Linking Admission Criteria to Passage of NCLEX-RN®

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ABSTRACT

Nursing programs are facing a crisis. In the environment of budget cuts, faculty shortages, and one of the largest nursing shortages in history, nursing programs are charged with the responsibility of training the next generation of registered nurses. These future nurses are facing uncertain times as well. The population of the United States is growing older and becoming more debilitated by disease. Nurses are growing older, retiring, or deciding to leave the profession for various reasons.

The purpose of this retrospective study was to analyze the relationship between the admission criteria and the National Council Licensure Examination (NCLEX-RN®) results of graduates from one regional university nursing program in the Southeastern United States. Data collection consisted of records from 347 students who graduated between summer semester 2006 and summer semester 2010. The graduates were from one of two tracks offered by this nursing program: the traditional (18 academic month course) and the accelerated track (14 academic month course).

This study found a significant relationship between English, math, admission test [Nurse Entrance Test (NET®)], and previous baccalaureate degree/preadmission Grade Point Average (GPA) in the form of model testing. Within each model, significant indicators were identified. These significant predictors included: (a) NET® reading within the English model; (b) NET® math and statistics course grades in the Math model; (c) NET® composite score for the Test model; and (d) previous baccalaureate degree concerning the

Previous degree/Pre-admission GPA model. While the Science model was not significant, anatomy and physiology was a significant predictor. There was no difference found between the traditional track and the accelerated track in the results on the NCLEX-RN®.

TABLE OF CONTENTS

LIST OF TABLES

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Chapter I

INTRODUCTION

With the nursing shortage entering its tenth year, one has to wonder when and if it is going to end. If efforts are not substantially increased, the shortage across America will reach one million registered nurses (RN) by the year 2020 (Murray, 2008). In the past, nursing shortages were driven by one of two factors: population growth or nurses leaving the profession because they were not satisfied with their working conditions. This shortage is different from every other shortage in history in that it is multifaceted. The environment of this shortage includes an aging workforce, an aging educator workforce, disinterest in nursing by the younger generation, and working conditions (Goodin, 2003).

According to the American Association of Colleges of Nursing (AACN, 2010a), the current percentage of vacant RN positions has reached 8.1% or approximately 135,000 positions. If the trend continues as it is now, in 2020 there will be a 29% vacancy rate for registered nurses (Murray, 2008). The Health Resources and Services Administration (HRSA), a division of the U.S. Department of Human Services, has estimated by the year 2020, there will be 1,808,000 registered nurses (full-time equivalent) employed in the United States. However, the demand for full time RNs has been projected at 2,824,900, which would equal an approximate 64% shortfall of nurses (HRSA, n.d.).

Determining the exact number of working RNs in Georgia is challenging. The Georgia Board of Nursing reported that as of September 23, 2010, there were 105,057 licensed registered nurses in the state (Georgia Board of Nursing, 2010). "However, not all of these RNs will be practicing full-time in the state. Some RNs may retire but maintain their license; some may be working part-time as a nurse; others may live in Georgia but work in contiguous states; yet others may live in other states but maintain an active license in Georgia" (University System of Georgia Board of Regents, 2009a, p. 3).

The U.S. Department of Labor's Bureau of Labor Statistics (BLS) and HRSA gather information about nurses employed in Georgia. Between the BLS and HRSA, the best estimate is that there are between 64,920 and 66,512 "full-time equivalent (FTE) nurses employed in Georgia" (University System of Georgia Board of Regents, 2009a, p. 4). Furthermore, according to the BLS and HRSA, Georgia has consistently ranked within the bottom 10 states for the number of RNs per 100,000 people. The state is already in a crisis situation that could be devastating for the quality of health care provided to the citizens of Georgia (University System of Georgia Board of Regents, 2009a). By 2020, the shortage of registered nurses in the state of Georgia is expected to be around 37,700 (University System of Georgia Board of Regents, 2009b).

With the "Baby Boomer" generation starting to reach 65 years of age, America is growing older. In the year 2000, there were 35 million people who were age 65 or older, which is a significant increase from 1900 when only 3 million people were age 65 or older (Murray, 2008). It is expected that by the year 2030, there will be 71.5 million senior citizens (age 65 and older) in the United States. These facts are alarming,

especially when they are coupled with the fact that "four out of five elderly persons experience at least one chronic condition and the likelihood of disability increases with age" (Murray, 2008, p. 217).

