DIFFERENCES IN NEW GRADUATE NURSE CRITICAL THINKING SKILLS

USING CONCEPT MAPPING

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TABLE OF CONTENTS

ABSTRACT

RESEARCH PAPER: Differences in New Graduate Nurse Critical Thinking Skills Using Concept Mapping

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New graduate nurses often lack the critical thinking skills needed to recognize and manage patient problems and life-threatening conditions. Concept mapping is an analytical tool used to enhance nurses' critical thinking skills. The purpose of this descriptive comparison study is to determine whether concept mapping improves critical thinking skills in new graduate nurses during a hospital orientation program. This is a replication of Wilgis and McConnell's (2008) study. The theoretical framework is Benner's (1984, 2001) Novice to Expert Theory. A convenience sample of new graduate nurses will be recruited from a mid-sized Midwestern tertiary care hospital. Schuster's (2003) Concept Map Care Plan Evaluation Tool will be adapted to measure new graduate nurse's critical thinking in concept maps based on case studies completed at the beginning and end of orientation. Findings will provide information about the effectiveness of concept mapping in developing and assessing critical thinking skills in new graduate nurses.

Chapter 1

Introduction

Introduction

In today's health care settings, new graduate nurses are required to care for more acutely ill patients. Therefore, they must acquire the critical thinking skills necessary to recognize and manage emerging patient problems and life-threatening conditions. According to the National Advisory Council on Nurse Education and Practice (2008), both new and experienced nurses must possess the critical thinking skills required "to rapidly acquire and assimilate new information and to use that information to make appropriate patient care decisions...in order to ensure patient safety, provide quality care, and deliver patient care efficiently" (pp. 5-6). However, new graduate nurses often lack the critical thinking experience needed to effectively handle these situations.

According to Benner (1984, 2001), new graduate nurses perform at the level of novice or advanced beginner, depending upon their level of previous work experience. While new graduate nurses perform at minimal competency levels, continued educational support is required in order to further develop the necessary critical thinking and decision-making skills essential in carrying out the professional role of nursing. Therefore, it is necessary for hospital nursing educators to include strategies that will enhance these skills in nurses, beginning with new employee orientation programs

(Wilgis & McConnell, 2008). Research indicates that clinically competent care, which requires critical thinking skills, improves patient safety as nurses are better equipped to recognize and manage changes in patients' condition (Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2008).

Complicating these growing needs even further is the challenge for health care organizations to provide the necessary supportive resources and training for new graduate nurses while facing rising health care costs and today's difficult economic times. According to the Centers for Medicare and Medicaid Services (CMS) (2008), National Health Expenditures 2008 Highlights:

> Hospital spending growth increased 4.5 percent to $718.4 billion compared to 5.9 percent growth in 2007. The 2008 growth was the slowest rate of increase since 1998 and was influenced by decelerating price growth, investment losses, and slower growth in Medicaid hospital spending. Partially offsetting these factors were increased growth in both inpatient and outpatient utilization and faster Medicare hospital spending growth (p.1).

Projecting future hospital services expenditure growth rates, the National Health Expenditure Fact Sheet from the CMS (2010) predicts hospital spending to grow at an increased rate of 5.9% in 2009 to $761 billion, with an average growth of 6.1% per year expected through 2019. Thus, continued financial concerns for resource utilization within the health care facilities employing new nurse graduates will remain a challenge. Therefore, hospital nurse educators must find effective strategies to enhance critical thinking skills in new graduate nurses while remaining fiscally responsible.

Concept mapping is an analytical tool and creative educational strategy that has been successfully used in various disciplines to help organize information by clustering and linking data in order to visually demonstrate relationships between the data (Cyr & All, 2009). While newer to the discipline of nursing, concept mapping has been successfully used in nursing research and nursing education to enhance and engage critical thinking skills (Cyr & All; Ferrario, 2004; Schuster, 2003; Tyler, 2004; Vacek, 2009). Concept mapping may be an ideal tool for hospital educators to use in guiding new graduate nurses in improving critical thinking performance, moving from the level of a novice to expert nurse whose critical thinking is more intuitive, or second nature (Cyr & All; Wilgis & McConnell, 2008).

Background and Significance

In an extensive literature review examining various teaching strategies used to increase critical thinking among nursing students, Staib (2003) found that while critical thinking is a more recent concept identified in nursing, it can in fact be traced as far back as to the Greek philosophers; such as, Socrates, Plato, and Aristotle. First proposed in general education in the 1950's, critical thinking became the focus of a Delphi study conducted by the American Philosophical Association (APA) in the late 1990s, where an international multidisciplinary team of experts led by Scheffer and Rubenfeld (2000) issued a consensus definition of critical thinking:

> Critical thinking in nursing is an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance,

and reflection. Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge (p. 357).

Following this study, several definitions of critical thinking emerged from nursing, all differing from the APA statement in that each nursing definition included outcomes, emphasizing that "it is not enough for nurses to think critically; they must translate thinking into action" (Staib, 2003, p. 499). Furthermore, adding to the difficulty of defining this complex concept in nursing is the challenge of measuring critical thinking ability in nursing. Various research studies (Riddell, 2007; Scheffer & Rubenfeld, 2006; Tanner, 2005) have reported the lack of a reliable or valid tool for measuring critical thinking within the context of nursing practice.

Critical thinking in nursing has been defined as "a thought process used by nurses for clinical decision-making" (Martin, 2002, p. 243). In general terms, it has been identified as "purposeful, reasonable and goal-directed thinking" (Hoffman & Elwin, 2004, p. 9). More specifically, critical thinking has been defined as "a complex process that is purposeful and self-regulatory in judgment and results in a comprehensive analysis, interpretation, and evaluation of information that involves evidential, conceptual, methodological, criteriological, or contextual considerations on which that judgment is based" (Wilgis & McConnell, 2008, p. 120). A nonlinear process that involves collecting, interpreting, analyzing, and evaluating information (Schuster, 2003), critical thinking is a complex concept that is both difficult to define and measure (Wilgis & McConnell).

Daley, Shaw, Balistrieri, Glasenapp, and Piacentine (1999) conveyed that while many current commercial instruments; such as, the Watson-Glaser Critical Thinking Appraisal, the California Critical Thinking Skills Test, and the Cornell Critical Thinking Test, are used to measure critical thinking in nursing, they do not "possess a connection to the context of nursing practice" (p. 42). In fact, these tools fail to demonstrate validity in measuring the concept of critical thinking within the context of nursing practice (Daley et al.). Furthermore, these commercial instruments have also lacked consistency in results among nursing research studies, failing to detect "significant differences in critical thinking among students when administered at the beginning and end of nursing programs" (Wilgis & McConnell, 2008, p. 120). However, several learning strategies have been used to improve and evaluate critical thinking skills in nursing. Concept mapping is one such strategy, allowing for the organization of "concepts, knowledge, and processes in a hierarchical fashion" (Wilgis & McConnell, p. 120).

Based on an assimilation of concepts and relationships among concepts, concepts maps "are visual illustrations of thought processes. Case studies or actual client data can be used to construct concept maps and may be evaluated by educators to determine whether students or nurses are able to assimilate, analyze, and relate information in a meaningful manner" (Wilgis & McConnell, 2008, p. 120). In addition, concept mapping has been established as a valid and reliable clinical tool that guides students to "clearly and succinctly visualize priorities and identify relationships in clinical patient data (Schuster, 2003, p. 1).

Several studies have identified concept mapping as an effective teaching-learning strategy to enhance and evaluate the higher cognitive abilities required for critical

thinking. Daley et al. (1999) explored the use of concept maps as a tool to teach, evaluate, and measure changes in nursing students' critical thinking over the course of a semester. The researchers found that concept mapping served as an outcome measure of critical thinking and the study showed that concept maps significantly improved students' critical thinking skills. Wheeler and Collins (2003) found concept mapping to be an effective tool in helping students develop critical thinking skills when examining the effectiveness of concept mapping over traditional care plans in helping baccalaureate nursing students. Furthermore, Hsu and Hsieh (2005) implemented concept mapping as a learning strategy within the context of a nursing course in order to evaluate students' learning progress through the construction of concept maps based on case scenarios and found that over the course of the semester, the nursing students had acquired problem-solving and critical thinking skills as evidenced by improved group concept map scores. In addition, Abel and Freeze (2006) evaluated the effectiveness of concept mapping as a clinical teaching-learning strategy that reflects the use of critical thinking and the nursing process in associate degree nursing (ADN) students, finding that concept mapping is an evidence-based teaching-learning strategy to improve critical thinking in nursing students.

Moving from the realm of nursing education, Wilgis and McConnell (2008) found concept mapping to be a useful teaching strategy and effective method to evaluate thought processes for graduate nurses participating in a hospital orientation program. While introducing concept mapping in a staff development education series for oncology nurses, Phelps et al. (2009) found that concept mapping not only improved the understanding and ability to apply learned content, but also noticed an increased confidence of participants in caring for oncology patients. Pilcher (2009), using a

comparative pretest-posttest design study to evaluate the effectiveness of concept mapping as a tool for measuring neonatal knowledge in an internship program, noted that improvements on concepts maps were significantly higher than those with a traditional multiple choice test. Veo (2010), using a qualitative action research design to determine the effectiveness of concept mapping as a strategy for teaching nurses how to apply theory to daily practice, found that the application of theory to practice was more understandable through the use of concept mapping.

Thus far, the majority of the research related to the effectiveness of concept mapping has focused on nursing students. A limited number of studies have applied the use of concept mapping in staff development. This study proposes to evaluate concept mapping as a strategy to improve critical thinking skills in new graduate nurses during a hospital orientation program.

Problem Statement

New graduate nurses often lack the critical thinking skills needed to recognize and manage patient problems and life-threatening conditions. Concept mapping is an analytical tool used to enhance nurses' critical thinking skills.

Purpose

The purpose of this descriptive comparison study is to determine whether concept mapping improves critical thinking skills in new graduate nurses during a hospital orientation program. This is a replication of Wilgis and McConnell's (2008) study.

