in subscale A "Reasons Why Medication Errors Occur in Practice," the standardized means ranged from 5.04 to 2.29, indicating reasons for occurrence of errors ranked between moderately agree and moderately disagree. The standard deviation for individual items ranged from 1.02 to 1.76, indicating small variability between students.

Reporting Medication Errors

For items in subscale B "Reporting Medication Errors", standardized means ranged from 5.25 to 2.75, indicating reasons medication errors may not be reported were ranked between moderately agree and moderately disagree. The standard deviations for subscale B ranged from 1.07 to 1.76.

Table 6

Means and standard deviations of survey responses for subjects in Case 1: LPN to RN Bridge Program (N = 24)

Item – Why errors occur	Mean $\pm$ *SD* (1=Strongly disagree, 6= Strong agree)
Nurses are assigned too many patients, delaying medication administration times	5.04 $\pm$ 1.16
Nurses are interrupted during medication administration	4.92 $\pm$ 1.10
The names of many medications are similar	4.58 $\pm$ 1.10
Poor communication between providers and nurses exist	4.58 $\pm$ 1.14
Providers' medication orders are unclear	4.13 $\pm$ 1.08
There is not enough time to look up medications on the floor	3.71 $\pm$ 1.65
Medication administration skills change often	2.58 $\pm$ 1.02
Nurses check the patient's ID band before medication administration	2.96 $\pm$ 1.68
Nurses use the Five Rights of Medication Administration	2.83 $\pm$ 1.76
There is no easy way to look up medications on the floor	2.29 $\pm$ 1.23
Item- Why errors are not reported	
Nurses fear negative consequences when reporting medication errors	5.25 $\pm$ 1.07
Nurses fear they will look incompetent to their peers	5.13 $\pm$ 1.91
The patient or family might sue the nurse if a medication error is reported	4.88 $\pm$ 1.15
No harm came to the patient, so no error occurred	3.96 $\pm$ 1.76
Nurses may not think the error was important enough to report	3.79 $\pm$ 1.67
Filling out an incident form to report an error takes too much time	3.79 $\pm$ 1.50
Contacting a provider to report an error takes too much time	3.50 $\pm$ 1.53
Nurses do not know how to report a medication error	2.75 $\pm$ 1.65

Case 1: LPN to RN Bridge Program Qualitative Results

According to students from the LPN to RN Bridge Program, learning by making errors with patients was the theme for how they learned about the concept. When asked to further explain this, one respondent described a "lack of didactic content on medication errors….leaving them unprepared for clinical practice" (A2). Six out of nine students (67%) from the focus group admitted to making an error in clinical practice, whether in their first program (licensed practical nursing) or the current program (associate degree nursing). They described how they felt during the event and how it prompted them to seek more information about the process of error making and reporting errors.

> I have made medication errors before, so I guess that is how I learned about it. I think I learned about it in LPN school, but I learned more about it when making an error. I was terrified, but it made me ask questions and learn how to prevent more. It made me feel more responsible because it made me ask questions about how this happened and what comes next. (A1)

Case 1: LPN to RN Bridge Program Knowledge about Medication Errors

When asked about their definition of what a medication error is, students were at a loss and had difficulty putting it into words. One respondent stated its "complicated" or "it depended on the situation" (A2). In the simplest definition, another respondent described an error as "a medication that's given in a different way than it's ordered" (A5). Lastly, one respondent stated the following that showed how an error is multi-faceted:

> It is a complication; there is a lot that goes into it. If you make the error-what is the consequence for me, the patient, their family, the trust, also the doctor and facility are affected. If the error or mistake results in death, they will be like do not go there-they will kill you. (A3)

Types of Medication Errors

"Besides the Six Rights, there are too many types to list" (A9)

This question got the largest response and encouraged much debate among the students. The discussion contained three themes: 1) nursing skills, 2) environment, and 3) time. Examples of poor nursing skills leading to medication errors provided by respondents included "crushing medications when they should not be, medication given by the wrong route, medications pushed too fast, and not assessing or checking vital signs prior to administration" (A1, A5, and A7). One respondent recalled an experience in clinical that led to a medication error because of packaging. "A medication was sent to the unit by the in-house pharmacy and the medication was mislabeled" (A3). Another replied with "patients' receive prescriptions following discharge with errors, such as the wrong medication or strength" (A4). Lastly, students discussed medication errors that occurred due to time issues. Respondents provided examples including "giving medications that another nurse mixed or drew up, pouring medications from a bottle without a visible label, nurses not following the double-check policy on insulin or narcotics, and pulling up medications for multiple patients without labeling the medication cups or syringes" (A2, A5, and A8).

It was during this discussion that several students commented on patients advocating for themselves. "Since medications often are dispensed in different colors and shapes, patients should not rely on what is handed to them" (A4). The students voiced a call to increase patient advocacy for themselves by asking questions of all healthcare workers. One student recalled one such event, prior to nursing school, resulting in a wrong medication dispensed to her family member.

> I got something from the pharmacy for a child in my home, and the medication was wrong. I took it back and they apologized and replaced it, but it was very scary. It could have had serious consequences. I never realized how incompetent I was not being in the medical field yet. People should always question something that does not look right to them. (A6)

Causes of Medication Errors

Students were also able to identify many causes of medication errors with their comments ranging from nursing errors to other department errors. Since most of these students already have experience as a nurse working in long-term care facilities, most of the causes surrounded the long-term care environment.

> It is difficult to pass meds when you may have more than 20 patients. There is a lack of time to look things up; even physicians have to look up meds because there are so many. When you are new to a facility, you learn the bad habits of those who train you…you do not want to be the new person who bucks the system. In the nursing home, you have 20-40 patients and realistically you have a small [limited] time frame to pass meds, especially with peg tubes. (A3)

Insulin administration, by far, seemed to be the largest concern among this group of students. One respondent stated,

> Licensed nurses are drawing up insulin and not following patient safety protocols of having two nurses verify the correct order and amount drawn up. (A5)

Another respondent reported a lack of patient compliance regarding not following provider orders with insulin dosages.

> I moonlighted as a school nurse. My students and their parents always argued about the dose of insulin. I kept all of my calculations and records to protect myself. I have to follow orders to prevent an error but their non-compliance caused errors in dosage. (A1)

Lastly, a large area of concern stemmed from working with certified nursing assistants (CNA). One respondent remarked how they "must rely on CNAs to help them, but many are not trained well themselves" (A4). Another stated how "CNAs often skip checking morning vital signs and often make up the numbers, including finger-stick glucose checks" (A7). A discussion ensued to offer solutions to this issue, including a "personal assessment of the patient before administration of medications" and "training improvements for CNAs" (A6, A8).

The long-term care environment itself seemed to be a catalyst for making medication errors in the minds of these students. Patients in long-term care may be mobile and "often are in the wrong rooms, wrong beds, or wearing someone else's clothing" (A1). Since this is their home and not a hospital environment, they "do not wear arm bands" (A2) or have any identifying information on them. Staff takes pictures of patients upon admission but are "rarely updated" (A3). New nurses to the facility have to "trust the CNAs until they learn the patients' names and routines" (A5).

Case 1: LPN to RN Bridge Knowledge about Reporting Medication Errors

Since these students had already worked as licensed nurses at long-term care facilities and clinics, they reported having experienced making medication errors but lacked confidence in reporting errors. They recalled training in their nursing program to report errors made to the director of nursing, charge nurse, and provider but had no knowledge of what occurred following the report. One student recalled another nurse asking why she was reporting herself.

> I remember my first one (error), metoprolol-ordered for 8 a.m. and I gave it at 8:30, which was not the error. I got busy after and came back to the paper MAR (medication administration record) and discovered I gave 50 milligrams when it should have only been 25. I did not want to report it, but I had to because I am accountable. I took the vitals, I told the patient (and she tried to make me feel better), I talked to the physician's nurse (who used to be my instructor), and I talked with the physician. The physician told me she (the patient) would be all right and he was not upset. I filled out the occurrence sheet and wrote up myself. I gave it to my charge nurse and she questioned why I was doing it, but I felt that I had to write myself up to be accountable. (A1, A6)

When discussing which medication errors should be reported, the response was in unison that "all errors should be reported" and "whether they cause harm or not." A respondent followed that thought with "this error may not have caused a problem but it could for the next" (A5). Reasons stated why they believe others may not report errors were "scary patients and family, repercussions for the nurse, reimbursement guidelines for the agency, and Press-Ganey

scores" (A1, A2, A5). Reasons why this group of students would not report an error was limited

to "not realizing an error had occurred (no side effect) and being fatigued during a shift" (A4,

A9).