By the year 2030, it is expected that 15.9% of the residents of Georgia will be of the age of 65 years or older. This represents a growth of 1.1 million people or 143% growth over the population in 2000, which is 40% higher than the national average. Therefore, Georgia will require a considerable number of services offered by healthcare agencies (University System of Georgia Board of Regents, 2009a).

Another element contributing to the worsening nursing shortage is the aging of the nursing population. The average age of nurses in the United States in the year 2000 was 43.3 years of age. At the same time, "the registered nurse population under the age of 30 dropped from 25.1% in 1980 to 9.1% in 2000" (Murray, 2008, p. 218). By the year 2012, the average RN is expected to be 44.5 years of age. It is also expected that approximately 25% of the nursing population will be between 50 and 59 years of age (AACN, 2010a).

In Georgia, RNs average age in 2004 was 47.2 years. Those RNs who are 55 years and older already make up 26% of the healthcare workforce; whereas, the general workforce average is only 16.1%. "Further, 5.6% of Georgia's RNs are age 65 or older and already eligible to retire, compared with only 2.9% of the total Georgia workforce" (University System of Georgia Board of Regents, 2009a, p. 15). To make matters worse, the RN work force that is under 30 years of age makes up only 6.8%, while in the general workforce 30.8% of workers fall into this category. These figures predict the severity of

the crisis in Georgia over the next seven to ten years (University System of Georgia Board of Regents, 2009a).

Problems associated with the nursing shortage have impacted care for patients. Some of the problems reported by nursing staff include "delayed responses to pages or calls, increased staff communication problems, increased patient complaints about nursing, reduced number of hospital beds, increased wait time for surgery and tests, and delayed discharges from the hospital" (Buerhaus, Donelan, Ulrich, Norman, & Dittus, 2005, p. 66). In general, nurses have also become more dissatisfied with their workload. With increases in patient assignments, nurses feel compelled to work longer hours and skip breaks and meals in order to care for patients (Goodin, 2003). The Institute of Medicine (IOM) sites "staff shortages, increasing workloads, inefficient work and technology processes, and the absence of effective pathways for nurses to purpose and implement improvement" as reasons for nurses leaving the profession (p. 118-119).

Encouragingly, more individuals are heading to nursing school. According to the AACN (2009), nursing programs have increased their graduation rate by 3.2%. However, nursing programs turned away 40,000 qualified applicants in 2009 (AACN, 2009). Universities and colleges are facing their own problem with a nursing faculty shortage. In September 2010, AACN reported that the national nursing faculty vacancy rate had risen from 6.6% in 2009 to 6.9% in 2010. A survey by the University System of Georgia Board of Regents (2009b) conducted in 2007 revealed a 9% nursing faculty shortage in Georgia. To further complicate the situation, budget restraints have interfered with the hiring of the needed faculty to adequately train nursing students. The AACN (2010) attributes the

inability to hire qualified faculty to the faltering economy which has imposed hiring freezes and budget cuts on nursing programs (AACN, 2010b).

Statement of Problem

The population of the United States is growing older. With aging, comes a greater likelihood of developing chronic debilitating diseases. The increase in the number of patients with debilitating diseases will increase the need for RNs to care for these patients. To add to this problem, the nurses themselves are also growing older. Long hours and dissatisfaction with the working conditions have led to nurses leaving the profession. The number of younger people entering the nursing profession has decreased. Nursing schools have had to turn away eligible candidates because of a shortage of nursing faculty and budget constraints.

Universities must be able to graduate candidates who are able to pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN®) and practice nursing. In order to graduate candidates who can pass the NCLEX-RN® and practice, nursing programs need to admit students who are the best candidates for success. The problem is the ability to select the students who are the best candidates. The admission criteria for nursing schools need to focus on the traits that will identify the students who are most likely to pass the NCLEX-RN® and become competent nurses.

Purpose of Study

The purpose of this study was to analyze the admission criteria for two cohorts of baccalaureate nursing students. The first cohort consisted of students who were admitted to the program prior to the use of Pathophysiology as an admission prerequisite course.

The second cohort consisted of the students for which Pathophysiology was a prerequisite admission requirement. Predictor variables were the Nurse Entrance Test (NET®) scores which include: NET® Composite, Reading, and Math sub scores; Science Grade Point Average (GPA); Pre-admission GPA; individual prerequisite science course grades (Chemistry, Microbiology, Anatomy and Physiology, and Pathophysiology); grades in Psychology, English, and Math; and previous degree. The outcome variable was first time success on NCLEX-RN®.

