PREDICTORS OF SUCCESS ON THE NATIONAL COUNCIL LICENSURE EXAMINATION FOR REGISTERED NURSES (NCLEX-RN) IN A TRADITIONAL BACCALAUREATE NURSING PROGRAM: A DESCRIPTIVE STUDY

by

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of
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Nursing

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DEDICATION

This is dedicated to all nurse educators who will shape the future of nursing.

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I would like to thank Mimi Mahon, Sarah Di Natale, Margaret Shepard, and Cheryl Toulouse for all of their encouragement, along with Colleen Spears.

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ABSTRACT

PREDICTORS OF SUCCESS ON THE NATIONAL COUNCIL LICENSURE EXAMINATION FOR REGISTERED NURSES (NCLEX-RN) IN A TRADITIONAL BACCALAUREATE NURSING PROGRAM: A DESCRIPTIVE STUDY

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A major issue for most nursing programs is how to produce graduates who will be successful in the program and on the NCLEX-RN. Providing an optimal undergraduate education is made more difficult by issues such as limited clinical space for students' experiences, and the nursing shortage, which increases the pressure on nursing programs to accept more students and graduate all admitted students. It is imperative that nursing programs accept those applicants who are most likely to graduate, and in a timely manner.

This study examined variables that have been suggested as predictors of success on the NCLEX-RN. The study was conducted in two phases. The first phase was an analysis of the results of a survey of graduates at a Mid-Atlantic public university during the years 2007 to 2010. The Phase I sample consisted of 91 subjects. The dependent variable for the Phase I of the study was success on the NCLEX-RN on the first attempt.

The independent demographic variables were academic difficulty, English as first language, marital status, residence during last year of the nursing program, perceived personal issues, gender, age, previous college education, average number of hours worked while enrolled in the last year of the nursing program, responsibility for others, and prior work experience in the medical field. Additional academic independent variables were ATI-TEAS preadmission scores (science, math, and reading comprehension), final grade for NURS 410 course (Nursing Care of Clients With Pathological Conditions), and ATI-CARP exit score on the first attempt.

Phase I data analysis did not reveal statistically significant demographic or academic variables that predicted success on the NCLEX-RN on the first attempt. However, study subjects who self-reported academic difficulties and self-reported failure on the NCLEX-RN on the first attempt also had low ATI-TEAS preadmission scores on the reading and science tests.

Phase II involved analysis of graduates' success using two dependent variables: NURS 410 final grade and ATI-CARP exit score (as a proxy for NCLEX-RN). Phase II consisted of two subject groups $n = 91$(survey respondents) and $N = 368$ (secondary data analysis of the university's records of traditional nursing graduates from 2007 to 2010) to explore relationships between the ATI-TEAS preadmission test scores (independent variables) and the dependent variables. Among the initial group of survey respondents ($n = 91$), the science preadmission test score significantly predicted ATI-CARP exit score success. This finding was consistent with prior research (Newton, Smith, Moore, & Magnan, 2007; Spurlock & Hunt, 2008; Symes, Tart, & Travis, 2005).

Among the larger group of all traditional nursing graduates of the nursing program ($N = 368$), all the ATI-TEAS preadmission scores (math, science, and reading comprehension), were significantly correlated. The residuals from the percentile values, however, were very high (22,872), indicating that a high percentage of the score is unaccounted for by these variables (Munro, 2001). Thus, no significant predictors of ATI-CARP success were found.

Analysis of the study data from these analyses demonstrated the difficulty of predicting baccalaureate nursing students' success on the NCLEX-RN on the first attempt. A longitudinal study would allow collection of concurrent student perceptions of academic difficulty. Also, future research should focus on the specific attributes and experiences of students who fail the NCLEX-RN (on the first attempt). Finally, concurrent evaluation of students as they progress through the program would allow ongoing evaluation of students, using their preadmission scores as potentially significant predictors of students' success.

CHAPTER 1. INTRODUCTION

Predicting success on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) is an important endeavor for nursing programs (Davenport, 2007; Haas, Nugent, & Rule, 2004). The program's accreditation status from the state and professional nursing associations will be impacted by the success of the graduates on the NCLEX-RN on their first attempt. For students who do not pass, there are also significant financial implications when the examination must be repeated and entry into the workforce is prolonged. The perceived quality of a nursing program is also based on the first-time NCLEX-RN pass rates (McDowell, 2008). If nursing programs are able to predict the success of their students on the NCLEX-RN, they may alter their admission strategies, and provide assistance to at-risk students earlier in their program. Increasing in the overall success rate on this exam is important to all stakeholders.

Background

The work of nursing is challenging and requires proficiency in many aspects of clinical practice, including medication administration, informatics, clinical support tools, and highly technical procedures. Crucial interactions with other healthcare professionals concerning these dimensions of practice, and communication with patients, increase the demands on the registered nurses' time (Donley, 2005). The acuity level of hospitalized patients has increased over the years, which leads to increased demands on nurses at the

bedside (Heller & Nichols, 2001; Penoyer, 2010). Patients admitted to healthcare facilities often have multiple comorbidities, and often require a range of technologies for the daily management of their health conditions. At the same time, hospital stays are shorter and patients are often leaving before they have the knowledge and skills to care for themselves at home. Since the patients' acuity levels have greatly increased, more patients require more intensive nursing care. Patients who are now admitted to general medical/surgical units would have been admitted to intensive care units in the past.

Nursing at the bedside is an extremely fast-paced job that requires the registered nurse to utilize strong critical thinking skills, make clinical decisions quickly, and be prepared to function competently in a crisis. Nursing care in the future will be even more complex and challenging, and will require a nurse with a different skill set than is expected today (American Organization of Nurse Executives [AONE], 2010). The nurse of the future will need strong systems information skills, the ability to work across many cultures, a range of technical abilities, and conflict resolution skills.

The profession of nursing, along with other healthcare professions, has been experiencing a shortage of educated, well-qualified applicants (Buchan & Aiken, 2008). The nursing shortage reached 1.2 million in 2011 (American Association of Colleges of Nursing [AACN], 2012). The shortage is greater in some regions of the United States; however, the severity of the shortage and the impact produce the same results. This shortage, along with the increasing demands placed on nurses, has become problematic for healthcare consumers across all types of care settings (Erlen, 2001; Siela, Twibell, & Keller, 2008). Nurses not only provide direct care at the bedside, but they are also

responsible for developing a plan of care for their patients, with input from physicians and families. Nurses supervise ancillary personnel, and provide discharge teaching. Nurses must stay current in their knowledge of new medications, medical treatments, and technology.

The shortage of nurses affects healthcare in many different ways. Fewer nurses are doing more for their patients (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). Patient falls have increased, medication errors have risen, and, according to patients, quality of care is declining (Hasmiller & Cozine, 2006; Kalisch, Tschannen, & Lee, 2012; Loquist, 2002). All of these factors cause a decrease in patient satisfaction, which in turn affects patient trust (Berg & Danielson, 2007; Laschinger & Leiter, 2006; Mark et al., 2008; Matthiesen & Wilhelm, 2006; Moody, Pesut, & Harrington, 2006). Nurses are leaving the bedside or even the profession due to burnout, which further adversely affects patient outcomes (Cimiotti, Aiken, Sloane & Wu, 2012; Stimpfel, Sloane, & Aiken, 2012; Vahey, Aiken, Sloane, Clarke, & Vargas, 2004).

Nursing programs are faced with significant, interrelated challenges: a decrease in NCLEX-RN pass rates, an increase in the number of applicants to nursing programs, and an increase in the number of students who are not admitted (AACN, 2012; Fraher, Belsky, Carpenter, & Gaul, 2008; Mulholland, Anionwu, Atkins, Tapperen, & Franks, 2008; Pryjmachuk, Easton, & Littlewood, 2008). The ultimate goal of every nursing program is to prepare new graduates who are able to pass the NCLEX-RN on the first attempt, and who are able to perform safely and competently in an entry-level position. Nationally, there was a notable 4.6% decline (from 88.4% to 83.8%) in pass rates on the

NCLEX-RN for first-time attempts between 1994-2000. This decline was apparent in graduates of all types of nursing programs: diploma, associate degree, and baccalaureate degree (Schwarz, 2005). Over the next decade, pass rates held steady between 85% and 89% and in 2013, the rate dropped slightly to 83% (National Council of State Boards of Nursing [NCSBN], 2014). Pass rates from 2000-2010 for second-time test-takers consistently remained between 50% and 55%, demonstrating that passing the examination on the first attempt offers the best chance for success.

Within the Mid-Atlantic states, the university in this study produced one of the highest numbers of graduates who were eligible to sit for the NCLEX-RN. In the early 2000s, the nursing program experienced a significant drop in its pass rates to below the national average norm rates. The program took steps to increase the pass rates, including a standardized testing program and a critical thinking and test-taking strategies course. The first standardized testing program was the Health Education Systems, Inc. (HESI). The program also included an exit exam taken in the first semester of the students' senior year. If a student did not achieve a score of 850 (considered predictive of success on the NCLEX-RN), a remediation program was developed to assist the student in passing the HESI and achieving a score of 850. The decision to use the 850 score was determined by the program's faculty after reviewing the literature and consulting with HESI executives.

In 2007, the faculty implemented the Assessment Technologies Institute (ATI) testing system, including the use of preadmission testing (Test of Essential Academic Skills or ATI-TEAS). The ATI-TEAS was administrated as an admission requirement for students selected for admission to the nursing program.

The students also took an ATI standardized test after each of the subject course (e.g., medical-surgical nursing, obstetrics, and pediatrics). With the end-of-course subject exams, the students were also required to take the Comprehensive Assessment and Review Program (ATI-CARP) predictive exam at the end of the second semester of the senior year. If the students did not achieve the required score, they were required to take a remediation program with a repeat of the ATI-CARP at the end of the remediation. They were required to achieve a score of 80.7% prior to graduation (ATI, 2013).

Table 1 includes the subject program's NCLEX-RN pass rates for the years 2000-2010. Note that the 2005-2008 passing rate for the program was at or above the state's passing rate. In 2009, the school's pass rate dropped to several points below national and state averages; however, in 2010 the pass rate increased to above the state's level (Bondmass, Moonie, & Kowalski, 2008).

Table 1

National Council Licensure Examination for Registered Nurses (NCLEX-RN) Pass Rates From 2001 Through 2010: National, State, and Baccalaureate School of Nursing Averages and Averages for Repeat Test-Takers

Year	National Average	State Average	Study's Subject School Average	Repeat Test-Takers Average
2000	83.90%	86.09%	80.00%	48.50%
2001	85.90%	77.90%	75.90%	50.00%
2002	86.70%	80.60%	70.70%	51.80%
2003	86.90%	85.15%	77.40%	51.90%
2004	84.80%	81.64%	85.00%	51.90%
2005	86.70%	86.70%	88.60%	53.60%
2006	88.30%	84.40%	87.00%	54.20%
2007	86.40%	82.16%	86.30%	52.40%
2008	87.50%	84.97%	89.80%	53.30%
2009	89.40%	87.40%	85.60%	55.87%
2010	87.40%	86.20%	87.20%	54.96%

Note. Source: National Council of State Boards of Nursing (NCSBN), 2014.

A notable drop in the NCLEX-RN pass rate for any nursing program may impact the number of applications to a nursing program. In addition, with a consistent and sustained drop in the pass rate of its graduates, nursing programs face a review by the state's board of nursing and the program's outside accrediting agency (Woo, Wendt, & Liu, 2009). If accreditation is revoked by the board of nursing, the program will have to close its doors to students.

Currently, nursing programs are challenged with accepting the best candidates who will be able to complete the program and be successful in their first attempt at passing the NCLEX-RN. Nursing programs began to include preadmission testing as an option to assist in selecting the candidates most likely to succeed in the nursing program, or in identifying students who would need additional assistance during the program

(Newton & Moore, 2009). Many nursing programs also added testing at the end of each nursing course, along with an end-of-program predictive exit exam, that assists the students in learning their overall chance for success on the NCLEX-RN. For some schools, each student must achieve a minimal set score on the exit exam to graduate.

All of these factors confirm that it is critical for a nursing program to identify variables that best predict success throughout a program of nursing, as well success on the first attempt on the NCLEX-RN.

Significance of the Problem

Predicting student success on the NCLEX-RN is a crucial task for nursing programs, affecting admission decisions and interventions to assist at-risk students once admitted. Research has supported the identification of predictors of successful program completion, and passage of the NCLEX-RN on the first attempt, as important endeavors for nursing programs (Beeson & Kissling, 2001; Crow, Handley, Morrison, & Shelton, 2004; Davenport, 2007; Haas et al., 2004; Newman & Williams, 2003; Newton, Smith, & Moore, 2007; Sayles, Shelton, & Powell, 2003; Symes, Tart, & Travis, 2005).

Despite demands for increasing numbers of nurses with competent knowledge and skills, nursing education programs are turning away qualified applicants (AACN, 2010). Nursing schools turned away 54,991 qualified applicants from baccalaureate and graduate nursing programs in 2009, due to an insufficient number of faculty, clinical sites, classroom space, clinical preceptors, and budget constraints (AACN, 2010). With these constraints, every student admitted to a program of nursing is precious and schools

must ensure that every student will have the best chance for success, throughout the program and on the NCLEX-RN.

Nursing programs need to select candidates for admission who can maintain passing grades in both didactic and clinical courses, and then complete the program according to the prescribed timeline for graduation. Once a student has failed and must repeat a course, there is a strain on the program due to limited class sizes and clinical placements. When limited clinical placement is an issue, students who must repeat a course often impact the next year's admission cycle as fewer students may be admitted. The delay in time-to-graduation for the student also means that productive work-years are delayed, tuition costs continue, and any outstanding loan repayment is delayed.

Schools of nursing have attempted to institute a variety of different methods to ensure that those students who are admitted graduate on time, and pass the NCLEX-RN on the first attempt (Carrick, 2011). But it is also important to identify predictors for success that would allow faculty in nursing programs to plan early intervention strategies if a student is identified as being at-risk for failure. Standardized preadmission nursing aptitude tests have been suggested as early predictors of success in baccalaureate nursing programs (Newton & Moore, 2009). Researchers and administrators have also suggested that these tests can assist faculty in advising students on course selection as a means to ensure success along with retention.

Nursing school graduates need to be successful on the NCLEX-RN on the first attempt as each program's accreditation status and perceived quality are based in part on the program's overall pass rate (Giddens, 2009). Recognizing predictors of success

during the admission process, and during the program, may allow for a change in the criteria used to select candidates for admission, and for early intervention during the program. Increasing NCLEX-RN pass rates maintains program accreditation and perceived quality, and is cost-effective for graduates who avoid repeated examinations with a lower chance for success, and gain earlier entry into the workforce.

