Deliberate Practice in Nursing

by

Melissa A. Bathish

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Nursing)
in The University of Michigan
2014

Doctoral Committee:

Dean and Professor Kathleen Potempa, Chair
Clinical Assistant Professor Michelle L. Aebersold
Assistant Professor Robert B. Stansfield
Research Investigator AkkeNeel Talsma
Associate Professor Colwick M. Wilson

© Melissa A. Bathish 2014

DEDICATION

I dedicate this dissertation to my mother, Caroline Marie Gorr, the strongest, bravest woman I have ever known. Although no longer with me on this Earth, still my pillar of unconditional love; providing a peaceful strength and encouragement while on this academic journey especially when my own doubts cloud my thoughts. Thank you for the endless source of inspiration. I miss you with all of my heart. This is for you… Sis.

ACKNOWLEDGEMENTS

It is with much gratitude that I express my great appreciation for the expert guidance, support and time that all of my committee members have provided to foster my academic growth and the success of my dissertation.

Thanks to all of my friends who continued to listen to me ramble on about my dissertation, yet wondering what on earth could possibly be taking me so long. I confused a lot of people along the way, including myself. Thanks for sticking in there with me!

My family was a constant source of strength. A special thanks to my parents, James and Caroline Gorr, for always telling me that I could accomplish anything I put my mind to. I know my mom is smiling from above; my dad is smiling with me here. Thanks to my parents' in-law, Emil and Hiam Bathish, for all the great meals you cooked for us when I was busy studying, going to class and working. We were always well fed! I'm forever grateful to my four children, Madisen, Emil, Julia and Lindsey, who made sacrifices along the way that definitely helped us grow as a family! And finally, a boundless thank you to my husband, Amer, whose undying support, encouragement and patience made all of this possible. I couldn't have made it without all of the 'pep talks' we had to boost my spirits when I teetered on the brink of exhaustion. They worked. Thank you to the moon and back for pushing me to make a dream become a reality.

"There is within every soul a thirst for happiness and meaning."

-Thomas Aquinas

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE

LIST OF TABLES

TABLE

LIST OF TABLES CONTINUED

TABLE

LIST OF APPENDICES

APPENDIX

ABSTRACT

Purpose: The nursing profession faces many obstacles that may impact nursing practice and patient care; a nursing shortage, a shortfall of nursing faculty, and a wave of nurses retiring, precipitating a loss of expert level knowledge and skills. Taken together with healthcare policy changes that aim to provide healthcare coverage to 32 million more Americans and an aging population relying on extensive health care services, the demands being placed on nursing to maintain competence and strive for expertise attainment are great. Development of expertise has been linked to *deliberate practice*, or activities engaged in to improve performance, in many domains but little is known about how it impacts the skill acquisition of registered nurses (RN). The purpose of this dissertation project was to: (a) examine a conceptual framework for evaluating the effects of individual nurse characteristics and deliberate practice on expertise, (b) develop and test an instrument to objectify the deliberate practice activities of nurses, (c) evaluate the relationships between experience, education and deliberate practice, and expertise (d) identify which of the variables (experience, education, or deliberate practice) makes the highest contribution to expertise.

Methods: An instrument, the Deliberate Practice in Nursing Questionnaire (DPNQ) was developed to measure the deliberate practice activities of RNs. Reliability and content validation was conducted via expert panel review and survey testing. The study utilized a cross-sectional, descriptive study design. Upon IRB approval, the DPNQ and Nurse Competence Scale were administered via Qualtrics © survey software to a convenience sample of 225 RNs from one

large, Midwestern tertiary care teaching hospital. Data was collected from three adult critical care units and 92 completed questionnaires were returned.

Results: Content validation via expert panel review for the DPNQ revealed an inter-rater agreement (100% reliability of raters) of .54-.75 and (80% reliability of raters) of .92-.96 and a content validity index of 0.94. Cronbach's alpha coefficient for the DPNQ in this study was .660 (standardized, .703). Deliberate practice was found to have a positive, significant correlation with total NCS scores (r_s = .366, p = .001). No significant correlation was found between experience and the total NCS score (r_s = .131, p=.245). Education had a significant negative association with nurse competence (beta = -.241, $p < .05$) indicating that nurses without a BSN (compared to nurses a BSN or higher) reported higher scores on the NCS. Deliberate practice had a significant, positive association with nurse competence (beta = .326, $p < .01$) suggesting that nurses who reported higher nurse competence engaged in more deliberate practice. Most notably, in this study it was found that after taking into consideration demographic variables, education and experience, deliberate practice made the highest contribution to expertise.

Conclusions: This study provided empirical evidence for the relationship of deliberate practice in expertise development and showed that it is a promising concept for explaining and contributing to the development of skill acquisition in nursing. This study found that higher competence levels (expertise) was most significantly impacted by those who engaged in more deliberate practice activities, not necessarily those with a longer length of experience or higher education levels. Future studies should look at the impact of deliberate practice on actual performance in addition to self-report expertise to better clarify the relationship. Further research with larger and varied samples in different hospital settings is warranted to further test instrument reliability and validity of the DPNQ.

Chapter I

Introduction

As the largest group of healthcare providers in the nation, it is imperative to good health care that the nursing workforce is appropriate in size and skill level (Page, 2004). In the perpetual goal to achieve quality care and patient safety; national priorities, the state of the nursing workforce and the healthcare landscape can provide a beacon for reducing errors that threaten the safety of those seeking healthcare in our country (IOM, 2000; Buerhaus, Auerbach, Staiger, & Muench, 2013). With patient safety initiatives at the forefront of national healthcare strategy, nurses performing in the theater of healthcare must endeavor to achieve excellence in nursing practice.

Healthcare is a rapidly advancing and evolving industry that faces high demands for its services (Forehand, 2000). The healthcare landscape is currently undergoing local, regional and national restructuring in order to attain long-term stability, growth and profitability. At this time of reorganization, the industry should focus on the hidden forces behind these cataclysmic undertakings— the human resources. Much like business success has been contingent upon an organization's ability to successfully use its employees' expertise (Torraco & Swanson, 1995), the United States (U.S.) healthcare industry is at a pivotal point at which to recognize its most important competitive advantage—its healthcare providers' expertise (Herling, 2000).

Background

National Priorities

Over the last decade there has been an increased emphasis on holding health care providers accountable for the quality of care they provide. The Institute of Medicine (IOM) has published landmark reports addressing issues of lapses in quality of healthcare and performance. The IOM report *To Err is Human: Building a Safer Health System* (IOM, 2000) states that healthcare in the U.S. is not as safe as it should be. They estimate that at least 44,000 and up to 98,000 people die annually from medical errors that are preventable. One strategy identified by the IOM (2000) to improve healthcare delivery is to raise performance standards and expectations. It is also identified in the IOM report *Performance Measurement: Accelerating Improvement* (2006) that performance measurement is a prerequisite in improving health care in the U.S. Since the groundbreaking IOM report that initiated the modern patient safety movement, many national and international safety initiatives have sprung. Those agencies include but are not limited to; the Joint Commission, the Agency for Healthcare Research and Quality, the World Health Organization, the National Quality Forum, and the Institute for Healthcare Improvement (Wachter, 2010). Despite the momentum of the patient safety initiatives and the spotlight that quality care has been given, performance remains suboptimal.

According to the U.S. Department of Health and Human Service's *2008 National Sample Survey of Registered Nurses* (2010), there are an estimated 3,063,163 registered nurses (RN) in the United States, making it the largest professional group in the healthcare industry. Nursing, representing the largest segment of the health care workforce, is a "key lever in achieving the patient safety targets and healthcare outcomes" that have been established in the U.S. (Kurtzman, Dawson, & Johnson, 2008, p. 187). As reported in the milestone report entitled *Keeping patients*

safe: Transforming the Work Environment of Nurses (Page, 2004), nurses perform a critical role in the U.S. health care system at every level of their care delivery and performance. Nurses, on the front line of patient care activities, have the capacity to significantly affect patient outcomes.

Large scale studies have in fact found evidence for better patient outcomes with more extensively educated nurses at the hospital level (Aiken, Cimiotti, Sloane, Smith, Flynn, & Neff, 2011; Tourangeau, Doran, McGillis, O'Brien, Pringle, Tu, & Cranley, 2007; Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005; Aiken, Clarke, Cheung, Sloane, & Silber, 2003). Aiken and colleagues (2011) looked at patient outcomes in 665 hospitals across four states. They found that the odds of 30-day inpatient mortality and failure to rescue (deaths following complications) were decreased by roughly 4% with an increase of 10% in bachelor's prepared nurses. This confirmed results found in an earlier study by Aiken and colleagues (2003) of 168 Pennsylvania hospitals where it was discovered that hospitals with a higher proportion of RN's educated with a bachelor's degree or higher were associated with a decreased risk for 30-day inpatient mortality and failure to rescue of surgical patients with serious complications. Estabrooks et al. (2005) also studied the impact of nurse education on 30-day mortality data of 49 Alberta, Canada hospitals. Outcomes data were specific to acute myocardial infarction, congestive heart failure, chronic obstructive pulmonary disease, and stroke. They found that hospitals with a higher proportion of bachelor's prepared nurses were associated with lower rates of mortality. Kendall-Gallagher, Aiken, Sloane and Cimiotti (2011) did a secondary analysis of 652 hospitals in four states, examining the effects of nurse education on patient outcomes. They found that the risk of inpatient 30-day mortality and failure to rescue were associated with nurses with a bachelor's degree and higher, confirming previous study results (Aiken et al., 2003). With every 10% increase in the percentage of BSN prepared nurses in a hospital, there was a 6%

decrease in the odds of patients dying. Interestingly, they also discovered a pronounced effect on patient outcomes with nurses with nonadvanced practice level nursing specialty certification. Although no significant effect was found with certification and patient outcomes alone, a 10% increase in nurses with a BSN and specialty certification combined were associated with a 2% decrease in the odds of patients dying. In an earlier study, however, conducted by Blegen, Vaughn, and Goode (2001), no association was found between education and quality of patient care. They conducted a secondary analysis of data from two studies (81 hospital units) and found no significant association between units with more baccalaureate-prepared nurses and patient fall rates and medication errors.

With the mixed yet convincing results of studies examining the educational level of the nurse and its correlation to patient outcomes, it comes as no surprise that the benchmark report by the IOM (2011), *The Future of Nursing: Leading Change, Advancing Health*, identifies as one of its eight confounding recommendations to increase nurses with a bachelor's degree to 80 percent by the year 2020.

Nursing Workforce Issues

National patient safety efforts define and shape the healthcare culture of today. Simultaneously, the projected nursing workforce shortage is a topic of great concern. This shortage is predicted to reach as many as 800,000 RN's by the year 2020 (U.S. Department of Health and Human Services, 2002) and up to one million by 2030 (Juraschek, Zhang, Ranganathan, & Lin, 2012). It is forecasted that the future supply of nurses will not be able meet the needs of an aging population with the number of adults age 65 and older nearly doubling between the years 2005 and 2030 (IOM, 2008). With nearly 20% of the U.S. population growing to constitute 'older adults', extensive reliance on healthcare services will abound as more than

three quarters of adults over age 65 have at least one chronic medical condition (IOM, 2008). Additional demands are also placed on nursing workforce resources by national healthcare reform with over 32 million additional Americans obtaining health insurance coverage. (Buerhaus, Staiger, & Auerbach, 2004; Buerhaus, Donelan, Ulrich, Norman, & Dittus, 2006).

The projected nursing shortage is the result of many different elements. First, an outflow of retiring nurses from the workforce is expected between the years 2010 and 2020 (Buerhaus, Staiger, & Auerbach, 2000). According to Buerhaus and colleagues (2013) approximately 850,000 RN's are between the ages of 50 and 64 (a third of the workforce) and considering retirement in the near future. Second, nurses who sought employment for their family's financial security during recent times of national recession may also choose to leave the workforce in the next several years. As unemployment rates decrease with economic recovery, it is estimated that 118,000 full-time RNs will exit the workforce between 2010 and 2015 if unemployment rates continue to drop (Staiger, Auerbach, & Buerhaus, 2012). A third component influencing the projected shortage is the decrease of younger individuals entering the profession. Affecting decisions for nursing as a career choice appear to include difficult working conditions, low pay in comparison to the responsibility involved in many complex areas of nursing, and a lack of autonomy and recognition. Fourth, also perpetuating the nursing shortage is the decrease in nursing faculty (Orsolini-Hain & Malone, 2007). According to Berlin and Sechrist (2002), between the years 2003 and 2012, an estimated 200 to 300 doctorally prepared nursing faculty will have retired each year denying tens of thousands of qualified applicants' entry into RN programs around the country (Kovner & Djukic, 2009). Compounding this faculty shortage is the shortfall of younger faculty with doctoral degrees. Given these statistics, it is clear that the

IOM's *Future of Nursing* report also addresses this issue as its fifth recommendation, to double the number of nurses with a doctorate by the year 2020 (IOM, 2011).

Nurses are faced with unprecedented workloads (Carayon & Gurses, 2008) and due to exceptional advances in medical technology; chronically ill patients that require more "sophisticated" health care (Schatz, Marraffino, Allen, & Tanaka, 2013) also require nurses with very sophisticated nursing skills. Thus, the nursing shortage goes beyond just numbers. In attempting to deal with the worldwide workforce issue, effective use of nursing skills is imperative (Buchan & Aiken, 2008). One key message from the *Future of Nursing: Leading Change, Advancing Health* report, (IOM, 2011) is that nurses should practice to the full extent of their education and training. This includes but is not limited to overcoming regulatory and policy barriers as well as workforce challenges and population obstacles. Influencing a nurse's quality of care and clinical judgment is one's level of expertise (Benner, 1984). This paper defines expertise from McHugh and Lake (2010, p. 278); summarized from Benner (1984) as a "hybrid of practical and theoretical knowledge; developed when a nurse tests and refines both theoretical and practical knowledge in actual clinical situations".

Theory of Expertise in Nursing

Expertise in nursing is most prominently guided by Benner's Novice to Expert Theory (Benner, 1984). This theory was synthesized from the Dreyfus and Dreyfus (2004) model of skill acquisition which forms the basis for this framework and for understanding the development of expertise in nursing. Dreyfus and Dreyfus offered a model of five sequential stages: novice, advanced beginner, competent, proficient and expert. According to this model, an individual moves through these stages of skill development as they accumulate situated practical experience, moving from analytical to intuitive thinking and from interpreting situations from its

parts to the situation as a whole. The Novice to Expert Theory likewise identifies nursing expertise as progressing through five stages (novice, advanced beginner, competent, proficient, and expert) that evolve from increased experience (see Table 1). Benner identified seven main domains of nursing in order to evaluate expertise: the helping role, the teaching-coaching function, diagnostic and patient monitoring function, effective management of rapidly changing situations, administration and monitoring therapeutic interventions and regimens, monitoring and ensuring the quality of healthcare practices, and organizational work-role competencies (Benner, 1984).

Table 1
Benner's Stages of Expertise Development

Stage	Name	Years in Field	Characteristics
1	Novice	Undergraduate Nursing School	No or very little experience; experience and context free; usually rule bound; focus on skill development; task oriented
2	Advanced Beginner	New graduate	Starts to intuitively recognize context months based on limited experience; much uncertainty in practice; beginning pattern recognition; marginally acceptable performance
3	Competent	2 to 3 years	Overwhelmed with information because of difficulty in assigning degree of relevance; tries to develop heuristics to deal with information overload; lacks flexibility
4	Proficient	3 to 4 years	Guided by maxims; plans intuitive care; sees the whole and the long term; assesses nuances
5	Expert	5 years or more	Thinking no longer linear; intuitive clinical grasp; deep understanding of the whole picture; early identification and management of a negative trajectory

(Benner, 1984; Orsolini-Hain & Malone, 2007)

Benner's theory synthesis was conducted via observation and interview narratives which enabled her to describe the performance characteristics of nurses at each level of development

much like the Dreyfus brothers studied the performance of chess players, air force pilots, and army tank drivers and commanders. Clinical judgment and skill acquisition in nursing was investigated by Benner using the Dreyfus model of skill acquisition in three studies conducted over a 21 year period (Benner, 2004). All three studies collected narrative accounts of clinical situations. The first study included interviews (small group and individual) with 21 paired new graduate nurses and their preceptors, and interviews and/or observations of 51 additional experienced nurses, 11 new graduate nurses, and 5 senior nursing students in six hospitals (two private community, two community teaching, one university, one inner-city). The second study sampled 130 nurses practicing in intensive care and general floor units conducting individual and small group interviews in eight different hospitals (seven far western U.S. and one eastern U.S.). The third study extended the second study to include other critical care areas such as emergency departments, flight nursing, home health, operating room, and post anesthesia care units, and to increase the number of advanced practice nurses in the sample. The sample in the third study included 75 nurses.

Collectively, these studies exhibited the usefulness of the Dreyfus model for understanding the five levels of skill delineation. Findings from the second and third studies, building on the first, identified four key aspects of expert nursing practice: (1) clinical grasp and response-based practice; the ability to read the patient and respond quickly occurs when the nurse is fully engaged and knows the patient, (2) embodied know-how; the nurse must be able to perform technical skills and judge when to use them, (3) seeing the "big picture"; the nurse recognizes the anticipated trajectory and not just the immediate clinical situation, and (4) agency or moral agency; moral agency occurs as the nurse learns to work with and act through positive relationships with others (Morrison & Symes, 2011, p. 164). From this seminal work, there is a

rich body of descriptive research on the differences between Benner's expert and novice nurses (Benner, 2004; Bobay, Gentile, & Hagle, 2009; Burger, Parker, Cason, Hauck, Kaetzel, O'Nan & White, 2010).

Benner's theory has sound theoretical underpinnings and possesses strengths that have deemed it useful in the domain of nursing. This theory is based on situated performance and emphasizes clinical nursing. Most importantly, it focuses on learning in context in order to truly understand the circumstances surrounding each learning experience. But despite this theory's many strengths, there are inherent theoretical limitations. One limitation to the model is the difficulty in applying the five levels of skill acquisition or expertise. Day (2002, p. 65) proclaims that practitioners "rarely perform at the same level on all tasks in a domain". Day provides an example of a therapeutic radiographer who performs at an expert level when discussing side effects of a particular radiological treatment but at a proficient level in an unfamiliar, specialized radiotherapy technique. Much would be the same for an oncology nurse who performs at the expert level in the administration of chemotherapeutic agents but only as an advanced beginner in performing peritoneal dialysis.

Day (2002) introduces other theoretical limitations of this model that are pertinent to the field of nursing; the position of Dreyfus and Dreyfus that novices only think analytically and experts only think intuitively. Day argues that conversely, a novice who is unfamiliar with a task may be prompted to use intuition to organize their thinking because they have not yet acquired any analytic principles about the situation. Moreover, this model fails to explain how an individual becomes an expert (Day, 2002; Farrington-Darby & Wilson, 2006). Dreyfus and Dreyfus are very vague as to how the novice, who uses an analytical approach to task

achievement transitions to intuitive thinking in the expert stage. In this, they do not explicate how a practitioner through accumulated experience is enabled to work intuitively.

Limitations identified in the Dreyfus and Dreyfus model of skill acquisition extend to Benner's model. Although a large body of nursing research supports the description by Benner of nurses' *stages* of expert practice (Roche, Morci & Chandler, 2009), criticism of Benner's *definition* of the expert level of nursing, which centers on the role of intuition, peer nomination, and extended length of experience have been made by other researchers (Cash, 1995;Altmann, 2007). Benner contends that the expert nurse can intuitively respond to clinical issues and read the patient without conscious deliberation. This theory asserts that the expert's actions are based on salient information gathering and that they rely less on organization, priority setting, and task completion (Benner, Tanner & Chesla, 1997). According to Benner (1984), a minimum of five years of full-time involvement in nursing practice is necessary for one to achieve expert status but even after many years of experience in a clinical setting, many nurses do not develop expert practice.

Familiar critiques of the model have been made by English (1993) and Cash (1995). English (1993) contended that Benner does not give an accurate description of expertise and does not clearly identify how a nurse transitions from one stage of skill acquisition to another. The use of intuition in describing expert nurses was also disputed by English (1993, p. 390) as "a subjective and questionable entity" that is without empirical validation. Likewise, Cash (1995) disputed the concept of expertise as "arbitrary". This criticism stemmed from how Benner determined expert practice; by peer nomination, managers and/or the research team collecting data.

More contemporary critics of the model include Altmann (2007) who argued that nursing expertise as it currently exists in the discipline is unrecognizable objectively. She contended that no operational definitions exist for nursing expertise based on intuition. Gobet and Chassy (2008) examined Benner's theory in detail and the role of intuition in nursing expertise. They established that the theory was "too simple to account for the complex pattern of phenomena that recent research on expert intuition has uncovered" (p. 129).

The Novice to Expert Theory has been the foundation for exploring how nurses progress through stages of skill acquisition for nearly three decades. It is not, however, without limitations that prompt the exploration of attainment of expertise in ways other than direct observations, personal interviews and self-reported critical incidents as concerns have been raised about whether experts identified through these means would actually exhibit superior performance (Ericsson, Whyte, & Ward, 2007). Traditionally expertise has been identified by length of experience, peer nomination or reputation, and perceived knowledge and skill (Ericsson 2008). Unfortunately, observed performance does not necessarily correlate with greater professional experience and only a weak relationship has been shown between the traditional indicators of expertise and observed performance.

Similar to results of studies on nursing education level and patient outcomes, the results of large-scale studies looking at nursing experience and patient outcomes are mixed. Aiken and colleagues (2003) found that mean years of experience was not a significant predictor of mortality (patients dying within 30 days of admission) or failure to rescue at the hospital level. Conversely, it was found by Blegen et al. (2001) that there was an association with a higher proportion of experienced nurses ($\geq$ 5 years' experience) on the unit level and fewer medication errors and patient falls. Likewise, Clarke, Rockett, Sloane, and Aiken (2002) also found that for

nurses with less than five years' experience, there was an increased likelihood in needlesticks and near-miss incidents.

In a review by Ericsson and colleagues (2007) of nursing expertise and expert performance, it was concluded that experienced nurses do not always perform better than novices. In reviewing studies of nurses with differing experience levels, no differences were found in performance of tasks such as preparing treatment plans, rating pain, and vascular assessment.

Statement of Problem

We must address the challenges presented by changing health care laws, an aging population and looming nurse workforce issues. Specifically, to confront the workforce fluctuations of the nation's largest group of healthcare providers. A decline in nursing expertise has implications for patient outcomes. In order to weather the storm, the nursing workforce's level of expertise needs to stay in stride with current demands and trends (Orsolini-Hain & Malone, 2007; Schatz et al., 2013). Little attention has however, been given to the forthcoming reduction in the levels of nursing clinical experience and expertise (Orsolini-Hain & Malone, 2007).

Large-scale studies have investigated nursing expertise on patient outcomes at the unit-wide or hospital-wide level indicating that experience may not be a predictor of better patient outcomes. Yet, scholars researching expertise in nursing have historically identified our domain's experts by peer nomination, knowledge, and extended experience. Development of expertise beyond the traditional means is needed in order to withstand storm conditions.

It is known that experience alone does not guarantee high levels of competence or performance (Dunn & Shriner, 1999; Ericsson et al., 2007). In fact, it has been shown that in

areas such as sports, music, and chess, experience without practice is not sufficient to develop expertise (Feltovich, Prietula, & Ericsson, 2006). According to Ericsson and colleagues (1993), the acquisition of expert performance is not one's innate abilities or experience but the amount of time one spends in *deliberate practice*. Several studies in other domains have linked expert performance to deliberate practice (Ericsson et al., 1993; Ericsson, 2004; Seymour et al., 2002; Keith & Ericsson, 2007). This dissertation applies the deliberate practice framework (Ericsson et al., 1993) to both enhance theoretical knowledge in the area of skill improvement and to evaluate nursing expertise.

Theoretical Framework

The deliberate practice framework posits that in addition to experience, the necessary and distinguishing factor to achieve expert performance levels is extensive hours of deliberate practice (Ericsson et al., 1993; Ericsson, 2002; Ericsson, 2008). Deliberate practice is defined as activities that are specifically designed to improve performance, includes feedback that compares actual performance to desired performance, and provides opportunity for repetition until the goal is achieved (Ericsson, 2002). The basic assumption of the framework asserts that an individual's performance level is directly related to the amount of deliberate practice that one engages in over a period of time. Its foundation is premised on expert performance being achieved by an individual's sustained effort to improve, not as the result of innate abilities or talent.

The deliberate practice framework ceases to identify experts based on social criteria or extended experience (Ericsson et al., 1993). This focuses on the type, not length of experience one has that can facilitate improvements in particular aspects of performance (Ericsson, Charness, Feltovich, & Hoffman, 2006). Experience itself makes performance less effortful and less demanding, but to improve, it is necessary to seek out practice activities that allow one to

work on improving performance (Feltovich, Prietula, & Ericsson, 2006). It is this model that served as the theoretical basis for this dissertation.

Purpose

The purpose of this dissertation project was to: (a) examine a conceptual framework for evaluating the effects of individual nurse characteristics and deliberate practice on expertise, (b) develop and test an instrument to objectify the deliberate practice activities of nurses, (c) evaluate the relationships among experience, education, deliberate practice and expertise, and to (d) identify which of the variables (experience, education, or deliberate practice) makes the highest contribution to expertise.

Significance of Nursing Expertise

Nurses at the front lines of patient care must strive towards expert anticipation of potential problems and display timely actions to avoid negative consequences; patient safety depends on it. Expertise is an "attribute of an individual which will affect their reliability and quality of performance" (Farrington-Darby & Wilson, 2006, p. 17). Accordingly, patients and our health care system would benefit if more experienced nurses' surpassed competency and became experts (Roche, Morsi & Chandler, 2009).

Deepening our understanding of the attainment of expertise will help us meet the needs of a changing healthcare landscape and nursing demographic. This will be central to designing patient safety and training efforts in order to ensure that we are able to meet national healthcare priorities by providing top quality care. The Institute of Medicine (IOM) and the National Council of State Boards of Nursing (NCSBN) have identified simulation as a strategy to improve and validate the sophisticated clinical judgment and psychomotor skills required of health care professionals (Decker, Sportsman, Puetz, & Billings, 2008). *The Future of Nursing* (IOM, 2011)

emphasizes the importance of embracing technology, notably the use of clinical simulation for education and evaluation. Simulation is defined as "activities that mimic reality of the clinical environment and are designed to demonstrate procedures, decision making and critical thinking through techniques such as role playing and the use of devices such as interactive videos or mannequins" (Jeffries, 2005). Simulators are widely used in commercial aviation, military, anesthesiology, medicine, business, and education. Simulation continues at a rapid pace in medicine, maintenance, law enforcement, and emergency management settings (Salas & Cannon-Bowers, 2001) but has only been documented in nursing education since 1998 (Roche, 2010). The use of simulation is growing in the field of nursing and nursing education and includes other forms of simulated learning such as "virtual training worlds" (Aebersold, Tschannen & Bathish, 2012). Use of simulation as a venue for deliberate practice is a way to both facilitate and identify expertise in a way beyond peer recognition and years of experience.

With the ability to objectively identify expertise, expert nurses could be rewarded by healthcare organizations through promotions, advancements and financial incentives. Bobay and colleagues (2009) discovered that financial considerations played a large part in nurses' professional development. Financial considerations nurses identified included such things as paid conferences and continuing education time, the ability to quality for other positions, and increases in salary with increased demonstrated clinical expertise (Bobay et al., 2009).

Developing a culture of deliberate practice would encourage and allow nurses to identify learning needs and areas of skill improvement. Combined, this would facilitate and encourage nurses to seek out deliberate practice experiences in order to achieve and sustain expert practice levels and provide top quality care. In fact, without deliberate practice, a professional nurse can become automated in his/her skills, impeding their ability to produce superior performance

(Ericsson, 2006; Clapper & Kardong-Edgren, 2012). Studying deliberate practice in nursing will enhance theoretical knowledge in the area of skill improvement. With the forecasted retirement wave there may be a general decline in this important resource, making this a necessary contribution to the discipline in order to transfer this responsibility to the upcoming, inexperienced workforce.

References

Aebersold, M., Tschannen, D., & Bathish, M. A. (2012). Innovative simulation strategies in education. *Nursing Research and Practice*. doi:10.1155/2012/765212

Aiken, L. H., Cimiotti, J. P., Sloane, D. M., Smith, H. L., Flynn, L., & Neff, D. F. (2011). Effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environments. *Medical Care, 49*, 1047-1053. doi.org/10.1097/MLR.0b013e3182330b6e

Aiken, L. H., Clarke, S. P., Cheung, R. B., Sloane, D. M., & Silber, J. H. (2003). Educational levels of hospital nurses and surgical patient mortality. *Journal of the American Medical Association, 290(12*), 1617-1623. doi.org/10.1001/jama.290.12.1617

Altmann, T. K. (2007). An evaluation of the seminal work of Patricia Benner: Theory or philosophy? *Contemporary Nurse, 25(1*), 114-123.

Benner, P. (2004). Using the Dreyfus model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *Bulletin of Science, Technology & Society, 24*, 188-199. doi:10.1177/0270467604265061

Benner, P., Tanner, C. A., & Chesla, C. A. (1997). Becoming an expert nurse. *American Journal of Nursing*, 97, 16BBB-16DDD.

Berlin, L. E., & Sechrist, K. R. (2002). The shortage of doctorally prepared nursing faculty: A dire situation. *Nursing Outlook, 50(2),* 50-56. doi:10.1067/mno.2002.124270

Blegen, M. A., Vaughn, T. E., & Goode, C. J. (2001). Nurse experience and education: Effect on quality care. *Journal of Nursing Administration, 31(1),* 33-39. Retrieved from http://journals.lww.com/jonajournal/pages/default.aspx

Bobay, K., Gentile, D. L., & Hagle, M. E. (2009). The relationship of nurses' professional characteristics to levels of clinical nursing expertise. *Applied Nursing Research, 22*, 48-53. doi: 10.1016/j.apnr.2007.03.005

Buchan, J., & Aiken, L. (2008). Solving nursing shortages: a common priority. *Journal of Clinical Nursing, 17*, 3262-3268. doi:10.1111/j.1365-2702.2008.02636.x

Buerhaus, P. I., Auerbach, D. I., Staiger, D. O., & Muench, U. (2013, January/February). Projections of the long-term growth of the registered nurse workforce: A regional analysis. *Nursing Economics,* 13-17. Retrieved from http://www.nursingeconomics.net/necfiles/news/JF_13_Buerhaus.pdf

Buerhaus, P. I., Donelan, K., Ulrich, B. T., Norman, L., & Dittus, R. (2006). State of the registered nurse workforce in the United States. *Nursing Economics, 24(1*), 6-12.

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2004). New signs of a strengthening U.S. nurse labor market? *Health Affairs*, *23*. Retrieved from http://healthaffairs.org

Buerhaus, P., Staiger, D., & Auerbach, D. (2000). Implications of a rapidly aging registered nurse workforce. *The Journal of the American Medical Association*, *283(22*), 2948-2954. doi.org/10.1001/jama.283.22.2948

Burger, J. L., Parker, K., Cason, L., Hauck, S., Kaetzel, D., O'Nan, C., & White, A. (2010). Responses to work complexity: the novice to expert effect. *Western Journal of Nursing Research*, *32(4*), 497-510. doi: 10.1177/0193945909355149

Carayon, P., & Gurses, A. P. (2008). Nursing workload and patient safety--A human factors engineering perspective. In R. Hughes (Ed.), *Safety and Quality: An Evidence-Based Handbook for Nurses* (pp. 1-14). Rockville, MD: Agency for Healthcare Research and Quality.