Case 1: LPN to RN Bridge Feelings about Education and Implications for Curriculum Improvement

Students from the LPN to Bridge Program felt they had adequate preparation in their

nursing program regarding skills practice for medication administration, largely in part due to

their prior training and experiences as licensed practical nurses. On the other hand, they reported

they "did not have enough practice with recognizing errors or how to report them" (A2) and

"didactic content for pharmacology was overwhelming" (A3, A6). One respondent stated,

"watching videos and reading articles in class about making medication errors [was helpful], but

hands on learning with making errors or discovering errors [in skills lab or simulation lab] would

have been beneficial" (A6).

Students described the didactic learning environment as "beneficial but we need more

pharmacology didactic material" (A7). One respondent stated the pharmacology course was "too

much information in a short time" and "too much information is covered between exams, making

it impossible to remember" (A9). "Examples of calculations were provided in class and by

video" (A5), but more examples and practice were desired by all students. Another commented

how valuable pharmacology content would be in every semester:

> Pharmacology should be added [integrated in each course], through verbal
> teaching or video. These medications could be learned through repetitive
> exposure, and we could build on the information in each class. It would be
> helpful to get pharmacology in smaller bites in more classes. (A5)

These students learned medication administration skills verbally, by demonstration, and

practice with other students (i.e., their peers). They reported that realistic labs were most

beneficial (simulation MAR, arm bands, and pill packets with medication name, dose, and expiration dates). One replied with "seeing it in a real and true outcome puts it in perspective for us" (A3). Most students in the focus group reported they had enough practice with medication administration since they had experience as a licensed nurse, but others brought up a good point.

> I think coming from an LPN background, it (education) was enough. Had I been a new nursing student, I would not want to practice with peers. Long-term care did not get us any experience with IVs. I was not confident until the second semester. IV training is intimidating, and I still feel overwhelmed with multiple medications and drips. (A3, A7)

Working with licensed registered nurse preceptors during clinical was also a source of developing and observing bad habits or medication errors. Students felt that preceptors were already "overwhelmed with their workload and did not want students to shadow them" (A2). Some reported that preceptors seemed "annoyed at questions" or "wouldn't let me do anything" (A7), hindering their learning experience at the bedside. Another reported, "I have observed preceptors not following hospital policies or the process of [medication] administration that we were taught in our nursing program, making it confusing for us" (A5). Lastly, another respondent concluded, "closed communication exists between the licensed nurses [preceptors], often excluding nursing students from the conversation" (A3).

Summary of Case 1: LPN to RN Bridge Program

Students remarked that despite having three semesters of pharmacology, practice in skills labs with checkoffs, and dosage calculation questions on tests in every class, their education on medication errors was not sufficient to prepare them before making an error in practice. They reported having substantial time to practice medication administration skills, but they desired more experience with making errors in simulated labs and more practice with intravenous medication skills. They desired the opportunity to work through the event, from making the

error to reporting the error and seeing the resulting events (discussion of policy change or changes within the hospital unit to prevent the re-occurrence).

Each student in the focus group strongly supported reporting all errors, but overall, they were still confused about the process. Students suggested practice with completing incident reports for errors, talking through the process of reporting, and a follow-up with what happens after the reporting of an error. They also want to talk through what changes occur in hospital policy after reporting errors, how the information makes healthcare safer for all, and what will happen to them professionally by reporting errors.

Students from the LPN to RN Bridge Program shared suggestions for improving patient safety in the student role and as a licensed nurse. As students, they wanted to feel empowered enough to recommend that their preceptors write up and report medication errors that occurred during their clinical. For didactic, the students recommend that pharmacology aligns with the topics being covered in other courses. As a licensed nurse, they recommend that all nurses must take competency tests every five years to refresh their skills and review hospital policies regarding medication skills. Continuing education credits in safe medication administration and reporting errors should be a requirement for all practicing nurses. Whistleblower protection should protect all healthcare workers who report errors to change the culture and remove the fear of reporting errors. Lastly, we need to encourage advocacy for patient safety. A student addressed this as follows: "We are our patient's advocate, and if we are too scared to speak up- then why are we needed here? We need to admit that we made a mistake and I will fix this" (A2).

Case 2: A Traditional Associate Degree Program (ADN)

This Traditional ADN program is located in the southern United States. Enrollment was at thirty last semester senior students during data collection. Clinicals occur in long-term care, hospitals, and clinics. The school has multiple skills labs and a simulation lab to practice medication skills.

Two distinguishing factors from the previous ADN program were age of the students and their pharmacology course. The students in this school were more traditional in age to college students and none had previous nursing experience. Another interesting point about this nursing program is the lack of a didactic course in pharmacology. The students reported their pharmacology training occurred in a skills lab. They did feel some pharmacology content threads throughout several didactic courses of their four-semester program, most notably by pharmacology questions or medication calculation questions on other course exams. When asked if they felt prepared on the subject of pharmacology, the group replied they did not feel prepared and wanted a stand-along pharmacology course for future students.

Survey Results for Case 2

Why Errors Occur

In order to analyze the quantitative data, the use of descriptive statistics calculated means and standard deviations for each item, as shown in Table 7. For items in subscale A "Reasons Why Medication Errors Occur in Practice," the standardized means ranged from 5.43 to 2.20, indicating reasons for occurrence of errors ranked between moderately agree and moderately disagree. The standard deviation for individual items ranged from .86 to 1.74, indicating a small variability between students.

Reporting Medication Errors

For items in subscale B "Reporting Medication Errors", the standardized means ranged

from 5.60 to 2.80, indicating reasons medication errors may not be reported ranked between

moderately agree and moderately disagree. The standard deviations for subscale B items ranged

from .85 to 1.87.

Table 7

Means and standard deviations of survey responses for subjects in Case 2: Traditional
Associate Degree Program (N = 30)

Item-Why errors occur	Mean $\pm$ *SD* (1=Strongly disagree, 6= Strong agree)
Nurses are assigned too many patients, delaying medication administration times	5.43 $\pm$ .86
Nurses are interrupted during medication administration	5.23 $\pm$ 1.14
Poor communication between providers and nurses exist	4.90 $\pm$ 1.12
The names of many medications are similar	4.60 $\pm$ 1.43
Providers' medication orders are unclear	3.90 $\pm$ 1.16
There is not enough time to look up medications on the floor	3.90 $\pm$ 1.65
Medication administration skills change often	3.30 $\pm$ 1.47
Nurses check the patient's ID band before medication administration	3.23 $\pm$ 1.74
Nurses use the Five Rights of Medication Administration	2.67 $\pm$ 1.37
There is no easy way to look up medications on the floor	2.20 $\pm$ 1.32
Item- Why errors are not reported	
Nurses fear negative consequences when reporting medication errors	5.60 $\pm$ .77
Nurses fear they will look incompetent to their peers	5.60 $\pm$ .86
The patient or family might sue the nurse if a medication error is reported	5.23 $\pm$ 1.07
Nurses may not think the error was important enough to report	4.97 $\pm$ .85
No harm came to the patient, so no error occurred	4.13 $\pm$ 1.87
Filling out an incident form to report an error takes too much time	3.83 $\pm$ 1.53
Nurses do not know how to report a medication error	2.80 $\pm$ 1.32

Case 2: Traditional Associate Degree Program Qualitative Results

Most respondents from the Traditional ADN program reported learning about medication errors through skills labs and didactic courses. One respondent stated, "We learned through reading assignments and course assignments" (B2). Several others commented on learning about the content in their first skills lab.

> We had one skills lab at the beginning of our first semester where we learned about injections and PO medication administration. The instructors talked about errors, how we should not make them, and one shared a personal experience with making an error. (B5, B6, B8)

Two other respondents commented that they learned about medication errors when they made or observed an error in practice, similar to the respondents from the LPN to RN Bridge program.