Research Questions

1. Is concept mapping an effective tool in developing critical thinking skills in new graduate nurses during a hospital orientation program?

2. Is concept mapping an effective tool for assessing critical thinking skills in new graduate nurses during a hospital orientation program?

Theoretical Model

Benner 's Novice to Expert Theory establishes a predictable pattern of critical thinking development in nurses and provides a theoretical framework for guiding hospital educators in determining the most effective teaching strategies to meet the various levels of nurses' learning needs (Wilgis & McConnell, 2008). According to Benner (1984, 2001), five distinct stages of nursing development exist: novice, advanced beginner, competent, proficient, and expert. Benner identifies new graduate nurses as novices or advanced beginners, depending upon the level of previous work experience and recognizes that both of these levels require continued support and experience in order to continue developing critical thinking and clinical-decision making skills. With each stage holding its own distinct elements of critical thinking development, new nurses tend to require further experience with pattern recognition and situational thinking in order to improve critical thinking and clinical decision-making skills (Wilgis & McConnell). Concept mapping has been identified as an effective teaching-learning strategy to enhance and evaluate the higher cognitive abilities required for critical thinking (Abel & Freeze, 2006; Daley et al., 1999; Hsu & Hsieh, 2005; Phelps et al., 2009; Pilcher, 2009; Veo, 2010; Wheeler & Collins, 2003; Wilgis & McConnell). Thus, this study proposes to evaluate concept mapping as a strategy for developing and assessing critical thinking skills in new graduate nurses during a hospital orientation program.

Definition of Terms

Applying Benner's (1984, 2001) Novice to Expert Theory as the framework, this study proposes that concept mapping is an effective tool for developing and assessing critical thinking skills in new graduate nurses during a hospital orientation program. The identified underlying terms and definitions serve as the basis for this study.

Critical Thinking: Conceptual

"Critical thinking involves a complex process that is purposeful and self-regulatory in judgment and results in a comprehensive analysis, interpretation, and evaluation of information that involves evidential, conceptual, methodological, criteriological, or contextual considerations on which that judgment is based" (Wilgis & McConnell, 2008, p. 120).

Critical Thinking: Operational

For this study, critical thinking is the numerical score representing the attainment of "nursing care standards related to the specific case study as well as the content of the overall map, which includes logical flow of thought processes, complexity, and hierarchical order, illustrated by the connections and cross-links on the map" (Wilgis & McConnell, 2008, p.122). Maps will be scored using a Concept Map Grading Tool adapted from Schuster's (2003) Concept Map Care Plan Evaluation Tool.

Concept Maps: Conceptual

Based on an assimilation of concepts and relationships among concepts, concepts maps "are visual illustrations of thought processes. Case studies or actual client data can be used to construct concept maps and may be evaluated by educators to determine

whether students or nurses are able to assimilate, analyze, and relate information in a meaningful manner" (Wilgis & McConnell, 2008, p. 120).

Concept Maps: Operational

In this study, concept maps are "an analytical tool as well as a creative educational strategy used to help synthesize, organize, and prioritize data in a logical sequence" (Wilgis & McConnell, 2008, p.119). For research analysis purposes, map scoring criteria will be the same as used by Wilgis and McConnell, with points awarded based on the achievement of nursing care standards related to the given case study, as well as the overall content of the map.

New Graduate Nurse: Conceptual

According to Benner (1984, 2001), a new graduate nurse performs as a novice or advanced beginner, depending upon the level of previous work experience. While new graduate nurses "can demonstrate minimal competencies, they need continual educational support in developing critical thinking and decision-making skills and learning professional roles" (Wilgis & McConnell, 2008, p. 119).

New Graduate Nurse: Operational

In this study, a new graduate nurse is one "entering the role of the registered nurse [having]…practiced less than 2 years in a clinical setting during their educational experience" (Wilgis & McConnell, 2008, p. 119).

Novice Nurse: Conceptual

At the first level of competence in Benner's Novice to Expert Theory, the novice nurse lacks experience in the environment in which they are expected to perform,

requiring continued support and experience in order to further develop critical thinking and clinical-decision making skills (Benner, 1984, 2001).

Novice Nurse: Operational

For this study, a novice nurse is a new graduate nurse entering the role of the registered nurse with no previous experience in the newly assigned clinical setting (Benner, 1984, 2001).

Advanced Beginner Nurse: Conceptual

Advanced beginner nurses exhibit a marginally acceptable level of performance, demonstrating the ability to recognize the meaning of a critical situation, but possibly not understanding or anticipating the care needed. Again, continued support and experience are necessary in order to continue developing critical thinking and clinical-decision making skills (Benner, 1984, 2001).

Advanced Beginner Nurse: Operational

In this study, an advanced beginner nurse is a new graduate nurse entering the role of the registered nurse with less than two years previous experience in the newly assigned clinical setting (Wilgis & McConnell, 2008).

Limitations

Due to the small sample size and use of a convenience sample, generalizibility of this study is limited. Furthermore, the findings need to be considered with caution due to a potential threat to internal validity related to the pretest/posttest design. Nonetheless, two different case studies will be used for the pre- and post-concept maps, both consisting of content familiar to the graduate nurses; therefore, undue influence on the posttest scores should not exist.

Assumptions

The following assumptions were made in this study:

- "Nurses' critical thinking processes should include a comprehensive assessment of the patient and analysis and prioritization of the patient's needs, followed by problem solving that applies evidence-based and outcome-directed interventions to improve the health of the patient" (Wilgis & McConnell, 2008, p. 120).

- Concept maps graphically depict thought processes used in assimilating, analyzing, and relating patient data in order "to determine nursing diagnoses, identification of expected patient outcomes, development of a patient's plan of care, implementation of nursing interventions, and evaluation of patient progress toward outcomes" (Wilgis & McConnell, 2008, p. 122).

- New graduate nurses perform as novices or advanced beginners, depending upon their level of previous work experience (Benner, 1984, 2001).

- New graduate nurse orientees will provide honest answers to the Concept Mapping Evaluation questions.

Summary

The demands of caring for more acutely ill patients in health care settings requires new graduate nurses to utilize critical thinking skills in order to recognize and manage emerging patient problems and life-threatening conditions. However, new graduate nurses often lack the critical thinking experience needed to effectively handle these situations. In addition, hospitals are challenged in providing the necessary supportive resources and training for new graduate nurses. The purpose of this study is to determine whether concept mapping improves critical thinking skills in new graduate nurses during

a hospital orientation program. Replicating Wilgis and McConnell's (2008) study, the framework is based on Benner's (1984, 2001) Novice to Expert Theory. According to Benner, new graduate nurses perform as novices or advanced beginners, depending upon the level of previous work experience. At both levels, continued support and experience are necessary in order to continue developing critical thinking and clinical-decision making skills. Wilgis & McConnell view critical thinking for nurses as a comprehensive process that includes the steps of assessment, analysis, and prioritization of patient needs, as well as problem solving that incorporates evidence-based and outcome-directed interventions toward the goal of improving the patient's health. Concept maps graphically depict thought processes used in assimilating, analyzing, and relating patient data in order to carry out the nursing process (Wilgis & McConnell). Thus, this study proposes that concept mapping is an effective tool for developing and assessing critical thinking skills in new graduate nurses during a hospital orientation program.

Chapter II

Review of Literature

Introduction

New graduate nurses often lack the critical thinking skills needed to recognize and

manage patient problems and life-threatening conditions. Concept mapping is an

analytical tool used to enhance nurses' critical thinking skills. Like concept mapping,

critical thinking is a nonlinear thought process. Furthermore, it requires the development

of higher-level cognitive functions. Concept mapping is an excellent strategy to help

process, organize, and prioritize information in a logical sequence; and therefore, may

serve as a valuable tool for improving critical thinking skills in new graduate nurses

(Wilgis & McConnell, 2008).

Purpose

The purpose of this descriptive comparison study is to determine whether concept

mapping improves critical thinking skills in new graduate nurses during a hospital

orientation program. This is a replication of Wilgis and McConnell's (2008) study.

Organization of Literature

The literature review to support this study is divided into four sections: (a)

theoretical framework; (b) critical thinking skills; (c) concept mapping and critical

thinking in nursing education; and (d) concept mapping and critical thinking in staff development. The chapter concludes with a summary.

Theoretical Framework

Benner's (1984, 2001) Novice to Expert Theory is the framework for this study. Through descriptive research, Benner used the Dreyfus Model of Skill Acquisition to clarify the characteristics of nurse performance at five different levels of competence: novice, advanced beginner, competent, proficient and expert. Indicating a predictable pattern of critical thinking development, Benner's findings revealed that each stage holds its own distinct characteristics.

According to Benner (1984, 2001), new graduate nurses perform as novices or advanced beginners depending upon the level of previous work experience. At the novice level, nurses lack experience in the environment in which they are expected to perform. As advanced beginners, nurses exhibit a marginally acceptable level of performance, demonstrating the ability to recognize the meaning of a critical situation but possibly not understanding or anticipating the care needed. Wilgis and McConnell (2008) suggested this framework serve as a guide for hospital educators in determining the most effective teaching strategies to meet the various levels of nurses' learning needs.

Benner's Novice to Expert theoretical framework has been used as the basis for a number of studies related to critical thinking in nursing (Fero et al., 2008; Martin, 2002; Wilgis & McConnell, 2008). Furthermore, it has provided a means for staff development programs aimed at promoting nursing excellence (Fero et al.). The findings from these studies indicate a measurable link between clinical experience and critical thinking (Martin), as well as the need for further research to test educational strategies to improve

critical thinking skills in nurses (Fero et al.) and further evaluate the effectiveness of concept mapping in promoting critical thinking skills in professional nurses (Wilgis & McConnell).