Cash, K. (1995). Benner and expertise in nursing: a critique. *International Journal of Nursing Studies, 32(16)*, 527-534. doi:10.1016/0020-7489(95)00011-3

Clapper, T. C., & Kardong-Edgren, S. (2012). Using deliberate practice and simulation to improve nursing skills. *Clinical Simulation in Nursing*, *8*, e109-e113. doi.org/10.1016/j.ecns.2010.12.001

Clarke, S. P., Rockett, J. L., Sloane, D. M., & Aiken, L. H. (2002). Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. *American Journal of Infection Control*, *30*, 207-216. doi.org/10.1067/mic.2002.123392

Day, J. (2002). What is an expert? *Radiography*, *8*, 63-70. doi: 10.1016/radi.2002.0369

Decker, S., Sportsman, S., Puetz, L., & Billings, L. (2008). The evolution of simulation and its contribution to competency. *The Journal of Continuing Education in Nursing*, *39*, 74-80.

Dreyfus, S. E. (2004). The five-stage model of adult skill acquisition. *Bulletin of Science Technology & Society*, *24*, 177-181. doi: 10.1177/0270467604264992

Dunn, T. G., & Shriner, C. (1999). Deliberate practice in teaching: what teachers do for self-improvement. *Teaching and Teacher Education*, *15*, 631-651.

English, I. (1993, June). Intuition as a function of the expert nurse: a critique of Benner's novice to expert model. *Journal of Advanced Nursing*, *18(3*), 387-393. doi.org/10.1046/j.1365-2648.1993.18030387.x

Ericsson, K. A. (2002). Toward a procedure for eliciting verbal expression on non-verbal experience without reactivity: Interpreting the verbal overshadowing effect within the

theoretical framework for protocol analysis. *Applied Cognitive Psychology, 16,* 981-987. doi: 10.1002/acp.925

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 79(10),* S70-S81. Retrieved from http://journals.lww.com/academicmedicine/pages/default.aspx

Ericsson, K. A. (2006). An introduction to Cambridge Handbook of Expertise and Expert Performance: Its development, organization, and content. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 3-19). New York, NY: Cambridge University Press.

Ericsson, K. A. (2008). Deliberate practice and acquisition of expert performance: A general overview. *Academic Emergency Medicine, 15,* 988-994. doi:10.1111/j.1553-2712.2008.00227.x

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review, 100,* 363-406.

Ericsson, K. A., Whyte, J., & Ward, P. (2007). Expert performance in nursing: Reviewing research on expertise in nursing within the framework of the expert-performance approach. *Advances in Nursing Science, 30,* E58-E71.

Estabrooks, C. A., Midodzi, W. K., Cummings, G. G., Ricker, K. L., & Giovannetti, P. (2005, March/April). The impact of hospital nursing characteristics on 30-day mortality. *Nursing Research, 54(2),* 74-84. Retrieved from http://journals.lww.com/nursingresearchonline/Pages/default.aspx

Feltovich, P. J., Prietula, M. J., & Ericsson, K. A. (2006). Studies of expertise from psychological perspectives. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 21-38). New York, NY: Cambridge University Press.

Forehand, A. (2000, July). Mission and organizational performance in the healthcare industry. *Journal of Healthcare Management, 45(4).* Retrieved from http://www.biomedsearch.com/article/Mission-Organizational-Performance-in-Healthcare/63714418.html

Gobet, F., & Chassy, P. (2008). Towards an alternative to Benner's theory of expert intuition in nursing: A discussion paper. *International Journal of Nursing Studies, 45,* 129-139. doi:10.1016/j.ijnurstu.2007.01.005

Herling, R. W. (2000). Operational definitions of expertise and competence. *Advances in Developing Human Resources, 2(8),* 8-21. doi:10.1177/152342230000200103

Institute of Medicine. (2000). *To err is human: Building a safer health system*. Retrieved from Institute of Medicine website: http://iom.edu/Reports/1999/To-Err-is-Human-Building-A-Safer-Health-System.aspx

Institute of Medicine. (2006). *Performance measurement: Accelerating improvement*. Retrieved from The National Academies Press: http://books.nap.edu/openbook.php?record_id=11517&page=83

Institute of Medicine. (2008). *Retooling for an aging America: Building the Health Care Workforce* [Fact sheet]. Retrieved from www.iom.edu

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*: The National Academies Press.

Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, *26(2*), 28-35.

Juraschek, S. P., Zhang, X., Ranganathan, V., & Lin, V. W. (2012). United States registered nurse workforce report card and shortage forecast. *American Journal of Medical Quality*, *27(3*), 241-249. doi.org/10.1177/1062860611416634

Keith, N., & Ericsson, K. A. (2007). A deliberate practice account of typing proficiency in everyday typists. *Journal of Experimental Psychology: Applied*, *13(3*), 135-145. doi:10.1037/1076-898X.13.3.135

Kendall-Gallagher, D., Aiken, L. H., Sloane, D. M., & Cimiotti, J. P. (2011). Nurse specialty certification, inpatient mortality, failure to rescue. *Journal of Nursing Scholarship, 43(2*), 188-194. doi.org/10.1111/j.1547-5069.2011.01391.x

Kovner, C. T., & Djukic, M. (2009). The nursing career process from application through the first 2 years of employment. *Journal of Professional Nursing*, *25(4*), 197-203. doi.org/10.1177/2327857913021026

Kurtzman, E. T., Dawson, E. M., & Johnson, J. E. (2008, August). The current state of nursing performance measurement, public reporting, and value-based purchasing. *Policy, Politics, & Nursing Practice*, *9*, 181-191.

McHugh, M. D., & Lake, E. T. (2010). Understanding clinical expertise: Nurse education, experience, and the hospital context. *Research in Nursing and Health*, *33*, 276-287. doi.org/10.1002/nur.20388

Morrison, S. M., & Symes, L. (2011). An integrative review of expert nursing practice. *Journal of Nursing Scholarship*, *43(2)*, 163-170. doi:10.1111/j.1547-5069.2011.01398.x

Orsolini-Hain, L., & Malone, R. E. (2007). Examining the impending gap in clinical nursing expertise. *Policy, Politics, & Nursing Practice*, *8(3*), 158-169. doi: 10.1177/1527154407309050

Page, A. E. (2004). *Keeping patients safe: Transforming the work environment of nurses* (1st ed.). Washington, DC: National Academies Press.

Roche, J., Morsi, D., & Chandler, G. (2009). Testing a work empowerment-work relationship model to explain expertise in experienced acute care nurses. *Journal of Nursing Administration*, *39*, 115-122.

Salas, E., & Cannon-Bowers, J. A. (2001). The science of training: a decade. *American Review of Psychology, 52*, 471-499.

Schatz, S., Marraffino, A., Allen, C., & Tanaka, A. (*2*013, June). Human-systems integration, simulation, and the nursing shortage. *Proceedings of the International Symposium of Human Factors and Ergonomics in Healthcare*, 2, 135-142. doi.org/10.1177/2327857913021026

Seymour, N. E., Gallagher, A. G., Roman, S. A., O'Brien, M. K., Bansal, V. K., Anderson, D. K., & Satava, R. M. (2002). Virtual reality training improves operating room performance. *Annals of Surgery, 236(4),* 458-464. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1422600/

Staiger, D. O., Auerbach, D. I., & Buerhaus, P. I. (2012). Registered nurse labor supply and the recession-are we in a bubble? *New England Journal of Medicine, 366,* 1463-1465. doi.org/10.1056/NEJMp1200641

Torraco, R. J., & Swanson, R. A. (1995). The strategic roles of human resource development. *Human Resource Planning, 18,* 10-21.

Tourangeau, A. E., Doran, D. M., McGillis Hall, L., O'Brien Pallas, L., Pringle, D., Tu, J. V., & Cranley, L. A. (2007). Impact of hospital nursing care on 30-day mortality for acute medical patients. *Journal of Advanced Nursing, 57(1*), 32-44. doi.org/10.1111/j.1365-2648.2006.04084.x

U.S. Department of Health and Human Services. (2002, July). *Projected supply, demand, and shortages of registered nurses 2000-2020* (Report). Retrieved from http://www.ahcancal.org/research_data/staffing/Documents/Registered_Nurse_Supply_Demand.pdf

U.S. Department of Health and Human Services Health Resources and Services Administration. (2010). *2008 national sample survey of registered nurses*. Retrieved from U.S. Department of Health and Human Services website: http://bhpr.hrsa.gov/healthworkforce/rnsurvey/2008/

Wachter, R. M. (2010). Patient safety at 10: Unmistakable progress, troubling gaps. *Health Affairs*, *29(1*), 165-173. doi.org/10.1377/hlthaff.2009.0785

Chapter II

Nursing Expertise: Use of Deliberate Practice

In this chapter two main areas of interest will be reviewed; expertise and deliberate practice. This review examines aspects of cognitive psychology, learning theory, and nursing science to inform the development of a nursing deliberate practice and expertise model.

Expertise Defined

In the abounding literature related to expertise, there is no universal agreement on its definition. Lack of a unified definition may be due to distinctive conceptions of expertise by different traditions that separately cite their own network of literature. It may also be due to the inherent complexity of the concept, making it nearly impossible to reduce it to one consolidated definition. Notwithstanding, expertise is a dynamic entity that includes experience, knowledge, skill, cognition, ability, and performance among other things. The definition outlined by the unifying publication of expertise and expert performance, *The Cambridge Handbook of Expertise and Expert Performance* (Ericsson, et al., 2006, p. 3) states that expertise "refers to the characteristics, skills, and knowledge that distinguish experts from novices and less experienced people" and that expert performance is the ability of experts to exhibit "superior reproducible performances of representative tasks capturing the essence of the respective domains" (2006, p.3). According to Nunn (2008), "Expertise is one of those seemingly ordinary comfortable words that have been around so long it looks solid until you probe deeper". Again, this dissertation defines expertise as a "hybrid of practical and theoretical knowledge; developed

when a nurse tests and refines both theoretical and practical knowledge in actual clinical situations" (McHugh and Lake, 2010).

Expertise Development

Scientists interested in studying excellence began as early as the 1800's. The first scientist to begin these investigations was Sir Francis Galton. He determined that brain capacity much like height and body size is genetically predetermined (Ericsson, 2004; Ericsson et al., 2006). In short, Galton believed that practice and training were indeed needed to reach high levels of performance but individual genetics put a ceiling on one's physical and mental achievements and levels of performance, which Galton asserted could not be altered through training. His belief was that many individuals could not inherently become an expert in their domain (Ericsson, 2004).

Benner's Novice to Expert Theory (Benner, 1984), based on the Dreyfus model of skill acquisition, incorporated this premise that there is an innate biological capacity that limits the level of achievement that an individual can attain. In review, this framework identifies five levels of skill acquisition from novice to expert. Novices (no clinical experience) and advanced beginners (new graduates) concentrate on avoiding gross mistakes. Those in the competent phase (6 months to 3 years of experience) do not need to concentrate as hard to perform at acceptable levels. Mistakes decrease and performance appears smoother. In the proficient phase (3 to 5 years of experience) and expert phase (minimum 5 years of experience), individuals lose conscious control over execution of skills and skills are smooth and without apparent effort. At this point in skill acquisition, and consistent with Galton, performance reaches a stable plateau (Ericsson, 2004). This combination of Galton's assumptions, Dreyfus' model of skill acquisition, and Benner's novice to expert theory can be summarized in the lower arm of Figure

1. At this level of performance, an individual effortlessly executes their activities or work and additional experience will not improve their performance (behavior or mediating cognitive mechanisms). Therefore, additional accumulated experience will not render higher performance levels, consistent with Galton's assumption of a performance limit due to innate abilities or limitations. Galton does however recognize eminence beyond only innate ability and acknowledges the interaction between environmental and genetic factors in his definition of natural ability as innate capacity, zeal, and power to do very laborious work. This definition is very similar to contemporary definitions of expertise involving motivation and perseverance (Ericsson, et al., 1993).

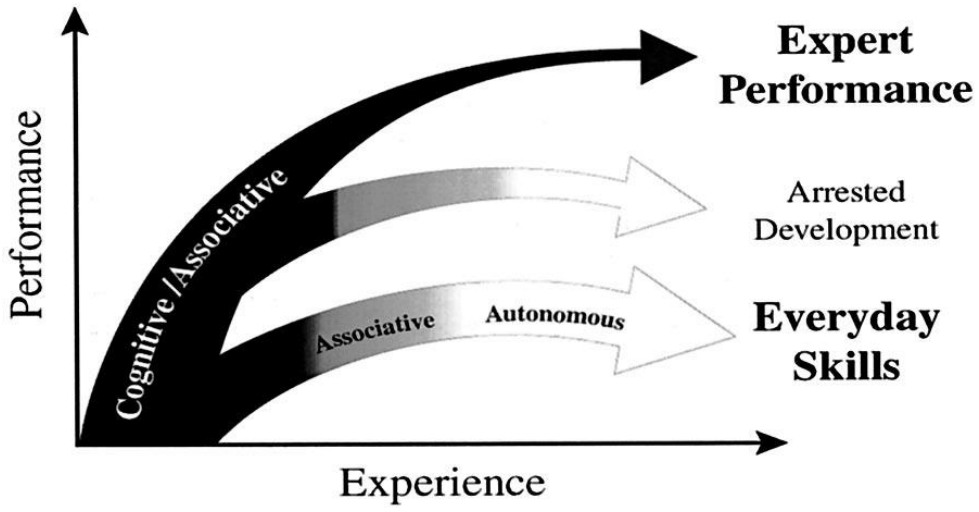


Figure 1. Differences of Expert Performance and Everyday Skills

An illustration of the qualitative differences between the courses of improvement of expert performance and everyday skills is shown in Figure 1 (Ericsson, Charness, Feltovich, & Hoffman, 2006, p. 685; Ericsson, Whyte & Ward, 2006). This schematic illustration is an extension of Fitts and Posner's phases of learning (as cited in Ericsson, et al., 2006, p. 684)

wherein they posit that there are three phases of learning that individuals go through. These phases are: a *cognitive phase* during which the performer develops a mental picture and fuller understanding of the required action; an *associative phase* during which the performer physically practices the required action learned in the cognitive phase; and an *autonomous phase* during which the performer learns to carry out the skill with little conscious effort (Ericsson et al., 2006). As represented by the third arm in Figure 1, expert performers do not necessarily progress to the autonomous stage, but remain in the cognitive/associative phases of learning and continue to seek excellence through deliberate practice. Once an expert gives up this commitment of seeking excellence, they are in a state defined as 'arrested development', representative of arm two in Figure 1. Industrious and striving experts must avoid this state of arrested development through deliberate practice activities that will help them exceed their current level of performance (Ericsson, 2008).

Contrary to traditional views of expertise in nursing, Ericsson's theory of expertise states that it is not talent or innate abilities, but deliberate practice that best explains achievement (Ericsson et al., 1993; Ericsson et al., 2007). In order to avoid this arrested development stage of automaticity, the expert acquires and refines cognitive mechanisms to support continued learning and performance improvement (Ericsson, 2004). Pioneering studies on memory and expert performance of chess players was conducted by De Groot wherein he identified and presented challenging situations in chess games that required decisions about the next move to the most proficient chess players (world class level) and their less successful colleagues (Gobet & Charness, 2006; Gobet & Simon, 1996). He found that the more skilled players had strikingly superior memory for chess positions after brief (2 to 15 second) exposure compared to the less skilled players, for knowledge which is held in memory mediates skill.

Chase and Simon (1973) expanded this research and found that more skilled players were only at an advantage when they were introduced to structured chess positions but had no advantage when the chess pieces were randomly arranged. This result helped to discount the belief that innate abilities accounted for skilled performance. Studying the pattern of eye fixations and recall, they discovered that the skill of different level players did not belong to differences in short- term memory (STM) but in what they termed "chunks" or groupings of information that help guide them in looking ahead for key features of a move. This is unlike novice players that have to use small groups of information, overtaxing their STM.

Gobet and Simon (2000) modified and expanded on the chunking theory introducing the template theory which identifies large schematic structures that evolve from chunks. These structures can be quickly accessed from STM and long-term memory (LTM) despite the expert having to memorize multiple chess boards or the individual being interrupted (Gobet & Charness, 2006). Templates are larger than standard chunks and explain how experts construct a "rapid internal representation of the environment and use high-level representations" (Gobet & Chassy, 2008, p. 134). Templates explain how experts can at times quickly anticipate the possible development of a situation, of which in the domain of nursing has been associated with expert intuition and termed "future think" (Benner, 1984). Many studies have verified the chunking and template theories in expertise by investigating blindfold chess wherein subjects were without view of the board and pieces and the moves were communicated through standard chess notation. It was found that results from blindfold chess tests could be explained by template theory and it has been applied to other domains such as business and physics (Gobet & Chassy, 2008). This theory does not support the Dreyfus and Benner models' definition of

intuition being 'holistic' or their premise that individuals move from analytic to intuitive, abstract to concrete, knowledge as they move from novice to expert (Gobet & Chassy, 2008).

Theories of Expertise

Expertise is multi-faceted, context specific, and widely analyzed and discussed in the literature. Expertise can envelope skills, knowledge or abilities in tasks, activities, sports, games or jobs (Farrington-Darby & Wilson, 2006). Current research on expertise comes from numerous traditions and domains and consists of multiple different classification systems. These classification systems include but are not limited to the Dreyfus and Dreyfus model of skill acquisition (Dreyfus, 2004) which describes expertise on a continuum from novice or beginner through five stages to expert; the "guild" terminology for knowledge development that is based on the craft guilds of the middle ages that focuses on seven stages and includes the naivette stage (total ignorance) through master or teacher of experts (Hoffman, Shadbolt, Burton, & Klein, 1995); and the Schmidt and Boshuizen (1993) four-stage theory of expertise in medicine which progresses from the accumulation of causal knowledge about disease and its consequences (phase 1) to expertise where accumulated knowledge structures *sedimentate* into multiple layers that are accessed when solving clinical problems. Table 2 identifies the strengths, limitations, and relevance to nursing of multiple different theories in the development of expertise and related to performance or skill acquisition.

Table 2
Theories in the Development of Expertise and their Relevance to Nursing

Theory	Strengths	Limitations	Relevance to Nursing
Theory of Skill Acquistion (Dreyfus & Dreyfus, 1980)	Identifies sequential stages of skill development/acquisition	Vague about the transition to intuitive expert thinking; difficulty in application of the levels	Theoretical basis for expertise theory in nursing
Reflective Practitioner (Schön, 1983)	Practitioners display "reflection-in-action" wherein	Experimenting with possible solutions until	Highlights direct interaction between the

	they can solve problematic events as they occur as opposed to "reflective-on-action" which is retrospective analysis of an action	an appropriate combination is found	nurse and the action improves performance but does not foster improvement for all
Novice to Expert Theory (Benner, 1984)	Involves practical experience; context specific	Methodology; identification of level of expertise "arbitrary"; use of intuition as identifying experts only; peer nomination; length of experience a determining factor of expertise	Most prominent expertise theory in nursing
Self-Regulated Learning Theory (Zimmerman & Schunk, 1989, Zimmerman, 1990; 2002)	Self-driven knowledge acquisition; motivated to learn	Mainly focuses on the process of learning as opposed to skill acquisition although knowledge would be a large component in this	Involves metacognition, motivation, feedback, and behavior in regulating one's learning; all concepts shared with deliberate practice theory
Theory of Deliberate Practice (Ericsson, Tesch, & Romer, 1993)	Does not consider innate abilities; identifies expertise by actual performance and not social criteria and length of experience	Does not consider innate abilities	Practical use for improving performance
Template Theory (TempT) (Gobet & Simon, 1996)	Cognitive theory thought by many to disregard the use of intuition altogether as not scientific but actually uses this theory to explain it as a cognitive process	May not be accepted in the field of nursing due to its reputation as rejecting the concept of "intuition"	Explains the concept of "future think" and intuition in nursing
Swanson's Taxonomy of Performance (Swanson,1994; Swanson, 1995)	Performance is a major part of human resource development; Includes motivation as a performance variable	Looks at 3 levels of performance: organizational, process, and individual. Identifies expertise as a performance variable as opposed to performance as a variable of expertise.	Maintaining and improving a system (healthcare system)

Common Components of Expertise

Herling (2000) simplified the commonly shared elements of the various theories of expertise into three foundational components, summarizing them as follows: (1) expertise is a dynamic state, (2) expertise is domain specific, and (3) the basic components of expertise can be identified as knowledge, experience, and problem solving. He also highlighted that expertise is a dynamic process, making the road to expertise a journey. He operationally defined expert as simply; one who continually demonstrates actions that are both efficient in their execution and effective in their results.

Knowledge is reflected in all theories of expertise. Although the type of knowledge needed for expertise is not universally agreed upon, two emerging themes of knowledge are consistent. First, knowledge is, and has to be, domain specific. Second, knowledge is a requirement of expertise but is not expertise itself. Many other components exist in the concept of expertise and the difference of knowledge in experts is portrayed in how much one has, how well one integrates it, and how effectively one gears it towards performance (Bereiter & Scardamalia, 1993, as cited in Herling, 2000). According to the deliberate practice framework, the deliberate practice task should take into account the pre-existing knowledge of the learner so that it can be correctly understood after a brief period of instruction (Ericsson, et al., 1993, p. 367).

Just like all experts are knowledgeable, all experts are experienced. According to seminal studies of master's level chess players, Simon and Chase (1973) at master level chess players spent between 10,000 and 20,000 hours of chess in order to obtain expertise. It was thus later generalized that in order to become an expert in any domain, a minimum of 10,000 hours or

ten years of combined study and experience to become an expert (Ericsson, et al., 1993). Experience is however, dependent on the type, quality, and quantity (Herling, 2000).

A third component of expertise involves problem-solving. Researchers in the field of cognitive psychology have endorsed and heavily investigated the way individuals exhibit self-awareness and self-regulation in their performance, reflect on their thought processes and performance and adapt brain activity and physical processes [mind and body] (Chi, 2006; Zimmerman, 2006; Feltovich et al., 2006; Hill & Schneider, 2006). Problem-solving within the deliberate practice framework occurs with feedback. This feedback encourages problem-solving, efficient learning, and performance improvement (Ericsson et al., 1993).

Generalizable Characteristics and Theoretical Origins of Expertise across Domains

Over the last several decades, the study of expertise has grown exponentially. An assemblage of papers, chapters, and books has analyzed the question, "What is expertise?" Researchers have looked at expertise in areas of sports, music, dance, games (chess), physics typewriting, and professions such as insurance sales, teaching, medicine, and many more. It has been identified through extensive research that there do exist commonalities in attaining expertise that generalize across many different domains. The following is a consensus of general characteristics of expertise gleaned from Feltovich, Prietula, and Ericsson's (2006) extensive review: expertise is domain specific and does not generalize to other domains (Ericsson & Lehmann, 1996; Ericsson, 2006; Chi, 2006); experts organize and store their knowledge in a large number of specific patterns, or chunks of information (Simon & Chase, 1973; Feltovich et al., 2006); experts exhibit effortless performance and their performance is associated with automation based on their ability to recognize patterns and easily access their actions (Benner, 1984: Ericsson, 2006; Feltovich et al., 2006); experts mental representations of problems are

more detailed than the superficial mental representations of novices (Feltovich et al., 2006; Chi, 2006); experts exhibit self-awareness and self-regulation in their performance (Chi, 2006; Zimmerman, 2006); experts reflect on their thought processes and performance (Feltovich et al., 2006; Zimmerman, 2006); and last, expertise involves adaptation of both brain activity and physical processes [mind and body] (Feltovich et al., 2006; Hill & Schneider, 2006).

Expertise in Nursing

There is an abundance of literature exploring expertise across a variety of clinical settings and practice specialties in nursing (Morrison & Symes, 2011). Similar to other domains, no ubiquitous definition of expertise in nursing exists and its defining qualities also remain elusive. Most studies and research papers written on this subject do, however, agree that the expert nurse presents advanced knowledge and skill (Jasper, 1994). Morrison and Symes (2011) conducted an integrated review of literature summarizing research across a variety of clinical areas delineating characteristics of expert nursing practice. Specialty areas included intensive care, emergency department, home care, labor and birth, nephrology, oncology, postoperative and psychiatry. Sixteen studies were synthesized and five themes were found to be characteristic of expert nursing practice: (1) knowing the patient, (2) reflective practice, (3) risk taking (4) intuitive knowledge and pattern recognition, and (5) skilled know-how. They concluded from their synthesis that the criteria for expert practice remained inconsistent and unclearly defined. However, the criteria most often used to identify the expert nurse was peer identification. The second and third most common criterion were years of experience and identification by a manager (Morrison & Symes, 2011).

McHugh and Lake (2010) looked at the impact of nurse education, experience and hospital contextual factors such as the educational background and experience levels of a nurse's

coworkers as well as the nursing practice environment on an individual nurse's expertise. They found that aggregate and individual education and individual experience were related to expertise. However, in their particular study, no association was found between professional practice environment or aggregate experience and expertise. Expertise in this study was categorized via nurse self-report as advanced beginner, competent, proficient, or expert; based on Benner's (1984) work. It was reported to be strongly correlated with assessments by colleagues and supervisors in a previous study by one of the authors (Lake, 2002 in McHugh & Lake, 2010).

Bobay and colleagues (2009) looked at professional characteristics of nurses that may contribute to the development of nursing expertise. Their criteria for expertise were based on a hospital professional practice model designed after Benner's (1984) four domains of practice: (1) clinical knowledge and decision making, (2) collaboration and coordination, (3) education, and (4) caring. Each stage cited specific expected behaviors for that phase of professional practice. Nurses in the study rated their level of expertise via narratives that were discussed with either a clinical nurse specialist or nurse manager and then scored, reviewed and shared with peers. Researchers in this study found with regression analysis that experience was a significant predictor of level of clinical expertise however the model accounted for 42.2% of the variance, "suggesting that there are other unmeasured factors that contribute to the development of expertise" (Bobay et al., 2009, p. 51).

Expertise determination in nearly all of the above mentioned studies was consistent with traditional ways of identifying expertise characteristics; peer nomination, manager identification, and length of experience. Ericsson et al. (2007) provided a review of research in nursing within the framework of the expert-performance approach to expertise. They found that studies were

unable to reliably find superior performance for nurses with longer professional experience, which for several decades has been the premise of expertise in the domain of nursing. It is this inability to link years of experience with superior performance and expertise that is the impetus of the current study, by exploring the effects of deliberate practice on nursing expertise. Overall, our understanding of the relationship between deliberate practice and nursing expertise is limited.

Deliberate Practice Defined

Deliberate practice is, by definition, those activities that are specifically designed to improve performance. They are goal oriented, include feedback that compares actual and desired performance, and provide an opportunity for repetition (Ericsson et al., 1993; Ericsson, 2002). It was found by Ericsson, et al. (1993) that four distinguishing criteria existed in those individuals where practice had significantly improved their performance. They were (1) given a task with a well-defined goal, (2) motivated to improve, (3) provided with feedback, and (4) provided with ample opportunities for repetition to refine performance. If these conditions are met then the practice activity will improve accuracy and speed of performance.

A primary assumption of Ericsson's theory is the "monotonic benefits assumption" wherein it is posited that an individual's performance is directly related to the amount of time spent in deliberate practice. It logically follows in this framework that one should maximize the amount of time they spend in deliberate practice to achieve expert level performance. Simon and Chase (1973) were the first to suggest, in their study of master chess players, that acquiring expertise requires a minimum of 10,000 hours or ten years of experience. Many subsequent studies have confirmed this 10,000 hour or ten year rule; musical composition, mathematics, tennis, swimming, running, evaluation of livestock, diagnosis of X-rays, and medical diagnosis

(Ericsson et al., 1993, Ericsson, 2002). While experience is a necessary condition for expertise it alone is not the unique requirement. This experience must be different than everyday skill acquisition or activities.

Domain-Related Activities: Work, Play and Deliberate Practice

Ericsson and colleagues (1993) identify three general types of domain-related activities; work, play, and deliberate practice. They establish work as activities being motivated by external rewards such as public performance, competition, or services rendered for pay. Work can discourage learning due to time constraints or fear of making mistakes. Unlike play and deliberate practice, work involves external rewards such as social recognition and making money. Play comprises activities that have no explicit goal and are done for enjoyment without focused attention as that needed in deliberate practice activities. Deliberate practice activities that are specifically designed with the goal of improving one's current level of performance, are highly structured, require effort, and are not inherently enjoyable, although some studies have found that certain domains have distinguished deliberate practice activities as being enjoyable (Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Starkes, & Williams, 2007). One must also be motivated to practice and deliberate practice activities usually cost money but do not directly make money.

Feedback

One important characteristic of deliberate practice is that an individual who is engaged in the effortful activity should receive immediate and informative feedback and knowledge of results of their performance (Ericsson et al., 1993). Ericsson and colleagues (1993, p. 367) stipulated that without adequate feedback, "efficient learning is impossible and improvement only minimal even for highly motivated subjects". The deliberate practice framework's use of

feedback as a necessary mechanism for performance improvement builds on Schön's reflection-in-action theoretical framework in the context of reflective practice in nursing (Powell, 1989; Dunn & Shriner, 1999). In this framework, Schön offers another way of understanding the development of high levels of performance in a profession. Reflection-in-action is an individual's flexibility and ability to experiment with problem-solving in order to solve puzzling or problematic situations as they occur. It is an innate learning behavior wherein Schön sees practitioners as problem-solvers and that "professional knowledge and the potential for more effective, improved performance arises from direct interaction between the practitioner and the action" (Dunn & Shriner, 1999, p. 632) A nurse who is unable to engage in reflection-in-action resorts to routine, rigid repetition of care regardless of how well their actions accomplish the situation at hand, uncharacteristic of expert nursing care. Therefore, the expert nurse, as a reflective practitioner, processes their experiences into personal knowledge and paradigm cases, and then unconsciously translates that knowledge intuitively into practice. This process occurring through feedback is what psychologists refer to as "chunking" and is an important component of deliberate practice.

Reflective thinking has also been explored in nursing in relation to self-regulated learning theory (Kuiper & Pesut, 2004). Self-regulated learning theory posits that self-regulated learners are operationally defined as metacognitively, motivationally, and behaviorally active participants in their own learning (Zimmerman, 1990). A distinguishing feature of self-regulated learning similar to the feedback concept in the deliberate practice framework is the "self-oriented feedback" loop. This loop is a cyclic process wherein learners monitor the effectiveness of their learning strategies and react to the feedback by making changes to self-perception or strategy. Slight differences exist between the deliberate practice and self-regulated feedback. The self-

regulated learning theory focuses on self-recording, self-instruction, and self-reinforcement for feedback. The deliberate practice theory relies heavily on external feedback from other experts, masters, or coaches. Also, feedback is only one requirement of deliberate practice. Further research exploring the relationships between self-regulation, metacognition (reflective thinking), and deliberate practice in nursing should be explored.

Constraints to Deliberate Practice

Along with the extended commitment of 10,000 hours or 10 years of education and experience, deliberate practice involves three constraints that one must overcome in order for engagement; resources, effort, and motivation (Ericsson et al., 1993). Deliberate practice requires certain resources that require time, energy, and money as well as access to teachers, training materials and facilities, and transportation to and from training opportunities. Examples of this in nursing would be time, money, and transportation to professional conferences, resources available to obtain certification in one's specialty area, and access to training opportunities and facilities.

The second constraint identified by Ericsson affecting the participation in deliberate practice is effort. Deliberate practice is an effortful activity that can lead to exhaustion with extended periods of practice. It can only be sustained for a limited time each day and individuals must restrict long-term practice to an amount from which they can recover completely on a daily or weekly basis (Ericsson et al., 1993).