Previous research suggests that there are many factors that may influence a student's likelihood for success. Identifying key student and academic variables will assist schools of nursing in making the best choices, in admitting qualified students, in planning strategies to help students succeed, and in improving program quality to ensure success (Newton & Moore, 2009; Spurlock, 2005; Yeom, 2013). With such a high cost of failure, for the student who struggles to finish a nursing program and is at-risk for NCLEX-RN failure and for the schools who are judged in part by the success of their graduates on the exam, it is crucial to identify predictors for NCLEX-RN success so that early intervention can be started or program modification can be achieved (Homard, 2013; Woo et al., 2009). The results of this study may provide guidance to faculty and administration regarding which variables impact graduates' success on the NCLEX-RN on the first attempt.

Conceptual Framework

A modified version of the Synergy Model of Nursing was used for this research study. The model was developed originally to link certified critical care nursing practice to patient outcomes (American Association of Critical-Care Nurses Certification Corporation, 1995; Kohr, Hickey, & Curley, 2012). The model's fundamental premise is

that patient characteristics drive nurses' competencies (Curley, 1998). The model addresses eight patient characteristics, each of which is measured on a continuum of high, medium, or low acuity. The nurse competencies are also measured on a continuum and provide the basis for differentiating levels of practice for the nurse: Level 1 indicates competency, Level 2 proficiency, and Level 3 expert practice (Green, 2006). This differentiation in nursing practice is based upon significant descriptive research conducted by Benner (1984). Although originally developed as a practice mode for the critical care staff nurse, at present, the Synergy Model is used as the professional model for nursing practice in various healthcare and academic institutions throughout the country (Curley, 1998; Reilly & Humbrecht, 2007; Swickard, Swickard, Reimer, Lindell, & Winkelman, 2014). The notion of advancing nursing competencies and the need to respond to the range of patients' needs made this link logically congruent for this study (Kaplow, 2002). Applying this model to nursing education puts the learner at "center stage" (Green, 2006, p. 280).

An analogue of the Synergy Model was developed to address admission decisions in the following manner: the patient outcome variable was replaced by success on the NCLEX-RN on the first attempt in Phase I. The eight "patient" characteristics were replaced by the selected variables that were hypothesized and supported by research to predict achievement on the NCLEX-RN. The differentiating levels of practice were replaced by independent variables: demographic variables (age, English as primary language, previous college education), final grade in NURS 410 (Nursing Care of Clients With Pathological Conditions), the ATI-CARP exit score on first attempt, and ATI-TEAS

preadmission scores in math, reading comprehension, and science. The resulting conceptual model (Figure 1) is the adapted Synergy Model for success on the NCLEX-RN. The relationship between variables is shown by the one-way dotted arrows that connect the three main variables (demographic variables, NURS 410 final grade, and ATI-CARP exit score) and the covariables (ATI-TEAS preadmission scores in reading comprehension, science scores, and math), to success on the NCLEX-RN on the first attempt. The new model will be referred to hereafter as the Stoehr Adapted Synergy Model.

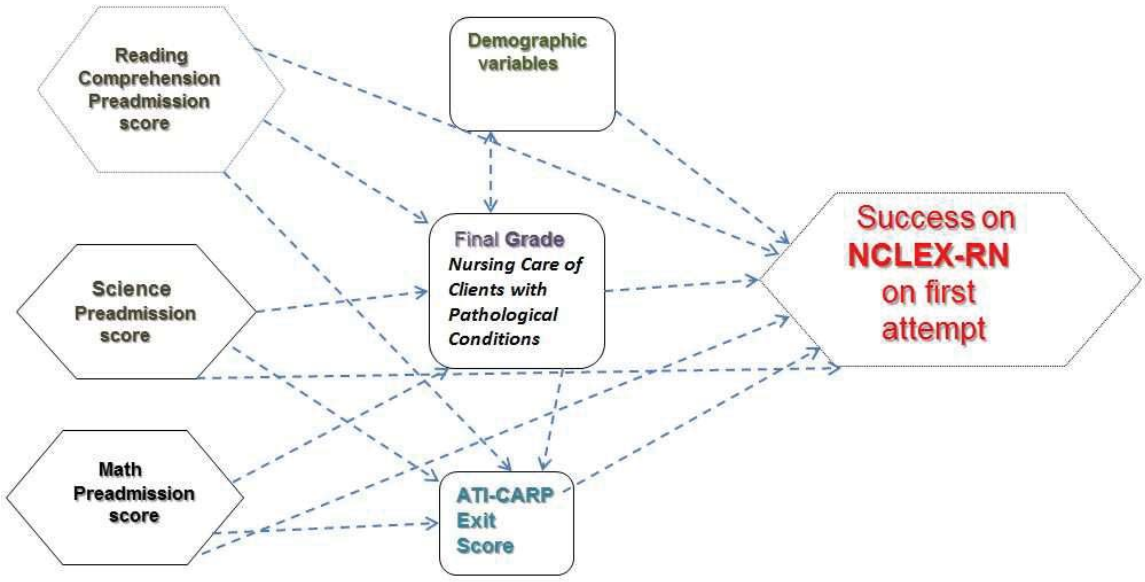


Figure 1. Stoehr Adapted Synergy Model for Success on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). ATI-CARP Exit Score on first attempt = Assessment Technologies Institute's Comprehensive Assessment and Review Program exit exam score. Adapted by Stoehr.

Purpose of Study

The purpose of this study was to determine which factors predicted success on the NCLEX-RN on the first attempt among 2007–2010 graduates from a baccalaureate nursing program at a Mid-Atlantic university. The study was divided into two phases: Phase I – analysis of data obtained from a survey of program graduates between 2007 and 2010 and Phase II – examination of the relationships among the whole population of program graduates from the identical time frame as the survey respondents.

Definition of Variables

For this study, the concepts of age, ATI-CARP, ATI-TEAS, average number of hours worked, English as primary language, gender, HESI exam, living arrangements, NCLEX-RN, NCLEX-RN success, NURS 410 Nursing Care of Clients With

Pathological Conditions, personal challenges, previous college education, and responsibility for others were the key terms to be defined.

Age

- Theoretical definition: An individual's development measured in terms of years.
- Operational definition: Survey respondents' self-report.

Assessment Technologies Institute Comprehensive Assessment and Review Program Exit Testing (ATI-CARP)

- Theoretical definition: The Assessment Technologies Institute's Comprehensive Assessment and Review Program is an academic measuring tool with established reliability and validity used to identify potential problem area difficulty among nursing students for early intervention (Norton, Relf, Cox, Farley, & Tucker, 2005). The ATI-CARP exit exam score on the first attempt is a method of predicting success on the NCLEX-RN. This exam is given in the first semester of the senior year of the nursing program.
- Operational definition: Scores were obtained by abstracting existing school records.

Assessment Technologies Institute Test of Essential Academic Skills (ATI-TEAS)

- Theoretical definition: The Assessment Technologies Institute Test of Essential Academic Skills is a multiple-choice assessment of basic academic knowledge in math, reading comprehension, and science. The objectives assessed on the ATI-TEAS exam are appropriate and relevant to measure

entry-level skills and abilities of nursing program applicants (Newton, Smith, Moore, & Magnan, 2007).

- Operational definition: Test score earned by students prior to starting their first semester in the nursing program. In this study the scores were obtained from the student's records for both phases of the study.

Average Number of Hours Worked

- Theoretical definition: Hours per week worked for pay while enrolled in the nursing program.
- Operational definition: Survey respondents' self-report.

English as Primary language:

- Theoretical definition: The primary language spoken as a child.
- Operational definition: Survey respondents' self-report.

Gender

- Theoretical definition: A range of physical, mental, and behavioral characteristics distinguishing between masculinity (male) and femininity (female).
- Operational definition: Survey respondents' self-report.

Health Education Systems, Inc. (HESI) Exam

- Theoretical definition: Health Education Systems, Inc.'s specialty exams were developed to assess students' knowledge level, and their ability to apply nursing concepts within specific content areas (Morrison, Adamson, Nibert, & Hsia, 2006).

- Operational definition: A test administered at the end of the first semester of the senior year.

Living Arrangements

- Theoretical definition: Lived on campus or off campus while in the last year of school.
- Operational definition: Survey respondents' self-report.

Marital Status

- Theoretical definition: The condition of being married or unmarried
- Operational definition: Survey respondents' self-report.

National Council Licensure Examination for Registered Nurses (NCLEX-RN)

- Theoretical definition: The National Council Licensure Examination for Registered Nurses is a comprehensive exam developed by the National Council of State Boards of Nursing (NCSBN) to measure the competencies needed to perform safely and effectively as a newly licensed, entry-level nurse (NCSBN, 2013). Passing the NCLEX-RN is required before nursing program graduates are licensed to practice nursing. Pass rates on the first attempt are reported for each state in the U.S. and are publically available.
- Operational definition: Survey respondents' self-report in Phase I.

National Council Licensure Exam (NCLEX-RN) Success

- Theoretical definition: The achievement of a passing score on the NCLEX-RN on the first attempt.
- Operational definition: Survey respondents' self-report.

NURS 410 (Nursing Care of Clients With Pathological Conditions course)

- Theoretical definition: Course taken in the first semester of the senior year; focuses on care of patients with complex disease conditions, the pathophysiologic basis for the disease, and the nursing care required. It is the final pathophysiology course and is a follow-up to a junior level pathophysiology course that focused on less complex disease conditions and basic pathophysiology content.
- Operational definition: Letter grade students earned in NURS 410 Nursing Care of Clients With Pathological Conditions.

Personal Challenge(s)

- Theoretical definition: An event or events that cause undue stress on an individual. Personal challenges include health conditions, marital difficulties, and financial difficulties.
- Operational definition: Survey respondents' self-report.

Previous College Education

- Theoretical definition: Completion or enrollment in college courses prior to enrolling in the nursing program.
- Operational definition: Survey respondents' self-report.

Responsibility for Others

- Theoretical definition: Providing care for children or adults, including physically, mentally, emotionally, and/or financially.
- Operational definition: Survey respondents' self-report.

Research Questions

Six research questions were explored.

Phase I

Phase I included graduates (2007–2010, $N = 91$) of a midsize, public university nursing program that had implemented a standardized testing program.

1. What were the relationships between the pass or fail status on NCLEX-RN on the first attempt, and (a) demographic variables, (b) the final grade in NURS 410, (c) ATI-CARP exit score on the first attempt and (d) ATI-TEAS preadmission scores?
2. Which of the variables are predictors of the dependent variable, success on the NCLEX-RN on the first attempt? Independent variables considered were (a) age, (b) whether or not English is the primary language, (c) previous college education, (d) final grade in NURS 410, (e) the ATI-CARP exit score on the first attempt, and (f) ATI-TEAS preadmission scores in math, reading comprehension, and science, in new graduates from a Mid-Atlantic region public university's nursing program during the years 2007 to 2010.

Phase II

Phase II included the entire nursing program's graduating members (2007–2010, $N = 368$). The sample included graduates for whom the program had completed records. Proxy variables were used for NCLEX-RN pass/fail status based on correlations that were found during data analysis for Phase I.

3. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010?
4. What is the relationship between the ATI-TEAS preadmission scores of math, reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010?
5. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?
6. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?

Summary

The increasing complexity of nursing practice today, along with a nationwide nursing shortage, demands that academic nursing programs prepare graduates who will be successful on their first attempt on the NCLEX-RN. This study described the relationships between selected demographic variables, academic variables, and standardized tests as predictors of success on the NCLEX-RN on the first attempt.

A review of the literature revealed that there are some predictors of success on the NCLEX-RN; however, there is not one specific predictor that could be applied to all graduates of a baccalaureate nursing program. The following review of the literature will provide evidence to support the link between these variables and NCLEX-RN success.

CHAPTER 2. REVIEW OF LITERATURE

Success for graduates of traditional baccalaureate nursing programs on the first attempt on the NCLEX-RN is one of the major goals of nursing programs (Seldomridge, & DiBartolo, 2004; Spurlock & Hunt, 2008; Woo et al., 2009). The ability to predict success is challenging because each nursing student is unique with different academic histories, personal challenges and responsibilities, and employment needs outside of school hours. This chapter presents and discusses a review of literature related to an academic and demographic variables and the use of standardized testing that may assist schools in predicting success on the NCLEX-RN on the first attempt.

The literature search was conducted using nursing, education, and psychology databases (Medline, Cinahl, InfoSearch, ProQuest, and ERIC) using the following key words: predictors of success on the NCLEX-RN, variables that predict success on the NCLEX-RN, and use of standardized testing for predicting success on the NCLEX-RN. Digital Dissertations were also reviewed in all of the subject areas. The search revealed fewer than 500 articles that included research and non-research articles that spanned the years from 2001 to 2014.

Standardized Tests Used to Predict Success

Incorporating standardized testing into nursing programs has been used to predict success on the NCLEX-RN, and many programs have begun to require senior-level

students to take a pre-NCLEX-RN assessment test at or near the end of the nursing program (Brown & Marshall, 2008; Stuenkel, 2006). This may indicate a desire of nursing programs to provide testing structures similar to the NCLEX to increase students' comfort with the use of computerized testing, as well as the use of such testing to predict success on the NCLEX-RN (Reising, 2003). Standardized tests that have been used include the National League for Nursing Comprehensive Test (NLN), Mosby's Assess Test (MAT), Educational Resources, Inc. Test (ERI), Meds Publishing, Health Education Systems, Inc. (HESI), and Assessment Technologies Institute Tests (ATI). All of these tests have support as strong predicators of success or failure on the NCLEX-RN (Holstein, Zangrilli, & Taboas, 2006). The HESI and ATI tests are currently among the most popular testing programs used in nursing programs (Holstein et al., 2006; Sifford & McDaniel, 2007; Wolkowitz & Kelly, 2010), and in recent years standardized tests have come to play a vital role in many nursing programs.

HESI

The HESI Exit Exam is a standardized computer test that simulates the National Council of Licensing Examination for the Registered Nurse (NCLEX-RN) exam and can be used as a predictor of student's performance on the NCLEX-RN (Adamson & Britt, 2009; Langford & Young, 2013).