Applying Benner's Novice to Expert Theory to the competence level of new graduate nurses, Wilgis and McConnell (2008) pointed out the need for further experiences with pattern recognition and situational thinking in order to improve the critical thinking and clinical decision-making skills in new graduate nurses. Several studies have identified concept mapping as an effective teaching-learning strategy to enhance and evaluate the higher cognitive abilities required for critical thinking (Abel & Freeze, 2006; Daley et al., 1999; Hsu & Hsieh, 2005; Phelps et al., 2009; Pilcher, 2009; Veo, 2010; Wheeler & Collins, 2003; Wilgis & McConnell, 2008). This study proposes to evaluate concept mapping as a strategy to develop and assess critical thinking skills in new graduate nurses during a hospital orientation program.

Critical Thinking Skills

Taking into consideration the growing demand for expanded critical thinking abilities and clinical decision-making skills of nurses, Martin (2002) conducted a study focused "on the relationships among critical thinking, decision-making, and clinical nursing expertise" (p. 243). Using the author's own developed midrange Theory of Critical Thinking of Nurses based on the Benner and Paul models as the framework, Martin explained the theory as follows: "As persons develop clinical nursing expertise from novice to expert nurse through the use of knowledge and experience, they also develop critical thinking and use it consistently to make objective and appropriate clinical decisions" (p. 244).

The stratified convenience sample was recruited from a target population of nursing students, graduate nurses, and registered nurses from schools of nursing and health care agencies within the Midwest. The sample of 149 participants consisted of 27 ADN and 20 BSN nursing students at the beginning of their first clinical course, 28 ADN and 20 BSN graduate nurses prior to obtaining RN licensure, and a combination of 24 BSN prepared and 20 ADN and diploma prepared registered nurses "identified by their supervisors as experts with five or more years of experience in the current field of practice" (Martin, 2002, p. 245). Of the 54 experienced nurses representing seven different service areas, 24 held specialty certifications, with a mean average of 12.17 years experience in the area of specialty. Furthermore, the sample consisted of 136 females and 13 males, including 47 nursing students (32 percent), 48 graduate nurses (32 percent), and 54 expert nurses (36 percent). Ages of the students and graduates ranged from 17 to 56 with 84% falling between the ages of 17 and 36, while the expert nurses ranged in age from 25 to 56 with 96% falling between 27 and 56 years of age. Grade point averages were consistent across groups, ranging from 2.3 to 4.0, with 91% at 3.0 or above and 55% of the students had previous health care experience prior to beginning nursing school.

Instruments included the Elements of Thought Instrument (ETI), videotaped vignettes, and a demographic data sheet that measured the level of clinical expertise, type of basic nursing education, and demographic variables. Described as "a series of continuous points using adjectives that describe critical thinking, such as clear, relevant, justified, and significant" (Martin, 2002, p. 245), the ETI's intellectual standards define the elements of thought using a three-point Likert-type scale characterized by 38

adjectives and scores ranging from 38 to 114, with 114 indicating a high level of critical

thinking and 38 indicating a low level of critical thinking. Quality of decision-making

was measured by a decision score derived from the ETI. Scores ranged from 5, indicating

the most possible appropriate decisions were identified, to a score of 1, indicating no

decisions were made. Validity of the ETI was established through evaluation and it was

determined that Cronbach's alpha for reliability was 0.96. The researcher determined

scoring consistency by rescoring each transcription four weeks after the initial scoring,

establishing an intrarater reliability of .96 (Martin).

As expected, mean critical thinking scores were lower for students than for

graduates and experts. "ANOVA indicated significant differences in ETI scores among

the three levels of clinical expertise (F [2.144] = 11.79, p <.001)" (Martin, 2002, p. 246).

Each group differed from the other two significantly at the .05 level, thus proving critical

thinking scores increased with clinical expertise. As far as the difference between ADN

and BSN students, graduates, and expert nurses, "no significant differences were found in

ETI score (t [147] = -.93, p = .36) between ADNs and BSNs at any of the three levels of

expertise" (Martin, p. 246). In examining decision scores related to levels of clinical

nursing expertise, "a progression of mean scores, from the lowest at the student level to

the highest at the expert level, was found. ANOVA indicated significant differences for

the three levels of expertise (F [2.149] = 11.114, p < .0001) for decision scores" (Martin,

p. 246). Each expertise level proved to be significantly different from the other two levels

with "decision scores correlated significantly with the ETI (r = .70, p < .0001)" (Martin,

p. 246). Finally, in examining the relationship among critical thinking, decision-making,

and several demographic variables, significant relationships were found with age, grade

point average (GPA), and years of nursing experience. However, no significant

relationships existed with the variables of gender, health care experience prior to entering

or while completing nursing education, prior degrees, clinical practice area, or nursing

certification. In addition, those who had taken a course in critical thinking demonstrated

increased scores in both critical thinking and decision-making.

The findings, as measured by the ETI, revealed a difference in critical thinking

among the three clinical expertise levels, with the lowest scores coming from the nursing

students and the expert nurses attaining the highest scores. "This finding suggests that as

nurses achieve higher levels of clinical expertise, they use more critical thinking during a

decision-making situation as predicted by the Theory of Critical Thinking of Nurses"

(Martin, 2002, p.246). The study also noted "the need for further study of critical thinking

in clinical situations. Because of the link between clinical experience and high levels of

critical thinking, more time spent in clinical practice and classroom methods designed to

increase experience would…be beneficial" (Martin, p. 247). Furthermore, the study

pointed out the possible implications Martin's Theory of Critical Thinking of Nurses has

for staffing in health care facilities, stating the importance of a mix of experienced and

inexperienced nurses needed to provide the best nursing care for patients, as well as the

benefit this mix has on preparing expert nurses for the future.

While the relationship between critical thinking and confidence in decision-

making so often determines the effectiveness of nursing care delivery, minimal

agreement exists regarding the relationship between the two. The purpose of Hoffman

and Elwin's (2004) was to examine the relationship between critical thinking and

confidence in decision-making for new graduate nurses. No specific theoretical

framework was cited, but the study was based upon the concepts of critical thinking and confidence in decision-making.

Hoffman and Elwin (2004) recruited a convenience sample from a target population of new graduate nurses entering two area health services in Australia, one within a major metropolitan area and the other within a regional area health service. The study took place over a twelve-month period and included a sample size of 83 new graduate nurses from 11 different universities, representing a wide range of undergraduate preparation. No further inclusion or exclusion criteria were discussed.

Within the descriptive correlational design of the study, Hoffman and Elwin (2004) utilized the following methods of measurement: a demographic questionnaire to gather background information on participants, the Watson and Glaser Critical Thinking Assessment Tool (WGCTA), and the Confidence in Decision-making Scale. The WGCTA is an 80-item test that scores an individual's critical thinking ability and measures it as a composite including the following: attitudes of inquiry that involve an ability to recognize the existence of problems; knowledge of the nature of generalizations in which accuracy of evidence are logically determined; and the skills used to apply these attitudes and knowledge. Citing the earlier research by Pardue, the authors share that the WGCTA has an established criterion and construct validity of 0.55 and 0.75. The Confidence in Decision-making Scale was used to measure the perception of confidence in decision making, using a Likert scale with a score of 5 indicating high confidence and 0 indicating no confidence. The Confidence in Decision-making Scale, a tool used in previous research with high reliability, was pilot tested and a high face validity was determined (Hoffman & Elwin).

The findings of Hoffman and Elwin's (2004) study revealed the mean overall score for critical thinking was 50.23, SD 9.45, range 32-74, with a total possible score of 80. The mean overall score for confidence in decision-making was 74.11, SD 11.77, range 32-103, with a total possible score of 110. A significant weak negative relationship (correlation coefficient -0.225, significance 0.02) was found between the scores for critical thinking and confidence in decision-making. "As scores on critical thinking increased, scores on confidence in decision-making decreased. Those with higher critical thinking ability were less confident in decision-making." (Hoffman & Elwin, p. 11).

With the surprising result revealing critical thinking ability and confidence in decision-making negatively correlated, Hoffman and Elwin (2004) concluded that new graduate nurses possessing higher critical thinking skills and more hesitancy in decision-making, should be encouraged to continue in their questioning attitude. Furthermore, the study indicated that "overconfidence in clinical decision-making may not necessarily be a positive attribute, as there is no evidence to link this with accuracy or quality of decision-making" (Hoffman & Elwin, p. 12). Therefore, Hoffman and Elwin call attention to the need for professional development courses that raise awareness of the importance to encourage a nursing culture that fosters an open, questioning approach to decision-making in patient care delivery in order to help support safe nursing practice by all clinicians.

Keeping the importance of professional development and its relationship to critical thinking in mind, little research can be found regarding the relationship between preceptorship and the development of critical thinking in new graduate nurses. More specifically, Sorensen and Yankech (2008) found no studies that examined the

relationship of preceptor education to critical thinking scores of new graduate nurses. The three-fold purpose of Sorensen and Yankech's study was to "[1] examine whether a research-based, theory-driven preceptor educational program could improve the critical thinking of new graduate nurses, [2] explore how participation in the program would influence preceptors, and [3] evaluate the learning outcomes of the new graduate nurses" (Sorensen & Yankech, p. 210). For the framework, Sorensen and Yankech developed and used a conceptual model that demonstrated "the relationships of the new graduate nurse, the preceptor as scaffold, preceptor development education, and the process of bridging the new graduate nurse to professional practicing nurse" (p. 210).