Research Questions

1. Does the pre-admission criteria which include the NET® score (Composite, Reading sub-score, Math sub-score), Science GPA, Pre-admission GPA, individual prerequisite science course quality points (Chemistry, Microbiology, Anatomy and Physiology, and Pathophysiology), as well as the quality points in Psychology, English and Math predict NCLEX-RN® success in the two cohorts?
2. Is there a difference in the NCLEX-RN® success between students in the traditional track and students in the accelerated track?

Operational Definitions

Pre-admission criteria is the method that schools use to decide who is admitted and who is denied admission.

NET® Scores (Composite, Reading, and Math) the score received on the NET® standardized test in the reading portion, math portion, and the overall score.

Science GPA the grade point average of all the science courses that the student had taken which were required by the College of Nursing.

Pre-admission GPA is the grade point average of all the courses required for the admission to nursing school.

Individual science course grades are the grades received in the prerequisite courses of Chemistry, Microbiology, Anatomy and Physiology, and Pathophysiology.

Psychology grade is the grade received in the prerequisite Psychology course.

Math grade is the grade received in the prerequisite Math course.

English grade is the grade received in the prerequisite English course.

Traditional student has no previous baccalaureate degree and seeking first baccalaureate degree.

Accelerated Student has already received a baccalaureate degree in some field of study unrelated to nursing and seeking a second baccalaureate degree in nursing.

NCLEX-RN® success is the passage of the NCLEX-RN® examination.

Chapter II

REVIEW OF LITERATURE

The profession of nursing has been faced with a growing shortage since about 1998. By the year 2020, the shortage of nurses is expected to reach 1 million, schools of nursing need to admit and graduate 90% more graduates than the current rate. The shortage of nursing faculty is making this job almost impossible (Benner, Sutphen, Leonard, & Day, 2010). To accomplish this feat, nursing programs must develop admission criteria that would best predict students' ability to pass the NCLEX-RN®.

There are several variables that have been considered in the development of admission criteria that would best predict success in nursing school as well as success on the NCLEX-RN®. Standardized tests have been examined in relationship with nursing education success (Beeson & Kissling, 2001; Crow, Handley, Morrison, & Shelton, 2004; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Gallagher, Bomba, & Crane, 2001; Gilmore, 2008; Jenks, Selekman, Bross, & Paquet, 1989; Newton, Smith, & Moore, 2007; Roat, 2008; Rubino, 1998; Sayles, Shelton, & Powell, 2003; Tipton et al., 2008; Uyehara, Magnussen, Itano, & Zhang, 2007; Ware, 1996). GPA prior to admission to the nursing program has also been studied (Collins, 2002; Crow et al., 2004; Daley et al., 2003; Jenks et al., 1989; Newton et al., 2007; Seldomridge & DiBartolo, 2004; Uyehara et al., 2007). Specific prerequisite courses both in the realm of science as well as other courses have been the subject of research (Beeson & Kissling, 2001; Collins, 2002;

Daley et al., 2003; Gilmore, 2008; Potolsky, Cohen, & Saylor, 2003; Roat, 2008; Roncoli, Lisanti, & Falcone, 2000; Seldomridge & DiBartolo, 2004; Uyehara et al., 2007; Ware, 1996). Other studies have focused on the science GPA prior to admission to nursing school as well as the number of times that science courses were repeated (Bentley, 2006; Jenks et al., 1989; Roncoli et al., 2000). Transfer credits have been studied as well as the completion of a degree prior to admission to nursing school (Beeson & Kissling, 2001, Roat, 2008). However, no clear criteria emerging from the previous research was found in the review for this study.

Standardized Tests

The Scholastic Aptitude Test (SAT®) and the American College Testing (ACT®) are basic tests generally taken by people who are entering college for the first time. Researchers had found ACT® and SAT® scores to be predictors of success on the NCLEX-RN® in BSN programs (Daley et al., 2003; Crow, Handley, Morrison, & Shelton, 2004). Using a logistic regression analysis Gilmore (2008) found the ACT® English sub-score to be the only statistically significant predictor of program success in an Associate of Science in Nursing (ASN) degree program, accounting for 20% of the variance. There are several pre-admission tests required by different colleges and universities that a student must complete in order to enter a specific nursing program. One test is the National League for Nursing Pre-Entrance Exam (NLN Pre-RN®). Ware (1996) found that the composite NLN Pre-RN score could possibly predict the level of the program that students would complete, but the relationship was weakly significant. However, Uyehara et al. (2007) did not find any relationship between the NLN pre-

admission exam and NCLEX-RN® success, program success, or students withdrawing from the program.