Lauchner, Newman, and Britt (1999) reported that the use of the HESI was a predictive indicator of student success on the NCLEX-RN. The HESI provides feedback to students about the probability of their success on the NCLEX-RN by generating a numerical score that gives the student an estimate on the likelihood that he or she will

pass. The HESI also provides rationales for correct answers on items, reinforcing the correct answer rather than an incorrect one. The examination is a computer-based assessment that is modeled after NCLEX-RN test blueprints (Spurlock, 2005). The HESI examination has demonstrated greater sensitivity, specificity, positive and negative predictive value, and test efficiency than the Mosby's Assess Test (Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003).

Multiple researchers have demonstrated that NCLEX-RN success cannot be predicted by a single variable (Harding, 2010; Newton & Moore, 2009; Wolkowitz & Kelley, 2010). Variables such as the Scholastic Aptitude Test and American College Test scores, high school rank, grades in prenursing and nursing courses, and performance on standardized nursing examinations have been identified as predictive for traditional graduates. Classroom success is based on many variables for students in traditional nursing programs, including but not limited to nursing and prenursing grades and a comprehensive preadmission examination (Abbott, Schwartz, Hercinger, Miller, & Foyt, 2008).

ATI

The ATI-CARP is a comprehensive exit assessment and review program that assists students in achieving success on the NCLEX-RN licensure examination by assessing mastery of nursing knowledge (ATI, 2013). ATI-CARP is administered via computerized testing, which increases familiarity with the use of computerized testing and reduces nonfamiliarity anxiety associated with the NCLEX-RN (Norton et al., 2005). The ATI-CARP mirrors the NCLEX-RN for content and the nursing process, and is

designed to assess nursing students' comprehensive knowledge prior to graduation (ATI, 2013). Student performance on the ATI-CARP exit exam is said to be 96% predictive of outcomes on the NCLEX-RN (ATI, 2013). Several research studies have examined the relationship between scores on the ATI-CARP with first-time pass rates on the NCLEX-RN (Alameida et al., 2011; Jacobs & Koehn, 2006). There are limited data on the association between success on the ATI-CARP and NCLEX-RN, indicating the need for additional studies regarding the predictive value of this examination (Alameida et al., 2011; Jacobs & Koehn, 2006).

Preadmission Tests

Administering a standardized nursing aptitude test as a program admission requirement may provide nursing program faculty, advisors, and administrators with more data regarding student academic strengths and weaknesses (Alexander & Brophy, 1997; Crow et al., 2004). Nursing aptitude test data provide insight into applicant preparedness for the nursing major, and allow for a more proactive, personalized approach to admission and advising decisions (Newton, Smith, Moore, & Magnan, 2007).

Research has validated the premise that early identification and intervention for students can help improve retention in nursing school and increase their likelihood of academic and NCLEX-RN success (Sayles et al., 2003; Simmons, Haupt, & Davis, 2004; Symes, Tart, Travis, & Toombs, 2006). The Nurse Entrance Test (NET) developed by Educational Resources, Inc. (ERI), is a diagnostic instrument used by diploma, associate degree, and baccalaureate nursing programs as part of their admissions criteria, and as a tool for identifying at-risk student populations (Ellis, 2006). Sayles et al., (2003)

determined that composite scores on the Nurse Entrance Test and Pre-Registered Nurse Test were statistically significant as good predictors of success and could have useful implications for nursing schools in predicting students success on the NCLEX-RN.

The HESI and the ATI-TEAS are additional preadmission tests that schools may use to guide admission decisions and to identify students' chance for success, and to identify at-risk students who may need additional assistance (Crow et al., 2004, Jacobs & Koehn, 2006). These tests include reading comprehension, anatomy and physiology, and math. Positive correlations between standardized entrance examinations and Scholastic Aptitude Test (SAT) scores with NCLEX-RN pass rates are consistent with previous studies (Alexander & Brophy, 1997; Barkley, Rhodes, & Dufour, 1998; Byrd, Garza, & Nieswiadomy, 1999; Campbell & Dickson, 1996; McClellan, Yang, & Glick, 1992; Waterhouse, Carroll, & Beeman, 1993; Younger & Grap, 1992). Because many schools admit students at the upper-division level and SAT scores are not timely once students have basic courses, the use of a standardized entrance exam such as the ATI-TEAS may provide data that could assist such schools in admitting candidates most likely to achieve success on the NCLEX-RN, and in identifying students who may be at-risk for failure. Crow and colleagues (2004) concluded that baccalaureate nursing programs should consider using standardized entrance examinations as admission criteria to enhance the NCLEX-RN success rates for their students and nursing programs.

Multiple research studies have demonstrated that NCLEX-RN success cannot be predicted by a single variable (Harding, 2010; Newton & Moore, 2009; Wolkowitz & Kelley, 2010). Variables such as the Scholastic Aptitude Test (SAT) and American

College Test (ACT) scores, high school rank, grades in prenursing and nursing courses, and performance on standardized nursing examinations have been identified as predictive for traditional graduates' success. Classroom success is based on many variables for the student in traditional nursing programs, e.g. nursing and prenursing grades, and scores on comprehensive preadmission examinations (Abbott et al., 2008). Other nonacademic variables also seem to play a role in student success and are discussed below.

Age and Gender

The relationships of some nonacademic variables to NCLEX-RN performance, including age and gender, have also been examined. Although gender has not been found to be significant as a predictor, age had been reported as a significant variable by some studies and refuted by others (Giddens & Gloeckner, 2005). Gender has not been shown to affect pass rates (Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Landry, Davis, Alameida, Prive, & Renwanz-Boyle, 2010; Sayles et al., 2003).

In 1996, Campbell and Dickson found that the best demographic variable to predict success on the NCLEX-RN was age, with older students being more likely to succeed. Beeson and Kissling (2001) reported that students age 23 years or older had a 96% pass rate, while college students age 21 years had an 88% pass rate. Four other studies supported a positive association between age and passing the NCLEX-RN (Akers, 1992; Briscoe & Anema, 1999; Lengacher & Keller, 1990; Roye, 1997).

Age at graduation and gender were evaluated by Giddens and Gloeckner (2005) to determine whether differences existed between student groups who passed the NCLEX-RN, and those who failed. They compared findings from their sample with other reported

research. In their sample, neither age nor gender were predictors of success. Yin and Burger (2003) conducted a study that also found that variables such as age and gender were not statistically significant predictors of success on the NCLEX-RN. Age has been found by some researchers to be associated with NCLEX-RN outcomes where older students (over 23 years) have passed the NCLEX-RN at higher rates than students of traditional college age (Beeson & Kissling, 2001; Briscoe & Anema, 1999; Daley et al., 2003). Other researchers, however, have found that age is not a significant predictor for NCLEX-RN success (Beeman & Waterhouse, 2001; Roncoli, Lisanti, & Falcone, 2000).

In conclusion, neither differences in age nor gender have been strongly supported as consistent predictors of NCLEX-RN success. Researchers have explored many other nonacademic predictors of NCLEX-RN performance, such as ethnicity, self-esteem, primary language, and test anxiety (Breckenridge, Wolf, & Roszkowski, 2012; Graham, 1994: Landry et al., 2010). Some of these variables are discussed below.

English as the First Language

As changes in the demographics of the United States have occurred, nursing programs have attempted to increased diversity (Crow et al., 2004; Penprase, Harris, & Qu, 2013). Diverse members of the nursing profession, including men and people of diverse cultures and ethnicities, better reflect the patient population. Throughout the 21st century, the number of individuals from cultural and ethnic minority groups in the U.S. will continue to increase. It is estimated that by the middle of the century, so-called "minorities" will constitute the majority in the U.S. population (Sutherland, Hamilton, & Goodman, 2007).

Many foreign-born students and others who have been raised in ethnically diverse families, where their native language is used predominately in the home, enter nursing programs with English as their second language (ESL). This poses academic challenges and may cause test-taking difficulties throughout their academic careers (DiBartolo & Seldomridge, 2008). In particular, these students may have difficulty interpreting and passing the NCLEX-RN exam (Crow et al., 2004). Typically, ESL students in U.S. nursing programs understand and communicate fairly well in spoken English, thus they may not perceive themselves as having problems with the written English language. As these students interpret multiple-choice questions such as those on the NCLEX-RN, they tend to focus on nursing skill and course content, ignoring the details of English grammar and sentence construction necessary to analyze the intent of the question, which may hinder them from answering multiple-choice questions correctly (Cunningham, Stacciarini, & Towle, 2004). These researchers suggest that nursing programs offer strategies to assist ESL students in taking the NCLEX-RN, including early identification of ESL students having difficulty on tests used throughout nursing courses. Arathuzik and Aber (1998) also found that students who did not speak English at home did not do as well on the NCLEX-RN.

Having English as the primary language, and speaking English in the home, have been supported as variables that influence success on the NCLEX (Crow et al., 2004; DiBartolo & Seldomridge, 2008). Additional variables that may influence success include other non-academic issues that may require students to shift attention from their studies

to external demands. These, too, may affect a student's ultimate success in nursing school and on the NCLEX-RN.

Responsibility for Others, Personal Challenges, and Working During School

Nonacademic variables such as family responsibilities and emotional distress were significantly correlated with success on the NCLEX-RN (Arathuzik & Aber, 1998; Breckenridge et al., 2012; Crow et al., 2004; Landry et al., 2010). In 2002, The California Board of Registered Nursing determined that the number of hours worked while in school impacted success on the NCLEX-RN (Crow et al., 2004). Additional stressors included the degree of fatigue, presence of role strain, and the level of family and work responsibilities, all of which compete for the student's time and attention (Arathuzik & Aber, 1998; Beeman & Waterhouse, 2003; Crow et al., 2004; Frith, Sewell, & Clark, 2005; Sayles et al., 2003; Stark, Feikema, & Wyngarden, 2002; Waterhouse & Beeman, 2003).

Researchers found that environmental and personal factors are influential on pass rates on the NCLEX-RN (Crow et al., 2004). Breckenridge et al. (2012) found that that the more hours a student worked at a job while in school, increased probability of failure on the NCLEX-RN. They also found that the more individuals for whom the student cared while in school impacted their outcome on the NCLEX-RN. Living arrangements off campus while in nursing school were found also to have an impact on success on the NCLEX-RN (Seldomridge & DiBartolo, 2004).

Summary

Previous research suggests that there are many factors that may influence a student's likelihood for success—but not all studies agree on what those factors are (Fortier, 2010; Kehm, 2013; Rowland, 2013; Seldomridge, & DiBartolo, 2004; Strayer, 2010). A review of the literature did not reveal variables that could be used consistently as predictors of success on the NCLEX-RN. Multiple research articles were identified that studied similar variables but with differing results. English as the primary language used, and additional nonacademic concerns such as external employment hours and additional personal responsibilities and challenges did seem to have effects on success. It is crucial to identify possible predictors for NCLEX-RN success so that early intervention can be started or program modification can be achieved. The results of this study may provide guidance to faculty and administration regarding which variables impact graduates' success on the NCLEX-RN on the first attempt. The next chapter will describe the research design including ethical considerations, the data analysis plan, and the research process.

CHAPTER 3. METHODOLOGY

In this chapter, the research design, review of variables selected for the research study, research questions, data collection process, data analysis plan, ethical considerations, and limitations along with assumptions are described.

Purpose of the Study

The purpose of this two-phase study was to examine variables that may predict success of baccalaureate nursing students on the NCLEX-RN on the first attempt. Phase I focused on determining success on the NCLEX-RN on the first attempt. The study variables include academic variables (NURS 410 Nursing Care of Clients With Pathological Conditions final grade, ATI-CARP exit scores (Comprehensive Assessment and Review) and ATI-TEAS preadmission test scores (Test of Essential Academic Skills) and demographic variables (age, gender, marital status, English as first language, hours worked while in school, previous college education, responsible for a dependent while in school, and self-identified personal challenges). Phase II focused on the predictive value for success on the ATI-CARP and NURS 410 Nursing Care of Clients With Pathological Conditions final grade and the ATI-TEAS preadmission scores. Exploring the above factors will assist in predicting success on NCLEX-RN on the first attempt and will help increase efficiency and appropriateness of admissions to baccalaureate nursing programs.

Research Design

This two-phase quantitative, correlational, descriptive design was used to examine the relationships among selected demographic and academic variables, and success on the NCLEX-RN on the first attempt (Phase I). The relationships between ATI-TEAS preadmission test scores in math, reading comprehension, and science; the final grade in the NURS 410; and ATI-CARP exit score in the final semester of the program were also explored (Phase II).

Phase 1

Phase I was a descriptive, correlational, and retrospective cross-sectional survey. It explored relationships among selected variables, both academic and demographic, and success on the NCLEX-RN on the first attempt. Based on a review of the literature, student factors thought to influence success rates were identified (Fortier, 2010; Rowland, 2013; Strayer, 2010). The independent variables in Phase 1 included: age, English as the first language, hours worked while enrolled in school, previous college education, ATI-CARP exit scores on the first attempt, final grade in NURS 410, responsibility for dependent(s) while in nursing school, any self-identified challenges, gender, and marital status. The dependent variable was identified as success on the NCLEX-RN on the first attempt.

The sample consisted of 91 students who graduated from a baccalaureate nursing program between 2007 and 2010. The online survey instrument was developed by the researcher (Appendix A). The survey was pilot tested on a small sample for comprehension, readability, and ease of usage.

Graduates of the nursing program from 2007 to 2010 were recruited to participate in the study by using email address from the university alumni office, and advertising at health care organizations using flyers on the units and the health care organization's intranet. Also, subjects were recruited to participate in the study via email and postal mail requests. There were 420 potential subjects, of whom 99 completed the on-line survey. Eight respondents were excluded due to duplication of participation in the on-line survey, leaving a total of 91 subjects eligible for data reporting. The survey included the demographic variables identified above, as well as the student's pass/fail status on NCLEX-RN on the first attempt. The remaining predictor variables, ATI-TEAS preadmission scores, NURS 410, and the ATI-CARP exit scores on the first attempt, were obtained from the students' university records and the ATI's official web site.

Phase II

Phase II was a retrospective record review of all completed student records in the same program from the years 2007 to 2010. It involved an additional assessment of graduates of the nursing program from 2007 to 2010. Specifically, the relationships between ATI-TEAS preadmission scores, ATI-CARP exit scores on the first attempt, and final grade in NURS 410 final grade were explored. The independent variable for Phase II was the ATI-TEAS preadmission score. The dependent variables were the ATI-CARP exit score on the first attempt and NURS 410 final grade. Since no records of whether an individual student had passed or failed the NCLEX-RN were available (they are not made available by the National Council of State Boards of Nursing due to privacy laws) (NCSB, 2014), two proxy variables were selected to indicate baccalaureate nursing

school success in data analysis. Specifically, the NURS 410 final grade and the ATI-CARP exit score on the first attempt were the proxy variables used in place of the NCLEX-RN status on the first attempt. A proxy variable is a variable that is used to measure an unobservable quantity of interest (Lewis-Beck, Bryman, & Liao, 2004). Researchers have found that scores in an advanced medical-surgical pathophysiology course and the ATI-CARP exit exams predict NCLEX-RN success (Fortier, 2010; Rowland, 2013; Strayer, 2010). Strayer and Beitz (2010) discovered in their research that the grade in a complex senior-level nursing course could be correlated with NCLEX-RN success. The researcher selected NURS 410 because it is the last medical-surgical course the student takes prior to graduation, and it covers complex diagnoses, exposing the student to critical thinking activities including development of patient care plans.