A convenience sample was recruited from a target population of new graduate nurses and preceptors participating in a preceptor-facilitated orientation program at a Midwestern not-for-profit hospital system. Of the 31 participating new graduate nurses, 16 were in a control group and 15 were in an experimental group. The majority of new graduate nurses in both the control and experimental groups ranged in age from 20 to 25 years, graduated from diploma programs, and had previous experience working as certified nursing assistants. Of the control group nurses, 2 (13%) spent 15 to 18 weeks in a preceptor-facilitated orientation to their unit, 7 (44%) had 11 to 14 weeks of preceptorship, 4 (25%) had 7 to 10 weeks and 3 (19%) had 3 to 6 weeks of preceptor-facilitated orientation to their unit. In the experimental group of new graduate nurses, 7 (47%) spent 11 to 14 weeks in a preceptor-facilitated orientation to their unit, 4 (27%) had 7 to 10 weeks, and 4 (27%) had 3 to 6 weeks. Fifteen preceptors were recruited from a group of 47 registered nurses who had attended and completed a 3-hour continuing education program developed and taught by the study authors that focused on teaching

the preceptors how to facilitate critical thinking. Of the 15 preceptors, 11 were baccalaureate prepared, 3 diploma prepared, and 1 had an associate degree in nursing. Two of the nurses were currently enrolled in master's degree programs. The majority (60%) of the preceptors had 0 to 5 years of nursing experience, 10 (67%) preceptors had 0 to 5 years work experience at the research site, and 7 (47%) had 0 to 5 total years experience working as a preceptor. No significant differences (p > .05) were found between the control and experimental groups in relationship to age, length of preceptorship in weeks, years of non-nursing education after high school, or total years of health care experience before completing nursing school (Sorensen & Yankech, 2008).

Using a quasi-experimental, mixed-methods design, Sorensen and Yankech (2008) utilized the following tools of measurement: the California Critical Thinking Skills Test (CCTST) Form 2000, focus group interviews, and demographic and personal background questionnaires. The CCTST is 34-item, multiple-choice, standardized test "designed to measure three of the six core critical thinking skills as described in the consensus definition of critical thinking of the 1990 APA Delphi study: analysis, inference, and evaluation" (Sorensen & Yankech, p. 210). In addition, two subgroups, induction and deduction are scored under the evaluation subscale. Test items contain no technical or critical thinking vocabulary and the CCTST has been widely used as a measurement tool within nursing programs. Internal consistency reliability values of the CCTST Form 2000 ranged from 0.78 to 0.80, using Kuder Richardson-20 and "a national survey and replication study conducted in 1993-1994 by the National Center for Higher Education Teaching, Learning and Assessment at Pennsylvania State University

reaffirmed the APA Delphi conceptualization of critical thinking" (Sorensen & Yankech, p. 210).

Further data was collected using focus group and individual sessions with semi-structured questions to explore the effect of the preceptor training on the practice of the preceptors. Interviews were audio-taped and transcribed. Examples of open-ended questions used in the interviews included: "'How has the critical thinking education benefited your practice?' and 'How have you implemented the education in your practice?'" (Sorensen & Yankech, 2008, p. 211). The authors "independently performed preliminary exploratory analysis, followed by selective coding [and] an academic advisor then confirmed the resulting themes" (Sorensen & Yankech, p. 211).

Using a two-tailed t test to evaluate the relationship between the type of nursing degree and CCTST scores, there were no significant differences ($p > .05$) in scores ($t = -1.154$, $p = .297$) between diploma and baccalaureate nursing degree graduates in the combined control and experimental groups. When an ANCOVA was performed, there was a significant difference ($p > .05$) in the evaluation subscale. "Age, length of preceptorship in weeks, and total years of health care role experience before completing the nursing degree were controlled as covariates and CCTST scores as the dependent variable" (Sorensen & Yankech, 2008, p. 212). In the control and experimental groups ($N = 31$), statistical significance was achieved in the evaluation subscale ($F = 4.709$, $p = .039$).

In seeking a comprehensive view of the effects of implementing a formal preceptor development course, Sorensen and Yankech (2008) conducted semi-structured interviews with the preceptors and triangulated the preceptor interview data with the

preceptees CCTST scores. From the preceptor interview data, three major themes emerged: "identification of need for the education, value of the educational program, and benefits to the preceptees" (p. 212). Preceptors shared how they had changed their practice of precepting new graduate nurses as a result of the educational program and believed the program better equipped them to empower the new graduate nurses to think critically.

Preceptor participation in the educational program "contributed to the evaluation subscale of critical thinking skills of the experimental group on the California Critical thinking Skills Test ($F = 4.709$, $p = .039$)" (Sorensen & Yankech, 2008, p. 208). Preceptors had positive qualitative responses, having changed their practice as a result of the educational program to a learner-centered cognitive approach, using teaching-learning strategies to facilitate critical thinking. "It is asserted, then, that improving the preceptors' knowledge in turn improves the learning outcomes of the preceptees" (Sorensen & Yankech, p. 214). Positive outcomes of both the qualitative preceptor component and the quantitative new graduate nurse component were encouraging and supported "an administrative and educational decision to continue offering the preceptor development program and measuring learning outcomes in the new graduate nurse" (Sorensen & Yankech, p. 215). Additionally, Sorensen and Yankech (2008) recommended further longitudinal study to evaluate the long-term differences in critical thinking skills of new graduate nurses who received preceptor-facilitated orientation with preceptors who had participated in the formal preceptor development program. Follow-up interviews with the preceptors to ascertain continued use of the teaching-learning strategies presented in the preceptor development program, as well as an evaluation of the critical thinking ability of

the preceptors themselves, were also recommended. Finally, the researchers stressed the necessity for a nursing-specific assessment tool for critical thinking to be developed and tested (Sorensen & Yankech).

There is no doubt that patient safety is a major priority for health care facilities today. To ensure patient safety, nurses must use critical thinking skills to provide competent nursing care. In a study conducted by Fero et al. (2008), the literature review revealed that most studies related to critical thinking had only taken place in the context of nursing education programs and had not identified specific learning needs. The purpose of this study was to identify critical thinking learning needs of new and experienced nurses. Benner's Novice to Expert Model was used as the theoretical framework.

Fero et al. (2008) used a convenience sample ($N = 2144$) from a population of newly hired registered nurses in a southwestern Pennsylvania university healthcare system from January 1, 2004 to September 30, 2006. The healthcare system included 19 acute care, specialty, community and regional hospitals. From the sample, 31.4% of the participants were diploma program graduates, 41.0% associate degree graduates, and 27.6% baccalaureate degree graduates. The majority of the participants (56.5%) were new graduates, defined as having ≤ 1 year of experience, while 24.5% had 10 or more years of experience. No further inclusion or exclusion criteria were discussed.

Fero et al. (2008) used the Performance Based Development System (PBDS) assessment to identify critical thinking learning needs of the participants in order to assist in the development of an individualized orientation action plan to prepare better nurses for safe clinical practice. Consisting of 10 videotaped vignettes depicting common

medical-surgical clinical problems, the participants were asked to view each vignette and then in a written response, identify the problem, the responding actions they would take, and their rationale. The authors reported that the PBDS assessment was "administered and rated based on the process developed by Performance Management Servies, Inc" (Fero et al., 2008, p. 143). The written responses were rated by nurses who compared the respondents' answers to model answers and determined if the expectations were met or not met in "six subcategories: problem recognition, reports essential clinical data, initiates independent nursing interventions, differentiation of urgency, anticipates relevant medical orders, and provides relevant rationale to support decisions" (Fero et al., p. 143). The nurse raters ($n = 5$) all held master's degrees, had over 10 years of clinical experience, and received 9-12 months of PBDS rater training. The researchers stated that reliability and validity of the PBDS assessment had been reported in previous studies, with an equivalence approach used to obtain reliability estimates for the clinical vignettes averaging at 94% for individuals tested in parallel situations (Fero, et al.).

Using "a *post hoc* retrospective analysis of PBDS assessment data collected prospectively during the initial 2 weeks of employment of 2144 newly hired nurses" (Fero et al., 2008, p. 142), the researchers found that 539 of the nurses did not meet expectations. However, 103 of the 539 (19.1%) were excluded from the study because their subcategory scores were incomplete. Due to the large sample size, the chi-square test for independence likelihood ratio was used along with Pearson chi-square to analyze differences in years of experience and level of preparation with the level of statistical significance set at ($P > 0.05$) (Fero et al.).

Expectations on the PBDS assessment were met with the majority (74.9%) of newly hired nurses. Of those not meeting expectations, 436 (81.0%) had complete subcategory information with the results showing 97.2% not initiating appropriate nursing interventions, 67.0% not reporting essential clinical data, 62.8% not anticipating relevant medical orders, 62.6% not understanding their decision rationale, and 57.1% deficient in problem recognition. Statistical significance differed regarding years of experience in those who met or failed to meet expectations (χ^2 = 21.631, d.f. = 3, P < 0.0004) with the least experienced nurses having the highest rate of not meeting expectations, and the most experienced having the lowest rate. As far as level of educational preparation, there was no statistically significant difference in regards to level of educational preparation and the rate of meeting or not meeting expectations (χ^2 = 4.886, d.f. = 2, P = 0.087) when analyzing the total sample. However, rates of meeting expectations "differed statistically significantly in those prepared at associate (χ^2 = 12.085, d.f. = 3, P = 0.0007) and baccalaureate levels (χ^2 = 18.498, d.f. = 3, P < 0.0001) based on years of experience" (Fero et al., 2008, p. 144). Of these, 29.6% of the baccalaureate prepared new graduates did not meet expectations, while only 11.5% with ≥ 10 years of experience did not meet expectations. At the associate degree level, 31.0% of the new graduates did not meet expectations whereas 18.3% with ≥ 10 years of experience did not meet expectations. In contrast, no statistically significant differences existed in relationship to the rate of meeting expectations for diploma prepared nurses based on years of experience (χ^2 = 6.259, d.f. = 3, P = 0.100) (Fero et al.).

As the findings suggested, expectations were more likely to be met on the PBDS assessment by nurses with more years of experience, specifically those prepared at the

baccalaureate or associate degree level. With the findings supporting a difference in testing outcomes based on the level of educational preparation, Fero et al. (2008) suggested further study to explore potential reasons for the results. In addition, the researchers pointed out that the study supported Benner's Novice to Expert theoretical framework and indicated further research is needed to identify additional areas of deficiency and test educational strategies to improve critical thinking skills in both new and experienced nurses (Fero et al.).