> I made an error as a medication tech, before I started this program. I was taking my pre-requisites for this program. It scared me that I might not be admitted because I made an error. I was working in an assisted living facility, had worked a 16-hour shift, and rotated days/nights/weekends. I gave a patient Klonopin at double the strength for her morning and evening dose [order was for one tablet a.m. and p.m. but gave two tablets a.m. and p.m.]. I had no idea until we counted the medications at the end of shift [11 p.m.]. I called my DON and she verified the error. I was investigated for diverting medication, and taken off my cart to train with a peer for two days. The DON wrote me up for not following the Six Rights of Medication Administration but thanked me for reporting the error. (B1)

> I worked as a medication tech also. My nurse and I floated from medsurg to the OB department. The pharmacy was in the process of switching out our dilaudid vials from 1 mg to 2 mg vials. The nurse was unaware of the change and administered two 2 mg vials instead of two 1 mg vials to a patient. The patient's vital signs changed immediately; respiratory rate of four. Realizing the error, we gave Narcan and called the MD. I had to stay with the patient four hours to monitor vital signs while the nurse reported the error, completed the paperwork, and was counseled. The nurse freaked out! She had 15 years of experience and never made an error. She hyperventilated and almost passed out once the patient was stable. It was very scary. (B4)

Case 2: Traditional ADN Program Knowledge about Medication Errors

When asked to define the concept medication error, the respondents agreed. One

respondent stated, "A medication error is when the Six Rights were not followed" (B8). All of

the others agreed and began listing the Six Rights; wrong dose, wrong route, wrong time, wrong

medication, wrong patient, and wrong documentation. Restatement of the question did not

produce any other definitions or characteristics of the concept.

Types of Medication Errors Discussed by Students

When asked to discuss the types of medication errors taught in their program, one

respondent stated, "We haven't learned any specific types" (B1). I restated the question and

provided one example to familiarize them with the concept. Again, the Six Rights were listed as

types of errors. Another respondent commented, "Make sure it is listed on the MAR [medication

administration record]" (B2). When asked to explain, he followed with "If it isn't on the MAR

[but is administered], then it is a type of error by giving meds without an order" (B2).

Other types of errors provided centered on observations made during clinical rotations.

One respondent stated, "Not checking the patient identification [before administration of

medications]" (B5). Another stated, "Omission or holding a medication would be a type. We

have to list the reason why; we can't just not give a medication" (B3).

Causes of Medication Errors

The respondents discussed three causes for medication errors. All agreed upon the first,

"Distraction, especially in the line waiting to access the medication machine" (B2). Another

shared her opinion of the medication room and distraction.

> At first, it was annoying to go into a super small medication room, but now I see
> the value in a one-person room. No one can come in to distract you from your job
> if there is not enough room. (B6)

Next, a discussion occurred following one respondent's statement, "Pulling medications for multiple patients at one time" (B7). The group agreed they had all witnessed their preceptors in long-term care pull medications for multiple patients at one time without labeling them. They discussed the large risk for error in giving the wrong patient the wrong medications. In addition, they would be unfamiliar with the names of the medications administered, since the medications were out of their package. One respondent closed the discussion with the following:

> I have observed medication passes done correctly at a VA facility. The nurse preceptor who pulls one medication at a time and then looks it up has been the best, so far. I know most are pressed for time, but I think this is the best way to prevent an error. (B5)

The respondents also listed nurse complacency with medication administration as a cause of medication errors in clinical practice.

> Nurses are complacent to believe the pharmacy got it right. We are all human and make mistakes. We learned to administer medications through a process and we should follow it. By assuming things are correct [in the medication machine], we are vulnerable to an error. (B8)

Case 2: Traditional ADN Program Knowledge about Reporting Medication Errors

Similar to the LPN Bridge program, students from the ADN program expressed a lack of program curriculum on how to report errors and what happens after an occurrence. One respondent asked, "Should we tell a supervisor?" (B3). Another shared a personal experience with a needle stick and her unwillingness to report the event.

> I had a dirty needle stick. A needle sticking out of a sharps container stuck me when I went to put my syringe in the container. I immediately went to one of my peers and told her what happened. She insisted that I tell our instructor immediately because I was seven months pregnant at the time. I did not want to report it because I was scared that I would be kicked out of nursing school. We were told about thousands of ways we can be kicked out of this program and I assume a mistake like this would be one of them. I finally reported it and had to fill out paperwork and do blood tests. The hospital has called me three times since the stick to check on me. (B6)

Following this story, the students shared their hypotheses about how to report errors. One respondent stated, "I think we could look at the hospital policy, since they are all different" (B1). Another shared, "We could also check how to follow the chain of command in a particular hospital" (B3). Lastly, another shared something she recalled learning in the program.

> Remember, we were told to never chart that we made an error in a patient's chart. Our instructors stressed this point several times throughout our skills labs. They told us to fill out an incident report (no examples provided or a chance to practice this), but they did stress to never document in a patient's chart that we made an error or that we filled out an incident report about a medication error. (B5)

When asked which medication errors should be reported, the group stated that *all* errors should be reported. One stated, "By reporting all errors, we can prevent future errors from occurring" (B2). Students were unfamiliar with the concept *near miss* when asked if these should be reported. A definition was provided and the group agreed that these types of errors should also be reported. One respondent recalled, "We did cover this once in Fundamentals . . . it means 'caught it' (B2).

When asked why they believe others may not report an error, many voiced an opinion. Fear was the largest theme within the discussion. Respondents expressed many ways that nurses would be fearful of admitting an error. "Job loss, repercussions to my position, and legal action by the family" (B4). "Families are scary and they ask a lot of questions [that I may not be able to answer] when I am mid-task" was another opinion shared regarding fear (B8). Another voiced, "I am afraid of a verbal bashing by providers if I admit to a mistake" (B2). Lastly, "a fear of loss in confidence by peers" (B7) was shared.

One respondent shared her fear with the death of a patient.

> What happens if my error results in patient death? I cannot report it, but wow, I hope I would be honest enough to share that it was my mistake. Fear is a strong emotion, but I hope honesty would win. (B3)

When asked what would prevent them from reporting an error, personally, the same reasons were given with the addition of a few new items. "I would feel stupid" (B5) was the first remark shared. "I am too terrified that I would be kicked out of nursing school-put all of this hard work in and could lose it all" was shared as a reason to omit errors during school. "Losing faith in my ability to care for others" (B2) was also shared as a reason to not report an error.

> How could I recover from admitting an error out loud and to others? What would they think of me? I have seen how others were treated. They [providers] like to make an example of us by making us look stupid in front of a crowd. (B8)

Case 2: Traditional ADN Program Feelings about Education and Implications for Curriculum Improvement

The members of the focus group had similar feelings about how their education had prepared them to administer medication. All students shared positive comments about their skills lab experience during their first semester. "I wish we could have a day like that every semester" (B8) and "We learned the most during that one day compared to all of the others" (B1) were resonated throughout the group. This particular skills lab occurred during their first semester when they learned how to pass oral medications and injections.

Since the first semester, the respondents have experienced frustration with their program regarding teaching medication errors. "We only had one instructor who stressed the importance of medication safety" (B2) was shared as a source of frustration with faculty of the program. "It seemed as though they only focused on two medications to teach safety-heparin and insulin" (B1). "I always feel unprepared for clinical and sim lab-teaching is not sufficient" (B3). Another shared their frustration by sharing the following experience.

> I learned how to push IV medications during last [third] semester with a preceptor at the hospital. We graduate this semester and this is not enough. This is a huge skill and it can get very confusing with multiple drips. Most preceptors at the hospital are unaware of our skill level and constantly ask us to do things we have

never heard of. We were trained heavily to perform skills, such as wound
dressings and assess fall risk, but medication administration is a huge deficiency
in this program. (B6)

Summary of Case 2: Traditional ADN Program

Students shared many frustrations of feeling unprepared in the skill of safe medication

administer following graduation. First, the students in this focus group desired more skills lab

days to address medication safety, sim labs set up to discover errors, and opportunities to talk

through the process of how to report errors once they occur in practice. Next, students in this

program also desired separate days to learn about medication administration (i.e. one day for

each-injections, oral, IV, etc.). Last, students also reported a deficiency in knowledge

surrounding how to work IV pumps. Students commented on how they were not taught how to

program IV pumps and were told the "hospital would teach you" (B4).