Data for Phase II were collected from university records, as well as from the ATI's official web site. Of 487 graduates from the program from 2007 to 2010, complete records were available for 368. The 91 graduates who responded to the survey in Phase I represented a subset of the 368 available study subjects. The graduates' informed consent was obtained for Phase I during the online process. Since the respondents to the survey were coded after all data was attained it was not possible to exclude them from the Phase II data collection and analysis. Data were collected and entered by the researcher.

All data were collected after permission was obtained from the University's Human Subjects Review Board (Appendix B), the health system's IRB (Appendix C), one hospital (Appendix D), and the School of Nursing's director (Appendix E). Figure 2 illustrates the research design.

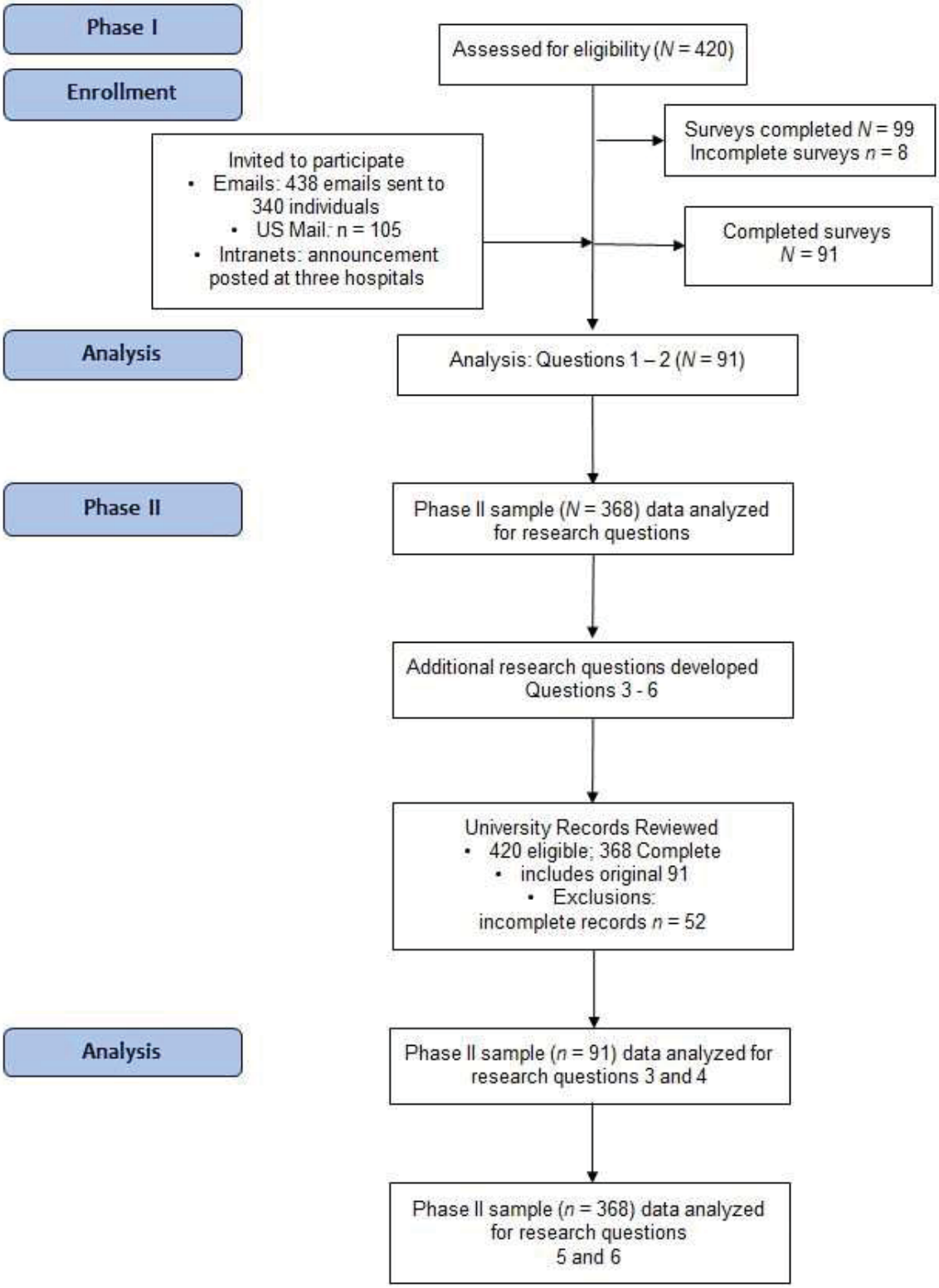


Figure 2. Research design.

Rationale for Selection of Variables

The literature review revealed a number of variables that have been found to predict success on the NCLEX-RN (Abbott et al., 2008; Crow et al., 2004; Frith et al., 2005). These have included achievement tests, such as preadmission tests administered by the National League for Nursing, ATI-TEAS, and HESI (Abbott et al., 2008; Barkley et al., 1998; Harding, 2010; Hernandez, 2011), as well as the final pathophysiology nursing course (Abbott et al., 2008; Barkley et al., 1998; Beeman & Waterhouse, 2001). Researchers have also identified nonacademic variables that may influence NCLEX-RN success. These include English as first language, lack of emotional distress, and lack of family demands (Arathuzik & Aber, 1998; Breckenridge et al., 2012; Mosser, Williams, & Wood, 2006; Strayer & Beitz, 2010).

For this study, the concepts of age, ATI-CARP, ATI-TEAS, average number of hours worked, English as primary language, gender, HESI exam, living arrangements, NCLEX-RN, NCLEX-RN success, NURS 410, personal challenges, previous college education, marital status, and responsibility for others were the key variables.

Table 2

Variables for Phase I

Variables for Phase I	Type of Variable	Level of Measurement
Age	Dependent	Interval
Assessment Technologies Institute Comprehensive Exit Testing (ATI-CARP)	Independent	Ratio; used as ordinal ($\leq$ 72; > 72)
Assessment Technologies Institute-Test of Essential Academic Skills (ATI-TEAS)	Independent	Ratio
Average Number of Hours Worked	Independent	Ratio
English as Primary Language	Independent	Nominal
Gender	Dependent	Nominal
Living Arrangements	Independent	Nominal
Marital Status	Independent	Nominal
National Council Licensure Exam (NCLEX)-RN Success	Dependent	Ordinal
NURS 410 (Nursing Care of Clients With Pathological Conditions course)	Independent	Ordinal
Personal Challenge(s)	Independent	Nominal
Previous College Education	Independent	Nominal
Responsibility for others	Independent	Nominal
Academic difficulty	Independent	nominal

Table 3

Variables for Phase II

Variables for Phase II	Type of Variable	Level of Measurement
Assessment Technologies Institute Comprehensive Exit Testing (ATI-CARP)	Dependent	Ratio; used as ordinal ($\leq$ 72; > 72)
Assessment Technologies Institute-Test of Essential Academic Skills (ATI-TEAS)	Independent	Ratio
NURS 410 (Nursing Care of Clients With Pathological Conditions course)	Dependent	ordinal

Variable Definitions

In this section, the theoretical and operational definitions for the variables used in this study are provided.

Age

- Theoretical definition: An individual's length of life measured in years.
- Operational definition: Survey respondents' self-report of age in years.

Assessment Technologies Institute Comprehensive Exit Testing (ATI-CARP)

- Theoretical definition: The Assessment Technologies Institute's Comprehensive Assessment and Review Program is an academic measuring tool with established reliability and validity used to identify potential problem area difficulty among nursing students for early intervention (Norton et al., 2005). The ATI-CARP exit exam is a method of predicting success on the NCLEX-RN. This exam is given in the first semester of the senior year of the nursing program.
- Operational definition: ATI Scores as reported to the University; obtained by abstracting existing school records.

Assessment Technologies Institute Test of Essential Academic Skills (ATI-TEAS)

- Theoretical definition: The ATI-TEAS is a multiple-choice assessment of basic academic knowledge in math, reading comprehension and science. The objectives assessed on the ATI-TEAS exam are appropriate and relevant to measure entry-level skills and abilities of nursing program applicants (Newton, Smith, Moore, & Magnan, 2007).

- Operational definition: Test score earned by students prior to starting their first semester in the nursing program. In this study the scores were obtained from the student's records for both phases of the study.

Average Number of Hours Worked

- Theoretical definition: Hours per week worked for pay while enrolled in the nursing program.
- Operational definition: Survey respondents' self-report.

English as Primary Language

- Theoretical definition: The primary language spoken as a child.
- Operational definition: Survey respondents' self-report.

Gender

- Theoretical definition: A range of physical, mental, and behavioral characteristics distinguishing between masculinity (male) and femininity (female).
- Operational definition: Survey respondents' self-report.

Health Education Systems, Inc. (HESI) Exam

- Theoretical definition: HESI's specialty exams were developed to assess students' knowledge level, and their ability to apply nursing concepts within specific content areas (Morrison et al., 2006).
- Operational definition: A test administered at the end of the first semester of the senior year to predict success on the NCLEX-RN.

Living Arrangements

- Theoretical definition: Lived on campus or off campus while in the last year of school.
- Operational definition: Survey respondents' self-report.

Marital Status

- Theoretical definition: The condition of being married or unmarried
- Operational definition: Survey respondents' self-report.

National Council Licensure Examination for Registered Nurses (NCLEX-RN)

- Theoretical definition: The NCLEX-RN is a comprehensive exam developed by the National Council of State Boards of Nursing (NCSBN) to measure the competencies needed to perform safely and effectively as a newly licensed, entry-level nurse (NCSBN, 2013). Passing the NCLEX-RN is required before nursing program graduates are licensed to practice nursing. Pass rates on the first attempt are reported for each state in the U.S. and are publically available.
- Operational definition: Survey respondents' self-report in Phase I.

National Council Licensure Exam (NCLEX-RN) Success

- Theoretical definition: The achievement of a passing score on the NCLEX-RN on the first attempt.
- Operational definition: Survey respondents' self-report.

NURS 410 (Nursing Care of Clients With Pathological Conditions course)

- Theoretical definition: Course taken in the first semester of the senior year; focuses on care of patients with complex disease conditions, the pathophysiologic basis for the disease, and the nursing care required. It is the final pathophysiology course and is a follow-up to a junior level pathophysiology course that focused on less complex disease conditions and basic pathophysiology content.
- Operational definition: Letter grade students earned in NURS 410 Nursing Care of Clients With Pathological Conditions.

Personal Challenge(s)

- Theoretical definition: An event or events that cause undue stress on an individual. Personal challenges include health conditions, marital difficulties, and financial difficulties.
- Operational definition: Survey respondents' self-report.

Previous College Education

- Theoretical definition: Completion or enrollment in college courses prior to enrolling in the nursing program.
- Operational definition: Survey respondents' self-report.

Responsibility for Others

- Theoretical definition: Providing care for children or adults, including physically, mentally, emotionally, and/or financially.
- Operational definition: Survey respondents' self-report.

Setting

The study was conducted at a four-year public university in a Mid-Atlantic state. The nursing program graduates undergraduate (BSN), master's (MSN), and doctoral (PhD and DNP) students. The BSN program during the years of 2007 to 2010 admitted approximately 130 traditional (i.e., nonaccelerated) students each year into the nursing major. At this university, students are admitted to the nursing program at the junior level. Students are required to meet both university and nursing program prerequisites and general education requirements prior to admission to the nursing curriculum. In spring of the sophomore year, prospective students must apply for fall admission to the four-semester upper division nursing program. Admissions are based on a competitive review process. During the review process, the School of Nursing must make the admission decisions based on the information available in the admission packet submitted by the students. There are many more applicants seeking admission than available students slots each academic year, therefore the school's review committee needs to accept the candidates that will be successful. Hence, the need for this study.

Sample

Phase I

The sample for this study was graduates of one traditional baccalaureate university nursing program from the years 2007 to 2010. The total number of potential subjects was 420 graduates. The sample for Phase I were graduates of the BSN program who returned a completed survey.

Students who previously had a license to practice nursing (e.g. licensed practical nurse (LPN)), any student who did not graduate in May with their cohort, and students who were admitted to the accelerated second-degree nursing program were excluded from the sample.

Email and postal addresses of the 2007 to 2010 graduates were obtained from the university's alumni association. An invitation to participate in the survey was emailed to 438 email addresses (some students had multiple email addresses, both personal and school email addresses). Twenty-eight emails were identified as undeliverable.

Invitations to participate were also sent to 105 graduates' postal addresses for whom the alumni association did not have email addresses; 9 were undeliverable. A second email and postal mailing was sent two weeks after the first mailing. No returns were received from the second mailing from either the emails or postal mailings. The invitation to complete the survey was also placed on three organizations' intranets, one at a local healthcare system and two at community hospitals. A copy of the introductory letter (Appendix F), recruitment flyer (Appendix G), and consent form (Appendix H) were included with the invitation on the intranet sites and in the emails, and postal mailings.

Phase II

The study population for Phase II was all graduates of the traditional nursing program at the same university from 2007 to 2010 who had complete record files stored with the School of Nursing. Inclusion and exclusion criteria for the Phase II analysis were the same as Phase I. Approval was obtained and the university's Human Subjects Review

Board (Appendix B) and from the Director of the Nursing Program (Appendix E) to complete a secondary analysis on these data. It should be noted that the sample for Phase II included those students who were also subjects in Phase I.

Data Collection and Instrumentation

Phase I data were survey responses. The email invitation along with the postal mailings included the flyer (Appendix G) and introduction letter (Appendix F). Once a subject agreed to be in the study, he or she was directed to the PsychData web site. An introduction letter (Appendix F), informed consent (Appendix H), and the survey (Appendix A) were posted on the Psych Data web site.