Concept Mapping and Critical Thinking in Nursing Education

Nursing education emphasizes an outcomes-oriented approach. The National League for Nursing requires nursing school graduates demonstrate critical thinking. Thus, nursing faculty must find and use tools to teach and evaluate critical thinking in nursing education. Daley et al. (1999) explored the use of concept maps as a tool to teach, evaluate, and measure changes in nursing students' critical thinking over the course of a semester. The study also focused on faculty and student perceptions of concept mapping and utilized Ausubel, Novak, and Hanesian's Assimilation Theory of Learning as the conceptual framework.

The study sample was randomly selected from a convenience study population of six senior-level clinical groups within a baccalaureate nursing program ($N = 54$). From each of the 6 groups, three students were randomly selected ($N = 18$) for scoring and analysis of the first and last of three concept maps developed over the course of the semester. All of the students and an unknown number of faculty members were asked to evaluate the effectiveness of concept mapping as a learning strategy. No further inclusion or exclusion criteria were provided (Daley et al., 1999).

Time was devoted by course and clinical faculty to learn the use of concept maps. During the first week of class, students were introduced to the use of concept mapping. Students completed a concept map using a scenario given in class in order to demonstrate understanding of concept mapping. These initial maps were discussed in clinical groups. In addition, the students evaluated the use of concept maps as a learning strategy. Throughout the semester in the clinical setting, students were required to complete three concept maps that focused on client relationships, pathophysiological and pharmacologic factors, and therapeutic nursing interventions. Post-conference clinical discussions focused on the student developed concept maps in order to link course theory material and assigned clinical patient care. Concept maps were scored using a formula based on Novak and Gowin's assimilation theory with points awarded in the following categories: propositional links (1 point each), hierarchy (5 points for each valid level), cross links (up to 10 points each), and examples (1 point each). Established reliability was reported with a correlation score of .82 between two independent scores obtained on each concept map. Two educational experts reviewed the theoretical premise of concept maps in relation to the American Philosophical Association (APA) Delphi study of critical thinking to establish content validity. In addition, students and faculty provided anecdotal evaluation regarding the use of concept maps in nursing education (Daley et al., 1999).

Comparison of concept maps revealed a group mean score difference of 98.16 from the first concept map (40.38) to the final concept map (35.55) with a *t* value of -5.69 (*p* = .001) and indicated a statistically significant difference "indicative of the students' increase in conceptual and critical thinking" (Daley et al., 1999, p. 45). Student evaluation of the concept mapping experience revealed mixed results. Students found

concept mapping to be a useful learning tool, but also shared frustration with changing learning strategies during their senior year, feeling that concept mapping was confusing and time consuming. Faculty indicated that concept maps were a beneficial learning strategy that helped demonstrate students' gains and development of thinking processes, as well as misperceptions that needed to be addressed (Daley et al., 1999).

Daley et al. (1999) found that concept mapping served as an outcome measure of critical thinking. The study showed concept maps significantly improved students' critical thinking skills and served as a useful tool to help students understand complex conceptual relationships related to patient care. However, the researchers considered this a preliminary study and suggested further research of concept mapping in nursing education, as well as replication of the study and the need to establish construct validity of concept maps as a measurement of critical thinking.

While nursing theorists and researchers have found that teaching-learning strategies which promote active processing of concepts are more likely to lead to critical thinking skill development, Wheeler and Collins (2003) found no data related to "the effectiveness of concept maps in preparing nursing students to think critically about clinical problems" (p. 342) when reviewing the literature. Therefore, a study was conducted to examine the effectiveness of concept mapping over traditional care plans in helping baccalaureate nursing students improve critical thinking skills when preparing for clinical experiences. The quasi-experimental, pretest-posttest study used Ausubel's Assimilation Theory of Learning as the basis for the framework of the study.

The study took place at a southeastern university in the spring of 1998 and used a convenience sample ($N = 76$) of sophomore baccalaureate students enrolled in an

introductory nursing course. All eligible students participated in the voluntary study and all had been accepted into the upper division-nursing program. Students were randomly assigned to a control group ($N = 32$) and experimental group ($N = 44$). Including students from the Maternity, Psychiatric Nursing, and two thirds of the Pediatric courses, the control group had no experience with concept maps and used traditional nursing care plans to prepare for clinical while the experimental group, including one section of Pediatric Nursing and all of the Adult Health students, used concept mapping according to specific guidelines to prepare for clinical each week. Ranging in age from $20 - 44$ years, 63% of the sample were less than 22 years old and the majority (95%) included women. The control and experimental groups showed no statistically significant differences in relation to age or sex. Interestingly, 14 % of the experimental group and 16% of the control group were working on a second degree (Wheeler & Collins, 2003).

Instruments used in the study included a demographic questionnaire and two conceptually equal versions of the California Critical Thinking Skills Test (CCTST), one used as the pretest given during the sophomore year of the baccalaureate program and one as the posttest administered at the end of the fall semester of the junior year. The demographic questionnaire asked for information regarding sex, age, level of education, and experience with concept mapping. The CCTST was used to measure critical thinking skills and yielded six scores: an overall score and five subscales scores including analysis, evaluation, inference, deductive reasoning, and inductive reasoning. Wheeler and Collins (2003) cited previous studies for established reliability, face validity, and construct validity of the CCTST tool, as well as the Kuder-Richardson-20 test which computed internal consistencies of both CCTST versions and found them acceptable

(Form A-.70, Form B=.71). Furthermore, the authors made note of the CCTST being accepted by the National League for Nursing Accrediting Commission (NLNAC) "as an appropriate outcome measure of critical thinking skills" (Wheeler & Collins, 2003, p. 343).

The results of the study revealed that the overall mean CCTST experimental group score ($MD = 1.04$, $SEM = 0.44$, $p = 0.02$) differed significantly from the pretest scores, but the control group scores did not ($MD = 0.29$, $SEM = 0.52$, $p = 0.52$). In the analysis subscale only the experimental group showed a significant mean difference ($MD = 0.55$, $SEM = 0.19$, $p = 0.005$), while the mean difference was significant in the evaluation subscale for both the experimental ($MD = 0.62$, $SEM = 0.31$, $p = 0.5$) and control ($MD = 0.89$, $SEM = 0.36$, $p = 0.01$) groups. Negative mean differences were noted in the inference subscale, non-significantly in the experimental group ($MD = -0.16$, $SEM = 0.24$, $p = 0.51$) and significantly in the control group ($MD = -0.81$, $SEM = 0.29$, $p = 0.007$). The deductive and inductive reasoning subscales showed no significant changes between pretests and posttests for either group (Wheeler & Collins, 2003).

Percentile rankings for the entire sample increased from the 62nd percentile (pretest) to the 66th percentile (posttest). The experimental group demonstrated a lower percentile ranking than the entire sample at pre-test, but a higher score at post-test; thus, exhibiting a higher percentage of change than the control group. Percentile rankings for each subscale revealed comparable changes (Wheeler & Collins, 2003).

Wheeler and Collins (2003) found that concept mapping was an effective tool to help students develop critical thinking skills. Anecdotally, faculty noted better problem-solving skills with the experimental group over the course of the study and students

indicated a more in-depth learning experience using concept mapping. The authors suggested further research, including a longitudinal study to determine the long-term effects of concept mapping and length of time needed for students to master the process, as well as a replication of the study to further explore the noted decrease of inference skills. Wheeler and Collins (2003) also proposed using the California Critical Thinking Disposition Inventory (CCDTI) for further research, suggesting it may be a better tool for measuring critical thinking skills in nursing students.

While concept maps have been successfully used to teach conceptual thinking and increase students' competence in critical thinking, the use of concept mapping has been limited by nursing faculty in the design of curriculum content. The purpose of Hsu and Hsieh's (2005) study was to "implement concept mapping as a learning strategy in a nursing course and to evaluate students' learning progress through the constructions of concept maps based on scenarios" (p. 142). No specific theoretical framework was cited by the authors; however, the study was based upon the general concepts of concept mapping and nursing education. Specifically, the study focused on Schuster's concept mapping steps within the context of a nursing course focused on the four concepts of Roy's Adaptation Model of Nursing: physical function, self-concept, role function, and interdependence (Hsu & Hsieh, 2005).

The convenience sample included all 43 Taiwanese nursing students enrolled in the Nursing 1 course of a 2-year nursing program during the fall semester of 2002. Each student was assigned to one of seven concept map groups and throughout the course of the semester, each group was required to complete six concept maps based on scenarios given by the instructors. In the initial two weeks of the course, students were taught to

construct scenario-based concept maps according to Schuster's concept mapping steps. A

scenario was presented by the instructor when a new topic or content area was

introduced. From the scenario, each group created a first draft and then revised it after

the instructor lectured on the topic. Group concept map assignments were due within two

weeks of the scenario presentation (Hsu & Hsieh, 2005).

Concept maps were scored based on a scoring system originated by Novak and

Gowin that included four categories: concept links (2 points each), cross links (10 points

each), hierarchies (5 points each), and examples (1 point each) with a total possible score

of 30. Furthermore, the researchers also used a Proposition Inventory Evaluation Tool to

qualitatively evaluate each concept map. No further information was reported regarding

the use, reliability, or validity of the instruments (Hsu & Hsieh, 2005).

The results showed that all of the first concept maps received low scores (total M

= 8, SD ± 5.16). However, all teams showed improvement with the third (total M = 19.93,

SD ± 4.57) and following maps (total M = 18.14, SD ± 4.70; total M = 18.57, SD ± 2.11;

total M = 18.64, SD ± 2.21; consecutively). Qualitatively, the maps revealed progression

from a linear sequence of concepts with the first map completed the first week of the

semester, to a map showing many accurate propositions by the third map completed the

sixth week, to a highly integrated web of concepts by the final concept map completed at

the end of the semester (Hsu & Hsieh, 2005).

Hsu & Hsieh (2005) found that over the course of the semester, the nursing

"students acquired problem-solving and critical thinking skills by organizing complex

patient data, analyzing concept relationships, and identifying interventions" (pp. 147-

148). While the students voiced concerns about the heavy workload and time consuming

process of concept mapping, the researchers noted that the small group discussions engaged the students in the development of integrated concept maps and concluded that concept mapping is a very useful tool for instructors as well as students, since this strategy provides a mechanism for instructors to probe students' misconceptions (Hsu & Hsieh, 2005).