Another pre-admission test in use is the Registered Nurse Entrance Exam (RNEE®). Gallagher, Bomba, and Crane (2001) stated "the RNEE® proved to be a good overall predictor of success in NUR 101" (p. 133). Along these same lines, the NLN Pre-RN® examination was found to be statistically significant in predicting passage of the NCLEX-RN® (Sayles, Shelton, & Powell, 2003). When comparing a group of students admitted in the fall semester with a group of students admitted in the winter semester, Newton, Smith, and Moore (2007) found that the Test of Essential Academic Skills (TEAS®) was the best predictor of the first semester of nursing school GPA for students admitted in the winter semester.

The Mosby's AssessTest® is another pre-admission standardized exam that has been used to assess students' abilities prior to admission to schools of nursing. Crow, Handley, Morrison, and Shelton (2004) found that the Mosby's AssessTest® was the most used comprehensive exam. Furthermore, the Mosby's AssessTest® was generally found to be a strong predictor of successful completion of the NCLEX-RN® (Jenks, Selekman, Bross, & Paquet, 1989; Beeson & Kissling, 2001; Uyehara et al., 2007).

Finally, the NET® has been used as part of the criteria for entrance into nursing schools. The NET® as a whole as well as subsections have been studied in relationship with performance in the first semester of nursing school, cumulative nursing GPA, and passing of the NCLEX-RN®. Associate degree students (ASN) as well as baccalaureate students (BSN) have also been studied. In regard to the relationship of the NET® with the

first-semester success, Rubio (1998) found a significant relationship exists between comprehensive math (r = 0.28) and comprehensive reading scores (r = 0.41). However, a later study contradicted these findings when they found no significant difference between successful and unsuccessful student scores (Gallagher, Bomba, & Crane, 2001). The relationship between the NET® and passage of NCLEX-RN® has been questioned as well. Rubio (1998) found that "the component of the NET® with the strongest positive relationship was the composite reading score"
(p. 78). In contrast, Tipton et al. (2008) found no significant relationship between either the composite reading or the composite math score.

Rubio (1998) looked at the relationship between the NET® and the GPA after the first semester in an associate degree nursing program; upon advancement to the second year of the nursing program; graduation from the nursing program; and NCLEX-RN® results. Procedures used to conduct the analysis included both bivariate and multivariate analyses. Rubio (1998) found a statistical relationship between all the variables and the NET® score; whereas, NET® could account for 12 to 25% variance.

Pre-Admission GPA

GPA prior to admission to nursing school has also been considered a factor in predicting the NCLEX-RN® passage. The majority of studies have not shown a relationship between the pre-admission GPA and passage of NCLEX-RN® (Jenks et al., 1989; Crow et al., 2004; Seldomridge & DiBartolo, 2004; Uyehara et al., 2007). However, Collins (2002) found "a weak but significant relationship between the cumulative pre-requisite GPA and the first time pass of the NCLEX-RN®" (p. 62).

Collins (2002) investigated pre-admission science courses, pre-admission GPA, grades in first three nursing courses, as well as NCLEX-RN® results in an associate degree nursing program. Using Pearson Product Moment Correlation and logistic regression to evaluate the relationship between the variables, Collins (2002) established a significant relationship between pre-admission science courses, pre-admission GPA, and the three introductory nursing courses. "Logistic regression analysis was performed on all eight of the variables with the chi square model indicating statistical significance" (Collins, 2002, p. 70). The model predicted 89.94% of the NCLEX-RN® pass/fail results. Pre-admission GPA showed a variance of 11.9% when looking at NCLEX-RN® outcome.

Newton, Smith, and Moore (2007) evaluated the association of pre-admission GPA and TEAS® with the students' status after the first semester in a baccalaureate nursing program. Their study examined at two groups; one group admitted in the fall semester with the other group admitted in the winter semester. The pre-nursing GPA accounted for 20% of the variance for the fall semester cohort. The TEAS® was the best predictor for the winter cohort (Newton et al., 2007).