The academic variables included: NURS 410 final grade, ATI-CARP exit scores on the first attempt, and ATI-TEAS preadmission scores for the math, reading comprehension, and science tests. The academic variables were obtained from the School of Nursing's database. PsychData supplied the names of the respondents with completed on-line surveys. The researcher then collected data from stored student records concerning the relevant academic variables. The variable data were then entered into the PsychData database for each subject. After the additional variable data were obtained and matched to the subjects, the students' identifiers were expunged from the PsychData record. Each data point was coded by PsychData.

NURS 410 focuses on care of patients with complex disease conditions, pathophysiology of the disease process, pharmacologic interventions, and the required nursing care. The course meets for 14 weeks for approximately three hours per week.

Students are given multiple-choice exams after three disease processes are discussed. The course concludes with a comprehensive final exam.

The ATI-TEAS preadmission tests are propriety tests that measure general education knowledge attained the first two years after high school (ATI, 2004).

To establish validity of the ATI-TEAS, content was developed with specialists in curriculum, testing, and psychometrics. Nursing program curriculum experts selected items most relevant to entry-level nursing students in order to predict academic success in a nursing program. The reliability of the ATI-TEAS was estimated using Cronbach's alpha coefficient, which demonstrated internal consistency. ATI reports that the composite score ranked highest in reliability estimates at 0.90 with the four subcategory scores estimated as follows: mathematics (0.83), reading (0.79), English (0.77), and science (0.67). Test/retest reliability estimates were reported as composite score (0.89), reading (0.79), English (0.76), mathematics (0.69), and science (0.68) (ATI, n.d.).

Four general content domains of reading, mathematics, science, and English language usage are included in the 170 multiple-choice question ATI-TEAS instrument available through the ATI organization. ATI-TEAS uses a weighted score to calculate the composite score in which English is weighted most heavily followed by mathematics, reading, and science, although the rationale for the weightings is not described (Wolkowitz & Kelly, 2010).

ATI-CARP is a propriety test given toward the end of the senior year to test students' knowledge acquired during their nursing program. ATI-CARP is a 180-item exam covering adult medical-surgical nursing, maternal–newborn, nursing care of

children, mental health nursing, community health nursing, and leadership in nursing. The exam was based on the NCLEX-RN Detailed Test Plan and NCSBN Practice Analysis study. The test plan was aligned with the knowledge, skills, and abilities important for the entry-level nurse. All items were scrutinized for sources of cultural, gender, racial, religious, and geographical bias or offensiveness. Field-testing using a representative sample of nursing schools provided additional testing for validity. A detailed item analysis and differential item functioning study were conducted to identify potentially flawed items (ATI, n.d.). The Cronbach's alpha reliability for the 180-item test was 0.75 (ATI, n.d.). The Cronbach's alpha reliability for the multiple-choice subscale was 0.721 and alternate-format subscale was 0.337 (ATI, n.d.).

Phase II data were collected during a review of the student records at the School of Nursing and the ATI's official web site. Identifying data were then separated from the research data. The research data were then coded by the researcher. Identifying data were then stored in a locked file cabinet and the researcher was the only individual with access to the identifying data. Identifying data were destroyed at the conclusion of the research process.

Pilot of the Instrument

The survey instrument (Appendix A) obtained the data that measured Phase I independent variables,(English as a first language, hours worked while enrolled in school, previous college education, ATI-CARP exit scores (on the first attempt), NURS 410, any dependent for whom the student was responsible for while in nursing school, any personal challenges while in nursing school, gender, and marital status) along with the

dependent variable, the pass/fail status on the NCLEX-RN on the first attempt. The survey was developed by the researcher after an extensive search of the literature was completed to identify the factors that were determined to be factors in NCLEX-RN success or failure. Five student volunteers from the 2011 senior class of the baccalaureate nursing program completed the pilot study. The pilot measured the time needed to complete the survey instrument, and whether the survey questions were clear, concise, and elicited desired data points. All five students completed the survey and offered no comments or concerns regarding the questions on the survey. The average time required to complete the survey was 4.5 minutes.

Data Analysis Plan

Data analysis was performed using the Statistical Package for Social Science 19 (SPSS) program. Because inferential statistics were planned, a power analysis was conducted to determine the necessary sample size. For Phase I the power analysis revealed that a minimum of 86 subjects were needed so that any significant differences could be detected (Munro, 2001). Independent *t*-tests and logistic regression were conducted in Phase I. To allow for incomplete surveys or other missing data, the goal for Phase I was to recruit 100 subjects. The Data Analysis Plan is discussed in Table 4.

Table 4

Data Analysis Plan

Research Questions	Dependent Variable	Statistical Analysis
Phase I		
1. What are the relationships between pass/fail status on the NCLEX-RN on the first attempt and (a) demographic variables, (b) NURS 410 final grade, (c) the ATI-CARP exit score first attempt, and (d) ATI-TEAS preadmission scores?	NCLEX-RN status	Independent *t*-test Chi-Square
2. Which of the variables are predictors of the dependent variable, success on the NCLEX-RN on the first attempt? Independent variables considered were (a) age, (b) whether or not English is the primary language, (c) previous college education, (d) final grade in NURS 410, (e) the ATI-CARP exit score on the first attempt, and (f) ATI-TEAS preadmission scores on math, reading comprehension, and science, in new graduates from a Mid-Atlantic region public university's nursing program during the years 2007 to 2010?	NCLEX-RN status	Logistic Regression
Phase II		
3. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010?	NURS 410 final grade	Multiple linear regression
4. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010?	ATI-CARP	Multiple linear regression
5. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?	NURS 410 final grade	Multiple linear regression
6. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?	ATI-CARP	Multiple linear regression

Analysis Strategies for Each Research Question

Phase I

Research Question 1:

1. What are the relationships between pass/fail status on the NCLEX-RN on the first attempt and (a) demographic variables, (b) NURS 410 final grade, (c) the ATI-CARP exit score first attempt, and (d) ATI-TEAS preadmission scores?

Research question one was analyzed with *t*-tests for independent groups (unpaired). Independent *t*-tests are used to compare the means of two samples; in this case, the single dependent variable was pass/fail status on NCLEX. In this study, a series of *t*-tests were conducted on the independent variables (age, gender, ATI-CARP exit score, NURS 410 final grade, and ATI-TEAS preadmission scores). The assumptions for the independent *t*-tests are that the dependent variable is measured on a continuous scale, random sampling, and normal distribution (Polit, 2010). In this study not all the dependent variables were analyzed using the *t*-test. The entire population of graduates was invited to participate, so random sampling was not necessary.

Chi-square testing was also used to assess for difference between those who passed and those who did not pass the NCLEX-RN on the first attempt. English as a first language and academic difficulty, living arrangements during the last year of school, gender, any personal challenge(s), previous college education, marital status, responsibility for others, and academic difficulty were the independent variables tested against the dependent variable pass/fail success on the NCLEX-RN on the first attempt. The chi-square test is used when independent and dependent variables are nominal level

variables (Polit, 2010). Chi-square tests also assume independent observations (Polit, 2010).

Research Question 2:

2. Which of the variables are predictors of the dependent variable, success on the NCLEX-RN on the first attempt? Independent variables considered were (a) age, (b) English as the primary language, (c) previous college education, (d) final grade in NURS 410, (e) the ATI-CARP exit score on the first attempt, and (f) ATI-TEAS preadmission scores on math, reading comprehension, and science, in new graduates from a Mid-Atlantic region public university's nursing program during the years 2007 to 2010?

Research question two was analyzed using logistic regression to determine which variables affect the probability of an event (Munro, 2001). Specifically, logistic regression is used with several independent variables and a two-category dependent variable (Mertler & Vannatta, 2005). In this study, logistic regression was used to determine whether any independent variable (both demographic and academic variables) predicted success on the NCLEX-RN on the first attempt. Logistic regression does not make any assumptions of normality, linearity, or homogeneity of variance for the independent variables (Polit, 2010).

Phase II

Research Question 3:

3. What is the relationship between the ATI-TEAS preadmission scores of math, reading comprehension, and science and NURS 410 final grade for graduates

from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010?

Research question three was analyzed using multiple linear regression, which defines the extent to which two variables are related. Multiple regression is used when the research involves several independent variables (IV) and one dependent variable (DV). A significant correlation between two variables does not always indicate that there is a cause-and-effect relationship between the variables. Multiple linear regression allows the prediction of one variable from several other variables (Cronk, 2012, p. 53). The assumptions include that: the independent variables are fixed, the IVs are measured without error, the relationships between the IV and DV are linear, and the means of repeated residuals are zero (Mertler & Vannatta, 2005). This analysis was used to determine the impact of the ATI-TEAS preadmission scores (independent variables) on NURS 410 final grade on subjects from Phase I (n = 91), a subset of the full sample in Phase II.

Research Question 4:

4. What is the relationship between the ATI-TEAS preadmission scores of math**,** reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010.

Research question four was analyzed using multiple linear regression. Again, multiple linear regression defines the extent to which two variables are related. Multiple regression is used when the research involves several independent variables and one

dependent variable. A significant correlation between two variables does not always indicate that there is a cause-and-effect relationship between the variables. Multiple linear regression allows the prediction of one variable from several other variables (Cronk, 2012, p. 53). The assumptions included that: the independent variables are fixed, the IVs are measured without error, the relationships between the IV and DV are linear, and the means of repeated residuals are zero (Mertler & Vannatta, 2005). This analysis was used to determine the impact of the ATI-TEAS preadmission scores on ATI-CARP exit score on the first attempt on subjects from Phase I ($n = 91$), a subset of the full sample in Phase II.

Research Question 5:

5. What is the relationship between the ATI-TEAS preadmission scores of math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program ($N = 368$) during the years 2007 to 2010?

Research question five was analyzed using multiple linear regression. Multiple linear regression allows the prediction of one variable (NURS 410 final grade) from several other variables (ATI-TEAS preadmission tests) (Cronk, 2012, p.53). The assumptions include that: the independent variables are fixed, the IVs are measured without error, the relationships between the IV and DV are linear, and the means of repeated residuals are zero (Mertler & Vannatta, 2005). This analysis was used to determine the impact of the ATI-TEAS preadmission scores on NURS 410 final grade from data collected in Phase II ($N = 368$)

Research Question 6:

6. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and the ATI-CARP exit score on the first attempt for graduates from a Mid-Atlantic region public university's nursing program ($N = 368$) during the years 2007 to 2010?

Research question six was analyzed using multiple linear regression. Again, multiple linear regression allows the prediction of one variable (ATI-CARP exit score) from several other variables (ATI-TEAS preadmission scores) (Cronk, 2012, p. 53). The assumptions include that: the independent variables are fixed, the IVs are measured without error, the relationships between the IV and DV are linear, and the means of repeated residuals are zero (Mertler & Vannatta, 2005). This analysis was used to determine the impact of the ATI-TEAS preadmission scores on ATI-CARP exit exam on the first attempt on from data collected in Phase II ($N = 368$).

Ethical Considerations

Permission to conduct the study was obtained from the university's Human Subjects Review Board (HSRB). A copy of the approval letter from the HSRB is in Appendix B, along with IRB approval form from one health care organization (Appendix C). One hospital granted permission to place the invitation on the hospital intranet (Appendix D). This permission was granted without a formal IRB approval per the hospital's policy (Appendix D). A third hospital did not require approval from that hospital's IRB and placed the invitation on the organization's intranet.

The research included collecting and examining the participants' survey responses and academic records. No risk to the subjects was anticipated. Protection of the subjects, including privacy of respondents, was accomplished through coding of returned surveys by PsychData and by the separation of identifiers after necessary student records data were reviewed. PsychData technicians then provided the raw data to the researcher in SPSS format with coded identifiers in lieu of respondents' names. Written permission to use the data (ATI-CARP exit scores on the first attempt, ATI-TEAS preadmission test scores (math, reading comprehension, and science) and NURS 410 final grades) was obtained from the Director of the School of Nursing (Appendix E).

The researcher is a faculty member in the subject School of Nursing and was involved in the decision-making process to include standardized testing in the program. The researcher was not one of the instructors of record for the NURS 410 course, nor was she involved in administering the ATI-CARP exit score first attempt exam or ATI-TEAS preadmission tests.

Assumptions

For this study, the following assumptions were made:

1. All data collected from the graduates were accurate and complete.
2. The ATI-CARP exit exam first attempt is a reliable and valid exam as well as a predictor of success on the NCLEX-RN exam on the first attempt.
3. The NURS 410 final grades were calculated according to the university's policies and represent an accurate measure of students' knowledge.

4. Students applied their best efforts on the ATI-CARP exit exam on the first attempt and ATI-TEAS (math, reading comprehension, and science) preadmission tests.
5. The bases of students' success in the nursing program and on the NCLEX-RN are multidimensional, including but not limited to previous life and educational experiences.
6. All data (primary and secondary) were entered and coded correctly.
7. Students in the sample of graduating cohorts were equally qualified based on standardized program admission requirements.
8. The NCLEX-RN exam is a valid and reliable exam of nursing competency for entry to practice as a registered nurse.
9. Study participants completed the nursing curriculum in four semesters.

Strengths

The strengths of the study were as follows:

1. The results of study will be useful for the program to make curriculum changes to assist students to being successful on the NCLEX-RN on the first attempt.
2. The faculty will become more aware of students' personal and academic issues that could impact success in the program and on the NCLEX-RN exam.
3. This beginning research study will serve as the foundation for future studies that assist in predicting success in nursing programs and on the NCLEX-RN exam.

Limitations

The limitations of this study were as follows:

1. Phase I used a convenience sample, with less than 22% of graduates involved. Phase I relied on self-reports about a sensitive topic, which may account for the high percentage of nonparticipation.
2. The answers to the Phase I survey were self-reported. Self-report surveys provide greater privacy for the respondents, but they also increase the likelihood of misunderstood items or incomplete responses (Dane, 2011).
3. The sample represented only one baccalaureate program, which may limit generalizability.
4. There may have been variability among sections and instructors in NURS 410.
5. Students may have had inconsistent preparation for the ATI-CARP exit exam on the first attempt due to variability in teaching and testing methods by the different instructors.

Summary

This chapter discussed the research design, setting, population and sample, data analysis plan, ethical considerations, and assumptions along with limitations. The use and findings of the pilot of the instrument were also discussed.

To summarize this study: The study was conducted in two phases. Phase I was conducted using the responses obtained from an on-line survey with 91 usable responses. The independent variables included demographic and academic variables. The dependent variable was pass/fail status on the NCLEX-RN on the first attempt.