As nursing educators have strived to find effective strategies to move students from rote, linear forms of learning to more meaningful learning that links previous knowledge and new information, concept mapping has come to the forefront as an effective tool to help develop critical thinking skills in nursing students. Abel & Freeze (2006) conducted a study to evaluate the effectiveness of concept mapping as a clinical teaching-learning strategy that reflected the use of critical thinking and the nursing process in associate degree nursing (ADN) students, while exploring student and faculty perceptions of the process. While no conceptual framework was identified, the study partially replicated previous research conducted by Daley et al. (1999) where Assimilation Theory was utilized.

Abel and Freeze (2006) used a convenience sample that included 28 of 30 graduating students of a 5-semester ADN program. Since the study required completion of an initial concept map during the second semester, two students were excluded because they had entered the nursing program in the third semester. The sample included 25 women and 3 men of which 24 were Caucasian, 2 African American, 1 Hispanic, and 1 Asian. The participants ranged in age from 21 to 43, with a mean age of 28 years.

During a one-year period, students completed a total of four concept maps, one each in the second and fourth semesters and two during the fifth semester. The same two

instructors provided instruction on concept mapping, as well as clinical supervision

throughout the study year. Concept maps were scored using the same scoring criteria as

those used by Daley et al. (1999), reflecting critical thinking used in the nursing process

with points awarded as follows: meaningful relational propositions between two concepts

(1 point each); general to specific hierarchal approach (5 points each); meaningful cross-

links (10 points each); and examples describing specific instances of concepts (1 point

each). Scoring reliability was determined for the two instructors involved in the study and

previous pilot study interrater reliablitiy was cited by the authors. In addition, two

independent scores were obtained for each completed concept map, with the percentage

of agreement of the independent scores being 85%. Furthermore, random selection of two

maps scored by each instructor determined intrarater reliability, with each instructor

rescoring the same two maps and the percentage of agreement for the two raters being

97% and 94%. Content validity was cited from the Daley et al. study. In addition,

anecdotal evaluation was gathered from both students and faculty (Abel & Freeze, 2006).

     The findings indicated that mean total map scores increased each semester with a

group mean score of 173 on the first map completed in the second semester to a mean

score of 249 for the last two maps completed in the fifth semester. With a critical t value

of 1.70 and $df = 1.70$ ($p = 0.05$) reported, a statistically significant score difference

between the first and last maps was indicated. Cross-link scores also revealed a

statistically significant difference between the first and last maps with a group mean

score on the first map of 89 and an average mean score for the fifth semester maps of 143

($t = 27$, $df = 2.05$, $p = 0.05$) (Abel & Freeze, 2006).

Anecdotally, faculty reported that students were challenged to think more on their own with concept mapping in comparison to copying nursing care plan information from a book. The majority of the students reported increased critical thinking and learning through the use of concept mapping. With the total map scores indicating increased student knowledge over time, the findings of the study "support the use of concept mapping as an evidence-based nursing education strategy" (Abel & Freeze, 2006, p. 364). The authors suggested that further study be conducted in order to assess the most effective ways to implement concept mapping in nursing education.

Concept Mapping and Critical Thinking in Staff Development

Bridging the gap between nursing education and the professional nurse role requires continued educational support and staff development. New graduate nurses often lack the critical thinking skills needed to recognize and manage patient problems and life-threatening conditions. Concept mapping is an analytical tool used to enhance nurses' critical thinking skills. Using a descriptive comparison study design, Wilgis and McConnell (2008) examined whether concept mapping improved critical thinking skills in new graduate nurses during a hospital orientation program. Benner's Novice to Expert Theory was used as the framework.

A small convenience sample ($N = 14$) was recruited from a target population of new graduate nurses participating in a hospital orientation program in northeast Florida. Ranging in age from 23 to 50 years and with a mean age of 33 years, thirteen of the participants were female and one was male. One was a baccalaureate nursing program graduate and also the only participant with previous concept mapping experience. All 14 participants had taken a National Council Licensure Examination (NCLEX) review

course. Only 21% had taken and passed the NCLEX, while 79% still needed to take the exam. Whereas 64% of the participants had no nursing experience, 36% had previously worked as patient care technicians and 50% had previous experience as a caregiver for someone (Wilgis & McConnell, 2008).

After receiving instruction on the methodology and construction of concept maps, as well as a review of the pathophysiology of specific diseases, the nursing process, and physical assessment on the first day of orientation, the graduate nurse participants developed a pre-concept map based on a given case study that reflected the main health problem, key assessment findings, nursing diagnoses, and interventions in appropriate hierarchical order. During the second day of orientation, the graduate nurses then completed a similar post-concept map based on a new case study after discussing nursing roles and responsibilities, patient care technicians' responsibilities, admission and emergency procedures, suggestions for dealing with difficult patient/family situations, cultural considerations, and organizational tips in planning care. To enhance the reliability in scoring the concept maps, the same faculty who taught the course also graded the maps (Wilgis & McConnell, 2008).

To evaluate the effectiveness of concept mapping in developing and assessing critical thinking in graduate nurses, Wilgis and McConnell (2008) examined the differences between pre- and post-concept maps utilizing the Concept Map Grading Tool, which was adapted from Schuster's (2003) Concept Map Care Plan Evaluation Tool. Based on the American Nurses Association standards of nursing care practice, the tool incorporated essential elements for assessing critical thinking and patient care planning skills, including collection of health data, development of nursing diagnoses from

analysis of data, identification of expected patient outcomes, development of a patient

care plan, implementation of nursing interventions, and evaluation of patient outcomes.

With 25 total points possible, the tool awarded points in 11 criterion areas: (a) identifies

physiological problems [6 points]; (b) identifies psychological problems [1 point]; (c)

identifies education needs [3 points]; (d) correctly links problems to each other [1 point];

(e) correctly identifies main health problem [1 point]; (f) writes key assessment findings

near problem [1 point]; (g) identifies abnormal assessment findings near problem [1

point]; (h) indicates medications [1 point]; (i) indicates treatments/interventions [4

points]; (j) correctly labels diagnosis [1 point]; and (k) overall, the map is logical [1

point], complex [1 point], and in appropriate hierarchical order [3 points]. To enhance

reliability of the tool, the same faculty who taught the course scored the maps since

Schuster (2003) had "reported that concept map care plans for clinical evaluation of

critical thinking, communication, and nursing interventions are reliable ($r = 0.70$ or

higher) if the same faculty who taught the course graded the maps" (Wilgis &

McConnell, 2008, p. 122). Further anecdotal information was collected using a written

Concept Mapping Evaluation form to categorize and summarize comments from the

graduate nurses (Wilgis & McConnell, 2008).

Total concept map scores showed an overall increase of 33 points from pre-

concept map (197) to post-concept map (230). Overall map quality scores increased by

17 points from pre-test (36) to post-test (53) indicating improved logic, complexity, and

appropriate hierarchical order in concept mapping. The post-concept map mean score was

substantially higher (16.43) than the pre-concept map mean score (14.07), with a paired

sample t test showing significant improvement ($t = -2.797$; $df = 13$; $p = .008$) in post-

concept maps at a set alpha level of $p = .05$. The majority (10) of the participants scored higher on the post-concept map, two scored lower, and two had the same score as the pre-concept map (Wilgis & McConnell, 2008).

Results from the Concept Mapping Evaluation forms indicated that 10 of the 14 participants found concept mapping to help link knowledge, prioritize and organize patient care planning, and improve critical thinking. Two others reported being unsure of how they felt, while another two participants found concept mapping to be too confusing and not helpful. Of the 14 participants, 12 indicated they would recommend concept mapping to other nurses, believing that learning increased as a result of concept mapping. However, two other participants said they would not recommend concept mapping because it involved too much time (Wilgis & McConnell, 2008).

The study found concept mapping to be a useful teaching strategy and effective method to evaluate thought processes of graduate nurses. Furthermore, concept mapping was identified as a useful and inexpensive strategy that could be easily incorporated into graduate nurse orientation programs. The authors suggested further study with larger samples to determine "the efficacy of concept mapping in promoting critical thinking in professional nurses" (Wilgis & McConnell, 2008, p. 125).

Concept mapping has been frequently used in the academic setting to apply critical thinking skills. However, there is limited research on its use in staff development. Phelps et al. (2009) evaluated the effectiveness of concept mapping in enhancing critical thinking skills within a staff development educational series for oncology nurses. The constructivism theory of learning was used as the underlying theoretical framework.

The convenience sample ($N = 25$) consisted of nurses participating in a 7-week oncology education series. The group represented varying degrees of nursing experience, ranging from novice nurses, to experienced nurses with limited oncology experience, to experienced oncology nurses. Both inpatient and outpatient care areas were represented, including "primary oncology, intensive care, and supportive care areas such as medical surgical and neurology" (Phelps et al., 2009, p. 44). No further demographic data was provided by the authors.

During the 7-week oncology education series, course participants were divided into groups based upon their patient care unit population. On the first day of class, instruction was given on the use of concept mapping and a checklist was provided to guide the participants through the given group care mapping assignment. In addition, an oncology Clinical Nurse Specialist (CNS) was assigned to each group in order to provide feedback regarding the content and process of concept mapping. Furthermore, the initial educator was available face-to-face on a weekly basis, as well as electronically, to help guide the course participants. On the final day of the oncology education series, each group presented their concept map to the class and CNS educator group. Each group member was responsible for presenting a section of the map including a presentation of the "patient, the patient's research protocol, treatment schema, symptoms, patient education, and other pertinent information along with rationales for the decisions developing the map" (Phelps et al., 2009, p. 44).