Last, the motivational constraint is apparent when individuals in a particular domain or perhaps on a particular nursing unit, do not initiate practice activities willingly, voluntarily, or without prompting by co-workers or management. Considering that deliberate practice is not immanently motivating according to Ericsson, the lack of inherent reward may overpower the

enjoyment of improvement in performance, ultimately decreasing initiation in deliberate practice. An important aspect to realize is that not everyone can engage in deliberate practice unless they can negotiate these three constraints.

Overview of Deliberate Practice Research

Deliberate practice has been applied to numerous domains. Table 3 describes the way deliberate practice has been defined in studies analyzing nine different disciplines. This section will include an overview of the seminal deliberate practice study by Ericsson and colleagues (1993), and provide an overview of deliberate practice research in the domains of music, sports, chess, typing, and spelling bee competitors as well as professional domains such as insurance sales, teaching, strategic and organizational consulting, medicine, and nursing.

Table 3
Deliberate Practice Activities Defined Across Nine Domains

Citation	Domain	Deliberate Practice Activities Defined
Charness, et al., 2005	Chess	Self-reported frequency of study, competition and instruction
Ericsson, et al, 1993,	Music (Violinists, Pianists)	Average time spent in solo practice (total duration and per week)
Ward et al., 2007	Soccer	Practicing technical skills and tactical and strategic decision-making activities, accumulated hours of team practice
Keith & Ericsson, 2007	Everyday Typists	Attending a typing class, adopting a speed goal during every day typing
Duckworth, et al., 2011	Spelling Bee Competitors	Studying and memorizing words alone, being quizzed by others
Dunn & Shriner, 1999	Teaching	Mental planning, preparation of materials, teaching, evaluation and revision cycle
Sonnentag & Kleine, 2000	Insurance Agent Sales	Preparation, mental stimulation, feedback, consulting colleagues, exploring new strategies, meetings and private conversations, concluding and assessing
Ericsson, 2004	Medicine	Specialization to encounter more patients with similar diseases, with feedback from knowledgeable colleagues
van de Wiel, Szegedi, & Weggemann , 2004	Strategic and Organizational Consulting	Asking expert colleagues for advice, evaluating assignments
Whyte, Ward & Eccles , 2009	Critical Care Nurses	Professional and demographic data; education, continuing education, certification, employment, critical care nursing activities, self-development, self-regulated learning
Whyte, Ward, Eccles, Harris, Nandagopal, & Torof , 2012	Critical Care Nurses	Training, experience, information-seeking habits

First Deliberate Practice Study: Musicians

Ericsson and colleagues (1993) conducted a pioneering study that led to a prominent model explaining the acquisition of expertise through the use of deliberate practice. In their initial studies they reported findings regarding violinists' and pianists' perceptions of activities most relevant to performance improvement. They discovered that *solitary practice* was the activity rated as most relevant. They also found that expert musicians spent more time engaged in practice activities than good or amateur musicians. Practice activities did not include actual performances or playing instruments for fun or enjoyment. It was also clear in this study as to what activities were considered "deliberate practice" activities; effortful and aimed at improvement.

Deliberate Practice in Chess, Sports, and Other Domains

Similar results have been found in studies of tournament-rated chess players (Charness, Tuffiash, Krampe, Reingold & Vasyukova, 2005). Cumulative hours of studying alone was the best index of deliberate practice in chess and the single most important predictor of one's chess rating. Factors such as number of games played in chess tournaments had a minimal unique contribution to chess skill prediction.

In contrast, the amount of time spent in *team-related* practice activities were related to superior performance in some sports (Ward et al., 2004). A consistent relationship existed between the level of competitive events and the total amount of different types of practice activities. For example, Helsen, Starkes, and Hodges (1998) found that in international, national, and local soccer and field hockey players there was a monotonic relationship between accumulated individual practice and team practice with skill level. Additionally, in a study conducted on elite and sub-elite soccer players between the ages of 9 and 18 years of age, it was

found that *weekly and accumulated* hours spent in soccer team practice most consistently differentiated skill levels across age levels (Ward et al., 2007).

A study conducted by Duckworth, Kirby, Tsukayama, Berstein, and Ericsson (2011) looked at how children improved their spelling skills and better predicted their performance in the National Spelling Bee. Other studies of National Spelling Bee finalists demonstrated that cumulative time preparing for competition predicted performance. This particular study focused on the particular type of preparation activities, or deliberate practice activities, wherein the students received feedback and repeated a similar task with full attention in order to improve areas of weakness. They found that studying and memorizing words while alone were the least enjoyable and most effortful activities investigated, characteristic of deliberate practice. They were also better performance predictors in the National Spelling Bee than being quizzed by others or reading for pleasure.

Practice leading to improvement in the areas of music, sports and competition are somewhat well-structured where it can be pretty easily recognized and observed. Further, improved performance in these domains is well defined and can be assessed in comparison to some standard (Dunn & Shriner, 1999). For example, a swimmer can observe improvements in performance based on speed in the pool. As shall be seen, this is not the case in all domains. Other performance domains in the professional realm are not as well-structured. In these so-called ill-structured domains, defining goals that comprise improved performance and identifying standards for performance comparison may be difficult to define (Dunn & Shriner, 1999; Lie, 2012; Sonnentag & Kleine, 2000). A close examination of the literature on deliberate practice in professional domains is warranted as nursing is a profession, sharing many unique characteristics with these fields.

Deliberate Practice in Professions

Dunn and Shriner (1999) were the first to look at deliberate practice in a professional domain: teaching. They identified that deliberate practice activities may look very different across domains yet serve the same purpose. Dunn and Shriner's work represented a creative application of the deliberate practice concept to an ill-structured profession, and a first-step towards identifying what constituted deliberate practice in teaching, based on perceptions of experienced teachers. Their study focused on deliberate practice as activities that provided opportunity for learning and improvement and discovered that the goal was not always self-improvement but student improvement.

In summary, the researchers concluded that deliberate practice activities for teachers may be activities that teachers regularly do to accomplish the mission of teaching. The deliberate practice activities identified were: preparing materials, mental planning, evaluation of written work, informal evaluation, written planning, and evaluation of self-made tests. Teachers reported these as highly relevant to teaching, engaged in frequently, and not highly enjoyable. The researchers concluded that deliberate practice activities of teachers may be considered a regular part of teaching and may be aimed at improving student learning. They considered this deliberate practice in that the teachers carried out the activities while being fully mindful of which activities were effective or not and actively chose to make an effort to look for better ways of teaching that could lead to improvement (Dunn & Shriner, 1999).

Another study examined the concept of deliberate practice in an interesting way—to explain performance of not "expert" typists but intermediate-level (everyday) typists who pursue typing on a regular basis (Keith & Ericsson, 2007). This study investigated the relative contribution of abilities, amount of experience, and deliberate practice activities to the prediction

of typing performance. It assessed sixty university students with semi-structured interviews and lab sessions evaluating typing assessment and various typing tasks. The researchers' elicited information about the amount of typical typing in a week with the number of lines of text typed per week measured as typing experience; estimates of the total amount of typing done by a respondent in their lifetime; and participants' deliberate attempts at improving their typing proficiency. Deliberate practice was recognized as an interaction effect of attending a typing class and the degree to which the participants adopted a speed goal during their everyday typing.

They found that experience (amount of typing since introduction to the keyboard) was related to typing performance however, in accordance with deliberate practice theory; the highest level of performance was attained by the participants who reported that they had attended a typing class in the past and had reported the ability of typing quickly during everyday typing. This study focused on deliberate practice activities of everyday typists, since these typists may only engage in typing activities that they need to do to complete their everyday tasks. Interestingly, it extended the definition of deliberate practice—by basing their analysis on the typist pursuing a speed goal as they type regardless of whether it was to improve performance or for other reasons (e.g. to get done quicker).

Sonnentag and Kleine (2000) addressed deliberate practice to the context of insurance sales. The researchers, much like in Dunn and Shriner's (1999) study of deliberate practice in teachers, were careful to delineate deliberate practice activities that were aimed at improving performance and performed on a regular basis, from activities done for task accomplishment or performed only sporadically. They pursued two main goals: first, to examine whether or not deliberate practice activities were performed in the insurance agency setting and, second to examine if a relationship existed between deliberate practice and work performance. They

conducted structured interviews with 100 sales agents asking about tasks that could be considered deliberate practice. The activities had to meet five criteria: (1) can result in performance improvement, (2) can incorporate aspects of practice and competence improvement, (3) can be regularly performed during daily work activities, (4) performing this activity is highly optional and goes beyond the task requirements, and (5) is only indirectly related to financial rewards.

Mental simulation, or imagining a challenging case with a client and thinking through ways of handling the situation (26%) and asking for feedback (20%) were the two main activities that arose as deliberate practice activities. Sixty-two percent of insurance agents reported engaging in one of ten identified deliberate practice activities at least once a week to improve performance. The researchers concluded that insurance agents did engage in deliberate practice activities, but no "standard" activities existed. Activities varied according to the work situation and the individual.

Sonnentag and Kleine (2000) added a unique addition to their study of deliberate practice in the professional arena by inclusion of a performance measure. Ratings of the work performance of insurance agents were obtained via supervisor ratings. Regression analysis affirmed that experience was not a predictor of performance. The number of cases handled and the amount of current time spent on deliberate practice was a predictor of better performance. Better achievement however, was not predicted by the cumulative amount of deliberate practice as is found in chess and sports. The authors attribute this to the shortcomings of the retrospective accounts of cumulative practice gathered from participants. Another influencing factor could have been the fact that in music or sports, continuously building on past practice, technical skill and fitness helps to maintain and improve one's level of performance. In a domain such as

insurance sales where there is the emergence of new procedures, products, and developments, already existing knowledge and skills can quickly become obsolete and are of lesser use. This may in fact be the case in the context of nursing as well, where new evidence-based practice and technological changes and advances permeate the profession. In sum, they found that it was not the amount of experience that influenced performance but the nature and amount of work.

Van de Wiel and colleagues (2004) evaluated strategic and organizational planning expertise development from a self-regulated learning and deliberate practice perspective. Researchers pondered whether top level and lower-achieving professionals with the same experience differed in amount of time spent in deliberate practice. They found that elite professionals tended to be older and work more hours, thus had higher amounts of cumulative practice hours. They were also acknowledged to have spent twice as much time on updating actives such as reading scientific literature and teaching in addition to writing more extensive proposals and spending more preparation time for client encounters. Activities most often appropriated as deliberate practice were asking colleagues for advice and evaluating assignments. These were considered work-related activities carried out with the intention to learn.

In summary, studying deliberate practice in professional domains has provided extensions of deliberate practice theory making it applicable beyond its original boundaries. It has been concluded from these initial studies in professions that (1) deliberate practice may be considered a regular part of everyday tasks of a professional activity or what professionals regularly do to accomplish the mission of their profession (Dunn & Shriner, 1999), (2) performance improvement may be an interaction of multiple deliberate practice activities, (3) in some domains, deliberate practice activities may have a goal other than skill improvement (i.e.

getting a task done quicker) and, (4) current practice, not cumulative practice may be a better predictor of performance in domains with rapidly changing developments (Sonnentag & Kleine, 2000). See Table 4 for a summary of deliberate practice activities by professional domain.

Table 4
Types of Deliberate Practice Activities by Domain

Domain	Types of Deliberate Practice Activities
Music and Chess (Ericsson, et al, 1993; Charness, et al., 2005)	Solitary practice
Sports (Ward et al., 2007)	Solo and team practice
Spelling Bees (Duckworth, et al., 2011)	Studying and memorizing words while alone
Typing (Keith & Ericsson, 2007)	Typing class and adopting daily speed goal
Teaching (Dunn & Shriner, 1999)	Preparing materials, mental planning, evaluation of written work, informal evaluation, written planning, and evaluation of self-made tests
Insurance Sales (Sonnentag & Kleine, 2000)	Mental simulation and asking for feedback
Strategic and Organizational Management (van de Wiehl, Szegedi, & Weggemann , 2004	Evaluating assignments and asking colleagues for advice.

Deliberate Practice in Medicine

Medical education is including the use of deliberate practice as a means of improving medical training and practice in both students and physicians. Most riveting in the medical profession is that the development of expertise in this area is "particularly exciting because in medicine, unlike in sport or other competitive domains, the beneficiaries of improved performance are not only the performers themselves, but also society at large" (Ericsson 2004, p.

S80). In medicine, much like nursing, superior performance and expertise is most often socially recognized and based on length of experience. It is also common to identify five stages of learning and skill proficiency in order to reach the ultimate stage of the expert (Ericsson, 2004). Research on medical performance has focused on three areas: (1) diagnosis via perceptual stimuli [X-ray, electrocardiogram, heart and lung sounds], (2) diagnosis from clinical interview or assessment, and (3) surgery (Ercisson, 2004).

The theory of deliberate practice is very prevalent in medicine, especially in medical education and surgery. In a meta-analysis conducted by McGaghie, Issenberg, Cohen, Barsuk and Wayne (2011), looking at research to compare the effectiveness of traditional clinical education toward skill acquisition and simulation-based medical education (SBME) using deliberate practice, fourteen research reports including 633 learners were analyzed. Learners included 389 internal medicine, surgical and emergency medical residents, 226 medical students, and 18 internal medicine fellows. They found that SBME with deliberate practice was superior.

Deliberate practice in the medical profession is often associated with clinical simulation. Several studies have shown a relationship between deliberate practice and increased skills and improved performance in areas such as advanced cardiac life support skills (Wayne et al., 2005) and hemodialysis and central venous catheter insertion (Barsuk, Ahya, Cohen, McGaghie, & Wayne, 2009; Barsuk, McGaghie, Cohen, Balachandran, & Wayne, 2009). All three of these studies showed that deliberate practice was associated with increased skill level.

It is also prevalent in areas of surgery such as cardiac procedures (Nesbitt, St. Julien, Absi, Ahmad, Grogan, et al., 2013; Price, Naik, Boodhwani, Brandys, Hendry, & Lam, 2011) and laparoscopic procedures via virtual simulators (Crochet, Aggarwal, Dubb, Zirin, Rajaretnam, Grantcharov et al., 2011). All of these studies also showed increased skill level and performance

with deliberate practice. The study conducted by Price and colleagues (2011) also identified an increase in residents' self-confidence and Crochet et al.'s (2011) study illustrated increased speed of residents' performance.

Deliberate Practice in Nursing

Similar to trends in medical education, deliberate practice has been explored as a framework for nursing education (Harris, Eccles, Ward, & Whyte, 2013; Chee, in press; Clapper & Kardong-Edgren, 2012; Oermann et al., 2011). Moreover, nursing has suggested its compatibility with clinical simulation in furthering national goals in nursing education set forth by *The Future of Nursing* report (IOM, 2011) that provides eight recommendations concerning the future of the nursing profession. Schatz and colleagues (2013) identified ways that simulation could substantially impact three of the recommendations and partially support four of the recommendations suggested by the IOM in this document:

3. Implement nurse residency programs. Introduction of simulation into these transition-to-practice programs has the potential to enhance practical learning, self-confidence and competence and decrease costs.

4. Increase nurses with a B.S. to 80 percent. Simulation in undergraduate training can reduce load on faculty and allow for more hands-on training and practice.

6. Ensure that nurses engage in lifelong learning. Simulation lends continuing education opportunities for training and skill enhancement.

2. Enable nurses to lead improvement efforts AND *7.Prepare and enable nurses to lead.* Simulation can enable leadership skills much like it fosters teamwork proficiency.

5. Double the number of nurses with a doctorate. Incorporating simulation throughout all levels of nursing education allows for the accommodation of more students in academic

programs by preventing ‘bottlenecking’. More students having access to nursing programs provides a larger pool of candidates for post-graduate curricula.

8. Infrastructure for analysis of workforce data. Simulation provides a means for standardized skill assessment allowing for basic, accepted workforce data collection.

Using simulation, Oermann and colleagues (2011) tested the theory of deliberate practice in nursing education. They explored the performance of nursing students’ CPR skills with and without deliberate practice via simulation. Deliberate practice included six minutes of monthly CPR practice over a one year period. Practice was conducted on a voice advisory manikin that gave verbal feedback on compressions and ventilations of single-rescuer CPR as learners performed the tasks. Study results indicated that students who engaged in deliberate practice either maintained their baseline skills or improved their performance and had better overall performance than the group with no deliberate practice, proving this theory both compatible with simulation and suitable for nursing education.

In 2009, Whyte, Ward, & Eccles conducted a study of 22 critical care nurses that measured the knowledge and performance of two nursing groups in a simulated task environment assessing their control of the physiologic deterioration of patients with respiratory compromise as well as their knowledge of the constructs present in the scenarios. Study data collected included: (1) outcome data from simulated task; (2) data from a knowledge test given after the simulated task, and; (3) data from the Deliberate Practice Questionnaire which was collected prior to the study and asked questions about nurses’ experience before, during training as a nurse, and as a practicing nurse. The questionnaire beheld nine sections that included: biographical information, secondary education, college/university education, continuing education, certification, employment, critical care nursing activities, self-development and self-

regulated learning since graduation/certification and, other experiences (i.e. internships, professional organization memberships). The nurses were divided into novice and experienced groups. Novice nurses had less than one year of experience and started their career in the intensive care unit (n=10). Experienced nurses had at least 7 years of experience in a critical care setting (n=12).

The study results showed that experienced nurses embody superior knowledge compared with novice nurses but there was a lack of significant differences in clinical performance based solely on experience. One major finding of this study was the differing professional backgrounds of the nurses performing as "experts" clearly showing that experience does not necessarily lead to superior performance. Nurses who performed at the higher level went above and beyond their normal duties such as achieving board certification in critical care nursing, instructed in a paramedic program, instructed in advanced cardiac life-support and pediatric advanced life-support courses—exhibiting extensive voluntary practice and study in addition to their normal duties. These duties represent the sort of deliberate, solitary, and self-motivated practice that encompasses deliberate practice. Again, this showing that in some ill-structured professions, extending the definition of deliberate practice to include aspects of everyday work tasks, specialization, certification, or taking classes may be a sufficient qualification of deliberate practice given that the main goal is to improve performance. According to Whyte et al., (2009, p. 524) "This calls into question the way in which deliberate practice is both theoretically and operationally defined in nursing".

In contrast, a subsequent study conducted by Whyte, Ward, Eccles, Harris, Nandagopal and Torof (2012) found that experience based on years was significantly related to superior performance. This study looked at the performance characteristics of novice (n = 10) and

experienced (n = 12) critical care nurses in a simulated task environment, assessing their reaction to the discovery of a fallen patient who had sustained a closed head injury. Direct observation quantified through coding of clinical behaviors and verbal reports were collected along with demographic information and deliberate practice activities. The questionnaire was similar to that used in the study conducted by Whyte, Ward, and Eccles (2009) that sought to gain information about nurse training, experiences and information seeking habits. Study results reflected overall superior performance by experienced nurses and a statistically significant advantage in their ability to undertake desired actions in the fallen patient scenario. No results about the relationship of certification, continuing formal education, or other deliberate practice activities were reported.

Haag-Heitman (2008) identified deliberate practice as an important influence in the development of expert nursing practice. In a qualitative analysis, she examined ten expert nurses' perceptions of personal and environmental influences on the attainment of expert performance and found that deliberate practice along with risk taking, social models/mentors, and recognition were of consequence. Specifically, three themes emerged from the data eliciting deliberate practice: (1) subjects described a self-directed approach to skill-building and knowledge, (2) subjects engaged in deliberate activities to enhance skill and knowledge at all levels in their career, and (3) they considered themselves lifelong learners. Nurses identified a variety of deliberate practice activities that were used to enhance their skill and knowledge including: (a) attaining formal education, (b) attending clinical in-service classes and seminars, (c) attaining specialty certifications, (d) asking questions, (e) de-emphasizing fear of failure, (f) teaching/coaching others, and (g) using written references and electronic resources.

It has been recognized that deliberate practice in a profession may be considered a regular part of the professional activity (Dunn & Shriner, 1999). Deliberate practice in nursing is what nurses do to accomplish the mission of nursing. Thus, based on the literature, the deliberate practice questionnaire developed by Whyte et al., (2009) and the deliberate practice activities identified Haag-Heitman (2008) in her study of nursing experts, six categories of deliberate practice activities for nursing were synthesized for this study: (1) continuing formal education, (2) continuing professional education (3) self-development/self-regulated learning, (4) precepting, (5) specialty certification and, (6) professional organization membership.

1. Continuing formal education. Studies have already indicated a theoretical relationship between education and expertise wherein the proportion of staff nurses with a BSN degree are a significant predictor of patient outcomes (Aiken et al., 2003; Estabrooks et al., 2005; Tourangeau et al., 2007). Whyte, et al., (2009) also found that nurses who participated in additional study and training performed at a higher level.

2. Continuing Professional Education. Haag-Heitman (2008) identified attending in-services and seminars as an important aspect of skill development in expert nurses. Employment requirements for learning "mandatories" and state licensure requirements for "continuing education units" are important components of this category. Identifying whether or not nurses go above and beyond hospital or state requirements are an indicator of motivation. Motivation is necessary for engaging in deliberate practice and is a predictor of performance.

3. Self-development/self-regulated learning. Clinical simulation is one component of self-development. Simulation has been clearly established in this paper as a deliberate practice activity proven to impact outcomes in both medicine and nursing (Nesbitt et al., 2013; Barsuk, Ahya, Cohen, McGaghie, & Wayne, 2009; Barsuk, McGaghie, Cohen, Balachandran, & Wayne,

2009; Wayne et al., 2005; Oermann et al., 2011). Haag-Heitman (2008) identified ‘asking questions’ and ‘using written references and electronic resources’ as an important aspect of skill development in expert nurses. Van de Wiel and colleagues (2004) found that elite professionals in strategic and organizational management spent twice as much time reading scientific literature. These are all characteristic of self-regulated learning and may be associated with feedback, problem-solving, learning and performance improvement (Ericsson et al., 1993).

4. Precepting. Expert nurses are often relied upon to be preceptors due to their superior performance (McHugh & Lake, 2010). Van de Wiel and colleagues (2004) also found that along with reading scientific literature, elite professionals in strategic and organizational management spent twice as much time teaching. Preceptorships are time intensive and require specialized training (Moore, 2008). Teaching/coaching others was identified by Haag-Heitman (2008) as enhancing expert development.

5. Specialty certification. Nurse specialty certification in nonadvanced practice nurses is a voluntary means of skill improvement and expertise development in nursing (Kendall-Gallagher & Blegen, 2009). Henderson-Everhardus (2004, as cited in Ericsson, et al., 2007 and Kendall-Gallagher & Blegen, 2009) found that the only difference in performance of expert and proficient cardiac nurses in palpation of peripheral pulses and ankle-brachial pressure measurement was the attainment of specialty certification. It was also found in a study conducted by Kendall-Gallagher et al., (2011) that a 10% increase in the percentage of BSN nurses who were specialty certified was associated with a 2% decrease in the odds of a patient dying (30 day inpatient mortality) and failure to rescue (deaths following complications). According to Ericsson et al., (2007, p. E66), “the superior performance of the expert group is thus linked to its

specialty nursing certification, which involved extended supervised training with feedback of the type that would be considered deliberate practice".

6. Professional organization membership. Professional organizations provide many opportunities to advance excellence in nursing practice. Services include professional journals, continuing education, certification, networking, and specialty standards. In a study conducted by DeLeskey (2003) assessing the factors motivating nurses to become members of professional organizations, self-improvement, education, new ideas, programs, professionalism, validation of ideas, improvement of their profession, improvement of their work, and maintenance of professional standards were the most important.

Conceptual Model

The debate about the contribution of experience and education to expertise presses on (McHugh & Lake, 2010). Little is known about how these individual nurse characteristics influence deliberate practice or the impact of deliberate practice on nursing expertise. The Deliberate Practice in Nursing Expertise Model (DPNE) was developed as a framework to structure an investigation of the relationships among deliberate practice, individual nurse characteristics and expertise (see Figure 2). Table 5 outlines the conceptual definitions and empirical indicators of model components.

Figure 2. Deliberate Practice in Nursing Expertise Model (DPNE)

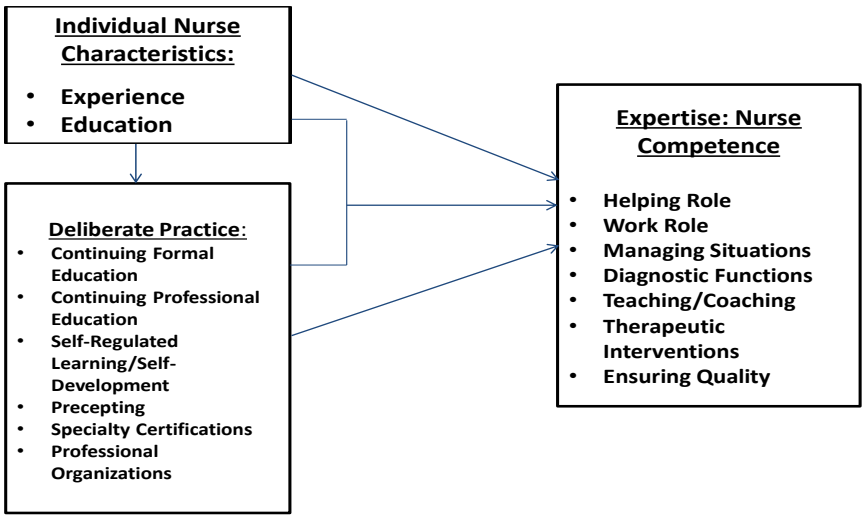


Table 5
Conceptual Definitions and Empirical Indicators of the DPNE Model Components

Variable	Conceptual Definition	Empirical Indicator
Deliberate Practice	Practice that involves effortful activities aimed at improving one's current performance (Ericsson, et al., 1993).	Total Score on the Deliberate Practice in Nursing Questionnaire (DPNQ)
Experience	Total amount of experience practicing as an RN	Number of years of nursing practice
Education	Highest level of nursing education in which an official degree was conferred	LPN/certificate, RN diploma, Associate's degree, Bachelor's degree, Master's degree, Doctorate
Nursing Expertise	"A hybrid of practical and theoretical knowledge; developed when a nurse tests and refines theoretical and practical knowledge in actual clinical situations" (McHugh & Lake, 2010, p. 278)	Total score on the Nurse Competence Scale [NCS] (Meretoja, Isoaho, & Leino-Kilpi, 2004)

Research Questions

This study addressed the following questions:

Q1. Are individual characteristics of the nurse associated with expertise?

Q1a. Is there an association between years of nursing experience and nurse competence?
Q1b. Is there an association between education and nurse competence?

Q2. Are individual characteristics of the nurse associated with deliberate practice?

Q2a. Is there an association between years of nursing experience and deliberate practice?
Q2b. Is there an association between education and deliberate practice?

Q3. Does deliberate practice influence expertise?

Q4. Which of the variables (experience, education, or deliberate practice) makes the highest contribution to expertise?

Summary

It is imperative that nursing as the largest group in the healthcare system take heed of national initiatives and needs by analyzing the implications of superior clinical performance and its impact on outstanding healthcare delivery. It is apparent in the literature that experts in nursing are historically identified by extended experience, knowledge, and peer nomination but it has also been established that experience without practice is not sufficient to develop expertise. Yet, it is this longevity in the profession that has traditionally identified expertise. There is, however, extensive empirical evidence supporting the relationship between extended and concentrated practice efforts and the attainment of superior performance. Although the relationship of deliberate practice has been examined in many different domains, several mentioned in this paper, there is very limited research exploring the effects of deliberate practice on nursing performance. Applying this framework to the discipline of nursing would enhance

both theoretical and practical knowledge in the area of skill improvement in nursing. With the national focus on patient safety initiatives, current healthcare policy changes increasing healthcare coverage to millions of Americans, the projected nursing workforce shortage, and an aging population, efforts by the nursing profession to understand the attainment and implications of superior clinical performance and its impact on outstanding healthcare delivery is very relevant.

References

Aiken, L. H., Clarke, S. P., Cheung, R. B., Sloane, D. M., & Silber, J. H. (2003). Educational levels of hospital nurses and surgical patient mortality. *Journal of the American Medical Association, 290(12*), 1617-1623. doi.org/10.1001/jama.290.12.1617

Barsuk, J. H., Ahya, S. N., Cohen, E. R., McGaghie, W. C., & Wayne, D. B. (2009). Mastery learning of temporary hemodialysis catheter insertion by nephrology fellows using simulation technology and deliberate practice. *American Journal of Kidney Disease, 54(1*), 70-76. doi:10.1053/j.ajkd.2008.12.041

Barsuk, J. H., McGaghie, W. C., Cohen, E. R., Balachandran, J. S., & Wayne, D. B. (2009). Use of simulation-based mastery learning to improve the quality of central venous catheter placement in a medical intensive care unit. *Journal of Hospital Medicine, 4(7*), 397-403. doi.org/10.1002/jhm.468

Benner, P. (1984). *From novice to expert. Excellence and power in clinical nursing practice*. Menlo Park: Addison Wesley.

Bobay, K., Gentile, D. L., & Hagle, M. E. (2009). The relationship of nurses' professional characteristics to levels of clinical nursing expertise. *Applied Nursing Research, 22*, 48-53. doi.org/10.1016/j.apnr.2007.03.005

Cash, K. (1995). Benner and expertise in nursing: a critique. *International Journal of Nursing Studies, 32(16)*, 527-534. doi:10.1016/0020-7489(95)00011-3

Charness, N., Tuffiash, M., Krampe, R., Reingold, E., & Vasyukova, E. (2005). The role of deliberate practice in chess expertise. *Applied Cognitive Psychology, 19*, 151-165. doi:10.1002/acp.1106

Chi, M. T. (2006). Two approaches to the study of experts' characteristics. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 21-30). New York, NY: Cambridge University Press.

Clapper, T. C., & Kardong-Edgren, S. (2012). Using deliberate practice and simulation to improve nursing skills. *Clinical Simulation in Nursing, 8*, e109-e113. doi.org/10.1016/j.ecns.2010.12.001

Crochet, P., Aggarwal, R., Dubb, S. S., Zipirin, P., Rajaretnam, N., Grantcharov, T., ... Darzi, A. (2011). Deliberate practice on a virtual reality laparoscopic simulator enhances the quality of surgical technical skills. *Annals of Surgery, 253(6)*, 1216-1222. doi:10.1097/SLA.0b013e3182197016

DeLeskey, K. (2003, February). Factors affecting nurses' decisions to join and maintain membership in professional associations. *Journal of PeriAnesthesia Nursing, 18(1),* 8-17. doi:10.1053/jpan.2003.50000

Dreyfus, S. E. (2004). The five-stage model of adult skill acquisition. *Bulletin of Science Technology & Society*, *24*, 177-181. doi: 10.1177/0270467604264992

Duckworth, A. L., Kirby, T. A., Tsukayama, E., Berstein, H., & Ericsson, K. A. (2011). Deliberate practice spells success: Why grittier competitors triumph at the national spelling bee. *Social Psychology and Personality Science, 2(2),* 174-181. doi:10.1177/1948550610385872

Dunn, T. G., & Shriner, C. (1999). Deliberate practice in teaching: what teachers do for self-improvement. *Teaching and Teacher Education, 15*, 631-651.

Ericsson, K. A. (2002). Toward a procedure for eliciting verbal expression on non-verbal experience without reactivity: Interpreting the verbal overshadowing effect within the theoretical framework for protocol analysis. *Applied Cognitive Psychology, 16(8),* 981-987. doi: 10.1002/acp.925

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 79(10),* S70-S81. Retrieved from http://journals.lww.com/academicmedicine/pages/default.aspx

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, P. Feltovich, & R. R. Hoffman (Eds.), *Cambridge Handbook of Expertise and Expert Performance* (pp. 685-706). Cambridge, UK: Cambridge University Press.