Phase II was conducted using data obtained from the nursing program's student records for 368 subjects with complete student records. The 91 respondents from Phase I were a subset of these 368 subjects. Proxy variables were used for the pass/fail status on the NCLEX-RN on the first attempt. The proxy variables were the NURS 410 final grade and the ATI-CARP exit score on the first attempt. The results of this study are presented and discussed in Chapter 4.

CHAPTER 4. FINDINGS

Two phases of data analysis were performed to determine relationships between selected variables. In Phase I, data collected from returned surveys from 91 graduates from 2007 to 2010 were analyzed. The goal was to examine the relationship between NCLEX-RN and NURS 410 final grade, ATI-CARP (Comprehensive Assessment and Review Program) exit score, gender, age, marital status, lived on campus during last year of nursing school, previous college, financial and/or marital issues, personal challenges, responsibility for others, and academic difficulties.

In Phase II, data collected from the nursing program records of 368 graduates from 2007–2010 were analyzed in terms of (a) the relationships among NURS 410 and ATI-TEAS preadmission scores (math, reading comprehension, and science), and (b) the relationships among ATI-CARP exit exam score and ATI-TEAS preadmission scores (math, reading comprehension, and science).

Phase I Sample

A total of 99 participants returned surveys. Ninety-one were included because 8 did not meet the inclusion criteria: one respondent was an accelerated nursing student graduate, two respondents submitted a survey twice, and five did not complete the survey.

Data Description: Demographics

Females comprised the majority of respondents (85.7%). The percentage of male (14.3%) respondents was slightly higher than the national average of male graduates of nursing programs, 11.4% (AACN, 2011). The majority of graduates were between 20 to 30 years old (68.1%), 26 (28.6%) were between 31 to 40 years old, and 3 (3.3%) graduates were between 41 to 50 years of age. Sixty-three (69.2%) participants were unmarried while in nursing school and 28 (30.8%) were married. A majority of the sample (63; 68.1%) reported English as their first language, while 28 (30.8%) of the sample reported that English was not their first language. A majority of respondents (76; 83.5%) reported having no previous college experience. Six (6.6%) had some college, one (1.1%) had an associate's degree in a major other than nursing, one (1.1%) already had a baccalaureate degree. One (1.1%) had completed a master's degree. One (1.1%) indicated "other" but did not provide any additional information.

Sixty-five (71.4%) respondents were employed during their last year of the nursing program. Twenty-six (28.6%) reported that they were not employed during their final year of school. Thirty-two (35.2%) of the 65 reported that they were employed in the medical field; a total of 33 (36.2%) reported that they were not employed in the medical field. Fifty-five (60.4%) reported that they had no responsibility for others while in school, while 32 (35.2%) reported that they had responsibility for others while in school. This included providing care for children and other family members.

Fifty-seven (62.6%) reported they did not live on campus during their last year in nursing school. Thirty-four (37.4%) lived on campus during the final year of nursing school.

Sixty-six (72.5%) respondents reported some amount of academic difficulty, while 25 (27.5%) reported no academic difficulty. Seventy (76.9%) reported no financial issues while in the nursing program. Eighty-two (90.1%) of the respondents were generally healthy, reporting no personal medical problems. Twenty-eight (30.8%) respondents were married and 63 (69.2%) were not married. While five (5.5%) reported marital difficulty, only 2 (2.2%) respondents reported that they had other significant stressors in their lives. Demographic data are presented in Table 5.

Table 5

*Sociodemographic Characteristics of the Phase I Sample (*N = *91)*

Variable	Frequency (%)
Age	
20-30	62(68.1%)
31-40	26(28.6%)
41-50	3(3.3%)
Gender	
Male	13(14.3%)
Female	78(85.7%)
Marital Status	
Married	28(30.8%)
Unmarried	63(69.2%)
English as a First Language	
Yes	63(69.2%)
No	28(30.8%)
Previous College Experience	
Some	6(6.6%)
Associate Degree	1(1.1%)
Baccalaureate	6(6.6%)
Master's	1(1.1%)
Other	1(1.1%)
None	76(83.5%)
Employed While in School	
Yes	65(71.4%)
No	26(19.6%)
Worked in the Medical Field	
Yes	32(35.2%)
No	59(64.9%)
Responsibility for Others	
Yes	36(39.6%)
No	55(60.4%)
Lived on Campus	
Yes	34(37.4%)
No	57(62.6%)
Academic Difficulties	
No	25(27.5%)
Yes	66(72.5%)
Financial Issues	
No	70(76.9%)
Yes	21(23.1%)

(continued)

Table 5. Sociodemographics (continued)

Variable	Frequency (%)
Personal Medical Issues	
No	82(90.1%)
Yes	9(9.9%)
Marital Difficulties	
Yes	5(5.5%)
No	86(94.5%)
Family Issues	
No	74(81.3%)
Yes	17(18.7%)
Other Issues	
Yes	2(2.2%)
No	86(97.9%)

Data Description: Characteristics of Academic Variables (*N* = 91)

Eighty-five (93.4%) students passed the NCLEX-RN on the first attempt; 6 (6.6%) failed. Letter grades for NURS 410 were converted to numbers, allowing analysis with an interval scale from a high of A (9) to a low of C (2). No student had earned lower than a C; the mean grade was 6.7, between B and B+.

ATI-CARP exit scores were reported on a continuous scale, a percentage score that ranged from 41.04 to 85.3%, with a mean of 70.8 ± 7.4. A score of 72% on the ATI-CARP exit score had been identified by the nursing program faculty as the minimum score that would be considered a passing score for the students in their program. The ATI web site also identified 72% as the minimum score that would be a good predictor of success on the NCLEX-RN on the first attempt (ATI, 2013). As a result, participants' scores were dichotomized into two categories: greater than or equal to 72%, and 71% or below (Table 6).

Table 6

*Characteristics of the Academic Variables (*N = *91)*

		***n* (%)**
Passed NCLEX on first attempt		
	Yes	85 (93.4)
	No	6 (6.6)
Grade in Nursing Care of Clients With Pathological Conditions (NURS 410)		
	A (9)	9 (9.9)
	A- (8)	17(18.7)
	B+ (7)	29 (31.9)
	B (6)	22 (24.1)
	B- (5)	8 (8.8)
	C+ (4)	4 (4.4)
	C (3)	2 (2.2)
	C- (2)	0
ATI score	$\geq$ 72%	47(51.6)
	< 72%	44(48.4)

Research Question 1

1. What are the relationships between pass/fail status on the NCLEX-RN on the first attempt and (a) demographic variables, (b) NURS 410 final grade, (c) the ATI-CARP exit score on first attempt and (d) ATI-TEAS preadmission scores?

Results are presented in Table 7.

Table 7

The Associations of Academic and Demographic Characteristics With NCLEX-RN Success, Mean (SD)

Variable	Fail	Pass	*p*
Academic			
ATI-CARP exit score	1.67(0.52)	1.48(0.52)	0.40
NURS 410 final grade	6.00(1.3)	6.80(1.4)	0.17
Math Preadmission Score	78.02(13.66)	77.09(15.46)	0.89
Reading Preadmission Score	79.90(11.34)	82.99(10.82)	0.50
Science Preadmission Score	63.73(9.46)	69.85(12.20)	0.23
Had academic difficulty *n* (%)	0 (0)	25 (29)	0.18

Note. Independent *t*-tests and Fisher exact tests were used.

Academic characteristics (scores, grades, and academic difficulties) were not significantly associated with NCLEX-RN success. Although the relationship between NCLEX-RN success and academic difficulties was not significant, students who failed the NCLEX-RN received lower scores in the science and reading ATI-TEAS preadmission tests.

Research Question 2

2. Which of the variables are predictors of the dependent variable, success on the NCLEX-RN on the first attempt? Independent variables considered are (a) age, (b) whether or not English is the primary language, (c) previous college education, (d) final grade in NURS 410, (e) the ATI-CARP exit score on the first attempt, and (f) ATI-TEAS preadmission scores on math, reading comprehension, and science, in new graduates from a Mid-Atlantic region public university's nursing program during the years 2007 to 2010?

Regression analyses were planned; however, the absence of significant correlations among the independent and dependent variables precluded the logic of performing these calculations. As predicted, analyses of predictive relationships by logistic regression yielded no statistically significant relationships.

Phase II Sample

The total number of graduates from this same program from 2007 to 2010 was 487, of which 368 were includes in the Phase II sample. One hundred nineteen student files were excluded from these analyses due to missing or incomplete student records documentation. Since the Phase I subjects were chosen from the same subset of graduates between 2007 and 2010, their student records data were included in the Phase II analysis; however, their survey responses were not included in Phase II analysis.

All the data were entered into the dataset by the researcher. Table 8 illustrates the total enrollment of graduates vs. total enrollment in the Phase II analysis from 2007 to 2010.

Table 8

Total Enrollment of Graduates vs. Total Enrollment in Phase II Analysis From 2007-2010

Year of Graduation	Number of Traditional Graduates	Number Included in Phase II Analysis	% Included
2007	120	104	87%
2008	105	89	84%
2009	144	116	81%
2010	118	59	50%*
Total	487	368	

*The results from the class of 2010 were low due to incomplete student records. The missing data from the student records were the ATI-TEAS preadmission scores, and these scores were not obtainable on the ATI web site. Many of the students completed the ATI-TEAS preadmission exams at another institution and the paper results did not get placed in the paper student records.

Research Question 3

3. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program from survey data ($n = 91$) during the years 2007 to 2010?

In bivariate relationships of ATI-TEAS with NURS 410 final grades, math ($r = 0.271$, $p < 0.01$) and science preadmission ($r = 0.240$, $p < 0.05$) scores were weakly to moderately significantly related to NURS 410 final grades, but reading preadmission test scores were not significantly related to NURS 410 final grade (Table 9).

Table 9

*Correlation Between NURS 410 Final Grades and ATI-TEAS (*n = *91)*

Variable	NURS 410 Final Grade	Significance
Math Preadmission test score	.271**	0.009
Science Preadmission test score	.240*	0.022
Reading Preadmission test score	.050	0.636

*Correlation (r) is significant at $p < 0.05$.
**Correlation (r) is significant at $p < 0.01$.

The results of the simultaneous multiple regression using NURS 410 final grade as the dependent variable and three predictors in the model are shown in Table 10.

Table 10

*Multiple Linear Regression Model for Predicting NURS 410 Final Grade (*n = *91)*

Predictor Variables	*b*	*SE*	*β*	*t*	*p*
Constant	3.232	1.178			0.007
Math preadmission test score	0.021	0.009	0.241	2.275	**0.025***
Science preadmission test score	0.024	0.012	0.222	2.076	0.041
Reading preadmission test score	-0.009	0.130	-0.075	-0.683	0.496

Note. Overall $R^2 = 0.115$, $p = 0.014$. R^2 is the proportion of the variation in NURS 410 explained by the model.
*$p < 0.05$ level (2-tailed).

The overall model with all three predictors was statistically significant and explained 11.5% of the variance in NURS 410 with F (3, 87) = 3.471, $p = 0.014$. Math preadmission test scores ($b = 0.021$, $p = 0.025$, $\beta = 0.241$) and science preadmission test scores ($b = 0.024$, $p = 0.041$, $\beta = 0.222$) were persistently significant predictors for NURS 410 final grade in multivariate relationships, but reading comprehension test scores ($b = -0.009$, $p = 0.496$, $\beta = 0.-0.075$) were not a significant predictor for NURS

410 grades. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.82 for the overall regression in prediction of NURS 410 final grade (Table 10).

Research Question 4

4. What is the relationship between the ATI-TEAS preadmission scores of math, reading comprehension, and science and the ATI-CARP exit score for graduates from a Mid-Atlantic region public university's nursing program from survey data (n = 91) during the years 2007 to 2010.

The results of the simultaneous multiple regression using ATI-CARP exit score as the dependent variable and three predictors in the model are shown in Table 11.

Table 11

*Multiple Linear Regression Model for Predicting ATI-CARP Exit Score (*n *= 91)*

Predictor Variables	*b*	*SE*	*β*	*t*	*p*
Constant	52.147	6.283		8.299	0.000
Math preadmission test score	0.061	0.049	0.125	1.243	0.217
Science preadmission test score	**0.024**	**0.012**	**0.222**	**2.076**	**< 0.001***
Reading preadmission test score	-0.054	0.710	-0.079	-0.761	0.448

Note. Overall R^2 = .205, p = 0.014. R^2 is the proportion of the variation in ATI-CARP exit score explained by the model.
*p < 0.001.

The overall model with all three predictors was statistically significant and explained 20.5% of the variance in ATI-CARP with F (*df*, regression, residual) = 2, 7.489 p = 0.014. ATI result analysis revealed math preadmission test scores (b = 0.061, p = 0.217 β = 0.125), science preadmission test scores (b = 0.024, p = 0.000, β = 0.222), and

reading comprehension test scores (b = -0.0.54, p = 0.448, β = -0.079). Science preadmission was the only significant predictor of ATI-CARP in multivariate analysis. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.82 for the overall regression in prediction of ATI-CARP exit score.

Research Question 5

5. What is the relationship between the ATI-TEAS preadmission scores of math, reading comprehension, and science and the NURS 410 final grade for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?

The results of the simultaneous multiple regression using NURS 410 final grade as the dependent variable and three predictors in the model are shown in Table 12.

Table 12

*Multiple Linear Regression Model for Predicting NURS 410 Final Grade (*N *= 368)*

Predictor Variables	*b*	*SE*	*β*	*t*	*p*
Constant	1.954	.801		2.439	.015
Math preadmission test score	.005	.005	.048	0.920	.358
Science preadmission test score	.012	.007	.103	1.843	.066
Reading preadmission test score	.038	.009	.222	4.063	< 0.001*

Note. Dependent variable: N410 final grade. Overall R^2 =.086, $p < 0.001$. R^2 is the proportion of the variation in NURS 410 final grade is explained by the model.
*$p < 0.001$.

The overall model with all three predictors was statistically significant and explained 8.6% of the variance in NURS 410 with F (3.364) = 11.344, $p < 0.001$; ATI

score analysis revealed math preadmission test scores (b = 0. 005, p = 0.358, β = 0.48), science preadmission test scores (b = 0.012, p = 0.066, β = 0.103) and reading comprehension scores (b = .038, p < 0.001, β = 0.222). Reading comprehension preadmission scores were significant predictors of NURS 410 final grade in multivariable analysis. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.82 for the overall regression in prediction of NURS 410 final grade.

Research Question 6

6. What is the relationship between the ATI-TEAS preadmission scores in math, reading comprehension, and science and the ATI-CARP exit scores for graduates from a Mid-Atlantic region public university's nursing program (N = 368) during the years 2007 to 2010?