The group offered many suggestions to improve education on medication errors and

reporting. Students desire a "stand-alone" pharmacology course with opportunities to practice

medication calculations and discuss medication safety. During clinical, students would like time

to discuss medication administration and errors in their post-conference debriefing.

Overwhelmingly, students voiced concern about working with preceptors during clinical. To

improve the preceptor-student relationship, they suggest preparing the preceptors with a list of

skills the students are prepared to perform.

Of all four schools surveyed, I felt this group of students had genuine concern about their

capability of administering medications safely to their patients. As one respondent stated, "Fear

will keep us on our toes and make us become aware of the potential for harm" (B3). Another

shared her thoughts on graduation with "Graduation is overwhelming and the majority of our

responsibility [as a nurse] will be medication administration. I feel like I need to improve in this area the most" (B7).

Case 3: An In-State Baccalaureate Program (BSN)

The third school is located in the southern United States and enrolls students pursuing their baccalaureate degree in nursing. This program is a private university. Enrollment totaled twenty last semester senior students during data collection. Clinicals occur in the hospital, and the program has several skills labs and a simulation lab to practice their medication skills.

This BSN program is unique on several accounts. The first is the program has five semesters of nursing courses (four traditional fall/spring semesters and one summer course). The students report having up to two semesters of pharmacology (depending on previous coursework), one or two clinical courses per semester, and one or two simulation lab experiences per semester. The students did report a loss of 15-20 students during their junior year due to failure of courses, resulting in the small cohort of 18 current senior students. Two additional students joined this cohort their senior year. These students were more traditional in age, and most, if not all, have experience as a nurse tech or certified nursing assistant in local hospitals. It is important to note that many of these students worked in a hospital in which they also did clinicals as a student.

Survey Results for Case 3

Why Errors Occur

In order to analyze the quantitative data, the use of descriptive statistics calculated means and standard deviations for each item, as shown in Table 8. For items in subscale A "Reasons Why Medication Errors Occur in Practice," the standardized means ranged from 5.00 to 1.70, indicating reasons for occurrence of errors ranked between moderately agree and strongly

disagree. The standard deviation for individual items ranged from .73 to 1.62, indicating a small

variability between students.

Reporting Medication Errors

For items in subscale B "Reporting Medication Errors", the standardized means ranged

from 5.30 to 2.35, indicating reasons medication errors may not be reported were ranked

between moderately agree and moderately disagree. The standard deviations for subscale B

items ranged from .73 to 1.69.

Table **8**

*Means and standard deviations of survey responses for subjects in Case 3: An In-State BSN
Program (N = 20)*

Item-Why errors occur	Mean $\pm$ *SD* (1=Strongly disagree, 6= Strong agree)
The names of many medications are similar	5.00 $\pm$ .73
Nurses are interrupted during medication administration	4.90 $\pm$ 1.02
Nurses are assigned too many patients, delaying medication administration times	4.90 $\pm$ 1.21
There is not enough time to look up medications on the floor	3.75 $\pm$ 1.41
Poor communication between providers and nurses exist	3.56 $\pm$ 1.28
Nurses use the Five Rights of Medication Administration	3.25 $\pm$ 1.62
Nurses check the patient's ID band before medication administration	3.20 $\pm$ 1.58
Medication administration skills change often	2.95 $\pm$ 1.19
Providers' medication orders are unclear	2.85 $\pm$ 1.14
There is no easy way to look up medications on the floor	1.70 $\pm$ .80
Item- Why errors are not reported	
Nurses fear negative consequences when reporting medication errors	5.30 $\pm$ .73
The patient or family might sue the nurse if a medication error is reported	5.05 $\pm$ .89
Nurses fear they will look incompetent to their peers	5.05 $\pm$ 1.15
No harm came to the patient, so no error occurred	4.30 $\pm$ 1.69
Nurses may not think the error was important enough to report	4.25 $\pm$ 1.55
Filling out an incident form to report an error takes too much time	3.75 $\pm$ 1.55
Contacting a provider to report an error takes too much time	3.35 $\pm$ 1.57
Nurses do not know how to report a medication error	2.35 $\pm$ 1.42

Case 3: In-State BSN Program Qualitative Results

Most respondents from this focus group recalled learning about medication errors

primarily through their didactic courses. One respondent shared the following, "We learned day

1 in pharmacology. We learned about the rights; not so much what an error was but how to

prevent them" (C3). Another reiterated with "We learned this on multiple days and multiple

classes. Lots of examples were given" (C4). Another respondent recalled information regarding

skills practice with clinical instructors.

> We had to pass medications with our clinical instructors before touching a patient
> in real life. They repeatedly quizzed us on each medication, instilling a fear in us.
> This was good because we should not be too confident in our skills. (C1)

When asked if they had observed or made an error themselves, the respondents shared many

relevant stories.

> I saw a near miss during the first semester in long-term care. We do not know
> these patients when we are in clinical and they [the patients] may not know their
> name or date of birth. The nurses are familiar with the patients and feel
> comfortable giving meds. One nurse pulled some medications and told me to 'go
> give these to Sandra' but I did not know any patient named Sandra. I did not feel
> comfortable with this and told the nurse. She [the nurse] seemed frustrated and
> gave the meds herself. This could have been a mistake if I had given them to the
> wrong person. (C4)

> I witnessed one of my peers make an error in surgery. One of the nurses in the
> room handed him a vial with 4 mg of a med. He drew up four mg and the surgeon
> asked him to push three mg. In his error, he pushed all four mg. The surgeon
> immediately asked for confirmation on what he administered. The surgeon said
> 'it will be fine' and the nurses had him go through the procedure of reporting the
> error to them and the physician for practice. No one in the room documented the
> error and we did not witness any discussion outside the operating room. We did
> tell our clinical instructor and she also talked us through the error. (C3)

> I observed an error in ICU with my nurse preceptor. We had a patient, who was
> just extubated, and needed medications. We had an order for morphine. The
> nurse discussed the order with me but pulled up more than was ordered. (C2)

> I had a near miss in the hospital. I was with my preceptor pulling meds and we
> noticed the wrong med was in the drawer of the med cart. She said it happens all

the time; if they drawer is too full, it falls into another one. She acted as if it was
not a problem and did not report it. (C7)

Case 3: In-State BSN Program Knowledge about Medication Errors

When asked for the definition of a medication error, the recurrent theme of *following the*
Six Rights was voiced. The students began listing "right patient, right medication, right dose,
right route, right time, and right documentation" (C2, C3, C4). Another offered her opinion by
stating, "It is a medication administered not as intended or going against the order" (C1). One
responded also stated, "It [An error] does not always have a harmful event; an error is still an
error" (C5).

Types of Medication Errors

When asked to discuss types of medication errors, the respondents restated the Six Rights
of Medication Administration. They had difficulty recalling any other types. To continue the
conversation on this topic, I provided an example. One respondent recalled the term *near miss*
and stated the following, "It is catching a mistake before administering the medication"
(C4). This statement led to a discussion of error types such as latent errors, sentinel events, and
errors by omission. "A latent error is when there is an error [wrong medication in wrong drawer]
that has not been discovered yet" (C1). "Sentinel events were discussed a lot but usually
described as events like falls instead of medication errors" (C3). "It is the nurse's job to note
[document] why a medication is not given. We cannot just hold medications without a rationale"
(C7).

Causes of Medication Errors

When asked to discuss causes of medication errors, time and skill were the main themes.
One respondent stated, "Not understanding the order correctly, how to administer the

medication, and not being familiar with the drug are causes" (C2). Several commented on a

recurring thought throughout each program-pulling too many medications without labels.