Aligning with the institution's performance evaluation process, an evaluation tool was adapted and modified from Hanson's Concept Map Evaluation Key, which was cited by the authors as being used in the academic setting. The tool used a scale from 1 to 5,

rating the concept maps "with 1 as unacceptable, 2 as minimally acceptable, 3 as fully successful, and 5 as exceptional. Points were assigned based upon the documentation of data, relationships identified, ease of readability, integration of patient, and presentation of information" (Phelps et al., 2009, p. 46). Neither reliability nor validity was reported for the tool. Furthermore, scoring results were not shared by the authors. However, qualitative data was collected from the participants and their nurse managers through course, group, and team evaluations, as well as impact evaluations conducted 8 weeks after completion of the educational series.

Overall, the participant and nurse manager feedback was positive. Staff reported a better understanding and ability to apply the content learned through the use of concept mapping, as well as increased confidence in caring for oncology patients. Nurse managers indicated that the participants demonstrated a greater understanding of the oncology disease process, were better prepared to care for oncology patients, and displayed an increased understanding of the complex care needs of the oncology patient. Based upon this feedback, the authors concluded that concept mapping led to the participants' retention of the content learned and suggested that "concept mapping may serve as a powerful tool to engage staff members in active learning in their specific clinical areas" (Phelps et al., 2009, p. 46).

When planning care, nurses must be able to organize and apply previous knowledge and available patient information. Concept maps provide a means for organizing such data. While concept maps have been suggested as a tool for developing critical thinking and evaluating understanding of course content, there is limited research to support the use of concept maps in staff development. Pilcher (2009) used a

comparative pretest-posttest design to evaluate the effectiveness of concept mapping as a tool for measuring neonatal knowledge in an internship program. No theoretical framework was noted; however, key concepts included concept mapping, critical thinking, and staff development.

The convenience sample included seven newly hired inexperienced nurses participating in a neonatal intensive care unit (NICU) internship program at a large university medical center in Texas. With an 83-bed capacity, the NICU was a combined Level II and Level III unit. No further demographic data was reported (Pilcher, 2009).

After being introduced to the use of concept mapping in a generic situation and verbalizing understanding of the use of concept maps, the participants completed concept maps on four neonatal topics. In addition, a multiple choice pretest, which had been traditionally used as a tool for assessing knowledge in previous internship programs, was also completed. After 6 weeks of training, the participants once again completed the same concept maps and multiple choice test. Concept maps were evaluated for appropriateness in the following areas: items assessed, potential diagnoses, anticipated orders, tasks to be performed, potential complications, and social issues. Neither reliability nor validity was reported for the instruments used (Pilcher, 2009).

Concept map pretest and posttest results were compared and revealed varied levels of improved knowledge noted in each of the evaluated categories. The group achieved an average improvement of 97.1% total responses, with individual improvements ranging from 59% to 181%. When comparing the traditional multiple choice pretest and posttest scores, the group demonstrated an average improvement of

29.8%. Anecdotally, the participants shared that the multiple choice tests had afforded them the ability to guess, while the concept maps did not (Pilcher, 2009).

Improvements noted on the concept maps were significantly higher than those with the traditional multiple choice test. On the basis of the results, concept maps proved to be a more accurate tool for assessing knowledge gained during a specialty internship program. No further study was suggested (Pilcher, 2009).

Although nursing theory is the foundation and guide for nursing practice, many times staff nurses are task oriented and find it difficult to identify ways in which theory guides their daily practice. Concept mapping has been identified as a learning tool that engages critical thinking through the process of identifying important concepts and their interrelationships. Proposing that nursing theory could be represented in the concept mapping process, Veo (2010) used a qualitative action research design to determine the effectiveness of concept mapping as a strategy for teaching nurses how to apply theory to daily practice. No conceptual framework was noted. Key concepts of the study included concept mapping, nursing theory, and nursing practice.

The study took place in a rural Midwest community hospital setting. The convenience sample consisted of 10 associate degree prepared nurses voluntarily serving on the hospital's nurse practice council. No further inclusion or exclusion criteria were mentioned (Veo, 2010).

Course instruction was provided by the researcher and consisted of four monthly lessons, each lasting 1 to 2 hours. Lesson 1 provided an overview of nursing theory, focusing on key concepts from five nursing theorists, along with discussion regarding the importance of choosing a theory to apply to the concept mapping exercise. Lesson 2

included a review of the first lesson, group selection of a nursing theory to apply to the concept mapping exercise, and an overview of concept mapping with samples and map-making rules provided. In addition, optional homework was assigned to develop a concept map of a familiar nursing task. Lesson 3 included a review of the first two lessons, along with a demonstration of applying theoretical symbols to concept mapping and a review of two concept maps done as homework. Lesson 4 provided a review of all the course content (Veo, 2010).

Likert scale pre-intervention and post-intervention opinion surveys were used "to measure participants' opinion and understanding of nursing theory, the nursing process, applying theory to practice, and theory giving meaning to practice" (Veo, 2010, p. 19). Nine of the 10 participants completed the pre-intervention survey and 5 participants completed the post-intervention survey. Because the unmatched sample sizes reflected inconsistent participation, conclusions from the survey point comparisons were not made. Interview questions aligned with the course content were used to gather anecdotal data.

Six participants completed the interview questions and the author found unanimous agreement that applying theory to practice was more understandable through the use of concept mapping. All participants agreed that concept mapping was a useful strategy for showing the nursing process, but felt it was time-consuming and involved a great amount of detail. The researcher suggested that "review of nursing theory and the use of concept mapping to analyze its application should be considered for staff nurse development" (Veo, 2010).

Summary

New graduate nurses often lack the critical thinking skills needed to recognize and manage patient problems and life-threatening conditions. Concept mapping is an analytical tool used to enhance nurses' critical thinking skills. The purpose of this descriptive comparison study is to determine whether concept mapping improves critical thinking skills in new graduate nurses during a hospital orientation program. This is a replication of Wilgis and McConnell's (2008) study. Benner's Novice to Expert Theory demonstrates predictable patterns of critical thinking development in nurses and provides a framework for guiding hospital educators in determining the most effective teaching strategies to meet the various levels of nurses' learning needs (Wilgis & McConnell).

Benner (1984, 2001) identified five distinct stages of nursing development: novice, advanced beginner, competent, proficient, and expert. According to this theory, new graduate nurses perform as novices or advanced beginners, depending upon the level of previous work experience. With each stage holding its own distinct elements of critical thinking development, new nurses tend to require further experience with pattern recognition and situational thinking in order to improve critical thinking and clinical decision-making skills (Wilgis & McConnell, 2008). The literature review revealed that concept mapping was identified as a strategy used to teach and evaluate critical thinking in both nursing education and staff nurse development. In addition, further study was suggested related to the need for developing and testing a nursing-specific assessment tool for critical thinking, identifying best practices for teaching and measuring critical thinking, expanding generalizability and longitudinal research related to the use of concept mapping in promoting critical thinking skills, and ensuring the reliability and

validity of measurement and findings as well as the efficacy of concept mapping in promoting critical thinking skills in professional nursing.

The literature review was divided into three sections. The first section included studies related to critical thinking skills, exploring the development and relationships of critical thinking to clinical decision-making, clinical nursing expertise, and new graduate preceptor programs, as well as the identification of critical thinking learning needs of new and experienced nurses. The second section contained studies that utilized concept mapping to assess, develop, and evaluate critical thinking skills in nursing education. The third section reviewed studies that focused on the development of critical thinking skills using concept mapping in new graduate and staff nurse development.

Critical Thinking Skills

Using a descriptive correlational design, Martin (2002) explored the relationships between critical thinking, decision-making, and clinical nursing expertise among nursing students, graduate nurses, and registered nurses. The study found that critical thinking and decision-making increased with the level of clinical expertise, age, grade point average (GPA), and years of nursing experience. Furthermore, the study revealed that the quality of clinical decisions progressed from novice to expert, with expert nurses making the best decisions. Because of the link between clinical experience and higher levels of critical thinking, further study of critical thinking in clinical situations was recommended. Furthermore, Martin indicated the need for more time to be spent in clinical practice, as well as the need for further development of classroom methods designed to increase critical thinking experience. In addition, staffing implications were identified for health care facilities, pointing out the importance of a mix of experienced and inexperienced

nurses needed to provide the best nursing care for patients, as well as the benefit this mix could have on preparing expert nurses for the future (Martin).

Hoffman and Elwin (2004) examined the relationship between critical thinking and confidence in decision-making for new graduate nurses. Surprisingly, the study revealed that critical thinking ability and confidence in decision-making were negatively correlated. The researchers recommended that new graduate nurses possessing higher critical thinking skills and more hesitancy in decision-making, be encouraged to continue in their questioning attitude. Furthermore, the researchers pointed out the need for professional development courses to raise awareness of the importance to encourage a nursing culture that fosters an open, questioning approach to decision-making in patient care delivery in order to help support safe nursing practice by all clinicians (Hoffman & Elwin).

In a study of new graduate nurses and registered nurse preceptors, Sorensen and Yankech (2008) examined the influence of a preceptor educational program on the critical thinking skills of new graduate nurses, explored how the program influenced the preceptors, and evaluated the learning outcomes of the new graduate nurses. The study revealed improved critical thinking skills of new graduate nurses, positive qualitative preceptor responses, and the development of learning relationships through preceptor education. The researchers recommended further longitudinal study to evaluate the long-term differences in critical thinking skills of new graduate nurses who received preceptor-facilitated orientation with preceptors who had participated in a formal preceptor development program. In addition, the study recommended follow-up interviews with the preceptors to ascertain continued use of the teaching-learning strategies presented in the

preceptor development program, as well as an evaluation of the critical thinking ability of the preceptors themselves. Furthermore, the researchers pointed out the necessity for developing and testing a nursing-specific assessment tool for critical thinking (Sorensen & Yankech).