The results of the simultaneous multiple regression using ATI-CARP exit score as the dependent variable and three predictors in the model are shown in Table 13.

Table 13

*Multiple Linear Regression Model for Predicting ATI-CARP Exit Score (*N = *368)*

Predictor Variables	*b*	*SE*	***β***	*t*	*p*
Constant	46.745	4.514		10.355	.000
Math preadmission test score	.093	.030	.158	3.054	.002
Science preadmission test score	.065	.038	.095	1.709	.088
Reading preadmission test score	.153	.053	.158	2.900	.004

Note. Dependent Variable: ATI-CARP exit score. Overall R^2 =.086, p = 0.014. R^2 is the proportion of the variation in ATI-CARP exit score explained by the model.
*p < 0.05 level (2-tailed).

The overall model with all three predictors was statistically significant and explained 8.6% of the variance in ATI-CARP exit score with F (11.35) = 3.471, p =

0.014. ATI score analysis revealed math preadmission test scores (b = 0. 093, p = 0.002, β = 0.158), science preadmission test scores (b = 0.065, p = 0.088, β = 0.095), and reading comprehension test scores (b = 0.153, p = 0.004, β = 0.15). The reading preadmission scores was a significant predictor of ATI-CARP in this multivariable analysis. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.99 for the overall regression in prediction of ATI-CARP final grade.

Summary

This chapter discussed the findings from the data analysis in both Phase I and Phase II. Eight survey responses were eliminated from the Phase I and one hundred nineteen records were excluded from Phase II due to incomplete records. In Phase I, 91 (N = 91) graduates who responded to the survey were included in the data analysis. In Phase II, 368 records (N =368) were included in the data analysis, of which the 91 graduates in Phase I were a subsample (n = 91).

In Phase I (N = 91) data analysis, no academic characteristics were found to be statistically significant in predicting the NCLEX-RN success on the first attempt. However, students who self-reported NCLEX-RN failure had lower scores in reading and science on the ATI-TEAS preadmission tests. Also, no predictive value was found between the demographic variables and the NCLEX-RN pass/fail status.

Phase II data analysis revealed a relationship between math and science preadmission scores and success in NURS 410 (n = 91). ATI-TEAS science preadmission was the best predictor of success on the ATI-CARP exit score (n = 91). Science, math and reading comprehension scores were predictors of success on the ATI-CARP exit

scores and NURS 410 final grade. These findings of the data analysis will be discussed in Chapter 5.

CHAPTER 5. DISCUSSION

The purpose of this study was to determine variables that would predict success on the NCLEX-RN exam on the first attempt by graduates of a traditional baccalaureate nursing program. Specifically, the 2007 to 2010 graduates from a Mid-Atlantic public university were asked to complete a survey consisting of the following variables: demographics (age, gender, marital status, English as a first language, living on campus, employment status, responsibility for others, academic difficulties), academic variables (ATI-TEAS preadmission test scores, ATI-CARP exit exam score, and NURS 410 final grade), and pass/fail status on the NCLEX-RN on the first attempt.

The initial survey was identified as Phase I (survey $N = 91$). With one exception, the results on the initial survey were not significant, therefore data collection was expanded. Phase II expanded the analysis to include not only the survey group, but also analysis of the records of other graduates (total $N = 368$) from the same time period 2007 to 2010. This chapter discusses the study results. This study has implications not only for future research, but also for educators and administrators who are preparing students to practice as nurses, and to pass the NCLEX-RN on the first attempt.

The theoretical foundation for this study was an adaption of the Synergy Model of Nursing, which was originally developed by the American Association of Critical-Care Nurses to link patient care outcomes with the nursing care provided. “Synergy results

when the needs and characteristics of a patient, clinical unit or system are matched with a nurse's competencies" (American Association of Critical-Care Nurses Certification Corporation, n.d.). This study looked at the various aspects of a nurse's preparation to determine the graduates' ability to practice as a nurse. Based on extant literature, the author hypothesized that demographic variables, along with final grade in the senior level course NURS 410 and ATI-CARP exit scores (first attempt) and ATI-TEAS preadmission test scores would predict success of these students' first attempt on the NCLEX-RN.

Research Design

Participants in the primary study (Phase I) were 91 graduates of the classes of 2007 to 2010 who completed an online survey. During this timeframe, the NCLEX-RN pass rate ranged from 85.6% (2009) to 89.8% (2008) (Table 1). This relative lack of variability in pass rates was an important factor which led to a lack of significance of most of the results in Phase I.

Phase II involved an analysis of records from the same university for the sample groups for Phase I, as well as of other traditional nursing graduates from the same years, 2007 to 2010. Specifically, the dependent variables of nursing NURS 410 and ATI-CARP exit exam scores were regressed against the independent variables of students' ATI- TEAS preadmission test scores for math, reading comprehension, and science.

Findings

In Phase I ($N = 91$), Research Questions 1 and 2 explored the relationship between the dependent variable (NCLEX-RN pass/fail status) and the independent

variables (both academic and demographic). Independent *t*-tests, chi-square analysis, Fisher exact, and logistical regression statistical tests revealed no statistically significant findings of any one demographic variable that predicted success on the NCLEX-RN on the first attempt. However, students who self-reported academic difficulty also self-reported failure on the NCLEX-RN, and also had lower scores on the science and reading ATI-TEAS preadmission scores.

In Phase II ($N = 368$), research questions 3 through 6 explored whether there were any relationships between the ATI-TEAS preadmission test scores and NURS 410 final grade, and the ATI-CARP exit score on the first attempt. Multiple linear regression was used for the research questions using the ATI-TEAS as the dependent variable.

Research Question 3 ($n = 91$) examined the relationship between ATI-TEAS preadmission test scores and NURS 410 final grade for students who had completed the survey in Phase I. A correlation and multiple linear regressions were conducted.

Bivariate relationships of ATI-TEAS with NURS 410 final grades, Math ($r = 0.271$, $p < 0.01$) and science preadmission ($r = 0.240$, $p < 0.05$) scores were weak to moderately significantly related to NURS 410 final grades, but reading preadmission test scores were not significantly related to NURS 410 final grade.

The results of the simultaneous multiple regression using NURS 410 final grade as the dependent variable and three predictors in the model are shown in Table 10. The overall model with all three predictors was statistically significant and explained 11.5% of the variance in NURS 410 grades, with $F(3, 87) = 3.471$, $p = 0.014$. Math preadmission test scores ($b = 0.021$, $p = 0.025$, $\beta = 0.241$) and science preadmission test

scores (b = 0.024, p = 0.041, β = 0.222) were persistently significant predictors for NURS 410 final grade in a multivariate relationship, but reading comprehension test scores (b = -0.009, p = 0.496, β = 0.-0.075) were not a significant predictor for NURS 410 grades. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.82 for the overall regression in prediction of NURS 410 final grade.

Research Question 4 (n = 91) explored the relationship between ATI-TEAS preadmission scores and the ATI-CARP exit exam score for students who had completed the survey in Phase I. The results of the simultaneous multiple regression using ATI-CARP exit score as the dependent variable and three predictors in the model are shown in Table11. The overall model with all three predictors was statistically significant and explained 20.5% of the variance in ATI-CARP with F (*df*, regression, residual) 90, 7.489, p = 0.014. ATI score analysis revealed math preadmission test scores (b = 0.061, p = 0.217, β = 0.125), science preadmission test scores (b = 0.024, p = 0.000, β = 0. 222) and reading comprehension test scores (b = -0.54, p = 0.448, β = -0.079). Science preadmission was the only significant predictor of ATI-CARP in a multivariate analysis.

Research Question 5 (N = 368) explored the relationship between ATI-TEAS preadmission test scores and NURS 410 final grade. A multiple linear regression test was used to explore this question. The results of the simultaneous multiple regression using NURS 410 as the dependent variable and the ATI-TEAS as the predictors are shown in Table 12. The overall model with all three predictors was statistically significant and explained 8.6% of the variance in NURS 410 with F (3.364) = 11.355, $p < 0.001$. ATI score analysis revealed math preadmission test scores (b = 0.005, p = 0.358, β = 0.48),

science preadmission test scores ($b = 0.012$, $p = 0.066$, $\beta = 0.103$), and reading comprehension test scores ($b = 0.038$, $p = 0.000$, $\beta = 0.222$). Reading comprehension preadmission scores were significant predictors of NURS 410 success in a multivariable analysis. Post hoc power analysis indicated that the power to detect obtained effects at the 0.05 level was 0.82 for the overall regression in prediction of NURS 410 final grade.

Research Question 6 ($N = 368$) studied the relationship between ATI-TEAS preadmission scores and the ATI-CARP exit scores. The results of the simultaneous multiple regression using NURS 410 final grade as the dependent variable and three predictors in the model are shown in Table 13. The overall model with all three predictors was statistically significant and explained 8.6% of the variance in ATI-CARP exit score with F (11.35) = 3.471, $p = 0.014$. ATI score analysis revealed math preadmission test scores ($b = 0.093$, $p = 0.002$, $\beta = 0.158$), science preadmission test scores ($b = 0.065$, $p = 0.088$, $\beta = 0.095$), and reading comprehension test scores ($b = 0.153$, $p = 0.004$ $\beta = 0.158$). Reading comprehension preadmission scores were a significant predictor of ATI-CARP in multivariable analysis.

Discussion

It is surprising that the study variables were not able to predict success on the NCLEX-RN on the first attempt. The student subjects were willing to participate in the study. The health care organizations were very interested in the study and readily offered various communication sites to display the survey. The faculty at the subjects' university were also very interested in offering suggestions for variables to be analyzed. Permission to access students' academic records was easy to obtain from the director of the nursing

program, who felt that the study variables were relevant and the study results would assist in determining admission criteria. Variables selected for the study were supported by evidence from prior research on the topic (Crow et al., 2004; Fortier, 2010; McCarthy, Harris, & Tracz, 2014; Romeo, 2013).

The results may be construed as discouraging. While some of the results were statistically significant, statistical significance does not necessarily translate to academic significance. The practicality of the significance has to be considered. These data did not identify any specific academic predictors. The ATI-TEAS preadmission scores provided some data points that should be considered in future research. The Phase II data analysis revealed that the ATI-TEAS science preadmission score is the best predictor for ATI-CARP. Science preadmission score accounts for approximately 20% of the variance in the ATI-CARP scores (Potolsky, Cohen, & Saylor, 2003; Wolkowitz & Kelley, 2010). Admissions counselors may prefer higher ATI-TEAS preadmission scores over lower scores, however, this factor alone does not guarantee success in a nursing program. Reading comprehension scores do not correlate negatively with the dependent variables. This may be because 30.8% of the primary sample did not have English as their primary language in Phase I of the study.

The absence of results with statistical significance makes recommending specific educational practices difficult. There are fewer opportunities to develop interventions to improve students' likelihood of passing the NCLEX-RN on the first attempt. The good news, however, is that a high percentage of graduates in Phase I of the study passed the NCLEX-RN on the first attempt. Since the pass rate was not 100%, there are

opportunities for improvement during the admission process and in the nursing curriculum. It may be that one of the challenges is improving test-taking skills rather than knowledge application. Graduates take the NCLEX-RN online, which requires a different set of skills than a pencil-and-paper test method. With pencil-and-paper tests, the test-taker is able to skip a question or questions, then go back to answer the question(s) or even change the answer(s). The on-line version does not allow the test-taker to go back to a question and change the answer or leave the question blank and go back to answer the question (NCSBN, 2010). This inability to leave a question blank or to go back to a question adds additional anxiety to the test-taker.

Strengths and Limitations

There are several strengths to this study. Multiple dimensions of analysis were undertaken to determine the significance of one or more of the variables. The range of analyses leaves little question about these results. It is tempting to rely on the initial appearance of statistical significance. Unfortunately, a more complete examination of the data did not provide significance upon which to base recommendations for change to current nursing educational practices.

There are limitations to this study. The sample size for the Phase I was small (N = 91). The participating health care organizations were not easily able to identify the university affiliation of their employees, therefore the study participants had to log onto the health care organizations' intranet sites or read the study flyer on unit staff bulletin board.

There were no academic variables that predicted the outcome on the NCLEX-RN first attempt. The variable "academic difficulty" seems important; however, it is complex to operationalize for several reasons. First, this was a retrospective self-report on the survey. Second, students who failed the NCLEX-RN on the first attempt may have been more likely to attribute academic difficulties as the cause of their failure.

Data for Phase II involved students' academic records from the university, and the analysis utilized 87.6% of the graduates of the four study years. The academic record data were incomplete for the remaining students. Many students did not provide their ATI-TEAS preadmission scores to the university. The university's decision about whether or not to accept the student was based on records that the students hand carried to the university. Hard copies may have existed for some of these students, but those records were not made available to the investigator. It is possible that more complete records would have revealed different results.

Research Implications

It is possible that a longitudinal study would yield different results. Specifically, there would be no reliance on memory, and missing data would be recognized and collected immediately. In addition, more data could be collected. This might include high school grade point average, which is commonly used as a criterion for admission (Newton, Smith, & Moore, 2007). Including more college grades, such as science grades (microbiology, anatomy and physiology, and pharmacology) would allow a broader range for comparison. Future study should also consider how many different faculty teach the same courses, which may capture the differences between faculty, as well as potential

grade inflation. Students who retake courses, and/or evaluative tests (i.e., ATI), should be considered for inclusion in the sample. These factors may make a difference in the ATI-CARP exit score due to exposure to the content more than once. A comparison study between the accelerated students (2nd degree) and the traditional students would provide more information about the differences between traditional and accelerated students e.g. application of knowledge vs. their ability to take a standardized test(s).

Generalizability of these findings is limited because participants were from only one university. The inclusion of students from multiple colleges and universities would provide a larger basis for comparison. The greater variability of the sample might provide greater variability of results.

Clinical and Academic Implications

This study was undertaken with an eye toward providing direction to academic institutions preparing students for, among other things, success on the NCLEX-RN. Specifically, other researchers have demonstrated relationships between some of these independent and dependent study variables (McGahee, 2010; Newton, Smith, Moore, & Magnan, 2007; Wolkowitz & Kelly, 2010). This study unfortunately did not. Administrators, educators, and researchers are challenged to construct a broad base when planning interventions to improve students' success both in the nursing curriculum and the standardized NCLEX-RN exam.

The ATI-TEAS and ATI-CARP had been administered differently by different faculty in the study university. Ensuring consistent policies and procedures for administration of any of the ATI exams may decrease the likelihood of variation of

outcomes. Also, a consistent group of instructors for the NURS 410 course should be considered.