> I have seen multiple nurse preceptors pull medications for several patients at one
> time. They put the medications in their pockets without labels and later gave
> them to patients. I do not see how they can remember who gets what. (C1, C3)

> I witnessed a nurse preceptor during clinical administering medications do the
> same thing. She got shift report and the nursing giving report admitted pulling
> medications for a patient but not given them. When asked where the medications
> were, she said she left them in the patient room, on the bedside stand. When we
> went to the room, there was a pile of unpackaged pills on the stand. We had no
> idea of what the medications were. (C8)

Case 3: In-State BSN Program Knowledge about Reporting Medication Errors

When asked which errors should be reported, each responded with *all errors should be*

reported. According to the respondents, knowledge of how to report errors is deficient in this

program, as well. One respondent learned about reporting more through her job. "We learned

about an online reporting system at work. It is not just for med errors, but I see a lot of people

use it" (C3). Another shared the following,

> It [teaching about reporting errors] is vague. I feel like it has been mentioned here
> and there. I know we should assess the patient first and then report the error to
> our charge nurse/supervisor and provider. I do not know what happens after that.
> (C2)

Reasons why an error may not be reported included the same theme as the other

programs: fear. "I don't want to lose my job over an error" (C2). "Some mistakes are silly. I

don't want others to know that I made a stupid mistake" (C4). Another brought up a different

take on fear when she stated the following:

> I hear nurses [at the hospital] talk about making errors all the time. They joke
> about things like 'I pushed that med too fast' and 'the patient was fine, so I am not
> worried about it.' Why would I want to be the one reporting an error when the
> other nurses treat it as nothing important? (C3)

Similar worries were expressed when I asked why they personally may not report an

error. "Loss of job" (C3), "Being sued" (C8), and "Loss of license" (C5) were the main

responses. Another reported, "I don't want to be cussed out by a provider. I have seen this

happen" (C7). Another held a different view when she remarked, "If the person I report an error

to will not handle it graciously, then it would be difficult to be willing to report it" (C4).

Case 3: In-State BSN Program Feelings about Education and Implications for Curriculum

Improvement

Overall, respondents of this program felt their education regarding medication

administration was sufficient. When asked how they were prepared for medication

administration, they shared several stories.

> We always did our medication passes with our clinical instructor before we went
> to the hospital or long-term care. They quizzed us about the Six Rights and each
> medication. This has set up a good habit for me. It [this practice] showed me to
> take my time" (C3).

> They [clinical instructors] made good points for nursing-in general. They taught
> us to remember that each patient is someone's loved one. We would not want any
> errors with our loved ones. It is our responsibility to not be careless with our
> skills. (C4)

> Our instructors have told us to never be ashamed to ask for more time to stop and
> look up a medication. We needed that assurance from our instructors to know
> that it is ok to have to look up something. We should never be rushed passing
> meds. Our preceptors are in a hurry because they are at work, but we still need
> time to double check and triple check ourselves. (C1, C7)

When asked if the content on medication errors and reporting them was sufficient, they

admitted to needing more instruction on the process as a whole [medication administration-error-

reporting]. "We can never really be ready until we are the nurse. The responsibility isn't there

yet, but I can always learn more" (C2).

> It is different when we are at the hospital with our preceptors. They have to log in
> [to the medication machine] because we do not have access. They pull the meds

and then hand them to us. We do not have full access to complete the procedure from start to finish. (C3)

The nurse goes through and organizes the process in her mind. We cannot stop them and ask questions because they are doing it [medication administration] the way they learned, which could be different from how we learned. We can only watch from the side and hope to understand. (C7)

I wish we could discuss each med pass as it happens or right after. It is difficult to recall the skill and our questions at the end of the day in post-conference. We need that immediate feedback-good or bad. (C6)

Summary of Case 3: In-State BSN Program

Although members of this focus group report feeling sufficiently prepared on medication administration, they did share opinions for improvement on teaching about medication errors and reporting errors. Within the didactic side of curriculum, the following was stated, "I would like to see actual examples of medication errors [videos, scenarios, etc.] and not just say the words. I think visuals help us see the reality of the issue" (C2). Several others followed with the request to have more practice with the whole process-order, pass med, make an error, discuss the error, report the error, and discuss what happens next. Two others shared experiences with preceptors hindering their performance.

"There is nothing worse than the look on a nurse's [preceptor] face when they learn they will have a student for the day. They do not want us there. We slow them down. They are unprepared for us, and they do not know what we can and cannot do in clinical" (C1, C6).

Another followed up this line of thinking with the following statement.

"There were a lot of days when I chose not to pass meds because my preceptor was too busy. I would be like 'I am out' because I cannot slow them down and they do not want me to ask questions. I cannot work at their pace. I do not want them to hand me meds to give without the opportunity to look them up. A way to fix this would be to know in advance that we could have a couple of days [in the hospital] to pass meds with our clinical instructor" (C2).

Case 4: An Out-of-State Baccalaureate Program

The fourth school is located in the southern United States and enrolls students pursuing their baccalaureate degree in nursing. Enrollment totaled thirty-one last semester senior students during data collection. Clinicals took place in hospitals, home health, and hospice agencies. This group did not have clinical in long-term care as the others.

This BSN program is unique on several accounts. First, the age of the students is more traditional, but few students reported nursing experience as a nurse tech or nursing assistant. Next, the program is four semesters in length, but acute clinical practice only occurs during the first and last semester with MedSurg and Intensive Care patients. The students also reported they do not have any clinical in a long-term care environment or assisted living facility, which is different from the three previous schools. Last, students reporting having only one skills lab to learn medication administration skills and other nursing skills occurs during the first semester.

Survey Results for Case 4

Why Errors Occur

In order to analyze the quantitative data, the use of descriptive statistics calculated means and standard deviations for each item, as shown in Table 9. For items in subscale A "Reasons Why Medication Errors Occur in Practice," the standardized means ranged from 4.83 to 2.00, indicating reasons for occurrence of errors ranked between slightly agree and moderately disagree. The standard deviation for individual items ranged from .75 to 1.75, indicating a small variability between students.

Reporting Medication Errors

For items in subscale B "Reporting Medication Errors", the standardized means ranged from 5.20 to 3.27, indicating reasons medication errors may not be reported were ranked

between strongly agree and moderately disagree. The standard deviations for subscale B items

ranged from .89 to 1.74.

Table 9

Means and standard deviations of survey responses for subjects in Case 3: An Out-of-State BSN Program (N = 30)

Item-Why errors occur	Mean ± *SD* (1=Strongly disagree, 6= Strong agree)
The names of many medications are similar	4.83 ± .83
Nurses are interrupted during medication administration	4.50 ± 1.25
Nurses are assigned too many patients, delaying medication administration times	4.33 ± 1.03
Poor communication between providers and nurses exist	4.30 ± .75
Nurses check the patient's ID band before medication administration	3.77 ± 1.74
Nurses use the Five Rights of Medication Administration	3.67 ± 1.75
There is not enough time to look up medications on the floor	3.53 ± 1.38
Medication administration skills change often	3.27 ± 1.44
Providers' medication orders are unclear	3.17 ± 1.12
There is no easy way to look up medications on the floor	2.00 ± 1.11
Item- Why errors are not reported	
Nurses fear negative consequences when reporting medication errors	5.20 ± .89
Nurses fear they will look incompetent to their peers	4.93 ± 1.14
The patient or family might sue the nurse if a medication error is reported.	4.77 ± 1.04
Nurses may not think the error was important enough to report	4.07 ± 1.17
No harm came to the patient, so no error occurred	4.00 ± 1.74
Filling out an incident form to report an error takes too much time	3.60 ± 1.54
Contacting a provider to report an error takes too much time	3.43 ± 1.48
Nurses do not know how to report a medication error	3.27 ± 1.39

Case 4: Out-of-State BSN Program Qualitative Results

Recruitment of focus group participants was on a voluntary basis prior to the collection of the quantitative data. Eight students volunteered to participate and met on campus with the researcher. The researcher performed recording of the focus group session and transcription.

When asked how they learned about medication errors, the respondents provided few examples. One stated, "We learned in intro class about the Six Rights and with dosage calculations" (D1). Another stated, "It was reiterated in sim lab" (D9).