Ericsson, K. A. (2008). Deliberate practice and acquisition of expert performance: A general overview. *Academic Emergency Medicine, 15,* 988-994. doi: 10.1111/j.1553-2712.2008.00227.x

Ericsson, K. A., Charness, N., Feltovich, P. J., & Hoffman, R. R. (2006). *The Cambridge Handbook of Expertise and Expert Performance*. New York, NY: Cambridge University Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review, 100*, 363-406.

Ericsson, K. A., Whyte, J., & Ward, P. (2007). Expert performance in nursing: Reviewing research on expertise in nursing within the framework of the expert-performance approach. *Advances in Nursing Science, 30,* E58-E71.

Estabrooks, C. A., Midodzi, W. K., Cummings, G. G., Ricker, K. L., & Giovannetti, P. (2005, March/April). The impact of hospital nursing characteristics on 30-day mortality. *Nursing*

Research, 54(2), 74-84. Retrieved from http://journals.lww.com/nursingresearchonline/Pages/default.aspx

Farrington-Darby, T., & Wilson, J. R. (2006). The nature of expertise: a review. *Applied Ergonomics, 37(1),* 27-32. doi:10.1016/j.apergo.2005.09.001

Feltovich, P. J., Prietula, M. J., & Ericsson, K. A. (2006). Studies of expertise from psychological perspectives. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 41-68). New York, NY: Cambridge University Press.

Gobet, F., & Charness, N. (2006). Expertise in chess. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 523-538). New York, NY: Cambridge University Press.

Gobet, F., & Chassy, P. (2008). Towards an alternative to Benner's theory of expert intuition in nursing: A discussion paper. *International Journal of Nursing Studies, 45,* 129-139. doi:10.1016/j.ijnurstu.2007.01.005

Gobet, F., & Simon, H. A. (1996). Templates in chess memory: A mechanism for recalling several boards. *Cognitive Psychology, 31,* 1-40. doi.org/10.1006/cogp.1996.0011

Haag-Heitman, B. (2008). The development of expert performance in nursing. *Journal for Nurses in Staff Development, 24(5),* 203-211. doi:10.1097/01.NND.0000320690.42061.07

Harris, K. R., Eccles, D. W., Ward, P., & Whyte, J. (2013). A theoretical framework for simulation in nursing: Answering Schiavenato's call. *Journal of Nursing Education, 52(1*), 6-16. doi.org/10.3928/01484834-20121107-02

Helsen, W. F., Starkes, J. L., & Hodges, N. J. (1998). Team sports and the theory of deliberate practice. *Journal of Sport & Exercise Psychology, 20,* 12-34.

Herling, R. W. (2000). Operational definitions of expertise and competence. *Advances in Developing Human Resources, 2(8),* 8-21. doi:10.1177/152342230000200103

Hoffman, R. R., Shadbolt, N. R., Burton, A. M., & Klein, G. (1995). Eliciting knowledge from experts: A methodological analysis. *Organizational Behavior and Human Decision Processes, 62(2*), 129-158. Retrieved from http://eprints.ecs.soton.ac.uk/2301/1/El%20Know%20from%20Exp%20OBHD.pdf

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*: The National Academies Press.

Jasper, M. A. (1994). Expert: a discussion of the implications of the concept as used in nursing. *Journal of Advanced Nursing, 20,* 769-776. doi:10.1046/j.1365-2648.1994.200040769.x

Keith, N., & Ericsson, K. A. (2007). A deliberate practice account of typing proficiency in everyday typists. *Journal of Experimental Psychology: Applied*, *13(3*), 135-145. doi:10.1037/1076-898X.13.3.135

Kendall-Gallagher, D., Aiken, L. H., Sloane, D. M., & Cimiotti, J. P. (2011). Nurse specialty certification, inpatient mortality, failure to rescue. *Journal of Nursing Scholarship*, *43(2*), 188-194. doi.org/10.1111/j.1547-5069.2011.01391.x

Kendall-Gallagher, D., & Blegen, M. A. (2009). Competence and certification of registered nurses and safety of patients in intensive care units. *American Journal of Critical Care*, *18(2*), 106-113. doi.org/10.4037/ajcc2009487

Kuiper, R. A., & Pesut, D. J. (2004). Promoting cognitive and metacognitive reflective reasoning skills in nursing practice: self-regulated learning theory. *Issues and Innovations in Nursing Education*, *45(4)*, 381-391. doi:10.1046/j.1365-2648.2003.02921.x

Lie, H. (2011). *Deliberate practice in professional speaking expertise* (Unpublished doctoral dissertation). University of San Francisco, San Francisco, California. Retrieved from http://gradworks.umi.com/34/93/3493859.html

McGaghie, W. C., Issenberg, S. B., Cohen, E. C., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic Medicine: Journal of the American Association of Medical Colleges*, *86(6)*, 706-711. doi:10.1097/ACM.0b013e318217e119

McHugh, M. D., & Lake, E. T. (2010). Understanding clinical expertise: Nurse education, experience, and the hospital context. *Research in Nursing and Health*, *33*, 276-287. doi.org/10.1002/nur.20388

Meretoja, R., Isoaho, H., & Leino-Kilpi, H. (2004). Nurse competence scale: Development and psychometric testing. *Journal of Advanced Nursing*, *47*, 124-133.

Morrison, S. M., & Symes, L. (2011). An integrative review of expert nursing practice. *Journal of Nursing Scholarship*, *43(2)*, 163-170. doi:10.1111/j.1547-5069.2011.01398.x

Nesbitt, J. C., St. Julien, J., Absi, T. S., Ahmad, R. M., Grogan, E. L., Balaguer, J. M., ... Putnam, J. B. (2013). Tissue based coronary surgery simulation: Medical student deliberate practice can achieve equivalency to senior surgery residents. *Journal of Thoracic Cardiovascular Surgery*, *145*, 1453-1458. doi.org/10.1016/j.jtcvs.2013.02.048

Nunn, R. (2008, October). A network model of expertise. *Bulletin of Science, Technology & Society*, *28(5*), 414-427. doi: 10.1177/0270467608322587

Oermann, M. H., Kardong-Edgren, S., Odom-Maryon, T., Hallmark, B. F., Hurd, D., Rogers, N., ... Smart, D. A. (2011, September/October). Deliberate practice of motor skills in nursing

education: CPR as exemplar. *Nursing Education Perspectives, 32(5),* 311-315. doi:10.5480/1536-5026-32.5.311

Powell, J. H. (1989). The reflective practitioner in nursing. *Journal of Advanced Nursing, 14,* 824-832. doi:10.111/j.1365-2648.1989.tb01467.x

Price, J., Naik, V., Boodhwani, M., Brandys, T., Hendry, P., & Lam, B. K. (2011). A randomized evaluation of simulation training on performance of vascular anastomosis on a high-fidelity in vivo model: the role of deliberate practice. *The Journal of Thoracic and Cardiovascular Surgery, 142(3),* 496-503. doi:10.1016/j.jtcvs.2011.05.015

Simon, H. A., & Chase, W. G. (1973). Skill in chess. *American Scientist, 61,* 394-403.

Sonnentag, S., & Kleine, B. M. (2000). Deliberate practice at work: A study with insurance agents. *Journal of Occupational and Organizational Psychology, 73,* 87-102. Retrieved from http://kops.ub.uni-konstanz.de/handle/comm-4/browse?offset=5540&type=type&value=article

Tourangeau, A. E., Doran, D. M., McGillis Hall, L., O'Brien Pallas, L., Pringle, D., Tu, J. V., & Cranley, L. A. (2007). Impact of hospital nursing care on 30-day mortality for acute medical patients. *Journal of Advanced Nursing, 57(1*), 32-44. doi:10.1111/j.1365-2648.2006.04084.x

Van de Wiel, M. W., Szegedi, K. H., & Weggeman, M. C. (2004). Professional learning: Deliberate attempts at developing expertise. In H. P. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional Learning: Gaps and Transitions on the Way from Novice to Expert* (pp. 181-206). Retrieved from http://www.link.spring.com

Ward, P., Hodges, N. J., Starkes, J. L., & Williams, A. M. (2007). The road to excellence: Deliberate practice and the development of expertise. *High Ability Studies, 18,* 119-153. doi:10.1080/13598130701709715

Wayne, D. B., Butler, J., Siddall, V. J., Fudala, M. J., Linquist, L. A., Feinglass, J., ... McGaghie, W. C. (2005). Simulation-based training of internal medicine residents in advanced cardiac life support protocols: A randomized trial. *Teaching and Learning in Medicine, 17(3),* 202-208. doi:10.1207./s15328015tlm1703_3

Whyte, J., Ward, P., & Eccles, D. W. (2009). The relationship between knowledge and clinical performance in novice and experienced critical care nurses. *Heart & Lung, 38(6*), 517-525. doi: 10.1016/j.hrtlng.2008.12.006

Whyte, J., Ward, P., Eccles, D. W., Harris, K. R., Nandagopal, K., & Torof, J. M. (2012). Nurses' immediate response to the fall of a hospitalized patient: A comparison of actions and cognitions of experienced and novice nurses. *International Journal of Nursing Studies, 49,* 1054-1063. doi:10.1016/j.ijnurstu.2012.03.005

Zimmerman, B. J. (2006). Development and adaptation of expertise: The role of self-regulatory processes and beliefs. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 705-722). New York, NY: Cambridge University Press.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25(1)*, 3-17. doi:10.1207/s15326985ep2501_2

Zimmerman, B. J. (2002). Becoming a self-regulated learner: an overview. *Theory into Practice*, *41(2)*, 64-70. doi:10.1207/s15430421tip4102_2

Chapter III

Measurement of Deliberate Practice in Nursing: Development of the Deliberate Practice in Nursing Questionnaire

This chapter describes the development and content validation of a self-administered questionnaire to assess the deliberate practice activities of critical care nurses. It then reports results of a survey study conducted to further validate the questionnaire and presents in detail the methodology used in developing a standardized score for the instrument.

Background

The seminal study of deliberate practice, conducted in musicians, lead to the development of a framework for explaining expert performance based not on one's innate abilities or talent but as the result of an individual's sustained effort to improve (Ericsson, Krampe, & Tesch-Romer, 1993). It explored violinists' and pianists' perceptions of activities most relevant to performance improvement and discovered that solitary practice was most relevant. They identified that "deliberate practice" activities were considered effortful and aimed at improvement.

Similarly, studies looking at expert performance in tournament-rated chess players identified cumulative hours of time spent studying alone as the single best indicator of chess rating (Charness, Tuffiash, Krampe, Reingold, & Vasyukova, 2005). Unlike in music and chess where solitary practice was found most relevant to expert performance, researchers have found that in some sports the development of expertise is related to both individual and team practice efforts (Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Starkes, & Williams, 2007).

In the areas of music, sports and chess the practice efforts leading to improvement are relatively easily identified and observed and well-structured. In other domains, such as in the professional domains, it is not as easy to define and assess improved performance compared to some standard. Dunn and Shriner (1999) spearheaded the suggestion that deliberate practice activities may look very different across these less or ill-structured professional domains yet serve the same purpose—to improve specific aspects of performance. They took a first-step towards identifying what may constitute deliberate practice in an ill-structured domain by applying the deliberate practice framework to the profession of teaching. They found that deliberate practice in the profession of teaching may be activities regularly done by teachers to accomplish their mission of teaching, fully knowing which activities did and did not lead to improvement; all the while planning evaluating and revising so that students could improve (Dunn & Shriner, 1999).

Sonnentag and Klein (2000) studied deliberate practice activities of insurance sales agents. They defined deliberate practice as aimed at improving performance and performed on a regular basis, not only done for task accomplishment or performed only sporadically, much like Dunn and Shriner (1999) did in their study of teachers. They found that insurance agents did engage in deliberate practice activities such as mental simulation, or imagining a challenging case with a client and thinking through ways of handling the situation, and asking for feedback. This type of deliberate practice a sharp contrast to the well-structured activities identified in the domains of sports, music and chess. They did not however find that performance was predicted by the cumulative amount of time spent in deliberate practice, attributing it to the shortcomings of the participants' retrospective accounts of deliberate practice and/or the continuous emergence of new developments in the domain making old knowledge quickly obsolete.

The definition of deliberate practice was extended further in a study of everyday (not expert level) typists conducted by Keith and Ericsson (2007). Both taking a typing class and adopting a speed goal everyday were identified as deliberate practice activities of everyday typists in order to attain higher levels of typing performance. They found that typing experience was related to performance but consistent with deliberate practice theory; highest levels of performance were achieved by those who reported they had attended a typing class in the past and reported adopting a daily speed goal. Extending the theory of deliberate practice, this study found that performance was enhanced whether or not the deliberate practice was done to improve performance or for another reason (to get done quicker).

Haag-Heitmann (2008) established that deliberate practice was indeed an important influence in the attainment of nursing expert performance. In this qualitative study of expert nurses, it was identified that subjects engaged in deliberate activities to enhance skill and knowledge throughout their career and considered themselves self-directed, lifelong learners. Deliberate practice included: (1) attaining formal education (2) attending clinical in-service classes and seminars (3) attaining specialty certifications (4) asking questions (5) de-emphasizing fear of failure (6) teaching/coaching others, and (7) using written references and electronic resources.

An extensive questionnaire assessing deliberate practice of nurses was developed in 2009 by Whyte, Ward, & Eccles and used in a study of 22 critical care nurses that measured the knowledge and performance of two nursing groups in a simulated task environment assessing their control of the physiologic deterioration of patients with respiratory compromise. This study compared performance and knowledge in novice *(<1 year of experience in critical care, n=10*) and experienced (*at least 7 years of experience in critical care, n=12*) nurses. It found that

experienced nurses embody superior knowledge compared with novice nurses but no significant difference was found in superior clinical performance between the two groups. Nurses who performed at the higher level went above and beyond their normal duties; achieved board certification in critical care nursing, instructed in a paramedic program, instructed in advanced cardiac life-support and pediatric advanced life-support courses—extensive voluntary practice and study in addition to their normal duties. These activities may encompass the type of deliberate practice that is representative of some of the ill-structured professions, extending the definition of deliberate practice to include aspects of everyday work tasks. Specialization, certification, or taking classes may be a sufficient qualification of deliberate practice given that the main goal is to improve performance.

Hence, studies of deliberate practice in professional domains have broadened the definition of deliberate practice lending utility to the study of expertise development in many domains (see Table 6 for a summary of indices of deliberate practice in other domains). In short, these studies have found that: (1) deliberate practice may include team practice as well as solo practice, (2) deliberate practice may be considered a regular part of everyday work-related activities, (3) deliberate practice may have a goal other than skill improvement and, (4) long-term cumulative practice may not predict better performance in domains with changing developments, current practice may be a better predictor.

Table 6
Indices of Deliberate Practice Related to Performance by Domain

Domain	Best Index of Deliberate Practice Related to Performance
Music and Chess (Ericsson, et al, 1993; Charness, et al., 2005)	Cumulative hours of solo practice
Sports (Ward et al., 2007)	Weekly and cumulative hours of solo and team practice

Spelling Bees (Duckworth, et al., 2011)	Cumulative time preparing for competition
Typing (Keith & Ericsson, 2007)	Cumulative time typing since introduction to the keyboard in addition to taking a typing class and adopting a speed goal whether or not it is specific to improving performance or another goal (getting job done faster)
Teaching (Dunn & Shriner, 1999)	Activities that teachers regularly do to accomplish the mission of teaching and may be aimed at improving student learning; carried out while being fully mindful of which are effective or not and actively chose to make an effort to look for better ways of teaching that can lead to improvement
Insurance Sales (Sonnentag & Kleine, 2000)	Amount of current time spent doing deliberate practice activities and number of cases handled
Strategic and Organizational Management (van de Wiehl, Szegedi, & Weggemann , 2004	Cumulative practice hours of work-related activities done with the intention to learn

Deliberate Practice in Nursing Questionnaire Development

The development of an instrument to measure the deliberate practice activities of critical care nurses was conducted in this study and included four phases (DeVellis, 1991; Zozula, Bodow, Yatcilla, Cody, & Rosen, 2001). The specific phases were: initial item selection, expert panel review, reliability and validity assessment, and final item selection and validation. Each phase of instrument development is described in detail below.

Phase 1: Initial Item Selection

Phase I of instrument development entailed initial item selection. Initial instrument items were developed based on a literature review and an existing questionnaire developed by Whyte and colleagues (2009) used to gain information about nurses' training, experience and information-seeking habits. All deliberate practice literature was reviewed to understand how it works as a framework for expertise development. With nursing being a professional domain, the

literature review particularly focused on studies of deliberate practice in professions. This narrowing of an abundance of literature on deliberate practice allowed for the ability to concentrate on the measurement efforts of areas or domains that tend to be less structured than the traditional areas of deliberate practice research such as sports, music and chess. Areas reviewed included teaching, typing, insurance sales, medicine and nursing.

Questionnaire items were developed that paralleled aspects identified by Haag-Heitman (2008) as specific to deliberate practice in nursing. Additionally, specific questions were drawn and adapted from those used in the questionnaire developed by Whyte and colleagues (2009) assessing nurses' training, experience and information-seeking habits. They collected additional information about self-regulated learning activities of nurses and professional membership in organizations.

Items for the instrument in this study elicited information about formal education, continuing education, self-regulated learning/self-development, certifications, precepting, and organizational memberships. Demographic information such as age, race, gender, work unit, and experience were also collected. The initial questionnaire consisted of 24 questions (see Appendix A).

It is implied that the deliberate practice activities are done with the goal of skill improvement. For instance, studies have shown that nurses obtain specialty certification to gain specialized knowledge, for professional growth and challenge (Byrne, Valentine, & Carter, 2004; Haskins, Hnatiuk, & Yoder, 2011). In a study conducted by Cary (2001) of a random sample of 19,452 nurses from the registries of 23 certifying organizations in the United States, Canada, and U.S. territories, it was found that nurses sought certification for personal reasons. They wanted to acquire knowledge in their specialty areas and agreed that attaining specialty certification had a

favorable impact on their quality of patient care delivery (Cary, 2001). Similarly, continuing formal education would be sought after with the goal of personal improvement. Self-regulated learning/self-development activities such as seeking out information about patients, clinical situations or general knowledge, reading nursing or health care-related materials or participating in simulation activities could be considered deliberate practice if they were performed with the specific intention of improving performance. Continuing education activities such as mandatories and CEUs could be considered deliberate practice if the nurse went above and beyond institution and state requirements, identifying those seeking deliberate opportunities for expertise enhancement. Moreover, precepting entails specialized training (Moore, 2008) and is an activity that may not always be inherently enjoyable, a defining characteristic of a deliberate practice activity. Studies have shown that precepting can be stressful due to the increased workload of teaching and having a patient assignment (Hautala, Saylor, & O'Leary-Kelley, 2007).

Phase 2: Expert Panel Review

Content validity of the initial deliberate practice questionnaire was examined by an expert panel of five nurses. Content validity studies are important as they provide the researcher with objective feedback about new measures. This allows for revisions to the instrument if necessary prior to dissemination, saving both time and money (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). All five expert reviewers were in academia; three PhD and two DNP prepared nurses. Experts were chosen based on their knowledge of the topic area, with five being an appropriate number of panel members to provide a sufficient level of control for chance agreement (Lynn, 1986). Experts were contacted via email correspondence, provided details about the study and invited to participate as an expert reviewer. Upon agreeing to take part, a hard copy of the

questionnaire was placed in each one of the panel members' office mailboxes. The questionnaires were placed in large campus mail envelopes and included a structured plan for the evaluation of each individual item and the questionnaire as a whole.

Evaluation Criteria

Three criteria were used to evaluate each individual item in the questionnaire. First, each individual item was rated on its **clarity of wording**. The experts were asked the following question regarding this content validity area: (1) How clear was this question? (For example, were you able to understand what the question was asking the first time you read it?) Experts rated each individual item's clarity of wording on a scale from 1 to 5 (*very unclear, unclear, fairly unclear, clear, very clear*).

The second criterion evaluated was the **representativeness of the content domain** for each item. The experts were asked to rate each item in this content validity area based on the following question: (2) How would you rate this item's relevance/importance to the concept of "deliberate practice" in nursing? Representativeness of the content domain was rated from 1 to 5 (*not at all important, very unimportant, neither important nor unimportant, very important, extremely important*).

The third and final criterion evaluated was the **ease of recall/level of difficulty in answering** individual items. The following question addressed this content validity area: (3) How would you rate this item's level of difficulty? (For example, how difficult was it to recall the information needed to answer this question?) The question's level of difficulty was also rated on a 1 to 5 scale as *very difficult, difficult, neutral, easy, or very easy*. Space for comments related to each individual item was provided. At the end of the questionnaire, an 'additional feedback' section was provided to experts soliciting information about the questionnaire as a

whole. All five experts returned the questionnaire, rated items and provided feedback throughout the questionnaire.

Phase 3: Reliability and Validity Assessment

In order to determine how reliable the experts were in their rating of the questionnaire items, the inter-rater agreement (IRA) was calculated (Lynn, 1986). The IRA for all three content validity areas, (1) clarity of wording (2) representativeness of the content domain, and (3) ease of recall/level of difficulty in answering was calculated for each item. This was calculated for clarity of wording by dichotomizing the data into categories of (1) *very clear, clear and fairly clear* or (2) *unclear and very unclear*. Representativeness of content domain was dichotomized into (1) *extremely important, very important* and (2) *neither important nor unimportant, very unimportant, and not at all important*. Last, east of recall/level of difficulty was dichotomized into (1) *very easy, easy* and (2) *neutral, difficult, and very difficult*. The items that the experts rated in the one and two categories were counted and the agreement among the experts on each individual item was calculated. The conservative approach is to divide the total number of items considered 100% reliable by the total number of items; a less conservative approach being to divide items that have at least 80% reliability by the total number of items. The conservative approach is recommended for samples of experts that exceed five so this panel is on the border of the two approaches (Lynn, 1986; Rubio et al., 2003). See Table 7 for results of both approaches.

Table 7
Interrater Agreement of Initial DPNQ

Category	≥ 80 % Interrater Agreement	100% Interrater Agreement
Clarity of question	.92	.63
Relevance/importance of content to deliberate practice	.96	.75
Level of difficulty in answering	.92	.54

The content validity index (CVI) of the questionnaire was calculated based on the representativeness of the measure. The CVI was computed for each individual item and for the entire measure. The CVI for each individual item was calculated by counting the number of experts who rated the item as the dichotomized variable (1) *extremely important, very important,* as mentioned above in reference to the calculation of IRA, and dividing that number by five (the total number of experts on the panel), deeming the item as content valid (Lynn, 1986). The CVI for the items ranged from .60 to 1.0 (see Table 8). The CVI for the measure was estimated according to Davis (1992) by calculating the average CVI across all 24 items in the questionnaire. The CVI for the questionnaire as a whole was .94 which was above the .80 criteria recommended for new measures (Davis, 1992). Eighteen of the 24 items in the questionnaire had a CVI of 1.00 and 23 items had a CVI of .80 or greater.

Table 8
Content Validity Indices for Initial Items of DPNQ

DPNQ Item	Representativeness of Content Domain CVI
DPNQ 1	.60
DPNQ 2	.80
DPNQ 3	1.00
DPNQ 4	1.00
DPNQ 5	1.00
DPNQ 6	1.00
DPNQ 7	1.00

DPNQ 8	1.00
DPNQ 9	1.00
DPNQ 10	1.00
DPNQ 11	1.00
DPNQ 12	1.00
DPNQ 13	1.00
DPNQ 14	1.00
DPNQ 15	1.00
DPNQ 16	1.00
DPNQ 17	.80
DPNQ 18	.80
DPNQ 19	1.00
DPNQ 20	.80
DPNQ 21	.80
DPNQ 22	1.00
DPNQ 23	1.00
DPNQ 24	1.00

Phase 4: Final Item Selection and Revision

Based on expert feedback and comments, modifications to existing questions were made such as changes to phrasing and response options. For example, item #2 phrasing was changed from "Are you currently enrolled in any formal nursing program?" to "Are you currently enrolled in a formal nursing degree program?". Response options for some items were also changed, for example, item # 12 asked how often one sought out information about the disease process of the patient they were caring for. Responses were changed from: *every shift worked, most shifts worked, some shifts worked, very seldom* to *all of the time (100% of shifts worked), often, sometimes (50% of shifts worked), rarely and never*. Item #1 with the very low CVI of .60 was removed. Six new questions were added based upon this process and further review of the literature. Six of the questions in the final questionnaire are "skip logic" questions that elicit additional information from participants who answer "yes" only. These questions are related to education, continuing formal education, simulation and precepting.

The final questionnaire consisted of 29 deliberate practice items and 10 items eliciting demographic, experience and education information, with a total of 39 questions (see Appendix B). Table 9 summarizes questionnaire items and categories.

Table 9
Questionnaire Items and Categories

Number of Questions in Questionnaire	Questionnaire Category/ Deliberate Practice Activity
5	Demographics
3	Experience
1 (+1)	Education
3 (+2)	Continuing Formal Education
8	Continuing Professional Education (CEUs, grand rounds, in-services, mandatories, conferences)
2	Specialty Certifications
8 (+1)	Self-regulated Learning/Self-development (seeking out info at work, in general, reading healthcare info, simulation)
2 (+2)	Precepting
1	Professional Organization Membership
39	Total

Testing of Deliberate Practice Questionnaire

Testing of the revised deliberate practice questionnaire was conducted in order to further validate the instrument and identify any potential errors in the electronic formatting and electronic survey administration (Rubio et al., 2003). Preliminary tests may be conducted to uncover flaws in study design, instruments or methodology without large usages of time and money. Moreover, they serve the purpose of refining data collection instruments and assessing problems in data collection techniques (Brink & Wood, 1998). Thus, the initial study used an

electronic survey format via Qualtrics© survey software based on a modified Dillman method of data collection (Dillman, Smyth, & Christian, 2009).

Dillman's tailored survey design method takes into account the context in which the survey is being administered. It is a scientific approach with three underlying considerations: (1) reducing the four sources of survey error—coverage, sampling, nonresponse, and measurement, (2) developing a set of procedures that work together, encouraging everyone in the sample to respond, and (3) developing procedures that foster social exchange and survey response by considering survey sponsorship, nature of the survey population, and content of the survey questions (Dillman et al., 2009).

Reduction in coverage error involves choosing the correct survey mode or modes to adequately cover your population of interest. *Coverage error* in large part occurs when not all known members of the population of interest have a chance of being included in the sample survey and when there is a difference between those who are included and excluded (Dillman et al., 2009). To avoid coverage error, updated university email lists used by unit management were used for study recruitment.

Sampling error is inherent in all sample surveys, resulting from sampling some rather than all of a survey population (Dillman et al., 2009). This study was a study of three critical care units. Since it utilized a convenience sample, some error in the estimates will be present.

Not all individuals in a sample will respond to a request to participate in a survey, causing nonresponse error to occur. *Nonresponse error* happens when there is a difference between those individuals in a survey sample that do and do not respond that is of importance to the study (Dillman et al., 2009). In order to reduce nonresponse error, carefully worded reminder

emails were used that contained language that was not only meaningful to the respondent but relayed the importance of the survey to the individuals, the PI and to the state of nursing practice.

Careful consideration of questionnaire construction, especially when self-administered is necessary to avoid measurement error. *Measurement error* occurs from inaccurate respondent answers due to the questionnaire design, layout and wording of questions (Dillman et al., 2009). Particular emphasis was placed on deliberate practice questionnaire development rigor and verification of content validity. In considering design, Qualtrics ©, a generalized University survey service, was utilized for distributing the web-based survey. To maintain a consistent visual stimulus, a standardized University School of Nursing design was chosen that was consistent with the theme also used in study recruitment and reminder emails and unit flyers. Informative opening and closing screens, thorough directions, encouraging messages throughout the survey such as "thanks for your input" and "almost done", and consistent, carefully thought out page layouts were all implemented in order to decrease measurement error.

Dillman applied the Social Exchange Theory to the tailored design method as an overarching framework for increasing response rate. Social exchange theory proposes that "people's voluntary actions are motivated by the return these actions are expected to, and often do, bring from others" (Dillman et al., 2009, p. 22). This framework defines *rewards* as what one expects to gain from a particular action and *costs* as what one will have to give up, or spend, to gain rewards. People thus engage in social exchange with others when the perceived rewards outweigh the costs (Dillman et al., 2009). The social exchange framework is one way to motivate individuals to respond to surveys, asking three key questions pertaining to how the design of a questionnaire and the process of delivery can motivate people to respond (Dillman et al., 2009, p. 23):

(1) How can the perceived rewards for responding be increased?

(2) How can the perceived costs of responding be reduced?

(3) How can trust be established so that people believe the rewards will outweigh the costs of responding?

In addressing question one; many tactics were applied to increase the rewards of participation in the study. Pre-notification emails were sent out to RNs on the participating units. All three units received invitation to participate emails asking for their help in the study that contained specific information about the purpose of the survey, how it impacts practicing nurses and expertise, how the results would be used and, highlighting the importance of participating. The email showed positive regard, and gave the primary investigator's name and email address to contact with any questions or concerns. Verbal appreciation of "thank you in advance for your time and thoughtful answers" was also included in correspondence. Most importantly, a token financial incentive of a $10 hospital-wide coffee house/bagel shop/café gift certificate was offered to all participants who completed the electronic survey.

Ways of decreasing the perceived costs of participation, as asked in question two were addressed in two main fashions; first, the survey was offered electronically via a web survey sent directly to the participants' work email addresses, easily accessible to all potential participants. Since the survey took 20 to 30 minutes to complete, each participant also received their own personalized link that allowed them to 'save and continue' the survey at their convenience. Second, the invitation email requesting study participation avoided language that could make the respondent feel subordinate to the surveyor, decreasing what may feel like a reward to the participant (Dillman et al., 2009).

In order for participants to want to complete a survey, they must trust that the benefits outweigh the costs. Ways of establishing this trust as addressed in question three were threefold; obtaining sponsorship by a legitimate authority, making the task appear important and ensuring confidentiality and security of information (Dillman, et al., 2009). Sponsorship of the project was first obtained from the Research Director of the health system and relayed to the unit management. Unit management then sent out the emails to their unit staff endorsing the study and encouraging participation. All email communication and unit flyers included the University School of Nursing logo. The survey design also included University School of Nursing logo and University colors, ensuring its affiliation. Last, trust was established by ensuring the confidentiality and security of the participant's survey responses in both the email communications prior to survey inception and at the introduction of the electronic survey. With close attention paid to the modified Dillman methodology, cross-sectional, survey data collection facilitated testing of the deliberate practice questionnaire.

Methods

Study Design

A cross-sectional, descriptive study design was used to assess the deliberate practice activities of critical care nurses in the acute care setting. The use of descriptive designs is considered appropriate when the phenomenon of interest has not been widely studied (Brink & Wood, 1998). Expertise development via deliberate practice has been widely studied in many different domains but little research exists in the field of nursing, making the chosen design appropriate (Ericsson et al., 2007; Haag-Heitman, 2008; Whyte et al., 2009).

Sample and Setting

A convenience sample (N = 225) of medical and surgical critical care registered nurses (RN) was selected for use in this study. The sample was obtained from one large Midwestern teaching hospital that agreed to participate. Three critical care units, a critical care medical unit (CCMU), a surgical intensive care unit (SICU), and a trauma/burn intensive care unit (TBICU) were all included in the study. A total of 92 electronic questionnaires were completed with an overall response rate of 41%. Response rates by unit were as follows: SICU; 47/90= 52%, TBICU; 30/59 = 51%, and CCMU; 15/76 = 20%.

Inclusion and Exclusion Criteria

In order to be included in the study, participants had to be a critical care RN. Critical care nursing included experience in the emergency department, intensive care, post-anesthesia care, and/or survival flight areas. Exclusion criteria included non-RN employees such as LPN's, nurse technicians, nursing assistants, patient care assistants, and student nurses.