Given the importance of the ATI-TEAS preadmission scores in the admission process, weaker students can be identified from the beginning. Remediation must be offered to assist weak students to be successful in the nursing program, to graduate on time, and to become members of the healthcare profession. The assistance given to students from the first day of their nursing program could encourage them to pursue an advance degree or certification in their practice area, which can influence positive patient outcomes (Stuenkel, 2006).

Conclusion

The results of this study do not support a predictive model for students' success on the NCLEX-RN on the first attempt. Many nursing programs include interventions or gather data (e.g., preadmission tests and exit exams) as a part of their curriculum/program evaluation with an eye toward improving the success of students. The results of this study indicate that undergraduate nursing programs need to utilize many different strategies to assist students in achieving success in their nursing programs.

Some students who struggle in their undergraduate nursing program do pass the NCLEX-RN on the first attempt (Stuenkel, 2006). Nursing programs continue to rely on NCLEX-RN pass rates for recruitment of new students, to obtain accreditation by the state board of nursing, and as an independent indicator of a successful nursing curriculum. The important point may be that it is not the NCLEX-RN pass rate, but the performance/struggles of the students while in the program which predicts their success

on the NCLEX-RN. A variety of factors motivate students to perform in their undergraduate programs. Nursing programs should avoid a rush to intervene until (a) stringent (longitudinal) studies are undertaken, and (b) consistent data points are identified that predict NCLEX-RN success on the first attempt. The reality is, for most schools, most graduates pass the NCLEX-RN on the first attempt. Cross-sectional studies of those graduates who do ***not*** pass the NCLEX-RN may also provide a better picture of what can be done to assist future students.

APPENDIX A. SURVEY

Ana Stoehr, RN, MSN
Dissertation Research Survey

1. Name (while in school) _____

2. Gender

1. Male_____
2. Female_____

3. Age (during your last year in school)

1. 20-30_____
2. 31-40_____
3. 41-50_____
4. Over 50_____

4. Year of Graduation_____

5. Marital Status (while in school):

1. Single_____
2. Married_____
3. Separated _____
4. Divorced_____
5. Widowed_____

5a. Did your marital status change while you were in school?
1.Yes_____
2.No_____

6. Is English your first language?

1.Yes_____
2.No_____

6a. If no, what is your first language?

1. Spanish_____
2. Chinese_____
3. Japanese_____
4. Korea_____
5. Arabic_____
6. Tagalog_____
7. Other(specify)_____

7. Did you work for pay during your last year in nursing school?

1. Yes_____
2. No_____

7a. If yes, on average, how many hours per week did you work?_____hrs.

7b. If yes, did you work in the medical or nursing field?

a. Yes_____
b. No_____

8. Did you receive any type of financial aid during your last two years in nursing school?

1. Yes_____
2. No_____

8a. If yes, how many semesters did you receive financial aid?

1. One_____
2. Two_____
3. Three _____
4. Four_____
5. Five or more_____

9. Did you complete any of the following prior to starting the nursing program at Mason?

1. Some College work (did not attain an degree)_____
2. Associated Degree (other than nursing)_____
3. Baccalaureate Degree (other than nursing)_____
4. Master's Degree_____
5. MD/PhD_____

9b. Where did you start your college education?

1. Mason_____
2. Another institution_____

10. Did you live on campus during your nursing program?

1. Yes_____
2. No_____

10a. If yes, how many semesters?

1. One_____
2. Two_____
3. Three_____
4. Four_____
5. Five or more_____

11. Did you have any dependents while in nursing school?
(Such as parents, spouse, children, and siblings)

1. Yes_____
2. No_____

11a. If yes, who (Check all that apply)

1. Mother_____
2. Father_____
3. Children (how many?)_____
4. Sibling (how many?)_____
5. Others (who and how many?)_____

12. To what extent did you experience the following difficulty while you were in nursing school?

	None	A Little	Somewhat	A Great Deal
Academic Difficulties				
Marital Issues				
Financial Issues				

Medical Issue of myself				
Family Issues				
Other Issues (specify:_____)				

14. How long after graduation did you take the NCLEX-RN?_____

15. Did you pass the NCLEX on the first attempt?

a. Yes_____
b. No_____

APPENDIX B. UNIVERSITY HSRB APPROVAL LETTER

GEORGE MASON UNIVERSITY

Office of Research Subject Protections

Research 1 Building
4400 University Drive, MS 4C6, Fairfax, Virginia 22030
Phone: 703-993-4121; Fax: 703-993-9590

TO: Loretta Brush Normile, College of Health and Human Service

FROM: Keith R. Bushey [redacted]
Chief of Staff, Office of Research

PROTOCOL NO.: 7476 Research Category: Doctoral Dissertation

PROPOSAL NO.: N/A

TITLE: Predictors of Success in a Traditional Baccalaureate Nursing Program: A Descriptive Study

DATE: May 19, 2011

Cc: Ana Stoehr

On 5/16/2011, the George Mason University Human Subjects Review Board (GMU HSRB) reviewed and approved the above-cited protocol following expedited review procedures.

Please note the following:

1. A copy of the final approved consent document is attached. You must use the content approved in the consent form with the HSRB stamp of approval for your research.
2. **Any modification to your research (including the protocol, consent, advertisements, instruments, funding, etc.) must be submitted to the Office of Research Subject Protections for review and approval prior to implementation.**
3. Any adverse events or unanticipated problems involving risks to subjects including problems involving confidentiality of the data identifying the participants must be reported to Office of Research Subject Protections and reviewed by the HSRB.

The anniversary date of this study is 5/15/2012. **You may not collect data beyond that date without GMU HSRB approval.** A continuing review form must be completed and submitted to the Office of Research Subject Protections 30 days prior to the anniversary date or upon completion of the project. A copy of the continuing review form is attached. In addition, prior to that date, the Office of Research Subject Protections will send you a reminder regarding continuing review procedures.

If you have any questions, please do not hesitate to contact me a[redacted]

APPENDIX C. HEALTH SYSTEM IRB APPROVAL LETTER

[redacted]

[redacted]

Certificate of Exemption

The following was reviewed and has been found to meet the requirements under 45-CFR-46 as being exempt from the requirement of IRB review

Date:	October 1, 2011
Investigator:	Ana Stoehr, RN, MSN
Study Name:	Predictors of Success in a Traditional Baccalaureate Nursing Program: A Descriptive Study
IRB Number:	[redacted]
Study Site(s):	[redacted] Nursing Staff
Exemption Category:	45-CFR-46 101 (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
Exemption is granted subject to:	1. No personal identifiers are being collected. 2. All outcomes will be described in the aggregate. 3. May use the George Mason approved consent 4. Submit any recruitment letters or advertisements for [redacted] nursing staff to [redacted] IRB and George Mason IRB for review prior to use.
Consent Waiver	Waiver of signed consent form granted per Section 46.117(c) Research presents no more than minimal risk of harm to subject and involves no procedures for which written consent is normally required outside of research context.

If you have questions, please contact [redacted] IRB at [redacted] or [redacted]

This is to certify that the information contained herein is true and correct as reflected in the records of [redacted] Institutional Review Board. I certify that [redacted] IRB is in full compliance with all condition pursuant to [redacted] Federal Wide Assurance (FWA)

[redacted]

[redacted], IRB Manager

10/1/2011

Date

APPENDIX D. HOSPITAL APPROVAL LETTER

August 25, 2011

Ana Stoehr, RN, MSN
Doctoral Candidate

Dear Ms. Stoehr:

The [redacted] Hospital Institutional Review Board ([redacted] IRB), which operates in accordance with DHHS regulations for the protection of human research subjects (Title 45 Code of Federal Regulation), the Food and Drug Administration (Title 21 Code of Federal Regulation) and the International Conference of Harmonization (ICH) Good Clinical Practice Guidelines, has reviewed and approved your request to distribute flyers on each of the nursing units at [redacted] Hospital and on the hospitals intranet asking George Mason alumni to complete a survey on ***Predictors of Success in a Traditional Baccalaureate Nursing Program*** for the data collection phase of your dissertation.

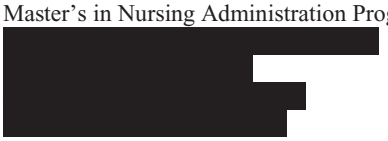
Please do not hesitate to contact our office at [redacted] if you have any questions.

Sincerely,

[redacted], MD
Chairman, [redacted] Institutional Review Board

APPENDIX E. PERMISSION LETTER FROM SCHOOL OF NURSING DIRECTOR

21 January 2011

Ana Stoehr, MSN, RN
Acting Coordinator
Master's in Nursing Administration Program


Dear Ms. Stoehr,

You have my permission to use the ATI Comprehensive exit exam scores, the final grade in the Nursing Care of Clients with Pathological Conditions (NURS 410) grade along with the TEAS (anatomy and physiology, math, and reading comprehension) results for the graduates from 2007-2010 academic years for your study entitled *Predictors of Success on the NCLEX-RN in a Traditional Nursing Program*: *A Descriptive Study* in preparation for your proposal for your doctoral dissertation. The expectation is that you will follow strict adherence to the privacy and confidentiality procedures to protect confidential student information.

Please work with to obtain the data. In addition, I am requesting that you report your research results to the undergraduate faculty. I support your research and wish you good luck with your study and the completion of your dissertation.

Sincerely,

Director School of Nursing

APPENDIX F. INTRODUCTORY LETTER

Approval for the use
of this document
EXPIRES

MAY 15 2012

Protocol # 7476
George Mason University

May 2011

Dear Colleague,

I am a currently a student in the PhD nursing program, George Mason University, Fairfax, Virginia. I am conducting a research study in partial fulfillment of my doctoral degree requirements. The research study is titled "Predictors of Success in a Traditional Baccalaureate Nursing Program: A Descriptive Study". The results of this study will provide guidance and advisement of nursing students concerning course selection. Increased attention to course selection will provide nursing students with an added advantage to succeed in the nursing program and on the NCLEX-RN (pass on the first attempt). The results of this study may also provide the faculty with supporting documentation on how demographics impact outcomes in the nursing program, including pre admission testing and first time success on the NCLEX-RN. Ultimately, this could result in additional nurses at the bedside which could improve patient outcomes, increase patient satisfaction, and help to reduce burnout among nurses

If you agree to participate, you will be asked to log into PsychData to complete the survey, which includes demographic information. The survey will take approximately no more than 10 minutes to complete. The survey will ask for your name

in order to retrieve your scores in the course *Nursing Care of Clients with Pathological Conditions,* and ATI score along with your preadmission test scores..

Once your scores are correlated with your survey results, your survey will be coded. I will not be able to identify you. The survey will be available from May___2011 to May___2011 (I will put the dates in once HSRB has approved the study).

There are no foreseeable risks or benefits associated with your participation in this study. Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which otherwise entitled. There are no costs to you or any other party for participating in this research.

Thank you in advance for your participation. Please feel free to contact me, Ana Stoehr at [redacted] or by email at [redacted] if you have any questions or concerns. My dissertation chairperson is Dr. Loretta Brush Normile at [redacted] or by email at [redacted]. You may also contact the George Mason University Office of Sponsored Programs at [redacted] if you have any questions or comments regarding your rights as a participant in the research. This research has been reviewed according to George Mason University procedures governing your participation in this research.

Sincerely,
Ana M. Stoehr
Doctoral Candidate

Approval for the use of this document EXPIRES
MAY 15 2012
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George Mason University

APPENDIX G. RECRUITMENT FLYER

Would you like to help determine which factors impact success on the NCLEX-RN

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If you are 2007-2010 George Mason Baccalaureate Traditional Nursing Graduates

Then: Please complete the on-line survey. The link can be found on the InovaNet

Why: To be able to advise future nursing students so that they may be successful on the NCLEX-RN

This study is being conducted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Nursing at George Mason University by Ana Stoehr

APPENDIX H. INFORMED CONSENT

Predictors of Success in a Traditional Baccalaureate Nursing Program: A Descriptive Study

INFORMED CONSENT FORM

RESEARCH PROCEDURES
This research, *Predictors of Success in a Traditional Baccalaureate Nursing Program: A Descriptive Study* is being conducted to determine which variables assist in predicting success on the NCLEX-RN on the first attempt. If you agree to participate, you will be asked complete the survey on line. The survey will require no more than ten (10) minutes to complete. The survey was developed by the researcher. The survey consists of fifteen items that consists of multiple choice questions. The researcher has been granted permission from the Director of the School of Nursing to use scores in Nursing of Care of Clients with Pathological Conditions course, ATI scores along with the preadmission test scores.

RISKS
"There are no foreseeable risks for participating in this research."

BENEFITS
There are no benefits to you as a participant other than to further research in nursing education.

CONFIDENTIALITY
The data in this study will be confidential. The survey will be conducted by PsychData. PsychData is a professionally developed and maintained web presence utilizing state-of-the art technology that combines parent-level, centralized database architecture with strict security policies and procedures. The survey will ask for your name. Once your name is correlated with your ATI scores and your final grade in *Nursing Care of Clients with Pathological Conditions* and pre admission test scores your survey will be coded. There will not be a link to you and your responses. Psych Data will maintain confidentiality of all surveys. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.

PARTICIPATION
Your participation is voluntary and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty. There are no costs to you or any other party.

CONTACT
This research is being conducted by Ana Stoehr, RN, MSN, a doctoral student at George Mason University. She may be reached at [redacted] for questions or to report a research-related problem. You may also contact Loretta Brush Normile, RN, PhD, advisor, at [redacted]. You may contact the George Mason University Office of Research Subject Protections at [redacted] if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

Approval for the use of this document EXPIRES

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CONSENT

The George Mason University Human Subjects Review Board has waived the requirement for a signature on this consent form. However, if you wish to sign a consent, please contact Ana Stoehr at [redacted] or [redacted].

Version date: 02/25/2011

Approval for the use
of this document
EXPIRES

MAY 15 2012

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BIOGRAPHY

Ana Marie DiNatale Stoehr was born in Scott AFB, Illinois. She obtained her basic nursing education from the Alexandria Hospital School of Nursing in Alexandria, Virginia, and her Bachelor of Science in Nursing from George Mason University (1998). Her Master of Science in Nursing was completed at George Mason University in Nursing Administration (2000). She also completed a certification in Nursing Education at George Mason University (2001). Stoehr has held a variety of nursing positions. She is currently certified in critical care and operating room nursing and currently practices in the perioperative and critical care areas. Stoehr is a member of ANA, AONE, Sigma Theta Tau, NLN, and ASPAN. She is a retired Naval Officer and has been a faculty member at George Mason University since 2001.