Fero et al. (2008) used the Performance Based Development System (PBDS) assessment to identify critical thinking learning needs of new and experienced nurses prepared at the diploma, associate, and baccalaureate degree levels. The researchers found that expectations were more likely to be met on the PBDS assessment by nurses with more years of experience, specifically those prepared at the baccalaureate or associate degree level. With the findings supporting a difference in testing outcomes based on the level of educational preparation, Fero et al. suggested further study to explore potential reasons for the results. In addition, the researcher's pointed out that the study supported Benner's novice to expert framework and indicated further research was needed to identify additional learning needs and test educational strategies to improve critical thinking skills in both new and experienced nurses (Fero et al).

Concept Mapping and Critical Thinking in Nursing Education

Daley et al. (1999) explored the use of concept maps as a tool to teach, evaluate, and measure changes in nursing students' critical thinking over the course of a semester. The researchers found that concept mapping served as an outcome measure of critical thinking. Furthermore, the study showed that concept maps significantly improved students' critical thinking skills and served as a useful tool to help students understand complex conceptual relationships related to patient care. However, the researchers considered this a preliminary study and suggested further research of concept mapping in

nursing education, as well as replication of the study and the need to establish construct validity of concept maps as a measurement of critical thinking.

In a quasi-experimental pretest-postest study, Wheeler and Collins (2003) examined the effectiveness of concept mapping over traditional care plans in helping baccalaureate nursing students improve critical thinking skills when preparing for clinical experiences. The study found concept mapping to be an effective tool in helping students develop critical thinking skills. Anecdotally, faculty noted better problem-solving skills with the experimental group over the course of the study. Furthermore, the students indicated a more in-depth learning experience with the use of concept mapping. The authors suggested further research, including a longitudinal study to determine the long-term effects of concept mapping and length of time needed for students to master the process, as well as a replication of the study to further explore a noted decrease of inference skills. Further research was also proposed using the California Critical Thinking Disposition Inventory (CCDTI), as the authors suggested it may be a better tool for measuring critical thinking skills in nursing students.

In a study conducted by Hsu and Hsieh's (2005), concept mapping was implemented as a learning strategy within the context of a nursing course in order to evaluate students' learning progress through the construction of concept maps based on case scenarios. The study found that over the course of the semester, the nursing students had acquired problem-solving and critical thinking skills as evidenced by improved group concept map scores. While students voiced concern regarding the heavy workload and time consuming process of concept mapping, the researchers noted that the small group discussions engaged the students in the development of integrated concept maps. The

study concluded that concept mapping was a very useful tool for instructors and students, as it provided a mechanism for instructors to probe students' misconceptions (Hsu & Hsieh, 2005).

Abel & Freeze (2006) conducted a study to evaluate the effectiveness of concept mapping as a clinical teaching-learning strategy that reflects the use of critical thinking and the nursing process in associate degree nursing (ADN) students, while exploring student and faculty perceptions of the process. Anecdotally, faculty reported that students were challenged to think more on their own with concept mapping in comparison to copying nursing care plan information from a book. The majority of the students reported increased critical thinking and learning through the use of concept mapping. With the total map scores indicating increased student knowledge over time, the findings supported concept mapping as an evidence-based teaching-learning strategy to improve critical thinking in nursing students. Further study was suggested in order to assess the most effective ways to implement concept mapping in nursing education.

Concept Mapping and Critical Thinking in Staff Development

Using a descriptive comparison study design, Wilgis and McConnell (2008) examined whether concept mapping improved critical thinking skills in new graduate nurses during a hospital orientation program. The study found concept mapping to be a useful teaching strategy and effective method to evaluate thought processes of graduate nurses. Furthermore, the researchers identified concept mapping as a useful and inexpensive strategy that could be easily incorporated into graduate nurse orientation programs. The authors suggested further study with larger samples to determine the

effectiveness of concept mapping in promoting critical thinking skills in professional

nurses (Wilgis & McConnell, 2008).

In an effort to enhance critical thinking skills, Phelps et al. (2009) introduced

concept mapping within a staff development educational series for oncology nurses. Both

staff nurse participant and nurse manager feedback were positive. Staff found that

concept mapping not only improved understanding and ability to apply learned content,

but also noticed an increased confidence in caring for oncology patients. Nurse managers

indicated that a greater understanding of the oncology disease process, better preparation

to care for oncology patients, and an increased understanding of the complex care needs

of the oncology patient were demonstrated by the participants. The authors concluded

that concept mapping led to the participants' retention of the content learned and

suggested that "concept mapping may serve as a powerful tool to engage staff members

in active learning in their specific clinical areas" (Phelps et al., p. 46).

Pilcher (2009) used a comparative pretest-posttest design to evaluate the

effectiveness of concept mapping as a tool for measuring neonatal knowledge in an

internship program. Improvements noted on the concept maps were significantly higher

than those with a traditional multiple choice test. On the basis of the results, concept

maps proved to be a more accurate tool for assessing knowledge gained during a

specialty internship program. No further study was suggested.

Using a qualitative action research design to determine the effectiveness of

concept mapping as a strategy for teaching nurses how to apply theory to daily practice,

Veo (2010) found that applying theory to practice was more understandable through the

use of concept mapping. Participants confirmed that concept mapping was a useful

strategy for showing the nursing process, but felt it was time-consuming and involved a great amount of detail. The researcher suggested that "review of nursing theory and the use of concept mapping to analyze its application should be considered for staff nurse development" (Veo, 2010).

Chapter III

Methodology

Introduction

New graduate nurses often lack the critical thinking skills needed to recognize and manage patient problems and life-threatening conditions. Concept mapping is an analytical tool used to enhance nurses' critical thinking skills. Like concept mapping, critical thinking is a nonlinear thought process. Furthermore, it requires the development of higher-level cognitive functions. Research has found concept mapping to be a useful teaching strategy and effective method to evaluate thought processes of new graduate nurses (Wilgis & McConnell, 2008). This study is a replication of the study conducted by Wilgis and McConnell to examine whether concept mapping improved critical thinking skills in new graduate nurses during a hospital orientation program. This chapter presents the research questions, population, sample, setting, methodology, and procedures utilized for this study.

Research Questions

1. Is concept mapping an effective tool in developing critical thinking skills in new graduate nurses during a hospital orientation program?

2. Is concept mapping an effective tool for assessing critical thinking skills in new graduate nurses during a hospital orientation program?

Population, Sample, and Setting

The population for this study will include a convenience sample of new graduate nurses ($N = 25$) participating in a new graduate nurse hospital orientation program at a mid-sized Midwestern tertiary care hospital.

Protection of Human Subjects

Prior to beginning the study, appropriate approvals will be obtained from the Ball State University Institutional Review Board and the review board of the participating hospital. Ethical standards for research will be maintained throughout the study. Participation will be voluntary and will not affect success in the orientation program or employment. Informed consent will be obtained from each participant and participant data will be coded to assure confidentiality.

Procedures

After receiving approval from Ball State University's Institutional Review Board, the participating hospital will be contacted and the study will be explained by the researcher. Once approved by the hospital review board, the researcher will meet with the staff educators who will be facilitating the new graduate nurse orientation program to work out a schedule for conducting the study. The proposed plan will recommend that on the first day of the orientation program, the researcher will provide the graduate nurses with instruction regarding the methodology and construction of concept maps, as well as a review of the pathophysiology of specific diseases, the nursing process, and physical assessment. The graduate nurses will then be asked to use a pre-concept map case study to determine the patient's plan of care by mapping out the main health problem, key assessment findings, nursing diagnoses, and interventions in appropriate hierarchical

order. On the second orientation day, the researcher will work with the staff educators to discuss nursing roles and responsibilities, patient care technicians' responsibilities, admission and emergency procedures, suggestions for dealing with difficult patient/family situations, cultural considerations, and organizational tips in planning care. The graduate nurses will then be asked to use a post-concept map case study to complete a mapping exercise similar to that completed on the first day of orientation. The researcher will score the pre- and post-concept maps using a Concept Map Grading Tool applicable to each case study.

Design

This study will utilize a descriptive comparison design with changes in critical thinking being measured in the same group of subjects during a hospital orientation program. Demographic and anecdotal data will be obtained through self-reporting surveys. Pre- and post-concept maps will be scored by the same researcher who will also teach the course.

Instrumentation

Each concept map will be scored using an instrument developed from Schuster's Concept Map Care Plan Evaluation Tool (Tyler, 2004). Pending permission from Schuster to use and adapt the instrument, the tool will reflect key objectives from the case studies used for the pre- and post-concept maps. Based on Schuster's Concept Map Care Plan Evaluation Tool, Tyler reported that concept map care plans for clinical evaluation of critical thinking, communication, and nursing interventions are reliable ($r = 0.70$ or higher) if the same faculty teaching the course grades the maps. In order to enhance the reliability of scoring, this will be carried out in this study. Further anecdotal information

will be collected using a written Concept Mapping Evaluation form to categorize and summarize comments from the graduate nurses (Wilgis & McConnell, 2008).

Intended Method for Data Analysis

Data analysis will be conducted utilizing descriptive statistics. Paired *t*-scores will be performed to determine statistically significant differences in pre- and post-concept map composite scores and grading criteria scores, indicating changes in critical thinking. Statistical significance level will be set at 0.05 (Burns & Grove, 2005). In addition, anecdotal survey responses will be categorized and summarized by the researcher.

Summary

The methodology and procedures for this study are described in this chapter. The study replicates Wilgis and McConnell's (2008) study and will examine whether concept mapping improves critical thinking skills in new graduate nurses during a hospital orientation program. A descriptive comparison study design with additional anecdotal data collection will be used. Data will be collected from a convenience sample of 25 new graduate nurses participating in a hospital orientation program. Differences between pre- and post-concept maps will be examined utilizing a Concept Map Grading Tool adapted from Schuster's Concept Map Care Plan Evaluation Tool (Tyler, 2004). Concept map composite scores and grading criteria scores will be analyzed yielding descriptive statistics with a significance level set at 0.05. In addition, anecdotal responses from the graduate nurses' Concept Mapping Evaluation forms will be categorized and summarized. This study will expand the number of evidence-based strategies to develop and assess critical thinking skills in new graduate nurses.

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