Procedure

Approval for the study was obtained from the institutional review board (IRB) of the medical center (see Appendix C). The survey was delivered electronically via Qualtrics© survey software. The survey was anonymous with all identifying information removed from individual responses. Data were kept on a password-protected computer accessible only to the primary investigator (PI).

Administrative permission from the Research Director of the health system was obtained to contact nurse managers of three participating units. Face-to-face meetings were conducted with unit managers to apprise them of the purpose of the study prior to inception. The PI also attended a "unit-based committee meeting" on the CCMU to present the research study for recruitment purposes.

Recruitment on two of the units (CCMU and SICU) involved nurse management sending out an email encouraging and inviting all unit RN's interested in participating in the study to send the investigator their email addresses. Nurses willing to participate in the study were then sent a personal invitation email message containing the purpose of the study, by whom and why it was being conducted, the estimated time needed to complete it, a personalized link (URL) to the survey and who to contact with any questions or concerns (See Appendix D for email). Upon agreement of the nurse manager of the third unit (TBICU), email addresses of all staff RN's were provided and an invitation email to participate in the study was sent out to everyone with the above mentioned information.

Implied consent was included in the survey directions and was obtained if the nurses completed the survey. Flyers were placed in the nursing conference and report rooms of all three units (See Appendix E for flyer). Gentle reminder emails were sent out weekly to study participants who had not yet completed the questionnaire (see Appendix F for reminder emails). Surveys were due within 2 to 4 weeks from the time they were sent.

All participants completing the survey received a study incentive. Study incentives were made possible via application and awarding of the Rackham Graduate Student Research Grant to the PI through the Rackham Graduate School. The incentive was a $10 gift certificate redeemable at any Aramark café. Aramark cafés were chosen as they are conveniently located throughout the medical center where the study participants work. Study participants upon completion of the survey received automated thank you emails which were printed and taken to the respective unit hosts and/or unit management for redemption of their study incentive. University Human Subject Incentive Program (HSIP) protocol was adhered to. The investigator attended HSIP training and study participants completed appropriate incentive documentation.

Variables

Deliberate Practice

Deliberate practice included information regarding nurses' participation in continuing formal education, continuing professional education, specialty certifications, self-development and self-regulated learning, precepting new orientees and professional organization membership involvement.

Experience

Experience was captured as three continuous variables. Respondents were asked to provide the total number of years they have been an RN, the total number of years they have practiced as an RN and the total number of years they have practiced as a critical care RN.

Education

Education was represented as a categorical variable asking for respondents' education background both in nursing and in other fields. Categories consisted of *LPN/certificate, RN diploma in nursing, Associate's degree in nursing, Bachelor's degree in nursing, Master's degree in nursing or other field, Doctorate in nursing or other field* (specifying type of nursing doctorate; DNP, DNSc, PhD), and *Other degree*.

Other Key Variables

Demographic variables in the study were age, sex, race, unit currently working on, and average number of hours per week worked in a critical care unit the last year. Response categories included: *1-19 hours, 20-32 hours, 33-48 hours, and 49 or more hours.* Critical care units were identified as emergency department, intensive care unit, post-anesthesia care unit, or survival flight; environments where critically ill patients require care (AACN, 2003).

Data Analysis

Data were analyzed using the statistical software for the social sciences (SPSS) software Version 21. Data were downloaded directly from the Qualtrics © survey software to the statistical software. Descriptive statistics were used to examine the demographics and main study variables of the questionnaire.

Results

Demographics

The sample (*n*=92) consisted of medical and surgical intensive care nurses from one large teaching hospital in the Midwestern U.S. Nearly two-thirds of the respondents held a Bachelor's degree as their highest level of nursing education (*n*=58, 63%) with an average of 13 years of experience practicing as an RN (*SD*=9.5). The majority were white (94.6%, *n* = 87) and between the ages of 23 and 61 years. A little over half of respondents were female (54.3%, *n* = 50) and a majority (86%, *n*=79/91) worked an average of 33-48 hours per week.

Univariate Analysis of Deliberate Practice Categories

Continuing Formal Education

Seventeen percent of respondents were currently enrolled in a formal nursing program (*n*=16). Forty percent (*n*=37) had taken an undergraduate class and 19% (*n*=17) had taken a graduate level class since graduating from their first nursing program. The majority of those classes taken were nursing courses (undergraduate nursing classes, n=34/37, 92%; graduate nursing classes, n= 16/17, 94%).

Continuing Professional Education

According to the Michigan Department of Licensing and Regulatory Affairs, (State of Michigan, 2014), RN's are required to earn 25 contact hours or 2.5 continuing education units (CEUs) within a two year cycle of licensure. Forty-two percent (n=39) of the nurses indicated

that they had completed the number that was required for state licensure and a little over half (55%, n=51) completed more than required.

Nurses were asked how many nursing or health care-related programs or conferences they attended, both within and outside of the workplace, which varied in length from a half a day to a week. The most frequently attended was the full day (n=64/92, 70%) program or conference within the workplace. The least frequently attended was a program or conference that was inside of the workplace and longer than 3 days (n=14/92, 15%). See Table 10 for full results.

Table 10
Descriptives of Number of Conferences or Programs Attended Within and Outside Workplace

Conference or Program	**Number of Conferences/Programs Attended (%)**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**≥8**
Within Workplace								
Half Day	23 (37)	11(18)	4(6)	12(19)	3(5)	3(3)	1(1)	6(7)
Full Day	23(36)	20(31)	7(11)	6(9)	1(2)	0(0)	2(3)	5(8)
2-3 Days	15(56)	8(30)	0(0)	0(0)	1(3.7)	1(3.7)	0(0)	2(2.2)
>3 Days	11(78.6)	1(1.1)	0(0)	0(0)	0(0)	0(0)	0(0)	2(2.2)
Outside of Workplace								
Half Day	11(41)	5(19)	4(15)	1(4)	1(4)	0(0)	1(4)	4(15)
Full Day	1(38)	12(30)	6(15)	2(5)	4(10)	0(0)	0(0)	1(3)
2-3 Days	14(70)	1(5)	2(10)	1(5)	1(5)	0(0)	0(0)	1(5)
>3 Days	9(53)	6(35)	0(0)	0(0)	1(6)	0(0)	0(0)	1(6)

Nursing grand rounds are presentations given by nurses who share a particular nursing care focus (Armola, Brandeburg, & Tucker, 2010). They allow for teaching and learning

opportunities to support professional development and are a format for knowledge acquisition (Wolak, Cairns, & Smith, 2008). Sixty-nine percent (n=61/88) of nurses who responded did not attend any grand rounds in the last year. The number of in-services of at least one hour in duration attended on nurses' specific units ranged from zero to 20 (*M*=3.01, *SD*=3.14), and off nurses' specific units ranged from zero to 10 (*M*=1.53, *SD*=1.80).

Mandatories and unit competencies are one-time and annual staff training to ensure patient and staff safety. Many are core mandatories and are required by every employee in the hospital. Others are required in specific areas only. Many mandatories and competencies can be available for those who are interested in training and learning but are not required. Of those nurses surveyed, most (91%, n=73/80) responded that they completed the number of mandatories that was required for their specific unit. Only 9% (n=7/80) completed more than was required.

Specialty Certification

Eighty-six percent (n=79) of nurses surveyed indicated that they held specialty certifications (*M*=2.27, *SD*=1.62). Licensures such as RN and basic cardiac life support (BCLS) were excluded as they are standard requirements for all critical care nurses. Half of those respondents who were certified (n=40) indicated that they held one certification, 11% (n=9) had two, 14% (n=11) held three, 17% (n=13) had four, 6% (n=5) held six, and one (1%) participant had seven. Sixty-one percent (n=49/80) of respondents who held certifications also indicated that they were all required by their employer. Some of the most common certifications that nurses from these units identified having were advanced cardiac life support, advanced burn life support, pediatric advanced life support, and critical care registered nurse certification.

Self-Regulated Learning/Self-Development

The average number of hours per week nurses spent reading nursing, medical, or health care-related information such as journal articles, books, websites or pamphlets was 3 hours (range, 0-20; *SD*=3.7). Almost two-thirds of the respondents read one (n=21, 27%) to two (n=26, 33%) hours a week. When nurses were asked about information seeking behaviors, over half (60%) indicated that they *often* sought out information about the specific disease process of the patient that they were caring for, 51% *often* sought out information about a specific clinical problem such as pathophysiology, equipment or a procedure, and 59% *often* sought out information in order to broaden their general knowledge. Nurses who always sought out information in those areas were 19%, 19% and 11% respectively, with fewer nurses tending to seek out information to broaden their general knowledge than for a specific purpose.

Clinical simulation was defined as a technique used to re-create real-life situations in order to practice and/or gain skills in a safe environment. A 'simulated' patient should be thought of as either a real person playing the role of a real patient, a manikin, a high-fidelity simulator, or a computerized 'virtual' patient. Nurses were asked to identify the types of simulation experiences they had encountered since becoming an RN and within the last two years. As can be seen in Table 11, almost two-thirds (n=67) of the nurses had encountered high-fidelity simulation, roughly a quarter (n=22) experienced low-fidelity simulation, a handful (n=10, 11%) virtual reality, but many (70%, n=64) had role played. More specifically, when asked about simulation experiences aimed at performance improvement with and without instruction and feedback opportunities, most nurses (n=76/91, 84%) had not done simulations without instruction in the past two years and a little more than half (n=48/90, 53%) indicated having not done simulation with instruction in the past two years. This result was most likely due to the fact that the question indicated that certification simulations were to be excluded as certification

deliberate practice was already being accounted for when asking about specialty certifications. Simulation was indicated for practicing procedures such as needle decompression and placement of intraosseous devices, post-pyloric bridles, feeding tubes and IVs. Also indicated was its use in improving performance in scope use and airway management, rapid infusion pump use, continuous renal replacement therapy. cardiac arrest management and mock codes, and stroke evaluation.

Table 11
Nurses' Simulation Experiences since Becoming an RN and in Past Two Years

Type of Simulation Experience	Frequency n	Percent %
Since becoming an RN:		
High-fidelity	67	72.8
Low-fidelity	22	23.9
Virtual Reality	10	10.9
Role Play	64	69.6
None	8	8.7
Past Two Years:		
High-fidelity	53	57.6
Low-fidelity	23	25.0
Virtual Reality	9	9.8
Role Play	57	62.0
None	12	13.0

Precepting

Nurses were asked about current and previous precepting experience. A preceptor was defined as a nurse who maintains regular nursing duties on the unit while supervising newly employed nurses during the orientation period. Only 8% (n=7/91) had not precepted on either

their current or previous unit of work. Almost half (n=42/89, 47%) had precepted on both units. Table 12 provides information about precepting and the number of orientees precepted.

Table 12
Descriptive Results of Nurses' Precepting and Orientee Activities

Precepting Variable	Frequency n	Percent %
Precept on Current Unit		
Yes	70	76.9
No	21	23.1
Number of Orientees on Current Unit		
1 to 3	21	30.4
4 t0 6	14	20.3
7 to 9	6	8.7
10 or more	28	40.6
Precept on Previous Unit		
Yes	57	64.0
No	32	36.0
Number of Orientees on Previous Unit		
1 to 3	11	19.6
4 to 6	19	33.9
7 to 9	5	8.9
10 or more	21	37.5

Organizational Membership

Of nurses surveyed, 68 (74%) identified belonging to professional organizations. Over half of the sample indicated belonging to one or two organizations (n=53, *M*=1.93, *SD*=1.08). A wide array of professional organization memberships were accounted for with the most common memberships belonging to the American Nurses Association, the Michigan Nurses Association, and the American Association of Critical Care Nurses.

Descriptive Analysis of Other Variables

Experience

Table 13 below presents descriptive results of nurses' experience. Information was collected pertaining to nurses total years as an RN, total years practicing as an RN, and total years practicing as a critical care RN.

Table 13
Descriptive Results of Nurses' Experience

Experience	Mean	Standard Deviation	Range	Total *N*
Total years as an RN	13.58	9.37	1-37	92
Total years practicing as an RN	13.28	9.51	1-37	91
Total years practicing as a critical care RN	11.10	9.01	<1-35	92

Education

While 68% (n=63) of respondents had obtained a Bachelor's or Master's degree in nursing, none of the nurses in the study had a doctorate (DNP, DNSc, or PhD) in nursing. Of those surveyed however, nine had degrees in fields other than nursing. Five had bachelor's degrees in other fields such as psychology, sociology, business, business administration and art. Three respondents had master's degrees in teaching, hospital administration, and anthropology and one had a doctorate in law (see Table 14 for further results).

Table 14
Descriptives for Highest Nursing Degree and Degree in Other Field

Education	Frequency n	Percent %
Highest Nursing Degree (N=92)		
RN Diploma	3	3.3
Associate's Degree	26	28.3
Bachelor's Degree	58	63.0
Master's Degree	5	5.4

Highest Degree in Other Field (N=9)		
Bachelor's Degree	5	55.6
Master's Degree	3	33.3
Doctorate Degree	1	11.1

Scoring of the Deliberate Practice in Nursing Questionnaire

Scoring of the DPNQ was accomplished after careful analysis of data gathered in the survey study. The DPNQ elicited information about deliberate practice activities by using multiple response formats and ranges that were appropriate to each individual item in the questionnaire. Both structured and unstructured formats were used including dichotomous, single and multiple-option choices, and text-based responses. So that the instrument could be used further to relate to other variables of interest, a mathematical methodology was developed in order to devise a common scale and standardized scoring system. It is assumed that the higher the score on the deliberate practice questionnaire, the more cumulative time is spent in deliberate practice.

Deliberate practice was measured with 29 items that identified activities nurses engage in to improve their performance. Data were collected at a single point in time and asked both current (present and in past two years) and retrospective (since becoming an RN) accounts of deliberate practice activities. Scoring was consolidated to 24 items, dispersed among 6 subcategories: continuing formal education (1 item), continuing professional education (13 items), self-regulated learning/self-development (6 items), precepting (2 items), specialty certification (1 item), and professional organization membership (1 item).

A composite score of deliberate practice was sought for data analysis purposes. Scoring methodology used probit scaling, by standardizing each individual item. Probit scaling is used when a measure's scales are heterogeneous as they are in the DPNQ (Giddens, Fogg, & Carlson-

Sabelli, 2010). This composite scoring method was created using multiple steps to transform the existing deliberate practice variables into a measure for deliberate practice. First, Table 15 identifies the frequencies, ranges, means, and standard deviations (SD) that were calculated and analyzed for each item as appropriate. This was done in order to evaluate the dispersion of item responses and identify the number of SDs included in the range of each individual item.

Table 15
Item Response, Frequency, Range, Mean and Standard Deviation

Variable	Frequencies and Response Choices	Range	Mean	Standard Deviation (SD)	Number of SDs in Range
Continuing Formal Education					
Current enrollment in formal nursing program	(1)Yes (n=16, 17.4%) (2)No (n=76, 82.6%)				
Taken undergrad classes since becoming an RN	(1)Yes (n=37, 40.2%) (2)No (n=55, 59.8%)				
Taken graduate classes since becoming an RN	(1)Yes (n=17, 18.5%) (2)No (n=75, 81.5%)				
Continuing Professional Education					
In past 2 years, number of nursing or health care-related programs or conferences held *at current workplace* attended lasting: ½ day (1 to 4 hrs)	1 (n=23, 36.5%) 2 (n=11, 17.5%) 3 (n=4, 6.3%) 4 (n=12, 19%) 5 (n=3, 4.8%) 6 (n=3, 4.8%) 7 (n=1, 1.6%) 8 or more (n=6, 9.5%)	1-8 (n=63)	3.06	2.27	3.5
In past 2 years, number of nursing or health care-related programs or conferences held *at your current workplace* attended lasting: Full day (5 to 8 hrs)	1 (n=23, 35.9%) 2 (n=20, 21.7%) 3 (n=7, 10.9%) 4 (n=6, 9.4%) 5 (n=1, 1.6%) 6 (n=0) 7 (n=2, 3.1%) 8 or more (n=5, 7.8%)	1-8 (n=64)	2.61	2.07	3.86
In past 2 years, number of nursing or health care-related programs or conferences held *at*	1 (n=15, 55.6%) 2 (n=8, 29.6%) 3 (n=0) 4 (n=0)	1-8 (n=27)	2.15	2.07	3.86

your current workplace attended lasting: 2-3 days	5 (n=1, 3.7%) 6 (n=1, 3.7%) 7 (n=0) 8 or more (n=2, 7.4%)				
In past 2 years, number of nursing or health care-related programs or conferences held *at your current workplace* attended lasting: >3 days	1 (n=11, 78.6%) 2 (n=1, 7.1%) 3 (n=0) 4 (n=0) 5 (n=0) 6 (n=0) 7 (n=0) 8 or more (n=2, 14.3%)	1-8 (n=14)	2.07	2.53	3.16
In past 2 years, number of nursing or health care-related programs or conferences held *outside of your current workplace* attended lasting: ½ day (1 to 4 hrs)	1 (n=11, 40.7%) 2 (n=5, 18.5%) 3 (n=4, 14.8%) 4 (n=1, 3.7%) 5 (n=1, 3.7%) 6 (n=0) 7 (n=1, 3.7%) 8 or more (n=4, 14.8%)	1-8 (n=27)	3.0	2.56	3.12
In past 2 years, number of nursing or health care-related programs or conferences held *outside of your current workplace* attended lasting: Full day (5 to 8 hrs)	1 (n=15, 37.5%) 2 (n=12, 30.0%) 3 (n=6, 15.0%) 4 (n=2, 5.0%) 5 (n=4, 10.0%) 6 (n=0) 7 (n=0) 8 or more (n=1, 1.2.5%)	1-8 (n=40)	2.33	1.56	5.12
In past 2 years, number of nursing or health care-related programs or conferences held *outside of your current workplace* attended lasting: 2-3 days	1 (n=14, 70.0%) 2 (n=1, 5.0%) 3 (n=2, 10.0%) 4 (n=1, 5.0%) 5 (n=1, 5.0%) 6 (n=0) 7 (n=0) 8 or more (n=1, 5.0%)	1-8 (n=20)	1.95	1.85	4.32
In past 2 years, number of nursing or health care-related programs or conferences held *outside of your current workplace* attended lasting: >3 days	1 (n=9, 52.9%) 2 (n=6, 35.3%) 3 (n=0) 4 (n=0) 5 (n=1, 5.9%) 6 (n=0) 7 (n=0) 8 or more (n=1, 5.9%)	1-8 (n=17)	2.0	1.83	4.37
In last year, total # of in-services attended *on specific unit* at least one hr long.		0-20	3.01	3.14	6.36

In last year, total # of in-services attended *outside specific unit* at least one hr long.		0-10	1.53	1.80	5.56
In last year, total # of nursing grand rounds within workplace.	*96.6% lie within the range of 0-8	0-72 0-8	2.23 .61	9.49 1.43	7.58 5.59
In last year, total # of mandatories/unit competencies completed:	(1) # required for unit (n=73, 91.3%) (2) more than # required for unit (n=7, 8.8%)				
In last year, # of CEUs completed *in* workplace.		0-100	14.54	16.52	6.05
In last year, # of CEUs completed *external to* workplace.		0-125	18.10	19.48	6.41
In last year, total # of CEUs completed overall:	(1) amount required for state licensure (n=39, 43.3%) (2) more than required for state licensure (n=51, 56.7%)				
Self-Regulated Learning/Self-Development					
In past 2 yrs, number of times attempted to improve performance by simulation WITHOUT instruction	0 (n=76, 83.5%) 1 (n=11, 12.1%) 2 (n=2, 2.2%) 3 (N=0) 4 (n=1, 1.1%) 5 or more (n=1, 1.1%)	0-10	0.32	1.18	8.47
In past 2 yrs, number of times attempted to improve performance by simulation WITH instruction	0 (n=48, 53.3%) 1 (n=14, 15.6%) 2 (n=13, 14.4%) 3 N=8, 8.9%) 4 (n=1, 1.1%) 5 or more (n-6, 6.6%)	0-10	1.17	1.77	5.64
In past 2 yrs, of the times attempted to improve performance by simulation WITH instruction how many times did you receive feedback?	0 (n=5, 12.2%) 1 n=16, 39%) 2 (n=9, 22%) 3 (n=8, 19.5%) 4 (n=1, 2.4%) 5 or more (n=2, 4.9%)	0-5	1.76	1.26	3.96
How frequently at work do you seek out info about specific disease process of your patient?	(1) All of the time (n=17, 8.7%) (2) Often (n=54, 59.3%) (3) Sometimes [50% of				

	time] (n=13, 14.3%) (4) Rarely (n=6, 6.6%) (5) Never (n=1, 1.1%)				
How frequently at work do you seek out info about a specific clinical problem?	(1) All of the time (n=17, 8.7%) (2) Often (n=46, 50.5%) (3) Sometimes [50% of time] (n=20, 22%) (4) Rarely (n=7, 7.7%) (5) Never (n=1, 1.1%				
How frequently at work do you seek out info to broaden your general knowledge (info not assoc. with a specific patient)?	(1) All of the time (n=10, 11.1%) (2) Often (n=53, 58.9%) (3) Sometimes [50% of time] (n=21, 23.3%) (4) Rarely (n=6, 6.7%) (5) Never (n=0)				
In last year, the average # of hrs spent reading nursing, medical or health care-related materials		0-20	3.04	3.70	5.41
Precepting					
Have you been a preceptor on current unit?	(1)Yes (n=70, 76.9%) (2)No (n=21, 23.1%)				
Have you precepted on a unit you were previously employed?	(1)Yes (n=57, 64%) (2)No (n=32, 36%)				
Number of orientees precepted on current unit	(1) 1 to 3 (n=21, 30.4%) (2) 4 to 6 (n=14, 20.3%) (3) 7 to 9 (6, 8.7%) (4) 10 or more (28, 40.6%)		2.53 (4 to 9 orientees)		
Number of orientees precepted on previous units	(1) 1 to 3 (11, 19.6%) (2) 4 to 6 (19, 33.9%) (3) 7 to 9 (5, 8.9%) (4) 10 or more (21, 37.5%)		2.62 (4 to 9 orientees)		
Specialty Certification					
Total number of certifications held:		0-7	2.27	1.62	4.32
Are any of these certifications required by employer?	(1) Yes (69, 82.1%) (2) No (15, 17.9%)				
Professional Organization					

Membership					
Total number of organizational memberships:		0-5	1.16	1.05	4.76

Items were found to span from 3.12 to 8.47 SDs in their response ranges. Based on the number of standard deviations in each item's range, response scales for all items were created that included three (*0,1,2*), four (*0,1,2,3*), five (*0,1,2,3,4*), and seven (*0,1,2,3,4,5,6*) response choice options. The response scales with three response options (*0,1,2*) were created with the middle category (*1*) as the mean score if the item range was less than six SDs and as the mean plus one SD if the item range was greater than six SDs. Response scales with four response choices (*0,1,2,3*) were created so that responses spanned two SDs. Response scales with five response choices (*0,1,2,3,4*) were created so that responses spanned three SDs and seven response choices (*0,1,2,3,4,5,6*) covered four SDs. All nominal level variables were scored as *0* if one had no experience with or did not participate at all in the deliberate practice activity and increasing in amount or number with *1, 2, 3, 4, 5, and 6* respectively. The items and response choices for all four scale types are detailed in Table 16.

Table 16
Item Response Scoring Scales

Variable	**Item Scoring 3 responses**	**Item Scoring 4 responses (2 SDs)**	**Item Scoring 5 responses (3 SDs)**	**Item Scoring 7 responses (4 SDs)**
Continuing Formal Education	Continuing Formal Education: **0** = Not currently enrolled and taken no classes since becoming RN **1** = Current enrollment only **2** = Current enrollment AND taken either undergrad or grad classes since becoming RN	Continuing Formal Education: **0** = Not currently enrolled and taken no classes since becoming RN **1** = Current enrollment only **2** = Current enrollment AND taken just undergrad or grad classes since becoming RN	Continuing Formal Education: **0** = Not currently enrolled and taken no classes since becoming RN **1** = Current enrollment only **2** = Current enrollment AND taken undergrad classes since becoming RN **3** = Current enrollment	Can't do with 7 response categories

		3 = Current enrollment AND taken BOTH undergrad and grad classes since becoming RN	AND taken grad classes since becoming RN **4 =** Current enrollment AND taken BOTH undergrad and grad classes since becoming RN	
Continuing Professional Education	Conferences internal *and* external (for ½ day): **0** = None **1** = 1-3 (mean) **2** = ≥4	Conferences internal *and* external (for ½ day): **0** = None **1** = 1-2 **2** = 3 (mean) **3** = ≥4	Conferences internal *and* external (for ½ day): **0** = None **1** = 1 **2** = 2-3 (mean) **3** = 4-5 **4** = ≥6	Conferences internal *and* external (for ½ day): **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	Conferences internal *and* external (for full day): **0** = None **1** = 1-3 (mean) **2** = ≥4	Conferences internal *and* external (for full day): **0** = None **1** = 1-2 **2** = 3 (mean) **3** = ≥4	Conferences internal *and* external (for full day): **0** = None **1** = 1 **2** = 2-3 (mean) **3** = 4-5 **4** = ≥6	Conferences internal *and* external (for full day): **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	Conferences internal *and* external (for 2-3 days): **0** = None **1** = 1-2 (mean) **2** = ≥3	Conferences internal *and* external (for 2-3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = ≥4	Conferences internal *and* external (for 2-3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	Conferences internal *and* external (for 2-3 days): **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	Conferences internal *and* external (for >3 days): **0** = None **1** = 1-2 (mean) **2** = ≥3	Conferences internal *and* external (for >3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = ≥4	Conferences internal *and* external (for >3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	Conferences internal *and* external (for ≥3 days): **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	In-services on unit: **0** = None **1** = 1-3 (mean)	In-services on unit: **0** = None **1** = 1-3 (mean)	In-services on unit: **0** = None **1** = 1-3 (mean)	In-services on unit: **0** = None

	2 = ≥4	**2** = 4-5 **3** = ≥6	**2** = 4-5 **3** = 6-8 **4** = ≥9	**1** = 1-2 **2** = 3 (mean) **3** = 4-5 **4** = 6-8 **5** = 9-11 **6** = ≥12
	In-services off unit: **0** = None **1** = 1-2 (mean) **2** = ≥3	In-services off unit: **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = ≥4	In-services off unit: **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	In-services off unit: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	Grand Rounds: **0** = None **1** = 1 **2** = ≥2	Grand Rounds: **0** = None **1** = 1 **2** = 2 (mean) **3** = ≥3	Grand Rounds: **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	Grand Rounds: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
	Mandatories: **0** = Less than required (didn't ask in survey) **1** = Required amount **2** = Above required amount	Mandatories: Can't do with 4 response categories	Mandatories: Can't do with 5 response categories	 Can't do with 7 response categories
	CEUs in workplace: **0** = None **1** = 1-15 (mean) **2** = ≥16	CEUs in workplace: **0** = None **1** = 1-13 **2** = 14-27 **3** = ≥28	CEUs in workplace: **0** = None **1** = 1-14 **2** = 15-28 **3** = 29-41 **4** = ≥42	CEUs in workplace: **0** = None **1** = 1-11 **2** = 12-22 **3** = 23-33 **4** = 34-44 **5** = 45-55 **6** = ≥56
	CEUs external to workplace: **0** = None **1** = 1-18 (mean) **2** = ≥19 **OR**	CEUs external to workplace: **0** = None **1** = 1-19 **2** = 20-37 **3** = ≥38	CEUs external to workplace: **0** = None **1** = 1-19 **2** = 20-38 **3** = 39-56 **4** = ≥57	CEUs external to workplace: **0** = None **1** = 1-15 **2** = 16-30 **3** = 31-45 **4** = 46-60 **5** = 61-75 **6** = ≥76
	CEUs: **0** = Less than required (didn't ask in survey) **1** = Required amount **2** = Above required amount	Can't do with 4 response categories	Can't do with 5 response categories	Can't do with 7 response categories

Self-Regulated Learning/ Self-Develop-ment	Simulation WITH Instruction: **0** = None **1** = 1 (mean) **2** = ≥2	Simulation WITH Instruction: **0** = None **1** = 1 (mean) **2** = 2-3 **3** = ≥4	Simulation WITH Instruction: **0** = None **1** = 1(mean) **2** = 2-3 **3** = 4-5 **4** = ≥6	Simulation WITH Instruction: **0** = None **1** = 1-2 **2** = 3 (mean) **3** = 4-5 **4** = 6-8 **5** = 9-11 **6** = ≥12
	Simulation WITHOUT Instruction: **0** = None **1** = 1 (mean + 1 SD) **2** = ≥2	Simulation WITHOUT Instruction: **0** = None **1** = 1 **2** = 2-3 **3** = ≥4 *response range 4 SDs due to mean score <1	Simulation WITHOUT Instruction: **0** = None **1** = 1 **2** = 2-3 **3** = 4-5 **4** = ≥6 *response range 6 SDs	Simulation WITHOUT Instruction: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8 *response range 8 SDs
	Information Seeking (about specific patient): **0** = Sometimes, rarely, never **1** = Often **2** = All of the time	Information Seeking (about specific patient): **0** = Never **1** = Rarely **2** = Sometimes, often **3** = All of the time	Information Seeking (about specific patient): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	Can't do with 7 response categories
	Information Seeking (about a specific clinical problem): **0** = Sometimes, rarely, never **1** = Often **2** = All of the time	Information Seeking (about a specific clinical problem): **0** = Never **1** = Rarely **2** = Sometimes, often **3** = All of the time	Information Seeking (about a specific clinical problem): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	Can't do with 7 response categories
	Information Seeking (general knowledge): **0** = Sometimes, rarely, never **1** = Often **2** = All of the time	Information Seeking (general knowledge): **0** = Never **1** = Rarely **2** = Sometimes, often **3** = All of the time	Information Seeking (general knowledge): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	Can't do with 7 response categories
	Hours spent reading nursing/health care-related material per week: **0** = None **1** = 1 to 3 (mean) **2** = ≥4	Hours spent reading nursing/health care-related material per week: **0** = None **1** = 1-3 (mean) **2** = 4-6 **3** = ≥7	Hours spent reading nursing/health care-related material per week: **0** = None **1** = 1-3 (mean) **2** = 4-6 **3** = 7-10 **4** = ≥11	Hours spent reading nursing/health care-related material per week: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean)

				4 = 4-8 **5** = 9-14 **6** = ≥15
Precepting	Precepting: **0** = Precepted on **neither** current nor previous unit **1** = Precepted on **either** current or previous unit **2** = Precepted on **both** current and previous unit	Can't do with 4 response categories	Can't do with 5 response categories	Can't do with 7 response categories
	Number of orientees precepted on current unit: **0** = None **1** = 1 to 9 (mean) **2** = ≥ 10	Number of orientees precepted on current unit: **0** = 0 **1** = 1-6 **2** = 7-9 (mean) **3** = ≥10	Number of orientees precepted on current unit: **0** = 0 **1** = 1-3 **2** = 4-6 **3** = 7-9 (mean) **4** = ≥10	Number of orientees precepted on current unit: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-8 **5** = 9-14 **6** = ≥15
	Number of orientees precepted on previous units: **0** = None **1** = 1 to 9 (mean) **2** = ≥ 10	Number of orientees precepted on previous units: **0** = 0 **1** = 1-6 **2** = 7-9 (mean) **3** = ≥10	Number of orientees precepted on previous units: **0** = 0 **1** = 1-3 **2** = 4-6 **3** = 7-9 (mean) **4** = ≥10	Can't do with 7 response categories
Specialty Certification	Number of specialty certifications: **0** = None **1** = 1-2 (mean) **2** = >2	Number of specialty certifications: **0** = 0 **1** = 1 **2** = 2 (mean)-3 **3** = ≥4	Number of specialty certifications: **0** = 0 **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	Number of specialty certifications: **0** = None **1** = 1 **2** = 2 **3** = 3 (mean) **4** = 4-5 **5** = 6-7 **6** = ≥8
Professional Organization Membership	Number of organizational memberships: **0** = None **1** = 1 (mean) **2** = ≥2	Number of organizational memberships: **0** = 0 **1** = 1(mean) **2** = 2 **3** = ≥3 *response range 3 SDs due to mean score of 1.16	Number of organizational memberships: **0** = 0 **1** = 1(mean) **2** = 2 **3** = 3 **4** = ≥4 *response range 4 SDs	Can't do with 7 response categories (range of responses only 0-5)

These four scales were then analyzed to identify which one maximized the variance in the data when standardizing response choices. The goal of this was to develop a common, Likert-type scale for measuring deliberate practice. This was accomplished with the five response choice scale, giving each item's responses a range of three SDs and a response scale of *0,1,2,3,4*. This standardized scale allowed for maximum dispersion of the data while only excluding three of the DPNQ items. One item elicited information about mandatories and unit competencies in the continuing professional education category. It asked whether nurses completed (1) the amount of mandatories/unit competencies required by their unit or, (2) more than the amount required by their unit. This item was unable to span five response choices. However, 91% (n=73/80) of respondents answered that they had completed the number of mandatories that was required for their unit and only 9% (n=7/80) completed more than was required, showing that the item had very little variance. Two additional items collecting information about CEUs and precepting were omitted due to the inability to create a five point scale from the original item Information related to CEUs and precepting was obtained from other questions asking about these activities in the DPNQ so data related to these deliberate practice activities was still collected in the questionnaire. Items eliciting information about continuing formal education were aggregated from three questions to one without losing any essential information.