Several shared events of witnessing an error while in clinical, making an error while working as a nurse tech, or making one in simulation lab. One stated, "I have seen nurses [while at work, not school] push meds way too fast. As a nurse tech, I cannot say anything, but it happens" (D7). Another stated, "I have seen a near miss at the hospital. A nurse pulled 40 mg when the order was for 20 mg. She did not notice the dose on the vial" (D3). Two other witnessed events are as follows:

> I had a nurse that spent the first hour of her shift reviewing the charts of her patients. Then she would pull all of her patients' medication, but pulled extra doses or larger than ordered amounts. She said she did this to keep her from having to return to the med room to pull more if the morning assessment showed a need for a larger dose. I reported this to my instructor, but she did not seem concerned about the possibility of an error occurring. (D5)

> I was observing a nurse in a long-term care facility for children with disabilities. The nurse must have been new or unfamiliar with the patients. She pulled the medication for a patient and went to the room with the patient. She asked the patient their name, but they were non-verbal and did not answered. She [the nurse] put the medication in the patient's mouth. Thankfully, she was nursing aloud [for my benefit] and the tech heard the conversation. He yelled out 'wrong patient.' and the nurse reached in the patient's mouth and pulled out the pill. She was so embarrassed, so I did not feel it was appropriate for me to question her about the event. As far as I know, she did not report it to anyone else. (D6)

The respondents shared three other events in which they made errors at work or in simulation lab. "Sometimes we will not know if we make an error in sim until they tell us in

debrief" (D14). Another stated, "If we nurse out loud [talk through the steps verbally], we can catch each other before the error reaches the patient. Otherwise, we will not catch it" (D5).

> There was a student in sim lab who made an error and none of us caught it. She administered medications to the patient, but she had doubled the dose. We saw changes in the patients' condition but thought it was part of the sim. We did not know these symptoms were the result of an error because we cannot see the orders when observing. (D11)

Case 4: Out-of-State BSN Program Knowledge about Medication Errors

When asked the definition of a medication error, the respondents from this program mirrored comments provided from other programs. Respondent D4 stated, "A medication error is anything that goes wrong-from the order to the bedside." Another stated, "It is something that strays from the order or against hospital policy" (D5). Another viewed the definition as "anything that causes harm or has the potential to harm a patient" (D2).

Types of Medication Errors

The respondents listed many types of medication errors and a subsequent discussion occurred. The Six Rights was the most reported type of error.

> I know we learned the Six Rights of Medication Administration during into class. It was more of a way to prevent errors from occurring but they could be types too. The Six Rights are the right patient, dose, medication, route, time, and documentation. Each of these [if done incorrectly] leads to an error. (D6)

Other errors types listed by members of the focus group includes "omission" (D2), "pushing meds too fast" (D7), "diluting/mixing" (D4), "crushing a medication not ordered in that form" (D3), and "use of medications that are contraindicated" (D12).

Causes of Medication Errors

When asked to list causes of medication errors, four themes emerged as skills of the nurse, med packaging, environment, and time. Two gave comments regarding the skills of the nurse. The first stated, "Lack of instruction in medication administration" (D3). The second

stated, "Nurses skip steps in the process. The system is too easy to skip around, such as with armbands. I've seen many skip this" (D5).

The second theme, medication packaging, provided the largest amount of discussion. One stated, "Packaging is not always obvious, such as sound alike/look alike medication labels" (D3). Another stated an issue with the medication machine.

> All of the medication machines in the hospitals for clinical are different, especially different from what we train on during skills lab. We are not oriented to the med machines at the hospital. They have different setups, such as drawer colors, grouping of medications, etc. This is confusing for us as students because we have very little time to pull meds and no time to learn the system. (D5)

Other problems with packaging include "There may be a difference in what the pharmacy has compared to the written order" (D7), "A change in suppliers leads to different packaging, confusing us" (D11), and "Medications can be stocked incorrectly by pharmacy. Without a big difference in the package, we may not notice" (D8).

The environment on the floor, in the patient room, and at the medication machine leads to distraction as a cause for making a medication error. "We see people talking at the med machine all the time" (D12). Another stated the patient and/or family is a potential cause.

> When we go into the room to pass meds or hang an IV, the patient wants to talk or ask questions. If family is present, they want to discuss the condition or ask questions. Honestly, I really do not mind talking with them, but it is a distraction when I am trying to focus on my serious task. (D4)

Case 4: Out-of-State BSN Program Knowledge about Reporting Medication Errors

Members of the focus group could not recall learning how to report errors or the process of reporting when an error occurs. "We have not discussed it [reporting errors]; not sure" (D4). Another reported, "We have been taught to assess the patient when an error occurs and then notify the provider, but that's it" (D2). "We were taught to never chart an error in a patient's

chart and to fill out an incident report, but I don't know what happens next" (D8).   When asked

if they could recall any nurse during clinical reporting error, the consensus was they have

witnessed errors made or caught but no one reported the error.

All fifteen members of the focus group support reporting all errors that occur, whether

they cause harm or are a near miss and stopped before reaching the patient. Other respondents

shared a different view on reporting.

> I think it really depends on the morals of the nurse and the hospital. When we
> start working, we will see how other nurses and administration [nurse managers
> or physicians] view reporting errors and what happens when they report. If no
> one reports and nothing is done about the error, why would we want to [report it]?
> (D8, D14)

When asked what reasons would prevent reporting an error, several responded. "I think

the consequences of reporting would be important" (D1). Others responded with "I would feel

dumb in front of my peers and may lose their respect" (D11) and "I feel it is a pride issue,

especially with experienced nurses" (D2). One respondent shared their thought regarding near

miss errors. "I think time is an issue, especially with a near miss. These don't seem to be taken

seriously, so we may not have the time to report them" (D5). Two others shared stories of how

this happens at their place of employment as a nurse tech.

> I know at work, they say you will not get in trouble for reporting an error because
> we want to talk about it in a huddle on the floor. I have seen people report errors
> and no huddle occurs. Nothing changes after the error. So, everyone stops
> reporting. (D6)

> Where I work, we have a self-reporting system. You can also use this tool to
> report an error you have witnessed.   I have turned in things a couple of times but
> have never been asked about it or contacted for a follow-up. It is disheartening,
> so why bother. (D4)

Case 4: Out-of-State BSN Program Feelings about Education and Implications for Curriculum Improvement

Overall, the members of the focus group feel they need more hands-on training about medication administration. "We pass medication in sim lab and discuss it in debrief, but we do not get more practice" (D6). Another stated, "J1 is the only skill lab training, the only one in four semesters" (D2). One shared her fear about recalling previously taught skills three semesters ago.

> It has been so long since we did those skills or even talked about some of them. For instance, if someone asked me to put in a Foley catheter I would be terrified. It is the same with administering an injection. We learned this during our first semester but never had the opportunity in clinical to perform the skill since then. (D10)

Another shared her fears about starting her career.

> We have learned some tips and tricks through observation at work or during clinicals by watching nurses. Some are good and some are bad. By working in the hospital, it really shows me how much we do not know. (D5)

Supplemental learning about medication administration and medication errors occurred through didactic courses, the use of videos, and with dosage calculation questions on exams per the group feedback. "We had dose calculation questions on exams in almost every class. This helped" (D6). Another responded, "We do have videos to watch, but I do not think we have time outside class" (D2).

Summary of Case 4: An Out-of-State BSN Program

This group suggested areas of improvement about medication administration and errors with reporting. "We need more lectures on compatibility of medications, additional drug resources [because we cannot use our phones in clinical], and what happens after an error" (D5).

"We also need more practice on administering medications. It has been so long since we have performed some of these skills" (D11). Another suggested improvement for simulation.

> We learn best when we make errors. Simulation lab is an area of our education that we are encouraged to make errors. I would like simulations designed for us to make errors and then go through the whole process making the error to reporting it. (D13)

Chapter Summary

The researcher collected data regarding: 1) why medication errors occur, with items grouped by communication, medication resources, nurse staffing, and medication administration protocols, and 2) reporting medication errors, with items grouped by fear and effort of reporting. One hundred and three last semester senior nursing students participated in the quantitative survey and 41 participated in the qualitative data collection through focus groups.

The results of the quantitative data support four areas of agreement between the four nursing programs. Three items supporting why errors occur include medication resources, nurse staffing, and medication administration protocols. One area of agreement on reporting medication errors was the items related to fear.

The findings of the focus group sessions showed agreement between the four nursing programs on several issues. First, all four programs reported limited to absent teaching about medication errors and the process of how to report a medication error. Next, students from all schools desired more hands-on training for medication administration skills. Students within each program discussed many types and causes of errors, either observed or made during their education. Last, all four programs agreed that fear is the leading cause of under-reporting of errors within healthcare.

CHAPTER FIVE

DISCUSSION AND IMPLICATIONS

A large body of research within healthcare confirms that the number of medication errors occurring annually is continuing to rise (Center for Disease Control and Prevention, 2019; National Coordinating Council for Medication Error Reporting and Prevention, 2018). The majority of this research has been with licensed professionals, including nurses, with only a paucity pertaining to students. Since nurses are *the last line of defense* (Sulosaari et al., 2012), we are in a unique position to make a difference in patient safety by reducing medication errors and reporting errors.

This study examined three areas of nursing education by evaluating last semester senior students' knowledge of medication errors (types and causes), reporting medication errors, and feelings about their education. A convenience sample of 104 senior nursing students completing their last semester of nursing school was recruited for the quantitative portion of the study. The students were from four different schools in two states, including an LPN to RN Bridge Program, a Traditional Associate Degree Program, and In-State Baccalaureate Program, and an Out-of-State Baccalaureate Program. The researcher visited each campus to provide a description of the study, answer any questions, and deploy the survey in paper form. The quantitative survey used was a modification of the *Medication Administration Error Reporting Survey* by Wakefield, Uden-Holman, and Wakefield (2005). A pilot study was conducted prior to the first campus visit to assess psychometric properties of the survey.

Focus group sessions were held on each of the four campuses to gather qualitative data. Forty participants volunteered and the sessions occurred in a classroom on campus. The

researcher recorded each session and transcribed the notes for each focus group. Coding began with transcription of the first session.

The focus group sessions allowed students to verbalize their opinions on a variety of topics related to medication errors. Students provided their own definition of a medication error, types, causes, reporting errors, and their opinions of the nursing content from their program regarding the above concepts. For the most part, the sessions showed agreement but there were a few differences.

This final chapter presents the findings of the study. Sections of this chapter outline the study's findings by research questions. Student recommendations for improvement to nursing education programs are addressed.

Findings on Why Errors Occur in Practice

To answer the first research question, student responses were collected via the modified survey on subscale A, *Reasons why Medication Errors occur in Practice*. Students ranked their agreement or disagreement to ten items related to medication administration. The items were divided into four categories: 1) communication, 2) medication resources, 3) nurse staffing, and 4) medication administration protocols.

The two associate degree schools showed agreement on the item stating that nurses are assigned too many patients, while the two baccalaureate programs agreed that many medication names are similar as the leading causes of why errors occur in practice. These findings show an understanding of how their professional life will be following graduation. These students have already observed clinical days with high patient acuity and low numbers of nurses to care for them. They understand interruptions will occur when administering medications to their patients. They have encountered many medications with similar names. They also know that

each of these factors will lead to a medication error, creating fear and anxiety about how they can navigate through an already flawed system.

By giving students the opportunity to practice medication administration in multiple settings, educators offer students necessary practice to improve their skills and reduce their chances of making an error. Environments created can contain errors to allow students to discover them and walk through the process of how to handle the event, from assessment to reporting. Students need to be taught in a positive environment showing that errors are expected, but it is essential that we maintain high standards in practice to prevent errors in a flawed system.

What is a Medication Error?

When asked to provide a definition for the term medication error, the students had difficulty putting it into words. According to the literature review in chapter two, a medication error is a mistake. To my surprise, the word mistake was not used to describe or define a medication error.

The students provided descriptions of reasons why error occurred or an action involving the medication administration process instead of a definition during each of the four focus groups. These reasons included something gone wrong, not following the Six Rights, or a medication given in a different way than ordered. By not including the word mistake and by instead linking it to an action, it is my opinion that students do not view medication errors as a possible human outcome in their career.

What are Types of Medication Errors?

Chapter two allowed for the discovery of a variety of types of errors throughout industry, including healthcare. When asked to list types of medication errors learned about in nursing programs, the students listed causes instead. Examples included distraction, giving the wrong

medication, not verifying the patient ID band, or pushing medications too fast. When asked if they had learned about specific types of errors in their courses, students were unable to identify them. When I provided terms, such as near miss, latent error, knowledge-based, rule-based, and so on, only one school responded yes to near miss and latent error. Two of the schools offered the term sentinel event, as well.

Types of errors, as described by the literature, are missing from nursing education. The majority of the students reported little time during coursework is devoted to types of medication errors. The conversations held during class focused on how not to make an error, excluding the definition of an error is and types of errors.

What are Causes of Medication Errors?

When asked to provide causes of medication errors, the students were able to provide many avenues in which errors occur. Most students from the different schools recited the same list as describing types of errors and provided many additional causes. Causes of medication errors included observed events throughout the students' clinical experiences with licensed nurses. This brings one to question, "are nursing students observing best practice and competent medication administration in the clinical site?"

By observing these behaviors in the clinical site, students are more prepared to understand the complexities of the medication administration process and the environmental/system flaws that allow for potential error making. Students observe many licensed nurses practice against the way they learned to pass medications by taking short cuts and deviate from hospital policy. Students were able to pick out poor nursing techniques and verbalize why they believed these risks were too great for their own practice following graduation.

Findings on Knowledge of Reporting Medication Errors

Student responses were evaluated on subscale B, *Reporting Medication Errors*, evaluating agreement or disagreement of reporting errors. Students ranked their agreement or disagreement to eight items related to medication administration. The items were divided into two categories: 1) fear, and 2) effort of reporting.

Students from all four schools agreed that fear is a reason why nurses do not report medication errors. The items in this category included: 1) nurses fear negative consequences when reporting medication errors, 2) the patient or family might sue the nurse if a medication error is reported, and 3) nurses fear they will look incompetent to their peers. The mean score was 5.35 for negative consequences, 4.98 for fear of lawsuit, and 5.19 for looking incompetent with peers.   Mixed responses showed a lack of uniform support or disagreement in the effort of reporting category.

The focus group discussions were unexpected as an educator. Student discussion fell flat and it appeared that students were uneducated on this topic. Many students verbalized they had never discussed the process of reporting errors. In my opinion, this piece of nursing education is a critical component to changing the negative culture surrounding reporting medication errors.

When faced with students responses such as "we have never been taught how to report an error," I was at a loss. Fear is the most reported finding as to why medication errors are not reported in healthcare today. These students already have a fear to report developed through their observations in the clinical site and bearing witness to improper techniques, errors going unreported, and physicians yelling at nurses who do report errors. Fear also includes job loss, potential lawsuits, and loss of respect by peers. None of these events is a positive reason to report errors, so as the student asks, "why bother?"

Student Feelings about Their Education Regarding and Reporting Medication Errors

Students from all four nursing programs felt they needed more education on medication errors and reporting errors. One student commented, "We learned good and bad tips by watching nurses at the hospital, but it also showed us how much we do not know." (D7) They reported learning some information in didactic courses, but most of their learning happened during a skills lab or clinical day, which were limited and based on patient census. Learning only took place when the instructors or nurse preceptors had adequate time to spend with them and answer their questions.

Students should feel empowered with the tools and knowledge they need to practice safely following graduation. Students in these focus groups shared fear and anxiety surrounding medication safety and reporting errors. These last semester nursing students provided many suggestions to help the next graduating class.

Recommendations for Improvements to Nursing Education

It was obvious through the focus group discussions that students crave more education on medication errors through coursework and especially hands-on learning. Students recommended more opportunities to practice medication errors, i.e. discovery of errors, opportunities to practice and make errors without judgment, and practicing the next steps following an error. Each school wanted an increase in the number of skills lab days and more time with their clinical instructors. One suggestion by a student was to set up blocks of time to meet with an instructor, one-on-one, to practice medication safety. A list of teaching strategies to improve education on these topics is listed as Appendix D with rationales and limitations.

By reporting a deficiency in education on how to report errors, students reported that they would like the opportunity to practice reporting errors. One student suggested having the

opportunity to walk through the whole process, from committing-to-reporting the error, would be beneficial. The uses of interprofessional clinical experiences, simulation, or other modes of teaching offer a safe environment to practice reporting an error and exploring solutions. It is my belief that practicing reporting errors in a safe environment will help to reduce fear and anxiety leading to a change in the culture of reporting errors. It may also increase confidence in skills of reporting errors to improve patient safety.

It is evident that students want more education on both of these topics, and nursing programs need to meet their needs. Gaps in the use of nursing preceptors in the hospital environment need to be addressed. These gaps include nurses not having enough time to teach, nurses not wanting students, and students viewing nurses taking shortcuts while administering medication. Preceptorship programs, which include how to educate and work with students, would be beneficial to ensure students are working with nurses who value their learning experience in the clinical environment.