A composite score was calculated by adding the final 24 items in the six subcategories: continuing formal education (1 item, 4 points); continuing professional education (13 items, 52 points); self-regulated learning/self-development (6 items, 24 points); precepting (2 items, 8 points); specialty certifications (1 item, 4 points); professional organization membership (1 item, 4 points). These sub-scores were then summed for a total DPNQ score of 96. The items, five

response scale scores, category scores and total score are included in Table 17. Cronbach's alpha coefficient of the DPNQ for this study was .660 (standardized, .703).

Table 17
Items, Five Response Scale Scores, Category Score, Total Score

Deliberate Practice Category	**Item Scoring 5 Response Scale (3 SDs)**	**Category Score**
Continuing Formal Education	Continuing Formal Education: 0 = Not currently enrolled and taken no classes since becoming RN 1 = Current enrollment ONLY or taken undergrad classes ONLY or taken grad classes ONLY since becoming RN 2 = Taken undergrad AND grad classes since becoming RN (but not currently enrolled) 3 = Current enrollment AND taken EITHER undergrad OR grad classes since becoming RN 4 = Current enrollment AND taken BOTH undergrad and grad classes since becoming RN	**4**
Continuing Professional Education	Conferences internal *and* external (for ½ day): **0** = None **1** = 1 **2** = 2-3 (mean) **3** = 4-5 **4** = ≥6	**52**
	Conferences internal *and* external (for full day): **0** = None **1** = 1 **2** = 2-3 (mean) **3** = 4-5 **4** = ≥6	
	Conferences internal *and* external (for 2-3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	
	Conferences internal *and* external (for >3 days): **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5	

	4 = ≥6	
	<u>In-services on unit:</u> **0** = None **1** = 1-3 (mean) **2** = 4-5 **3** = 6-8 **4** = ≥9	
	<u>In-services off unit:</u> **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	
	<u>Grand Rounds:</u> **0** = None **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	
	<u>Mandatories:</u> Can't do with 5 response categories	
	<u>CEUs in workplace:</u> **0** = None **1** = 1-14 **2** = 15-28 **3** = 29-41 **4** = ≥42	
	<u>CEUs external to workplace:</u> **0** = None **1** = 1-19 **2** = 20-38 **3** = 39-56 **4** = ≥57	
	<u>CEUs more or less than state requirements:</u> Can't do with 5 response categories	
Self-Regulated Learning/ Self-Develop-ment	<u>Simulation WITH Instruction:</u> **0** = None **1** = 1(mean) **2** = 2-3 **3** = 4 **4** = ≥5	

	Simulation WITHOUT Instruction: **0** = None **1** = 1 **2** = 2-3 **3** = 4 **4** = ≥5 *response range 5 SDs	**24**
	Information Seeking (about specific patient): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	
	Information Seeking (about a specific clinical problem): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	
	Information Seeking (general knowledge): **0** = Never **1** = Rarely **2** = Sometimes **3** = Often **4** = All of the time	
	Hours spent reading nursing/health care-related material per week: **0** = None **1** = 1-3 (mean) **2** = 4-6 **3** = 7-10 **4** = ≥11	
Precepting	Precepting: Neither, Either or Both Units: Can't do with 5 response categories	

	Number of orientees precepted on current unit: **0** = 0 **1** = 1-3 **2** = 4-6 **3** = 7-9 (mean) **4** = ≥10	**8**
	Number of orientees precepted on previous units: **0** = 0 **1** = 1-3 **2** = 4-6 **3** = 7-9 (mean) **4** = ≥10	
Specialty Certification	Number of specialty certifications: **0** = 0 **1** = 1 **2** = 2 (mean)-3 **3** = 4-5 **4** = ≥6	**4**
Professional Organization Membership	Number of organizational memberships: **0** = 0 **1** = 1(mean) **2** = 2 **3** = 3 **4** = ≥4 *response range 4 SDs	**4**
Total Score		**96**

With the DPNQ being the first instrument of its kind to measure deliberate practice in nursing, further validation was done by evaluating whether the DPNQ correlated with an instrument measuring performance. Performance is shown to have a positive (monotonic) relationship with deliberate practice in other domains such as music, chess, and sports (Ericsson et al., 1993; Tuffiash, Krampe, Reingold, & Vasyukova, 2005; Ward, Hodges, Starkes, & Williams, 2007).

Performance was measured as self-reported nurse competence with the Nurse Competence Scale (NCS) which was administered via electronic survey at the same time as the

DPNQ (see Appendix G for the NCS). The NCS is a 73-item scale divided into seven competence categories: helping role (7 items), teaching/coaching (16 items), diagnostic functions (7 items), managing situations (8 items), therapeutic interventions (10 items), ensuring quality (6 items), and work role (19 items) (Meretoja, Isoaho, & Leino-Kilpi 2004). In its original format, NCS items were measured using a visual analog scale from 0 to 100 (*0 = low competence, 100 = high competence*) but this study used a slider scale in an electronic format, from 0 to 100 (*0 = low competence, 100 = high competence*). Cronbach's alpha for the original NCS ranged from .79 to .91 for the seven competence categories (Meretoja et al., 2004). In this study, the Cronbach's alpha for the total NCS was $\alpha = .95$. Cronbach's alpha for the subscales ranged from .71 to .94, specifically: helping role (.71), teaching/coaching (.93), diagnostic functions (.80), managing situations (.83), therapeutic interventions (.89), ensuring quality (.78), and work role .93). Table 18 summarizes the internal consistency reliabilities of the seven competence subscales of the NCS obtained in this study and three other studies that used the instrument (Meretoja et al., 2004; Salonen, Kaunonen, Meretoja, & Tarkka, 2007; O'Leary, 2012).

Table 18
Internal Consistency Reliabilities of NCS Competence Categories across Studies

Study	**Internal Consistency Reliability of NCS Competence Categories (Cronbach α)**						
	Helping Role	**Teaching/ Coaching**	**Diagnostic Functions**	**Managing Situations**	**Therapeutic Interventions**	**Ensuring Quality**	**Work Role**
Bathish (2014)	0.71	0.94	0.81	0.83	0.89	0.78	0.93
O'Leary (2012)	0.83	0.92	0.75	0.83	0.85	0.84	0.90

Salonen, Kaunonen, Meretoja, & Tarkka (2007)	0.78	0.91	0.81	0.84	0.85	0.80	0.89
Meretoja, Isoaho, & Leino-Kilpi (2004)	0.79	0.91	0.79	0.83	0.88	0.82	0.91

The relationship between deliberate practice (as measured by the DPNQ) and nurse competence (as measured by the NCS) was investigated using the Spearman rank order correlation. Preliminary analyses indicated that the DPNQ was normally distributed however the NCS was non-normally distributed, slightly skewed to the left. The Spearman's correlation between the total composite DPNQ score and the total NCS score was $r_s = .366$, $p = 001$. There was a medium, positive, correlation between the two variables, with high levels of deliberate practice significantly associated with high competence levels (Cohen, 1988 as cited in Pallant, 2007). These results, in short, further validate the DPNQ with significance in association and directionality of results that confirm existing evidence of the relationship of deliberate practice and performance in other domains (Helsen, et al., 1998; Ward et al., 2004; Charness et al., 2005; Ward et al., 2007).

Discussion

The findings from the content validity study were crucial in the development of the 29 item deliberate practice in nursing questionnaire (DPNQ). It allowed for the rigorous assessment of the clarity, relevance and understanding of the wording of individual items included in the questionnaire by a panel of expert reviewers. Although the conservative approach of 100% IRA was low and ranged from .54-.75, demonstrating that at least one rater rated the item differently

from the others, IRA with at least 80% reliability ranged from .92-.96 for each of the three categories assessed by the reviewers.

The CVI of .94 is considered strong. The one item with the lowest CVI of .60 was removed from the questionnaire. All other items with a CVI of less than 1.0 were revised to either better represent the construct of deliberate practice or to better form the question. Based on feedback from experts, many revisions were made in the wording of items and additional items were added to the questionnaire. Overall, the content validity study provided great guidance and direction for revisions and further development of the instrument.

At the completion of the assessment of content validity, the questionnaire was further tested via a survey study. This testing allowed for the examination of details of the measure such as the ease of administration, formatting issues and problems that could arise during the web survey implementation (Rubio et al., 2003). Survey design, distribution, and data collection with the Qualtrics © survey software were unremarkable.

Results of the survey study indicated that some changes in question formatting would be warranted. In particular, responses of item numbers 20, 21 and 22 eliciting information about improving performance through simulation needs to be changed to facilitate interpretation and analysis. For example, Item #21 read as follows:

> Q21 In the past 24 months, how many times have you attempted to improve your performance by practicing a procedure on a simulated patient WITH instruction from an instructor/teacher/preceptor before performing by yourself (excluding certifications)?
>
> □ 0
> □ 1, explain procedure: _____
> □ 2, explain procedure(s): _____
> □ 3, explain procedure(s): _____
> □ 4, explain procedure(s): _____
> □ 5 or more, explain procedure(s): _____

Some individuals interpreted the question as asking for multiple answers. This interpretation led to respondents listing how many times they did each different type of simulation as opposed to choosing one response and then explaining the different types of procedures practiced. To account for this discrepancy in interpretation for analysis, a new variable was created that added all of the respondents' simulation experiences. An alternative response choice would be the following:

> Q21 In the past 24 months, please identify many times have you attempted to improve your performance by practicing a procedure on a simulated patient WITH instruction from an instructor/teacher/preceptor before performing by yourself (excluding certifications)?
>
> Number of procedures_____
> Type of procedures performed_____

Limitations of the study include the use of a small, convenience sample of critical care nurses from one large, Midwestern teaching hospital. Further studies should explore deliberate practice in larger, more diverse samples from different geographic areas. Another limitation is that the expert feedback needed for content validation was subjective so the study was exposed to bias. This subjective bias introduced by expert opinion was however an unavoidable and necessary part of instrument validation. In addition, no existing deliberate practice measures in nursing exist so validity testing beyond that done in this study was not performed.

Standardized scoring of the DPNQ will allow the questionnaire to be used by nurses and health care professionals to assess the deliberate practice activities of nurses. It also provides opportunities to empirically relate deliberate practice to other variables of interest that may affect quality of nursing care. Understanding deliberate practice in nursing affords the opportunity to examine this unique contribution to nursing expertise in ways that may benefit nursing practice, nursing education opportunities, career development, and patient outcomes.

References

American Association of Critical Care Nurses. (2003, March). Safeguarding the patient and the profession: the value of the critical care nurse certification. *American Journal of Critical Care, 12(2),* 154-164. Retrieved from http://www.ajcc.org

Armola, R. R., Brandeburg, J., & Tucker, D. (2010). A guide to developing nursing grand rounds. *Critical Care Nurse, 30(5),* 55-62. doi:10.4037/ccn2010486

Brink, P. J., & Wood, M. J. (1998). *Advanced design in nursing research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Byrne, M., Valentine, W., & Carter, S. (2004). The value of certification-A research journey. *AORN Journal, 79(4*), 825-835. doi:10.1016/S0001-2092(06)60823-5

Cary, A. H. (2001, January). Certified registered nurses: Results of the study of the certified registered workforce. *American Journal of Nursing, 101(1),* 44-52.

Charness, N., Tuffiash, M., Krampe, R., Reingold, E., & Vasyukova, E. (2005). The role of deliberate practice in chess expertise. *Applied Cognitive Psychology*, *19*, 151-165. doi:10.1002/acp.1106

Davis, L. (1992). Instrument review: Getting the most from your panel of experts. *Applied Nursing Research, 5,* 194-197. doi:10.1016/S0897-1897(05)80008-4

DeVellis, R. F. (1991). *Scale Development: Theory and Applications*. Newbury Park, CA: Sage.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). . In *Internet, mail, and mixed-mode surveys: The tailored design method* (3rd ed.). Hoboken, NJ: John Wiley & Sons.

Duckworth, A. L., Kirby, T. A., Tsukayama, E., Berstein, H., & Ericsson, K. A. (2011). Deliberate practice spells success: Why grittier competitors triumph at the national spelling bee. *Social Psychology and Personality Science, 2(2),* 174-181. doi:10.1177/1948550610385872

Dunn, T. G., & Shriner, C. (1999). Deliberate practice in teaching: what teachers do for self-improvement. *Teaching and Teacher Education, 15*, 631-651.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review, 100*, 363-406.

Giddens, J., Fogg, L., & Carson-Sabelli, L. (2010). Learning and engagement with a virtual community by undergraduate nursing students. *Nursing Outlook, 58*, 261-267. doi:10.1016/j.outlook.2010.08.001

Haag-Heitman, B. (2008). The development of expert performance in nursing. *Journal for Nurses in Staff Development, 24(5),* 203-211. doi:10.1097/01.NND.0000320690.42061.07

Haskins, M., Hnatiuk, C. N., & Yoder, L. H. (2011, March/April). Medical-surgical nurses' perceived value of certification study. *MedSurg Nursing, 20(2*), 71-93.

Hautala, K. T., Saylor, C. R., & O'Leary-Kelley, C. (2007). Nurses' perceptions of stress and support in the preceptor role. *Journal for Nurses in Staff Development, 23(2),* 64-70. doi:10.1097/01.NND.0000266611.78315.08

Helsen, W. F., Starkes, J. L., & Hodges, N. J. (1998). Team sports and the theory of deliberate practice. *Journal of Sport & Exercise Psychology, 20,* 12-34.

Lie, H. (2011). *Deliberate practice in professional speaking expertise* (Unpublished doctoral dissertation). University of San Francisco, San Francisco, California. Retrieved from http://gradworks.umi.com/34/93/3493859.html

Lynn, M. R. (1986, November/December). Determination and quantification of content validity. *Nursing Research, 35(6*), 382-386.

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research, 27(2*), 94-104. doi:10.1093/swr/27.2.94

Sonnentag, S., & Kleine, B. M. (2000). Deliberate practice at work: A study with insurance agents. *Journal of Occupational and Organizational Psychology, 73,* 87-102. Retrieved from http://kops.ub.uni-konstanz.de/handle/comm-4/browse?offset=5540&type=type&value=article

State of Michigan. (2014). michigan.gov

Van de Wiel, M. W., Szegedi, K. H., & Weggeman, M. C. (2004). Professional learning: Deliberate attempts at developing expertise. In H. P. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional Learning: Gaps and Transitions on the Way from Novice to Expert* (pp. 181-206). Retrieved from http://www.link.spring.com

Ward, P., Hodges, N. J., Starkes, J. L., & Williams, A. M. (2007). The road to excellence: deliberate practice and the development of expertise. *High Ability Studies, 18,* 119-153. doi:10.1080/13598130701709715

Whyte, J., Ward, P., & Eccles, D. W. (2009). The relationship between knowledge and clinical performance in novice and experienced critical care nurses. *Heart & Lung, 38(6*), 517-525. doi: 10.1016/j.hrtlng.2008.12.006

Wolak, E. S., Cairns, B., & Smith, E. (2008). Nursing grand rounds as a medium for the continuing education of nurses. *Journal of Continuing Education in Nursing, 39(4)*, 173-178.

Zozula, R., Bodow, M., Yatcilla, D., Cody, R., & Rosen, R. C. (2001). Development of a brief, self-administered instrument for assessing sleep knowledge in medical education: "The ASKME survey". *SLEEP*, *24(2)*, 227-233.

Chapter IV

Understanding the Relationship between Individual Nurse Characteristics, Deliberate Practice and Nurse Competence

Nursing expertise is fundamental to quality patient care. The debate about the contribution of experience and education to expertise, however, continues and demands a solution (McHugh & Lake, 2010). Various, yet inconclusive, findings have been reported on the impact of these nursing characteristics on patient outcomes such as mortality and failure to rescue (Aiken et al., 2011; Tourangeau et al., 2007; Estabrooks et al., 2005; Aiken et al., 2003; Clarke et al., 2002; Blegen et al., 2001). Studies have shown that they do have serious implications for medication errors, patient falls and near-miss incidents such as needle-sticks (Aiken et al., 2003; Clarke et al., 2002; Blegen et al., 2001); however, no conclusive empirical evidence exists to support the relationship of years of experience and education to expertise or positive patient outcomes. The contribution of this study is to explore deliberate practice as an approach to enhance expertise.

Background

Nursing's theoretical foundation for expertise development is solidly grounded in Benner's Novice to Expert Theory. This theory identifies nursing expertise as progressing through five stages (novice, advanced beginner, competent, proficient, and expert) that evolve from increased experience. Characteristically, the fifth stage of development, or 'expert' stage is described by the use of 'intuition' in expert practice and has been a concept much disputed for its subjective and potentially arbitrary nature (English, 1993; Cash, 1995) .These criticisms stem

from the lack of empirical validation of expertise based on intuition and the way that Benner determined expert practice; by peer nomination, manager input and/or through the research team collecting data.

Simon and Chase (1973) were the first to suggest, in their study of master chess players, that acquiring expertise requires a minimum of 10,000 hours or ten years of experience. Many subsequent studies have confirmed this 10,000 hour or ten year rule; musical composition, mathematics, tennis, swimming, running, evaluation of livestock, diagnosis of X-rays, and medical diagnosis (Ericsson et al., 1993, Ericsson, 2002). According to Benner (1984), a minimum of five years of full-time involvement in nursing practice is necessary for one to achieve expert status. While experience is a necessary condition for expertise it alone is not the unique requirement.

The IOM (2011) has benchmarked a goal of increasing the educational level of nurses by the year 2020 wherein 80% will hold a bachelor's degree in order to deliver safer and more effective patient care. It also encourages life-long learning and continued competence in order to keep up with the challenges of an increasingly technical and complex profession. Some studies have identified that the educational level of nurses influences expertise and patient outcomes (McHugh & Lake, 2010; Aiken et al., 2011; Kendall-Gallagher et al. ,2011; Tourangeau et al., 2007; Estabrooks et al., 2005; Aiken et al., 2003) while others found no association with education and quality of patient care (Blegen et al., 2001).

It is clear from the literature that both experience and education are important contributors to expertise development, expert performance and positive patient outcomes. Notwithstanding, they have not proven to be unique contributors. High levels of competence or performance are not guaranteed with experience alone (Dunn & Shriner, 1999; Ericsson, et al.,

2007). It has been demonstrated in areas such as sports, music, and chess that experience without practice is not sufficient to develop expertise (Feltovich et al., 2006). Improvement does not come from experience and education alone but from practice activities that allow one to work on improving performance (Feltovich et al, 2006). Activities aimed at improving one's competence, skill acquisition and leading to expertise are necessary within work contexts. This type of effort towards improvement is *deliberate practice*. The purpose of this study was to examine the influence of deliberate practice, experience, and education on expertise.

Conceptual Framework

The deliberate practice theory asserts that the necessary and distinguishing factor to achieve expert performance levels is extensive hours of deliberate practice (Ericsson, et al., 1993; Ericsson, 2002; Ericsson, 2008). Deliberate practice is, by definition, those activities that are specifically designed to improve performance. A primary assumption of the deliberate practice theory is that an individual's performance is directly related to the amount of time spent in deliberate practice, also known as the "monotonic benefits assumption" (Ericsson, et al., 1993). The deliberate practice framework ceases to identify experts based on traditional indicators of expertise such as social criteria or extended experience (Ericsson, et al., 1993). In this paper the DPNE Model (see Figure 3) was tested to examine the effects of deliberate practice and individual nurse characteristics such as experience and education on expertise.

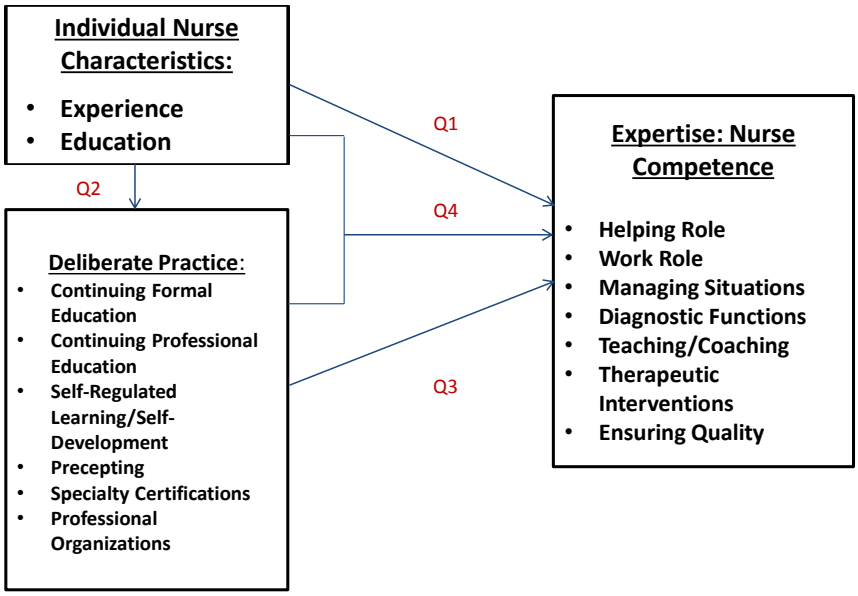


Figure 3. Deliberate Practice in Nursing Expertise Model

Research Questions

The following research questions were examined:

Q1. Are individual characteristics of the nurse associated with expertise?

Q1a. Is there an association between years of nursing experience and nurse competence?
Q1b. Is there an association between education and nurse competence?

Q2. Are individual characteristics of the nurse associated with deliberate practice?

Q2a. Is there an association between years of nursing experience and deliberate practice?
Q2b. Is there an association between education and deliberate practice?

Q3. Does deliberate practice influence expertise?

Q4. Which of the variables (experience, education, or deliberate practice) makes the highest contribution to expertise?

Methods

Study Design

A cross-sectional study using a descriptive, correlational design assessed the deliberate practice activities of critical care nurses in the acute care setting and the impact of deliberate practice, experience and education on self-assessed nurse competence (Brink & Wood, 1998). The study was cross-sectional in nature as participants were surveyed at a single time period.

Setting

The nursing units used in this study were drawn from one large Midwestern teaching hospital. They included a critical care medical unit (CCMU), a surgical intensive care unit (SICU), and the trauma/burn intensive care unit (TBICU).

Sample

A convenience sample (N=225) of registered nurses (RN) from three medical-surgical critical care units were invited to participate in this study. The RN sample was comprised of critical care RN's who work in environments where critically ill patients require care such as the emergency department, intensive care, post-anesthesia care, and/or survival flight area (AACN, 2003). Non-RN employees such as LPN's, nurse technicians, nursing assistants, patient care assistants, and student nurses were excluded from the study.

Prior to data collection a power analysis was conducted with G*Power 3.1 51 for a power of 0.80, and a small effect size of 0.20. A minimum sample size of 42 for a model with 4 predictor variables was indicated, but the plan was to collect data on a minimum of 60 participants for this study. A total of 92 electronic questionnaires were completed with an overall response rate of 41%. Response rates by unit were as follows: SICU 47/90= 52%, TBICU 30/59

= 51%, CCMU 15/76 = 20%. Eleven questionnaires were rejected for major missing data (greater than 25% missing data), giving the final sample of 81 questionnaires analyzed.

An ideal recommended sample size for multivariate analysis of 80 participants (20:1 ratio of participants to predictor variables) was met in this study (Tabachnick & Fidell, 1989, as cited in Brink & Wood, 1998).

Measures

Demographic Questionnaire

Demographic questions requested information about sample age, sex, race, and employment (unit of employment and average number of hours worked per week).

Education

Nurses reported their highest nursing education degree as diploma, associate's degree, bachelor's degree, master's degree, or doctorate. Education was aggregated into two categories for analysis: *less than a bachelor of science in nursing (BSN) degree* and *BSN or higher*.

Experience

Experience was measured as a continuous variable as *the total number of years practicing as an RN.*

Deliberate Practice

Deliberate practice was measured with the Deliberate Practice in Nursing Questionnaire (DPNQ). The DPNQ is a 29-item, self-report questionnaire developed by the PI to collect information about activities that nurses engage in to improve their performance. Scoring of the DPNQ is consolidated to 24 items dispersed among six subcategories: continuing formal education (1 item, 4 points), continuing professional education (13 items, 52 points), self-regulated learning/self-development (6 items, 24 points), precepting (2 items, 8 points), specialty

certification (1 item, 4 points), and professional organization membership (1 item, 4 points). A composite score is calculated for all items based on a standardized mathematical methodology (see Chapter three, page 90 for detailed scoring methodology). Each item is scored on a five point scale (*0 to 4*) with a total maximum DPNQ score totaling 96. Content validity of this instrument was based on a comprehensive literature review and a five panel expert review. Cronbach's alpha coefficient of the DPNQ in the present study was .660 (standardized, .703).

Expertise

The dependent variable of interest was nursing expertise, measured as self-reported nurse competence. The Nurse Competence Scale (NCS), developed by Meretoja, Isoaho, and Leino-Kilpi (2004), was used in this study. It is a 73-item scale that can be used by nurses (self-report) or managers to assess the level of nurse competence (See Appendix G). Permission for the use of this instrument was obtained from both the research developer, Dr. Riitta Meretoja (affiliated with Hospital District of Helsinki and Uusimaa, Finland) and from the copyright holder (Wiley-Blackwell). The NCS consists of seven competence categories adapted from Benner (1984); helping role (7 items), teaching-coaching (16 items), diagnostic functions (7 items), managing situations (8 items), therapeutic interventions (10 items), ensuring quality (6 items), and work role (19 items). Each item was rated by using a 'slider' scale from 0-100 with the ends labeled 0 for *very low level* and 100 for *very high level* of competence. The mean score of each NCS category was calculated as the group average of the individual scores for that category. An overall NCS score of all categories of an individual nurse was calculated as the average of the individual mean scores of the nurse.

Meretoja, et al., (2004) developed the NCS over a four year period from 1997-2001. Content validity was based on an extensive literature review and on the judgments of six expert

groups. Construct validity was established by conducting principal component factor analysis with identified factors accounting for 52.7% of the variance. Concurrent validity was tested by correlating the NCS with the 6D Scale showing a very strong correlation between overall NCS mean scores and the 6D Scale *(r* = .83, *p* = .00). The 6D Scale also measures nurse competence and is a widely tested international scale with established validity and reliability (Schwirian, 1978).

Cronbach's alpha for the NCS ranged from .79 to .91. In the present study, Cronbach's alpha for the total NCS was α = .95. Cronbach's alpha for the subscales ranged from .71 to .94 and were as follows; helping role (.71), teaching/coaching (.93), diagnostic functions (.80), managing situations (.83), therapeutic interventions (.89), ensuring quality (.78), and work role (.93). Table 19 summarizes the comparison of the current study's results using the NCS with previous study results.

Table 19
Comparison of Nurse Competence Scale Studies

Study	Sample Size	Sample Participants	Response Rate	Cronbach's α	NCS Mean	NCS Range
Bathish (2014)	81	Critical care nurses in a large Midwest teaching hospital in U.S.	41%	.71 - .94	84.6	53.4-100
O'Leary (2012)	101	Critical care nurses in a tertiary care hospital in U.S.	31%	.97	76.9	71.4 – 82.0
Salonen, et al., (2007)	147	RN with 3 yrs or less experience from ICU or ER in Finland	63%	.78 - .91	56.0	47.3 – 63.7
Meretoja, et al., (2004)	498	RN's in ward, ER, outpatient, ICU or OR in Finland	87%	.79 - .91	63.7	55 - 69

Procedures for Data Collection

Institutional review board approval (see Appendix C for study approval) and administrative permission from the health system Research Director was obtained prior to initiating the study. Qualtrics © survey software was used to deliver the study questionnaire electronically. The survey was anonymous with all identifying information removed from individual responses. Data were kept on a password-protected computer accessible only to the primary investigator (PI). Implied consent was obtained if the nurses completed the online survey and was included in the survey directions.

Prior to inception, meetings with unit management were conducted to inform them of the study purpose. Invitation emails were then sent to all RNs on the participating units that contained the purpose of the study, by whom and why it was being conducted, the estimated time needed to complete it, a personalized link (URL) to the survey and who to contact with any questions or concerns (See Appendix D for email). A modified tailored approach (Dillman, 2009) was used to increase response rate.

Informational flyers were placed in the nursing conference and report rooms of all three units (See Appendix E for flyer). Surveys were due within 2 to 4 weeks from the time they were sent, with gentle reminder emails sent out weekly to study participants who had not yet completed the questionnaire (see Appendix F for reminder emails).

A study incentive of a $10 gift certificate redeemable at any Aramark café within the medical center was also offered to study participants. Incentives were possible through funds from the Rackham Graduate Student Research Grant. Subjects received automated thank you emails upon completion of the survey which they took to unit management for redemption of

their study incentive. University Human Subject Incentive Program (HSIP) protocols were implemented during the data collection phase.

Data Analysis

Data were analyzed using SPSS Version 21. Descriptive and bivariate analyses were used to examine the demographics and main study variables. Spearman rank order correlation coefficients were calculated to analyze relationships between experience and deliberate practice and nurse competence. The Mann-Whitney *U* test was used to examine the relationship between education and nurse competence. Independent samples t-tests examined relationships between education and deliberate practice. Hierarchical multiple regression analysis assessed the effect of gender, experience, education and deliberate practice on the contribution of self-report nurse competence. Questionnaires with less than 25% missing data were used in analyses ($n = 81$). Statistical significance was set at $p < .05$.

Results

Demographics

The 92 registered nurses who participated in the study were between the ages of 23 and 61 years ($M = 39.4$, $SD = 9.8$). A majority were white ($n = 87$, 95%) and worked an average of 33-48 hours per week ($n = 79$, 86%). A little over half ($n = 50$, 54%) of the sample were females. See Table 20 for further descriptive analysis of demographic characteristics.

Table 20
Demographic Characteristics of Sample

Characteristics	*M (SD)*	Range
Age (years; n=91)	39.39 (9.8)	23.0-61.0
	n	**%**
Unit Worked (n=92)		
Surgical ICU	47	51.1
Trauma/Burn ICU	30	32.6
Critical Care Medical Unit	15	16.3
Gender (n=92)		
Female	50	54.3
Male	42	45.7
Racial Background (n=92)		
Hispanic or Latino	1	1.1
Black or African American	1	1.1
White	87	94.6
Asian	1	1.1
American Indian or Alaska Native	1	1.1
Other (Bi-racial: White/Hispanic)	1	1.1
Average Hours Worked Per Week (n=91)		
1-19 hours	2	2.2
20-32 hours	7	7.6
33-48 hours	79	85.9
49 or more hours	3	3.3

Univariate Analysis

The total years of experience practicing as an RN ranged from 1 to 37 years (M = 13.28, SD = 9.51) and nurses had been working as a critical care RN's for an average of 11.10 years (SD = 9.01). Nearly two-thirds of the sample (n = 58, 63%) had a bachelor's degree in nursing.

Total average NCS scores ranged from 52 to 100 (*M* = 85.15, *SD* = 10.83) out of a possible score of 100. A majority (79%) of the nurses surveyed considered themselves in the competence category of Excellent (75-100). Nurses considered themselves most competent in the Diagnostic Functions category (*M* = 87.67, *SD* = 11.01) and least competent in the Teaching/Coaching role (*M* = 81.17, *SD* = 14.63). Scores in the other categories were as follows: Work Role (*M* = 86.60, *SD* = 11.63), Managing Situations (*M* = 87.25, *SD* = 11.22), Helping Role (*M* = 86.34, *SD* = 9.22), Ensuring Quality (*M* = 81.62, *SD* = 13.52), and Therapeutic Interventions (*M* = 86.07, *SD* = 12.05).

For the individual items in the NCS, nurses considered themselves most competent in prioritizing activities flexibly according to changing situations (*M* = 93.86, *SD* = 8.44), acting autonomously (M = 93.81, *SD* = 8.08), being able to identify family members' need for emotional support (*M* = 93.67, *SD* = 7.24), making decisions concerning patient care taking particular situations into account (*M* = 93.39, *SD* = 8.39), and incorporating relevant knowledge to provide optimal care (*M* = 93.27, *SD* = 8.58). Nurses found themselves least competent with making proposals concerning further development and research (M = 64.38, SD = 28.99), developing orientation programs for new nurses on their unit (*M* = 66.70, *SD* = 32.16), and arranging debriefing sessions for the care team when needed (*M* = 71.73, *SD* = 28.56).

Total DPNQ scores ranged from 9 to 60 (*M* = 28.79, *SD* = 8.59) out of a possible score of 96. Scores for subcategories of the DPNQ were: Continuing Formal Education (*M* = .93, *SD* = 1.26) out of 4; Continuing Professional Education (*M* = 11.17, *SD* = 5.67) out of 52; Self-Regulated Learning/Self-Development (*M* = 10.66, *SD* = 3.14) out of 24; Precepting (*M* = 3.55, *SD* = 2.28) out of 8; Specialty Certification (*M* = 1.55, *SD* = 1.08) out of 4; Professional Organization Membership (*M* = .85, *SD* = .99) out of 4. In summary, a little over half (*n* = 49,

53%) of the nurses were not currently enrolled in any formal education classes or had not taken any formal education classes since becoming an RN. Two-thirds (n = 60, 65%) held at least one to three specialty certifications. A little under half (n = 41, 44.6%) had no professional organization memberships, with roughly one-third (n = 33, 35.9%) of the sample having one membership. A majority (n=64/92, 70%) of participants reported attending programs or conferences lasting a full eight hour day and held within their workplace. Almost half (n=42/89, 47%) had precepted on their current unit and a previous unit of work and only 8% (n=7/91) had never precepted.

Bivariate Analysis

Research question one explored whether there were associations with individual nurse characteristics and nurse competence. The relationship between years of nursing experience and nurse competence was examined using Spearman rank order correlation. No significant correlation was found between experience and the total NCS score (r_s = .131, p=.245). Experience did have positive significant correlations with two of the seven nurse competence categories: Managing Situations (r_s = .243, $p < .05$) and Work Role (r_s = .268, $p < .05$). These correlations are weak and positive indicating that more years of experience practicing as an RN is associated with higher self-report competence in managing situations and work role competencies.

Mann-Whitney U tests were conducted to explore the relationship between education and nurse competence. No significant difference was found in overall nurse competence scores of those with a bachelor's degree in nursing (BSN) or higher (Md = 86.47, n = 53) and those without a BSN (Md = 90.71, n = 27), U = 526, z = -1.92, p = .054, r = .21. Both groups reported competence in the Excellent category, however those without a BSN (M = 88.58, SD = 7.37)

reported slightly higher competence scores than those with a BSN or higher (M = 83.40, SD = 11.90) overall. Significant differences were found between those with differing education levels (with and without a BSN) specifically in the Helping Role (U = 507, z = -2.22, p < .05, r = .25), Teaching-Coaching Role (U = 515, z = -2.04, p < .05, r = .23), and the Diagnostic Functions Role (U = 519, z = -2.00, p < .05, r = .22).

Research question two explored whether individual nurse characteristics were associated with deliberate practice. Spearman rank order correlation analysis was utilized to examine the relationship between total years of experience practicing as an RN and the total score on the DPNQ. No significant relationship was found between total years of nursing experience and deliberate practice (r = 0.09, p = .403). There were significant negative associations found for the deliberate practice sub-categories of Certification (r = -.298, p <.01) and Self-Regulated Learning/Self-Development (r = -.243, p < .05). A significant positive correlation was found between experience and Precepting (r = .507, p < .001).

A two-tailed t-test for independent groups was utilized to explore the relationship between education and deliberate practice. No significant difference in scores was found for those nurses with a BSN or higher in nursing (M = 29.13, SD = 9.22) and those with less than a BSN in nursing (M = 28.07, SD = 7.16); t(89) = .546, p = .586. The magnitude of the differences in means (mean diff = -1.08, 95% CI: -4.91 to 2.79) was very small (eta squared = .003) wherein only 3% of the variance in deliberate practice was explained by education. As summarized in Table 21, no significant differences were observed between these two groups in any of the deliberate practice categories.

Table 21
T-tests for Education and Deliberate Practice

Deliberate Practice Category	Less than a BSN (n = 29) Mean (SD)	BSN or higher (n = 63) Mean (SD)	t-value	p*
Continuing Formal Education	1.03(1.32)	.89(1.23)	.51	.61
Certification	1.55(1.12)	1.56(1.10)	-.02	.98
Professional Organization Memebership	.62(.82)	.95(1.05)	-1.5	.14
Continuing Professional Education	10.76(4.48)	11.37(6.17)	-4.7	.64
Self-Regulated Learning/Self-Development	10.03(2.76)	10.95(3.28)	-1.31	.20
Precepting	4.07(2.36)	3.32(2.22)	1.48	.14

Note. BSN = Bachelor of Science in Nursing. SD = standard deviation.
*Two-tailed p-value

Research question three addressed the influence of deliberate practice on expertise, specifically self-report nurse competence. Spearman rank order correlation analysis revealed that total DPNQ scores had a positive, significant correlation with total NCS scores (r_s = .366, p = .001). The more deliberate practice that one was engaged in was associated with a higher self-reported competence level. As presented in Table 22, deliberate practice was significantly correlated with six of the nurse competence categories with the exception of Diagnostic Functions (r_s = .199, p = .076).

Table 22

Correlations between Deliberate Practice in Nursing Questionnaire Categories and Nurse Competence Scale Categories

Variable	**NCS Categories**							
DPNQ Categories	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total NCS Score**
Continuing Formal Education	.121	.045	.106	-.025	.127	.200	.246*	.150
Continuing Professional Education	.188	.098	.250*	.177	.170	.098	.188	.206
Self-Regulated Learning/ Self-Development	.212	.200	.194	.308**	.291**	.339**	.330**	.293*
Precepting	.355**	.249*	.325**	.353**	.232**	.272*	.307**	.304**
Specialty Certification	.113	.095	-.032	-.059	.168	.182	.089	.086
Professional Organization Membership	.266*	.019	.293**	.252*	.119	.293*	.309**	.256*
Total DPNQ Score	.369**	.199	.333**	.346**	.300**	.369**	.431**	.366**

Note. NCS = Nurse Competence Scale. DPNQ = Deliberate Practice in Nursing Questionnaire.
Nurse Competence Scale Categories: 1=Managing Situations, 2=Diagnostic Functions, 3=Work Role, 4=Helping Role, 5=Teaching/Coaching, 6=Ensuring Quality, 7=Therapeutic Interventions.
*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

Multiple Regression

Hierarchical multiple regression was employed to address research question four. This question explored which of the predictor variables of interest (experience, education, or deliberate practice) makes the highest contribution to expertise. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, and multicollinearity. Nurse demographics considered as control variables for analysis included race, gender and age. No variation was found in racial background, with 95% of participants (n = 87) being White, so this variable was not included in the analysis. Age was also excluded as it was highly correlated with experience (r = .89, p <. 001) and violated the assumption of multicollinearity (Pallant, 2007). Since this sample included a high amount of male nurses (n = 42, 46%), higher than national nursing population estimates of 11% of the nurses licensed between the years of 2010 and 2013 (Bidden, Zhong, Moulton, & Cimiotti, 2013), gender was kept in the analysis to control for any effects on the outcome of interest.

Gender was entered at Step 1, explaining 0% of the variance in nurse competence. Education was added at Step 2 with the variable category of *less than a bachelor of science in nursing (BSN) degree* used as the reference group. It explained 5 % of the variance in nurse competence. Step 3 included the addition of Experience which maintained an explanation of 5% of the variance. In Step 4, after entry of one control variable (gender) and all three predictor variables (Education, Experience and Deliberate Practice), the total variance explained by the model as a whole was 16%, $F(1,75) = 9.12$, p = < .01. The addition of the predictor variable of Deliberate Practice in Step 4 explained an additional 10% of the variance in nurse competence, after controlling for gender, education and experience. In the final model, both Education (beta = -.241, p < .05), and Deliberate Practice (beta = .326, p < .01) were statistically significant with

Deliberate Practice making the highest contribution to nurse competence, all else considered.

Results are summarized in Table 23.

Table 23

Hierarchical Multiple Regression Analyses Predicting Expertise (Self-Report Nurse Competence) from Gender, Education, Experience and Deliberate Practice

	Model 1			**Model 2**			**Model 3**			**Model 4**		
Variable	***B***	***SE B***	***β***	***B***	***SE B***	***β***	***B***	***SE B***	***β***	***B***	***SE B***	***B***
Gender	.203	1.61	.009	.329	2.42	.015	.474	2.47	.022	1.78	2.38	.08
Education				-5.16	2.53	-.228*	-5.12	2.55	-.255*	-.549	2.43	-.241*
Experience							.040	.126	.036	.054	.120	.048
Deliberate Practice										.407	.135	.326**
R^2		.000			.052			.053			.156	
***F* Statistic**		.007			4.22*			.103			9.12**	

Note. $N = 80$. B = standardized beta coefficient. SE B = Standard error of beta. β = unstandardized beta coefficient. *$p < .05$. **$p < .01$

Discussion

In this study, the deliberate practice model was tested to identify associations between individual nurse characteristics, deliberate practice and nursing expertise. This study used the DPNQ, an instrument developed by the primary investigator that conceptualized and empirically identified deliberate practice activities of practicing RNs in order to relate this construct to the other variables of interest. It is the first known study to determine the influence of deliberate practice in predicting self-report nurse competence. Most studies related to deliberate practice in nursing have focused on nursing students and education (Harris, Eccles, Ward, & Whyte, 2013; Chee, in press; Clapper & Kardong-Edgren, 2012; Oermann et al., 2011) with a strong focus on the use of clinical simulation as a form of deliberate practice impacting performance (Schatz, 2013). This study provides empirical evidence for the relationship of deliberate practice and nurse competence. Most notably, in this study it was found that after taking into consideration demographic variables, education and experience, deliberate practice made the highest contribution to expertise.

No significant relationship was identified between years of experience practicing as an RN and overall scores of self-report nurse competence in this study. While results of studies exploring this are mixed (Bobay, et al., 2009; McHugh & Lake, 2010), this study's results were consistent with previous results showing no significant associations between experience and expertise (Sonnetag & Kleine, 2000; Ericsson, et al., 2007) and support the theoretical premise of the inability to reliably find superior performance for nurses with longer professional experience. Specifically, studies utilizing the NCS have shown significant relationships between experience and self-report nurse competence (see Table 24 for a comparison of study results using the NCS). Differing results in this sample may be a result of sample size.

Table 24
Comparison of Study Result Correlations: Total NCS score and RN Experience

Study	n	r	p
Bathish (2014)	81	0.13	.245
O'Leary (2012)	101	0.27	<0.01
Salonen, et al., (2007)	147	0.27	<0.001
Meretoja, et al., (2004)	498	0.30	<0.01

This study did however establish significant relationships between experience and the competence categories of Managing Situations and Work role. These relationships were positive indicating more years of experience practicing as an RN being associated with higher self-report competence in these specific competency areas. These particular findings are logical. Nurses with extended lengths of experience may find themselves more competent in Managing Situations such as: recognizing situations that may pose a threat to life, flexibly prioritizing activities and promoting team cooperation with changing situations, acting appropriately in threatening situations, arranging debriefing sessions with care teams, coaching others in rapidly changing situations, consistent care planning, and maintaining nursing care equipment (Meretoja et al., 2004). Whyte and colleagues (2012) conducted a study and found significant differences in experienced (greater than seven years of experience) nurses and novice nurses (less than one year of experience) in the situation management of a simulated scenario where nurses discovered a 'fallen patient with a head wound'. One hundred percent of experienced nurses compared to 60% of novice nurses summoned help for the fallen patient.

Similarly, nurses with a longer length of practice experience may feel more competent in their Work Role (aware of own limits and colleagues' need for support, use professional identity

as a resource, coordinate student and novice nurse mentoring, provide expertise, act autonomously, guide staff members to duties corresponding with skills and provide feedback, provide patient's overall care and orchestrate whole situation, and work in multidisciplinary teams) as this comfort with professional identity accumulates over time. Managing Situations and Work Role may be areas where the rich accumulation of nursing experiences developed with length of practice plays an important role.

In this study, no significant differences were found between education levels and expertise. Nurses both without a BSN and with a BSN or higher reported nurse competence scores in the Excellent category (75-100). Significant differences were noted in education levels for specific competence categories including: Helping Role, Teaching-Coaching, and Diagnostic Functions Role. In all three categories, nurses without a BSN reported higher competence scores than those with a BSN or higher (see Table 25). These findings are similar to results found by McHugh and Lake (2010). They examined the effects of education on expertise and discovered that second to nurses with a master's degree, diploma prepared nurses reported the highest level of expertise, with BSN and associate's degree nurses following in descending order. They attributed these results to an 'experience effect' (McHugh & Lake, 2010, p. 283) as the Diploma nurses also reported the most years of experience. Similarly, in this study, nurses with a diploma or an associate's degree (n = 29) had an average of 14.08 years of experience (SD = 8.87) while those with a BSN or higher (n = 62) averaged 12.90 years (SD = 9.84). Given the work environment of critical care, nurses in this sample may also have reported Excellent competence despite educational preparation.

Table 25
Score Distribution of Education and NCS Competence Categories of Helping Role, Teaching/Coaching and Diagnostic Functions Role

NCS Category	*n*	*M*	*SD*
Helping Role			
Less than BSN	26	88.89	8.66
BSN or higher	52	85.05	9.10
Teaching/Coaching			
Less than BSN	25	86.45	10.70
BSN or higher	45	79.36	15.85
Diagnostic Functions Role			
Less than BSN	25	91.54	6.40
BSN or higher	47	84.77	12.44

Note. NCS = Nurse Competence Scale. *n* = number of RNs. *M* = Mean. *SD* = Standard Deviation. BSN = Bachelor of Science in Nursing.

Functions of the Helping Role such as; evaluating one's own philosophy of nursing, utilizing research findings in relationship to patients, developing the treatment culture of one's unit and decision-making guided by ethical values may be impacted by a baccalaureate education. Similarly, Teaching-Coaching elements regarding patient education, developing orientation programs for new nurses and coaching others may also be associated with an advanced educational preparation beyond the associate degree level, enabling nurses to function in a teaching and coaching role for patients, families and co-workers on their units. Furthermore, the Diagnostic Functions Role entails the ability to identify patients' and families' needs from many perspectives and involves additional skills in coaching other staff members, which may also be an advantage of higher education. Many of the characteristics of these competence categories are inherent in the American Association of Colleges of Nursing's Essentials of Baccalaureate Education for Professional Nursing Practice (2008) such as: ethical judgment as a consequence of a liberal education (Essential I), application of evidence to practice (Essential

III), knowledge and skills in leadership and quality improvement (Essential II), and the provision of spiritually and culturally appropriate care (Essential VII), among others. In this study, after considering sampling and context, certain aspects of competence were influenced by educational preparation.

The effects of both experience and education on deliberate practice were explored and no significant associations were found between either the number of years practicing as an RN or those with a BSN or a higher or those without a BSN, and the total score on the DPNQ. Thus, in this study, there was no distinguishing difference in the amount of deliberate practice engaged in based on years of experience or educational background. These data were collected from nurses in critical care areas and in a large tertiary care, teaching facility where many nurses engage in deliberate practice. Differences may be noted in other contexts.

There were however significant negative associations with sub-categories of deliberate practice; in particular Certification, Professional Organization Membership and Self-Regulated Learning/Self-Development. Thus, as the number of years practicing as an RN increased the number of Certifications and Organizational Memberships held decreased and the amount of simulation experiences, information seeking and time spent reading healthcare related information decreased. Two explanations could be possible for this finding. One, this could be theoretically consistent with the concept of "arrested development" wherein some individuals with extended experience may at some point in their career "give up their commitment to seeking excellence and thus terminate regular engagement in deliberate practice to further improve performance" (Ericsson, 2006, p. 685). In this state of arrested development, one remains in a stable and automated state of performance in their profession. The second explanation for these study findings takes into consideration the cross-sectional nature of the

study and the possibility of a cohort affect. Since age was highly correlated with experience (r = .89, p < .001), one might conclude that with age as a proxy for experience, RNs of a certain age cohort may be less likely to engage in deliberate practice activities.

This study did find a significant positive association between years of experience practicing as an RN and the number of orientees one precepted. Although this increase in the number of orientees precepted with length of experience seems logical, this result must be interpreted in context. Nurses working at the teaching hospital where data were collected have precepting expectations and are not able to necessarily be idle in this area of practice. Therefore, in other types of hospital settings where precepting is not an expectation, findings may differ.

This study did show a significant relationship between deliberate practice and expertise. The more deliberate practice that one was engaged in was associated with a higher self-reported competence level. This finding is consistent with evidence from prior research showing that deliberate practice is associated with performance in other professional domains (Sonnentag & Kleine, 2000) as well as in sports (Helsen et al., 1998; Ward et al., 2004; Ward et al., 2007) and chess (Charness et al., 2005).

Limitations

The current study's cross-sectional, correlational design does not allow for causal relationships to be established (Brink & Wood, 1998). The study was conducted in a large, tertiary care teaching facility which is one of many types of hospital settings. This influences the structural and nursing features of the healthcare setting which may have influenced findings of the study and had an impact on data interpretation and generalizability. Non-response bias should be considered. Not all participants responded to the questionnaire and responses were not evenly distributed across the units selected for the study. Also, the dependent variable of interest,

expertise, was self-reported by nurses. Self-assessment is subjective and this study did not relate self-assessments to actual care given to patients.

Another limitation is associated with the use of a new instrument, the DPNQ. Several steps were however taken to establish content validity of the instrument such as an expert panel review and survey testing. A respectable sample size for the study revealed good evidence of the feasibility of the instrument based on initial testing. Future studies with larger and varied samples in different hospital settings are warranted to further test instrument reliability and validity.

Conclusion

This study was an important first step in understanding the impact of deliberate practice on nursing expertise. Unlike other studies that have examined factors that affect nursing expertise and patient outcomes such as experience and education (Aiken et al., 2011; McHugh & Lake, 2010; Tourangeau et al., 2007; Estabrooks et al., 2005; Aiken et al., 2003; Clark et al., 2002; Blegen et al., 2001), this study went further by examining the impact of deliberate practice activities in addition to individual nurse characteristics on nursing expertise, specifically self-report nurse competence. Although some of these studies have found conclusive evidence for the relationship of both experience and education with expertise, others have been inconclusive. Other domains have clearly shown that, specifically, experience based on years is not necessarily a precursor to expertise and expert performance (Ericsson, et al., 2007). This study supported that premise and provided empirical evidence for the relationship of deliberate practice to the attainment of expertise in nursing.

References

Aiken, L. H., Cimiotti, J. P., Sloane, D. M., Smith, H. L., Flynn, L., & Neff, D. F. (2011). Effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environments. *Medical Care, 49,* 1047-1053. doi:10.1097/MLR.0b013e3182330b6e

Aiken, L. H., Clarke, S. P., Cheung, R. B., Sloane, D. M., & Silber, J. H. (2003). Educational levels of hospital nurses and surgical patient mortality. *Journal of the American Medical Association, 290(12*), 1617-1623. doi:10.1001/jama.290.12.1617

American Association of Colleges of Nursing. (2008). *The Essentials of Baccalaureate Education for Professional Nursing Practice*. Retrieved from http://www.aacn.nche.edu/publications/order-form/baccalaureate-essentials

Bidden, J. S., Zhong, E. H., Moulton, P., & Cimiotti, J. P. (2013). Highlights of the National Workforce Survey of Registered Nurses. *Journal of Nursing Regulation, 4(2),* 5-14. Retrieved from https://www.ncsbn.org/4551.htm

Blegen, M. A., Vaughn, T. E., & Goode, C. J. (2001). Nurse experience and education: Effect on quality care. *Journal of Nursing Administration, 31(1),* 33-39. Retrieved from http://journals.lww.com/jonajournal/pages/default.aspx

Bobay, K., Gentile, D. L., & Hagle, M. E. (2009). The relationship of nurses' professional characteristics to levels of clinical nursing expertise. *Applied Nursing Research, 22,* 48-53. doi: 10.1016/j.apnr.2007.03.005

Brink, P. J., & Wood, M. J. (1998). *Advanced design in nursing research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Cash, K. (1995). Benner and expertise in nursing: a critique. *International Journal of Nursing Studies, 32(16),* 527-534. doi:10.1016/0020-7489(95)00011-3

Chee, J. (in press). Clinical simulation using deliberate practice in nursing education: A Wilsonian concept analysis. *Nurse Education in Practice*. doi:10.1016/j.nepr.2013.09.001

Clapper, T. C., & Kardong-Edgren, S. (2012). Using deliberate practice and simulation to improve nursing skills. *Clinical Simulation in Nursing, 8,* e109-e113. doi:10.1016/j.ecns.2010.12.001

Clarke, S. P., Rockett, J. L., Sloane, D. M., & Aiken, L. H. (2002). Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. *American Journal of Infection Control, 30,* 207-216. doi:10.1067/mic.2002.123392

DeLeskey, K. (2003, February). Factors affecting nurses' decisions to join and maintain membership in professional associations. *Journal of PeriAnesthesia Nursing, 18(1),* 8-17. doi:10.1053/jpan.2003.50000

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). . In *Internet, mail, and mixed-mode surveys: The tailored design method* (3rd ed.). Hoboken, NJ: John Wiley & Sons.

Dunn, T. G., & Shriner, C. (1999). Deliberate practice in teaching: what teachers do for self-improvement. *Teaching and Teacher Education, 15*, 631-651.

English, I. (1993, June). Intuition as a function of the expert nurse: A critique of Benner's novice to expert model. *Journal of Advanced Nursing, 18(3*), 387-393. doi:10.1046/j.1365-2648.1993.18030387.x

Ericsson, K. A. (2002). Toward a procedure for eliciting verbal expression on non-verbal experience without reactivity: Interpreting the verbal overshadowing effect within the theoretical framework for protocol analysis. *Applied Cognitive Psychology, 16(8),* 981-987. doi: 10.1002/acp.925

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, P. Feltovich, & R. R. Hoffman (Eds.), *Cambridge Handbook of Expertise and Expert Performance* (pp. 685-706). Cambridge, UK: Cambridge University Press.

Ericsson, K. A. (2008). Deliberate practice and acquisition of expert performance: A general overview. *Academic Emergency Medicine, 15,* 988-994. doi:10.1111/j.1553-2712.2008.00227.x

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review, 100,* 363-406.

Ericsson, K. A., Whyte, J., & Ward, P. (2007). Expert performance in nursing: Reviewing research on expertise in nursing within the framework of the expert-performance approach. *Advances in Nursing Science, 30,* E58-E71.

Estabrooks, C. A., Midodzi, W. K., Cummings, G. G., Ricker, K. L., & Giovannetti, P. (2005, March/April). The impact of hospital nursing characteristics on 30-day mortality. *Nursing Research, 54(2),* 74-84. Retrieved from http://journals.lww.com/nursingresearchonline/Pages/default.aspx

Feltovich, P. J., Prietula, M. J., & Ericsson, K. A. (2006). Studies of expertise from psychological perspectives. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 21-38). New York, NY: Cambridge University Press.

Harris, K. R., Eccles, D. W., Ward, P., & Whyte, J. (2013). A theoretical framework for simulation in nursing: Answering Schiavenato's call. *Journal of Nursing Education, 52(1*), 6-16. doi:10.3928/01484834-20121107-02

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*: The National Academies Press.

Kane, R. L., Shamliyan, T. A., Mueller, C., Duval, S., & Wilt, T. J. (2007). The association of registered nurse staffing levels and patient outcomes: Systematic review and meta-analysis. *Medical Care, 45(12),* 1195-1204. doi:10.1097/MLR.0b013e3181468ca3

Kendall-Gallagher, D., Aiken, L. H., Sloane, D. M., & Cimiotti, J. P. (2011). Nurse specialty certification, inpatient mortality, failure to rescue. *Journal of Nursing Scholarship, 43(2*), 188-194. doi.org/10.1111/j.1547-5069.2011.01391.x

McHugh, M. D., & Lake, E. T. (2010). Understanding clinical expertise: Nurse education, experience, and the hospital context. *Research in Nursing and Health*, *33*, 276-287. doi.org/10.1002/nur.20388

Meretoja, R., Isoaho, H., & Leino-Kilpi, H. (2004). Nurse competence scale: Development and psychometric testing. *Journal of Advanced Nursing*, *47*, 124-133.

Oermann, M. H., Kardong-Edgren, S., Odom-Maryon, T., Hallmark, B. F., Hurd, D., Rogers, N., ... Smart, D. A. (2011, September/October). Deliberate practice of motor skills in nursing education: CPR as exemplar. *Nursing Education Perspectives*, *32(5)*, 311-315. doi:10.5480/1536-5026-32.5.311

Pallant, J. (2007). *SPSS survival manual* (3rd ed.). New York, NY: McGraw Hill.

Schatz, S., Marraffino, A., Allen, C., & Tanaka, A. (*2*013, June 2013). Human-systems integration, simulation, and the nursing shortage. *Proceedings of the International Symposium of Human Factors and Ergonomics in Healthcare*, 2, 135-142. doi:10.1177/2327857913021026

Schwirian, P. M. (1978). Evaluating the performance of nurses: A multi-dimensional approach. *Nursing Research*, *27(6*), 347-351.

Simon, H. A., & Chase, W. G. (1973). Skill in chess. *American Scientist*, *61*, 394-403.

Sonnentag, S., & Kleine, B. M. (2000). Deliberate practice at work: A study with insurance agents. *Journal of Occupational and Organizational Psychology, 73*, 87-102. Retrieved from http://kops.ub.uni-konstanz.de/handle/comm-4/browse?offset=5540&type=type&value=article

Tourangeau, A. E., Doran, D. M., McGillis Hall, L., O'Brien Pallas, L., Pringle, D., Tu, J. V., & Cranley, L. A. (2007). Impact of hospital nursing care on 30-day mortality for acute medical patients. *Journal of Advanced Nursing, 57(1*), 32-44. doi:10.1111/j.1365-2648.2006.04084.x

Whyte, J., Ward, P., Eccles, D. W., Harris, K. R., Nandagopal, K., & Torof, J. M. (2012). Nurses' immediate response to the fall of a hospitalized patient: A comparison of actions and cognitions of experienced and novice nurses. *International Journal of Nursing Studies*, *49*, 1054-1063. doi:10.1016/j.ijnurstu.2012.03.005

Chapter V

Summary, Recommendations and Conclusion

This dissertation reviewed expertise development and examined the theoretical foundation of expertise in nursing. In addition, theories of expertise development in many other domains were explored in the context of deliberate practice and a conceptual model was developed to examine expertise in nursing based on deliberate practice, experience and education. Moreover, the DPNQ, an instrument to assess the deliberate practice activities of nurses was developed and tested. Probit scaling was used to devise a standardized scoring methodology for the DPNQ. Instrument validation was conducted via expert panel review and a survey study using a modified Dillman's tailored design methodology (Dillman, 2009). The study focused on the impact of deliberate practice and individual nurse characteristics on expertise. Specifically, it investigated relationships among experience, education, deliberate practice and self-report nurse competence. Notably, it was found in this study that deliberate practice made the greatest contribution to self-report nurse competence.

Summary

The Deliberate Practice in Nursing Expertise (DPNE) Model was developed and theoretically guided by the framework of deliberate practice. The deliberate practice framework asserts that a necessary precursor to expert performance is extensive hours of deliberate practice, or activities aimed at improving performance (Ericsson et al., 1993). Although a rigid definition of deliberate practice was initially introduced in seminal work using this framework in the areas of music and chess, other domains researching expertise within this framework have expanded

upon the definition. Expansion of the definition of deliberate practice in less structured domains, such as in the professional arenas like teaching (Dunn & Shriner, 1999) and insurance sales (Sonnentag & Kleine, 2000) have identified that deliberate practice may look different in these areas. Based on this premise, deliberate practice activities of nurses were identified through an extensive literature review and an existing questionnaire developed by Whyte and colleagues (2009) used to gain information about nurses' training, experience and information-seeking habits and paralleled aspects identified by Haag-Heitman (2008) as specific to deliberate practice in nursing. This information guided the development of the Deliberate Practice in Nursing Questionnaire (DPNQ) which served as one of the independent variables of interest in this study.

Chapter 3 described the instrument development process for the DPNQ. It detailed the content validation of the instrument with the expert panel review. Inter-rater agreement (100% reliability = .54 - .75; 80% reliability = .92 - .96) and the content validity index (.94) were both respectable and provided valuable information and direction for instrument revision and development. The DPNQ was then tested with adult critical care nurses via an electronic format using Qualtrics © survey software.

Data from the study were analyzed and probit scaling was used to create a standardized scoring methodology for the instrument based on means and standard deviations. Probit scaling is used when questionnaire scoring is heterogeneous as was the case with the DPNQ (Giddens et al., 2010). A common, Likert-type scale for measuring deliberate practice was devised, giving each item's responses a range of three SDs and a response scale of *0,1,2,3,4*. This standardized scale format allowed for maximum dispersion of the data while allowing for the calculation of total composite score for deliberate practice. A total composite score was calculated by

summing the scores from the six deliberate practice categories for a maximum total score of 96. Cronbach's alpha coefficient for the DPNQ in this study was .660 (standardized, .703).

Further validation of the DPNQ was undertaken by looking at its correlation with the Nurse Competence Scale (NCS). Deliberate practice was significantly associated with self-report nurse competence. Consistent with existing evidence of the relationship of deliberate practice and performance in other domains, these results further validated the DPNQ with the identification of significance in association and directionality of results.