In addition to practice reporting medication errors, increased coursework on ethics and ethical nursing practice is needed. Neither of these terms came up in any of the focus group conversations showing a limitation in the ethics of reporting. Nurses are obligated to report any medication, whether harm occurred or not, in order to prevent future errors and learn from our mistakes.

Limitations

This study has several limitations. First, the study was limited to four nursing programs in the Southern United States and may not be generalizable to other nursing programs in the country. Convenience sampling was used at each of the four schools. Randomization of the sample would have strengthened the study. Next, the sample was small at 104 for four schools.

With the school in case three's loss of 20 students during their junior year, the ratio of associate and bachelor students was unequal. Finally, the results of this study are short term. In order to produce real change in reducing the number of medication errors occurring and to improve nursing education on this topic, more research is needed.

Conclusion

Reducing the number of medication errors globally has become key to ensuring patient safety. The World Health Organization issued a pledge in 2017 to reduce preventable medication errors by 50% and within the next five years around the globe (Shrivastava, Shrivastava, & Ramasamy, 2017).   With the release of the film, *To Err is Human: A Patient Safety Documentary,* the spotlight is coming back to medical errors and improving patient safety. Because the number of medication errors and threats to patient safety continue to increase, there is a continued need for further research. This global initiative will need stakeholders from all areas of healthcare, including education.

Key issues identified by the participants from each nursing program, such as deficits to knowledge of medication errors and reporting errors, which can be addressed through changes to nursing education curriculum and increased clinical practice time involving administering medications and reporting errors. Because this is a global concern, nurse educators should use findings from this study and others related to medication errors to design curricula for medication administration safety and a positive culture for reporting errors.

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Appendices

Appendix A: Survey

Medication Administration Error and Reporting Errors Survey for Students (MAE-RESS)

Purpose of the research study: To seek input, based upon your clinical experience and observance of nurses in practice, from your perspective on the occurrence of medication administration errors and the extent to which errors are reported.

To participate: Complete the attached survey. This survey will take approximately 5-10 minutes to complete. Completion of this survey will serve as consent to participate in this study.

Participation is completely voluntary, and refusing to participate will not adversely affect any other relationship with the University or the researchers

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If you have questions or concerns about your rights as a research participant, please contact Ro Windwalker, the University's Human Subjects Compliance Coordinator, at 479-575-2208 or irb@uark.edu

All responses will be kept confidential to the extent allowed by law and University policy. Thank you for your time and cooperation.

Definition of Medication Error: For purposes of this survey, medication administration errors are defined as *any unintentional act or near miss that deviates from the planned outcome but offers an opportunity for learning and prevention of future mistakes.*

A. Reasons why Medication Errors occur in practice. Please circle the number that best reflects the extent to which you agree that the following reasons contribute to <u>why medication errors occur in practice.</u>

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
The names of many medications are similar.	1	2	3	4	5	6
Providers' medication orders are unclear.	1	2	3	4	5	6
Poor communication between providers and nurses exists.	1	2	3	4	5	6
There is no easy way to look up medications on the floor.	1	2	3	4	5	6
There is not enough time to look up medications on the floor.	1	2	3	4	5	6
Medication administration skills change often.	1	2	3	4	5	6
Nurses are interrupted during medication administration.	1	2	3	4	5	6
Nurses are assigned too many patients, delaying medication administration times.	1	2	3	4	5	6
Nurses check the patient's ID band before medication administration.	1	2	3	4	5	6
Nurses use the Five Rights of Medication Administration.	1	2	3	4	5	6

B. Reporting Medication Errors. Please circle the number that best reflects the extent to which you agree that the following reasons contribute to <u>why errors may not be reported</u>.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
Nurses may not think the error was important enough to report.	1	2	3	4	5	6
Nurses fear negative consequences when reporting medication errors.	1	2	3	4	5	6
The patient or family might sue the nurse if a medication error is reported.	1	2	3	4	5	6
No harm came to the patient, so no error occurred.	1	2	3	4	5	6
Nurses do not know how to report a medication error.	1	2	3	4	5	6
Filling out an incident form to report an error takes too much time.	1	2	3	4	5	6
Contacting a provider to report an error takes too much time.	1	2	3	4	5	6
Nurses fear they will look incompetent to their peers.	1	2	3	4	5	6

All information gathered from the Likert questions will be entered into an electronic database for analysis without any identifying or personal information. The following section of the survey (containing personal information) will be detached from the survey and stored separately in a locked file cabinet in the researcher's office.

Appendix B: Interview Guide

Research Questions	Grand Tour: Tell me about your education regarding medication errors and reporting errors.
1. What do associate and baccalaureate program senior nursing students know about medication errors, types, and causes?	
2. What do associate and baccalaureate program senior nursing students know about reasons for reporting or avoiding to report errors by licensed nurses?	
3. What are associate and baccalaureate program senior nursing students' feelings about their education regarding and reporting medication errors?	
	1. How did you learn about medication errors?
Aim for RQ #1: Evaluate knowledge retained about medication errors from last semester nursing students.	a. What is the definition of a medication error?
	b. What are the types of medication errors you have learned about in school?
	c. What causes medication errors?
	2. How has your education prepared you to administer medications safely?
	a. How were you taught medication safety?
	b. Where have you practiced this skill? Was it enough?
	c. Discuss a time when you observed an error or made one in clinical. Was it reported?
Aim for RQ #2: Evaluate knowledge retained about reporting medication errors from last semester nursing students.	How were you taught to report medication errors?
	a. What types of medication errors should be reported?
	b. Why would an error not be reported?
	c. What reasons would prevent you from reporting an error?
Aim for RQ #3: Evaluate last semester students' feelings regarding their education and reporting medication errors.	1. What suggestions do you have for improving your education on medication errors?
	a. Didactic?
	b. Clinical?
	2. What suggestions do you have for improving your education on reporting errors?
	a. Didactic?
	b. Clinical?

Appendix C: IRB Exemption

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To:	Tabatha Diann Teal BELL 4188
From:	Douglas James Adams, Chair IRB Committee
Date:	11/27/2018
Action:	**Exemption Granted**
Action Date:	11/27/2018
Protocol #:	1810155980
Study Title:	Associate and Baccalaureate Degree Nursing Students Knowledge of and Attitudes toward Medication Errors and Reporting Medication Errors: Implications for Curriculum Development

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: William McComas, Investigator

Appendix D: Teaching Plan Strategies

1. Foster a positive teaching environment-skills lab, simulation, clinical experience, etc.

Rationale: If we shame our students when they make an error, we close any opportunity for continued learning on the subject and prevent that future nurse from reporting any errors they make in their career. Learning should be a positive environment where the student feels like they have every opportunity to learn in a safe container with open lines of communication to ask questions or ask for help.

Limitations: This may require some educator training. This, like many other teaching skills, requires practice. Educators need to experience the role of a student in this situation to produce empathy and experience the viewpoint of today's learner. Role play is an excellent opportunity to grow this skill.

2. Develop a program of standardized clinical preceptors

Rationale: Most clinical experiences are based on a ratio system, usually eight students to one instructor. An instructor cannot be present for every medication pass, and we have to rely on licensed nurses serving as preceptors to fill these gaps. By creating a standardized training, we can be sure our students are getting the same education as if they were in a classroom. Students get confused when they learn in class one way and then observe another in clinical.

Limitations: This would take time and money, but the outcomes are worth it. This would require dedication from those licensed nurses to attend training to match our educational teaching strategies on medication administration and reporting errors.

3. Interprofessional education

Rationale: To change the culture of reporting medication errors, we need students to learn these values early in their career. Simulation is the perfect place to experience interprofessional collaboration through making and reporting medication errors. Students often witness open verbal criticism and lose confidence of their peers and in their skills. Due to witnessing these events, it will be hard to convince students to report future errors.

Limitations: This project requires the use of a simulation lab and a partnership between multiple disciplines. Development of the simulation scenario should occur as a collaboration between the disciplines, while debriefing should maintain individual objectives pertaining to their specific discipline.

4. Instill a professional culture of safety

Rationale: Missing from these student responses was a dialogue regarding ethics of reporting. Professional is taught in nursing programs and should be stressed when discussing patient safety and reporting errors.

Limitations: none