In Chapter 4, the DPNE model was tested to examine relationships among the individual nurse characteristics of experience, education, deliberate practice and expertise. In this study, no significant relationships were identified between either experience, which was measured as the number of years practicing as an RN, or education (no BSN, or BSN or higher) and deliberate practice or expertise (self-report nurse competence). As discussed previously, findings vary in studies looking at the effects of education and experience on expertise and patient outcomes.

Notably, there was a significant relationship identified between deliberate practice and expertise. Those nurses engaged in more deliberate practice rated themselves as having higher nursing competence levels. Deliberate practice was also identified as making the highest contribution to expertise after taking into consideration gender, experience, and education. This finding was consistent with previous research on deliberate practice; that regularly expending time in competence improvement increases skill and knowledge (Ericsson et al., 1993; Ericsson et al., 2007; Sonnentag & Kleine, 2000). Therefore, this study provided empirical evidence for the importance of deliberate practice activities in expertise development in the domain of nursing. Results of this study have implications for theory, research and measurement, policy, practice and ultimately patient outcomes.

Recommendations

Theoretical

This research focused on nursing expertise development. Benner's (1984) Novice to Expert Theory was examined and familiar criticisms about the 'arbitrary' nature of the classification of experts based on intuition and the absence of empirical indication was identified. This study concentrated on efforts (deliberate practice) utilized to attain expert performance and developed an empirical indicator, the DPNQ, that can be used in the identification and measurement of expertise. Findings from the use of the DPNQ can help nursing better understand how nurses become experts and may be a way of empirically classifying experts based on their deliberate practice efforts.

This study also begins to expand the traditional identification of nursing expertise which has historically been classified by; length of experience, peer nomination or reputation, and perceived knowledge and skill (Ericsson, 2008). This study's findings, that higher competence levels (expertise) were most significantly impacted by those who engaged in more deliberate practice activities, provide initial evidence for more comprehensive expertise identification. Future studies should explore the impact of deliberate practice on actual performance levels and patient satisfaction in addition to self-report expertise to better clarify the relationship.

Methodological

Social and health science research involves the examination of many complex constructs of which valid and reliable measurement tools are necessary (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). No tool existed for the measurement of deliberate practice in nursing so part of this dissertation entailed developing an instrument. Due to the nature of the information collected to identify deliberate practice in nurses, questionnaire item formats varied which introduced

measurement challenges; making scoring difficult and psychometric testing for reliability and validity impossible.

Classical measurement theory using probit scaling was employed using survey data to devise a standardized scale (Giddens et al., 2010). Development of a composite scoring methodology would allow for the instrument to be related to other variables of interest in the study and for further validation of the instrument with other instruments. Further testing of the instrument with larger samples, different nursing populations, and in diverse healthcare settings is needed to continue to validate the instrument and ensure its reliability.

Clinical

The IOM (2011) *Future of Nursing* report notes that it is essential to create an expectation and culture of lifelong learning for nurses. However, it is also noted in this report that there are major flaws in the current continuing education system and that in order for nurses and other healthcare providers to continue to provide top quality care, a new vision of professional development is needed. The new vision aims specifically at improving patient care and is called 'continuing competence'. At the core of deliberate practice is lifelong learning, continually seeking out activities to improve performance and gain expertise in a technical and complex healthcare environment. The ability to measure deliberate practice may give the opportunity to demonstrate competence. This has implications for the individual nurses, managers, systems and policies.

Developing a culture of deliberate practice would encourage and allow nurses to identify learning needs and areas of skill improvement. Healthcare institutions, management and nursing staff could be made more familiar with the benefits of deliberate practice as part of education, training, and competence development and maintenance. This culture, consistent with the new

vision of the IOM (2011) *Future of Nursing* report and supporting a lifelong learning environment would then require that management and healthcare institutions provide opportunities for deliberate practice. These would include such things as certification opportunities, simulation experiences, conference opportunities, etc.

With deliberate practice as part of the 'continuing competence' culture in a healthcare organization, the focus should be on consistency and regularity in practice and the importance of setting goals for improvement of practice. Nurses should be rewarded for their efforts in expertise development. However, it has been identified that financial considerations play a large part in nurses' professional development (Bobay et al., 2009). So, once the culture is established and opportunities provided, if rewards are not offered, it may be harder to maintain the culture. These rewards would entail such things as promotions, advancements, and financial incentives.

Deliberate practice could impact recruitment of nurses. Management who normally rely on more 'experienced' nurses or nurses who have a higher education background may also someday inquire as to how much deliberate practice a potential employer engages in.

Several studies have linked nurse staffing ratios to positive patient outcomes (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007) that have ultimately affected institutional and state policies. This study identified a relationship between deliberate practice and expertise. Future studies should explore the link between deliberate practice and patient outcomes which may impact policy related to competence demonstration, expertise attainment and accountability for nurses. It may as also serve as a more constructive way to measure competency for state licensure requirements or certification renewals.

Conclusion

The present study showed that deliberate practice is a promising concept for explaining and contributing to the development of nursing expertise. We are facing as a profession many obstacles such as an upcoming nursing shortage, a shortfall of nursing faculty, and a wave of nurses retiring precipitating a loss of expert level knowledge and skills. With the Affordable Care Act, we will be expected to eventually provide healthcare coverage to approximately 32 million more Americans (NCSBN, 2014) and also greet an aging population relying on extensive health care services. Taken together, the demands being placed on nursing to maintain competence and strive for expertise attainment are great. These challenges have the potential to affect nursing care quality and patient outcomes. Deliberate practice provides a fruitful medium in which to address the challenges that threaten our profession.

References

Dunn, T. G., & Shriner, C. (1999). Deliberate practice in teaching: what teachers do for self-improvement. *Teaching and Teacher Education, 15*, 631-651.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review*, *100*, 363-406.

Giddens, J., Fogg, L., & Carson-Sabelli, L. (2010). Learning and engagement with a virtual community by undergraduate nursing students. *Nursing Outlook, 58*, 261-267. doi:10.1016/j.outlook.2010.08.001

Haag-Heitman, B. (2008). The development of expert performance in nursing. *Journal for Nurses in Staff Development, 24(5)*, 203-211. doi:10.1097/01.NND.0000320690.42061.07

National Council of State Boards of Nursing. (2014). Implications of the Affordable Care Act on nursing regulation and practice. *Journal of Nursing Regulation, 5(1)*, 26-34. Retrieved from http://www.journalofnursingregulation.com

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research, 27(2*), 94-104. doi:10.1093/swr/27.2.94

Sonnentag, S., & Kleine, B. M. (2000). Deliberate practice at work: A study with insurance agents. *Journal of Occupational and Organizational Psycholog , 73*, 87-102. Retrieved from http://kops.ub.uni-konstanz.de/handle/comm-4/browse?offset=5540&type=type&value=article

Whyte, J., Ward, P., & Eccles, D. W. (2009). The relationship between knowledge and clinical performance in novice and experienced critical care nurses. *Heart & Lung, 38(6*), 517-525. doi:10.1016/j.hrtlng.2008.12.006

Appendix A

Initial Deliberate Practice Questionnaire

1. Within the last year (12 months), how many hours of educational experiences relevant to nursing do you average per month? _____

2. Are you currently enrolled in any formal nursing program?

a. Yes
b. No

3. Since graduating from your first nursing program, have you taken any undergraduate level college courses (level 100 to 400)? If no, skip to Question 5.

a. Yes
b. No

4. Please identify the type of undergraduate level college courses (level 100 to 400):

a. Nursing or healthcare related
b. Other, please identify:_____

5. Since graduating from your first nursing program, have you taken any graduate level college courses (level 500 or above)? If No, skip to Question 7.

a. Yes
b. No

6. Please identify the type of graduate level college courses (level 500 and above):

a. Nursing or healthcare related
b. Other, please identify:_____

7. Within the last two years (24 months), how many nursing or healthcare related conferences held *within* your current employment institution have you attended?

Length of Conference	Number of Conferences							
	1	2	3	4	5	6	7	8
1 to 4 hours								
5 to 7 hours								
One 8 hour day								
Greater than 8 hours								

8. Within the last two years (24 months), how many nursing or healthcare related conferences held *outside* of your current employment institution have you attended?

Length of Conference	Number of Conferences							
	1	2	3	4	5	6	7	8
1 to 4 hours								

5 to 7 hours								
One 8 hour day								
Greater than 8 hours								

The next three questions (#9, #10 and #11) ask about your experience with simulated patients. A "simulated" patient should be thought of as either a person trained to act as a real patient, a manikin, or a high-fidelity simulator.

9. Within the last two years (24 months), how many times have you attempted to improve your performance by practicing a procedure on a simulated patient before performing solo (excluding certifications)?

a. 0
b. 1, be specific_____
c. 2, be specific_____
d. 3, be specific_____
e. 4, be specific_____
f. 5 or more, be specific_____

10. Within the last two years, how many times have you attempted to improve your performance by practicing a procedure and receiving instruction from an instructor/teacher/preceptor whilst performing on a simulated patient before performing solo (excluding certifications)?

a. 0
b. 1, bespecific_____
c. 2, be specific_____
d. 3, be specific_____
e. 4, be specific_____
f. 5 or more, be specific_____

11. Within the last two years (24 months), how many times have you received feedback on your performance from an instructor/teacher/preceptor while practicing on a simulated patient in order to improve your performance (excluding certifications)?

a. 0
b. 1, be specific_____
c. 2, be specific_____
d. 3, be specific_____
e. 4, be specific_____
f. 5 or more, be specific_____

12. How often do you actively seek out information related to the specific disease process of a patient for whom you've cared or a specific problem that you want to resolve (not including medication information)?

a. Every shift that you work
b. Most shifts that you work
c. Some shifts that you work
d. Very seldom

13. How often do you actively seek out information in order to broaden your general knowledge of nursing and/or health-related issues when the purpose for seeking the information is not associated with a specific patient?

a. **Every shift that you work**
b. **Most shifts that you work**
c. **Some shifts that you work**
d. **Very seldom**

14. In the last year, the number of nursing grand rounds *within* your employment institution that you attended and were at least one hour in length or longer was:

_____

15. In the last year, the number of in-services that were offered *on your specific unit* that you attended and that were at least one hour in length or longer was:

_____

16. In the last year, the number of in-services that were *outside of your specific unit* but within your employment institution that you attended and that were at least one hour in length or longer was:

_____

17. In the last year, the number of mandatories/unit competencies that you completed was:

a. **The number that was required for my unit**
b. **Above the number that was required for my unit**

18. In the last year, the number of continuing education units (CEUs) that you completed *within* your employment institution was:

_____

19. In the last year, the number of continuing education units (CEUs) that you completed *external* to your employment institution was:

_____

20. In the last year, the number of continuing education units (CEUs) that you completed overall was:

a. **The number that is required for state RN licensure maintenance**
b. **Above the number that is required for state RN licensure maintenance**

21. In the last year, the number of nursing or health-related journals that you subscribed to was:

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5 or more

22. Please list all certifications that you currently hold and the month and year that you acquired each certification (ex. Critical Care Registered Nurse [CCRN], Pediatric Advanced Life Support [PALS] :

Certification_____ Month/Year Acquired_____
Certification_____ Month/Year Acquired_____

Certification_____ Month/Year Acquired_____
Certification_____ Month/Year Acquired_____
Certification_____ Month/Year Acquired_____

23. Are any or all of these certifications required by your current employer?

a. **Yes, please specify which ones_____**
b. **No**

24. Please list all healthcare organizations you are affiliated with other than those with which you have been employed (ex. Michigan Nurses Association):

Organization_____ Month/Year Affiliated_____
Organization_____ Month/Year Affiliated_____
Organization_____ Month/Year Affiliated_____
Organization_____ Month/Year Affiliated_____
Organization_____ Month/Year Affiliated_____

Appendix B

Final Deliberate Practice Questionnaire

1 .On what unit do you currently work?

- ❑ SICU
- ❑ CCMU
- ❑ Trauma/Burn ICU

2. In what month and year were you born?

Month (ex. January)
Year (ex. 1965)

3. What is your sex?

- ❑ Male
- ❑ Female

4. Please indicate which racial/ethnic background you most closely identify with:

- ❑ Hispanic or Latino
- ❑ Black or African American
- ❑ White
- ❑ Asian
- ❑ American Indian or Alaska Native
- ❑ Native Hawaiian or other Pacific Islander
- ❑ Other, please specify: _____

5. What is your education background? (Mark all that apply)

- ❑ LPN diploma/certificate
- ❑ RN diploma in nursing
- ❑ Associate's degree in nursing
- ❑ Bachelor's degree in nursing
- ❑ Master's degree in nursing
- ❑ Master's degree in other field, please specify: _____
- ❑ Doctorate in nursing
- ❑ Doctorate in other field, please specify: _____
- ❑ Other degree, please specify: _____

Answer If Doctorate in nursing Is Selected

6. If you have a doctorate in nursing, please indicate the type of doctorate degree. (Mark all that apply)

- ❑ Doctor of Nursing Practice (DNP)
- ❑ Doctor of Nursing Science (DNSc)
- ❑ Doctor of Philosophy (PhD)

7. In what year did you graduate from your first nursing program? (ex. 1990)

8. We are interested in identifying the total number of years that you have provided direct patient care. How many years have you practiced as a registered nurse (RN)?

9. How many years have you provided direct patient care as a critical care nurse (emergency department, intensive care unit, post-anesthesia care unit, and/or survival flight nurse)?

10. In the past year, how many hours on average have you worked as a critical care nurse (emergency department, intensive care unit, post-anesthesia care unit, and/or survival flight nurse) per week?

- ❑ 1-19 hours
- ❑ 20-32 hours
- ❑ 33-48 hours
- ❑ 49 or more hours

11. Are you currently enrolled in a formal nursing degree program?

- ❑ Yes
- ❑ No

12. Since graduating from your first nursing program, have you taken any undergraduate level college courses?

- ❑ Yes
- ❑ No

If No Is Selected, Then Skip To Within the last two years (24 months)...

13. Please identify the type of undergraduate level college courses:

- ❑ Nursing
- ❑ Health care-related, please specify: _____
- ❑ Other, please specify: _____

14. Since graduating from your first nursing program, have you taken any graduate level college courses?

- ❑ Yes
- ❑ No

If No Is Selected, Then Skip To Within the last two years (24 months)...

15. Please identify the type of undergraduate level college courses:

- ❑ Nursing
- ❑ Health care-related, please specify: _____
- ❑ Other, please specify: _____

16. In the past 24 months, how many nursing or health care-related programs or conferences held at your current workplace have you attended?

	1	2	3	4	5	6	7	8 or more
Conferences 1 to 4 hours	❍	❍	❍	❍	❍	❍	❍	❍
Conferences 5 to 8 hours	❍	❍	❍	❍	❍	❍	❍	❍
Conferences 2 to 3 days	❍	❍	❍	❍	❍	❍	❍	❍
Conferences longer than 3 days	❍	❍	❍	❍	❍	❍	❍	❍

17. In the past 24 months, how many nursing or health care-related programs or conferences held outside of your current workplace have you attended?

	1	2	3	4	5	6	7	8 or more
Conferences 1 to 4 hours	❍	❍	❍	❍	❍	❍	❍	❍
Conferences 5 to 8 hours	❍	❍	❍	❍	❍	❍	❍	❍
Conferences 2 to 3 days	❍	❍	❍	❍	❍	❍	❍	❍
Conferences longer than 3 days	❍	❍	❍	❍	❍	❍	❍	❍

18. Since you have been practicing as an RN, what type(s) of simulation experience have you had? (Mark all that apply)

- ❑ High-fidelity simulator (e.g. SimMan)
- ❑ Low-fidelity simulator (e.g. IV task trainer)
- ❑ Virtual reality simulation (e.g. Second Life)
- ❑ Role Play
- ❑ None

19. In the past 24 months, what type(s) of simulation experience have you had? (Mark all that apply)

- ❑ High-fidelity simulator (e.g. SimMan)
- ❑ Low-fidelity task trainer (e.g. IV task trainer)
- ❑ Virtual reality simulation (e.g. Second Life)
- ❑ Role play
- ❑ None

20. In the past 24 months, how many times have you attempted to improve your performance by practicing a procedure on a simulated patient WITHOUT instruction from an instructor/teacher/preceptor (excluding certifications)?

- ❑ 0
- ❑ 1, explain procedure: _____
- ❑ 2, explain procedure(s): _____
- ❑ 3, explain procedure(s): _____
- ❑ 4, explain procedure(s): _____
- ❑ 5 or more, explain procedure(s); _____

21. In the past 24 months, how many times have you attempted to improve your performance by practicing a procedure on a simulated patient WITH instruction from an instructor/teacher/preceptor (excluding certifications)?

- ❑ 0
- ❑ 1, explain procedure: _____
- ❑ 2, explain procedure(s): _____
- ❑ 3, explain procedure(s): _____
- ❑ 4, explain procedure(s): _____
- ❑ 5 or more, explain procedure(s): _____

If 0 Is Selected, Then Skip To In the past 24 months, of the times t...

22. In the past 24 months, of the times that you practiced a procedure on a simulated patient WITH instruction, how many times did you receive feedback on your performance either during or after practicing the procedure (excluding certifications)?

- ❑ 0
- ❑ 1, explain procedure: _____
- ❑ 2, explain procedure(s): _____
- ❑ 3, explain procedure(s): _____
- ❑ 4, explain procedure(s): _____
- ❑ 5 or more, explain procedure(s): _____

23. How frequently at work do you actively seek out information about the specific disease process of a patient that you're caring for (not including medication information)?

- ❑ All of the time (100% of shifts worked)
- ❑ Often
- ❑ Sometimes (50% of shifts worked)
- ❑ Rarely
- ❑ Never

24. How frequently at work do you actively seek out information about a specific clinical problem (ex. pathophysiology, equipment, procedure) that you want to resolve (not including medication information)?

- ❍ All of the time (100% of shifts worked)
- ❍ Often
- ❍ Sometimes (50% of shifts worked)
- ❍ Rarely
- ❍ Never

25. How frequently at work do you actively seek out information in order to broaden your general knowledge of nursing and/or health care-related issues when the purpose for seeking the information is not associated with a specific patient?

- ❑ All of the time (100% of shifts worked)
- ❑ Often
- ❑ Sometimes (50% of shifts worked)
- ❑ Rarely
- ❑ Never

26. In the last year, what is the average number of hours per week in general that you spend reading nursing, medical, or health care-related information? (ex. journal articles, books, websites, pamphlets)

27. A preceptor is a nurse who maintains regular nursing duties on the unit while supervising newly employed nurses during the orientation period. Have you been a preceptor for a nurse orientee on your current unit?

- ❑ Yes
- ❑ No

If No Is Selected, Then Skip To Have you precepted orientees on a uni...

28. How many orientees have you precepted on your current unit?

- ❑ 1 to 3
- ❑ 4 to 6
- ❑ 7 to 9
- ❑ 10 or more

29. Have you precepted orientees on a unit that you were previously employed?

- ❑ Yes
- ❑ No

If No Is Selected, Then Skip To In the last year, the number of nursi...

30. How many orientees did you precept on a previous unit(s)?

- ❑ 1 to 3
- ❑ 4 to 6
- ❑ 7 to 9
- ❑ 10 or more

31. In the last year, the number of nursing grand rounds that you attended within your workplace that were at least one hour in duration was:

32. In the last year, the number of in-services that you attended on your specific unit that were at least one hour in duration was:

33. In the last year, the number of in-services that you attended outside of your specific unit but within your workplace and at least one hour in duration was:

34. In the last year, the number of mandatories/unit competencies that you completed was:

- ❑ The number that was required for my unit
- ❑ More than the number that was required for my unit

35. In the last year, the number of continuing education units (CEUs) that you completed within your workplace was:

36. In the last year, the number of continuing education units (CEUs) that you completed external to your workplace was:

37. In the last year, the number of continuing education units (CEUs) that you completed overall was:

- ❑ The number that is required for state licensure
- ❑ More than the number that is required for state licensure

38. Please list all certifications that you currently hold and the month and year that you acquired each certification (ex. Critical Care Registered Nurse [CCRN], Advanced Cardiovascular Life
40. Are any of these certifications required by your current employer?

- ❑ Yes, please specify which ones are required _____
- ❑ No

39. Please list all health care professional organizations you are a member of and the month and year you became a member (ex. Michigan Nurses Association, American Nurses Association).

Appendix C

Study Approval

UNIVERSITY OF MICHIGAN
eResearch.umich.edu

Medical School Institutional Review Board (IRBMED) • 2800 Plymouth Road, Building 520, Suite 3214, Ann Arbor, MI 48109-2800 • phone (734) 763 4768 • fax (734) 763 9603 • irbmed@umich.edu

---

To: Melissa Bathish

From:

Michael	Geisser
Alan	Sugar

Cc:

Melissa	Bathish
Kathleen	Potempa

Subject: Notice of Exemption for [HUM00072195]

SUBMISSION INFORMATION:
Title: Deliberate Practice and Nursing Expertise
Full Study Title (if applicable):
Study eResearch ID: HUM00072195
Date of this Notification from IRB: 7/8/2013
Date of IRB Exempt Determination: 7/8/2013
UM Federalwide Assurance: FWA00004969 (For the current FWA expiration date, please visit the UM HRPP Webpage)
OHRP IRB Registration Number(s):

IRB EXEMPTION STATUS:
The IRBMED has reviewed the study referenced above and determined that, as currently described, it is exempt from ongoing IRB review, per the following federal exemption category:

EXEMPTION #2 of the 45 CFR 46.101.(b):
Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

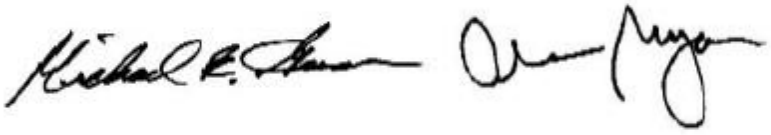
Note that the study is considered exempt as long as any changes to the use of human subjects (including their data) remain within the scope of the exemption category above. Any proposed changes that may exceed the scope of this category, or the approval conditions of any other non-IRB reviewing committees, must be submitted as an amendment through eResearch.

Although an exemption determination eliminates the need for ongoing IRB review and approval, you still have an obligation to understand and abide by generally accepted principles of responsible and ethical

conduct of research. Examples of these principles can be found in the Belmont Report as well as in guidance from professional societies and scientific organizations.

SUBMITTING AMENDMENTS VIA eRESEARCH:
You can access the online forms for amendments in the eResearch workspace for this exempt study, referenced above.

ACCESSING EXEMPT STUDIES IN eRESEARCH:
Click the "Exempt and Not Regulated" tab in your eResearch home workspace to access this exempt study.



Michael Geisser
Co-chair, IRBMED

Alan Sugar
Co-chair, IRBMED

Appendix D

Email Sent to Registered Nurses

Hello TBICU Nurses!

My name is Melissa Bathish and I am a PhD student at the University of Michigan School of Nursing, Ann Arbor. I have a great opportunity for you to participate in a study that examines the types of practice activities nurses are doing to improve their performance. The results will help us improve our practice by better understanding clinical expertise at a time when we face national workforce issues such as an aging workforce and a nursing shortage.

Everyone who completes the ***Nursing Practice and Expertise Survey*** will receive a $10 gift certificate redeemable at any UMHS Aramark café (Main Hospital cafeteria, Mott Children's Hospital cafeteria, Starbuck's Go Brew, and Einstein Bros. Bagels). The study should take 20 to 30 minutes to complete. All of the information you provide is anonymous. Any personal information you provide will not be linked to survey answers.

Click Here to Take Survey

Please contact Melissa Bathish at mbathish@umich.edu with any additional comments or questions.

Thank you,

Melissa

Appendix E

Flyer to Participate in Study

Trauma/Burn ICU Nurses

An Opportunity to Participate!

✓ Check for an Email from Unit Management and Melissa Bathish with an Opportunity to Participate in the ***Nursing Practice and Expertise Survey***

✓ Click on Link to Complete Survey

✓ Receive a $10 gift certificate to any Aramark Café (UM, Mott cafeteria, Einstein Bagel, Starbucks)

Thank You!

Appendix F

Reminder Email Sent to Registered Nurses

Friendly Reminder to Complete the Nursing Practice and Expertise Survey!

Hello!

This is just **a friendly reminder** to complete the Nursing Practice and Expertise Survey. Please set aside 20 to 30 minutes to answer some questions about clinical practice activities.

For your commitment to improving nursing practice you will receive a $10 gift certificate redeemable at any UMHS Aramark café (Main Hospital cafeteria, Mott Children's Hospital cafeteria, Starbuck's Go Brew, and Einstein Bros. Bagels) upon completion of the survey. Please see your unit host!

As many responses as possible are needed to use the information most effectively! Thanks again for your time and thoughtful answers!

Please contact Melissa Bathish at mbathish@umich.edu with any additional comments or questions about this survey.

Thank you!
Melissa

Appendix G
Nurse Competence Scale

No	Item	**Level of competence** 0 for very low level and 100 for very high level of competence	**The frequency with which individual items are actually used in clinical practice** (0) not applicable in my work; 1, used very seldom; 2, used occasionally and 3, used very often in my work.
	Helping role		
1.	Planning patient care according to individual needs	(0) _____ (100)	0 1 2 3
2.	Supporting patients' coping strategies	(0) _____ (100)	0 1 2 3
3.	Evaluating critically own philosophy in nursing	(0) _____ (100)	0 1 2 3
4.	Modifying the care plan according to individual needs	(0) _____ (100)	0 1 2 3
5.	Utilizing nursing research findings in relationships with patients	(0) _____ (100)	0 1 2 3
6.	Developing the treatment culture of my unit	(0) _____ (100)	0 1 2 3
7.	Decision-making guided by ethical values	(0) _____ (100)	0 1 2 3
	Teaching–coaching		
8.	Mapping out patient education needs carefully	(0) _____ (100)	0 1 2 3
9.	Finding optimal timing for patient education	(0) _____ (100)	0 1 2 3
10.	Mastering the content of patient education	(0) _____ (100)	0 1 2 3
11.	Providing individualized patient education	(0) _____ (100)	0 1 2 3
12.	Co-ordinating patient education	(0) _____ (100)	0 1 2 3
13.	Able to recognize family members' needs for guidance	(0) _____ (100)	0 1 2 3
14.	Acting autonomously in guiding family members	(0) _____ (100)	0 1 2 3
15.	Taking student nurse's level of skill acquisition into account in mentoring	(0) _____ (100)	0 1 2 3
16.	Supporting student nurses in attaining	(0) _____ (100)	0 1 2 3

	goals		
17.	Evaluating patient education outcome together with patient	(0) _____ (100)	0 1 2 3
18.	Evaluating patient education outcomes with family	(0) _____ (100)	0 1 2 3
19.	Evaluating patient education outcome with care team	(0) _____ (100)	0 1 2 3
20.	Taking active steps to maintain and improve my professional skills	(0) _____ (100)	0 1 2 3
21.	Developing patient education in my unit	(0) _____ (100)	0 1 2 3
22.	Developing orientation programmes for new nurses in my unit	(0) _____ (100)	0 1 2 3
23.	Coaching others in duties within my responsibility area	(0) _____ (100)	0 1 2 3
	Diagnostic functions		
24.	Analyzing patient's well-being from many perspectives	(0) _____ (100)	0 1 2 3
25.	Able to identify patient's need for emotional support	(0) _____ (100)	0 1 2 3
26.	Able to identify family members' need for emotional support	(0) _____ (100)	0 1 2 3
27.	Arranging expert help for patient when needed	(0) _____ (100)	0 1 2 3
28.	Coaching other staff members in patient observation skills	(0) _____ (100)	0 1 2 3
29.	Coaching other staff members in use of diagnostic equipment	(0) _____ (100)	0 1 2 3
30.	Developing documentation of patient care	(0) _____ (100)	0 1 2 3
	Managing situations		
31.	Able to recognize situations posing a threat to life early	(0) _____ (100)	0 1 2 3
32.	Prioritizing my activities flexibly according to changing situations	(0) _____ (100)	0 1 2 3
33.	Acting appropriately in life-threatening situations	(0) _____ (100)	0 1 2 3
34.	Arranging debriefing sessions for the	(0) _____ (100)	0 1 2 3

	care team when needed		
35.	Coaching other team members in mastering rapidly changing situations	(0) _____ (100)	0 1 2 3
36.	Planning care consistently with resources available	(0) _____ (100)	0 1 2 3
37.	Keeping nursing care equipment in good condition	(0) _____ (100)	0 1 2 3
38.	Promoting flexible team co-operation in rapidly changing situations	(0) _____ (100)	0 1 2 3
	Therapeutic interventions		
39.	Planning own activities flexibly according to clinical situation	(0) _____ (100)	0 1 2 3
40.	Making decisions concerning patient care taking the particular situation into account	(0) _____ (100)	0 1 2 3
41.	Co-ordinating multidisciplinary team's nursing activities	(0) _____ (100)	0 1 2 3
42.	Coaching the care team in performance of nursing interventions	(0) _____ (100)	0 1 2 3
43.	Updating written guidelines for care	(0) _____ (100)	0 1 2 3
44.	Providing consultation for the care team	(0) _____ (100)	0 1 2 3
45.	Utilizing research findings in nursing interventions	(0) _____ (100)	0 1 2 3
46.	Evaluating systematically patient care outcomes	(0) _____ (100)	0 1 2 3
47.	Incorporating relevant knowledge to provide optimal care	(0) _____ (100)	0 1 2 3
48.	Contributing to further development of multidisciplinary clinical paths	(0) _____ (100)	0 1 2 3
	Ensuring quality		
49.	Committed to my organization's care philosophy	(0) _____ (100)	0 1 2 3
50.	Able to identify areas in patient care needing further development and research	(0) _____ (100)	0 1 2 3
51.	Evaluating critically my unit's care philosophy	(0) _____ (100)	0 1 2 3

52.	Evaluating systematically patients' satisfaction with care	(0) _____ (100)	0	1	2	3
53.	Utilizing research findings in further development of patient care	(0) _____ (100)	0	1	2	3
54.	Making proposals concerning further development and research	(0) _____ (100)	0	1	2	3
	Work role					
55.	Able to recognize colleagues' need for support and help	(0) _____ (100)	0	1	2	3
56.	Aware of the limits of my own resources	(0) _____ (100)	0	1	2	3
57.	Professional identity serves as resource in nursing	(0) _____ (100)	0	1	2	3
58.	Acting responsibly in terms of limited financial resources	(0) _____ (100)	0	1	2	3
59.	Familiar with my organization's policy concerning division of labour and co-ordination of duties	(0) _____ (100)	0	1	2	3
60.	Co-ordinating student nurse mentoring in the unit	(0) _____ (100)	0	1	2	3
61.	Mentoring novices and advanced beginners	(0) _____ (100)	0	1	2	3
62.	Providing expertise for the care team	(0) _____ (100)	0	1	2	3
63.	Acting autonomously	(0) _____ (100)	0	1	2	3
64.	Guiding staff members to duties corresponding to their skill levels	(0) _____ (100)	0	1	2	3
65.	Incorporating new knowledge to optimize patient care	(0) _____ (100)	0	1	2	3
66.	Ensuring smooth flow of care in the unit by delegating tasks	(0) _____ (100)	0	1	2	3
67.	Taking care of myself in terms of not depleting my mental and physical resources	(0) _____ (100)	0	1	2	3
68.	Utilizing information technology in my work	(0) _____ (100)	0	1	2	3
69.	Co-ordinating patient's overall care	(0) _____ (100)	0	1	2	3

70.	Orchestrating the whole situation when needed	(0) _____ (100)	0	1	2	3
71.	Giving feedback to colleagues in a constructive way	(0) _____ (100)	0	1	2	3
72.	Developing patient care in multidisciplinary teams	(0) _____ (100)	0	1	2	3
73.	Developing work environment	(0) _____ (100)	0	1	2	3