Prerequisite Science Courses

Prerequisite science courses have been studied in relation to passing of NCLEX-RN®. This is not surprising because these courses help to build a foundation for the study of nursing. Some individual courses that have been studied including microbiology, anatomy and physiology, pathophysiology, chemistry, the general prerequisite science GPA, science grades, and if any of the science courses had to be repeated.

In looking at microbiology as an indicator of the "level of completion" in a BSN program, Ware (1996) found no significant relationship between the two. Beeson & Kissling (2001) found that no significant relationship existed between the microbiology grade and success or failure on the NCLEX-RN® in a BSN program. However, another study found that microbiology did have a significant correlation with the passage of NCLEX-RN®, but was not the best predictor (Collins, 2002). In a different study, microbiology was found to be significantly correlated and the best predictor for success on the NCLEX-RN®. Logistic regression found that "for every one unit increase in grade, a participant was 1.98 times more likely to pass the NCLEX-RN" (Roat, 2008, p. 90).

Anatomy and physiology is another science course or series that has been studied. Early studies found that anatomy and physiology was not a significant factor in the completion of nursing curriculum or NCLEX-RN® success (Ware, 1996; Beeson & Kissling, 2001). Collins (2002) found that the anatomy and physiology sequence did not show a significant correlation with NCLEX-RN® success. In fact, "anatomy and physiology I was the least predictive of the NCLEX-RN® performance" (Collins, 2002, p. 60). Daley et al. (2003) found anatomy and physiology to be a significant factor for one set of cohorts (required to take Mosby AssessTest®), but not the other set of cohorts [required to take Health Education Systems, Incorporated (HESI®) Exit Examination]. Daley et al. (2003) found students within Mosby AssessTest® group who had a B average or better in anatomy and physiology were more likely to pass NCLEX-RN® when compared to students who had less than a B average.

Gilmore (2008) examined the relationship between preadmission GPA, ACT® Composite score, ACT® Math sub-score, ACT® Reading sub-score, ACT® Science sub-score, ACT® English sub-score, and the Anatomy and Physiology sequence. Gilmore (2008) cited anatomy and physiology among the variables, ACT® Composite score, and Pre-admission GPA, "are successful in the nursing program and should continue to be used" (p. 123). However, Gilmore (2008), using logistic regression, found that only the "ACT® English sub-score" was statistically significant within the study. The regression analysis showed that the "overall model fit of all the independent variables (pre-nursing GPA, ACT® Composite, ACT® Math, ACT® Reading, ACT® Science, ACT® English, Anatomy and Physiology I, and Anatomy and Physiology II) was statistically significant" ($R^2 = .196$) (p. 123).

Another science course that has been evaluated is pathophysiology. Daley et al. (2003) found that the grade received in pathophysiology was a significant indicator for the cohort who were successful on the NCLEX-RN® in contrast to the students were not successful on the NCLEX-RN®. Seldomridge & DiBartolo (2004) found that the score received in pathophysiology could aid in determining who would fail NCLEX-RN® by increasing the prediction of who would not pass NCLEX-RN® to 50% when added to the National League of Nursing Comprehensive Achievement Test for Baccalaureate Students (NLN-CATBS®). But the addition of pathophysiology as a variable to the NLN-CATBS® decreased the prediction of passage of NCLEX-RN® from 99.3% to 93.3% (Seldomridge & DiBartolo, 2004). In a study to differentiate students who successfully completed a nursing program from those would drop out of the program.

Pathophysiology was significant for predicting students who would drop out of the program, but was not significantly correlated with the successful completion of the same program (Uyehara et al., 2007). By using logistic regression, Uyehara et al. (2007) found "the odds of withdrawal are expected to drop as much as 79.4% or as little as 44.8%" with "each 1-point increase in the letter grade of the pathophysiology course" (p. 35).

Chemistry grades have also been looked at in regard to nursing GPA and success on NCLEX-RN®. With regards to nursing GPA, basic chemistry was significantly correlated, (Roat, 2008). Roat (2008) found the best predictors to be "Microbiology, Pathophysiology, Mathematics, Psychology, Nutrition, and NET® Reading" (p. 82). Collins (2002) found that basic chemistry was the best predictor of NCLEX-RN® results.

However, Daley et al. (2003) did not find a statistically significant relationship between chemistry and passage of NCLEX-RN® in a baccalaureate nursing program. Daley et al. (2003) found anatomy and physiology, pathophysiology as the only prerequisite courses that were statistically significant within the Mosby AssessTest® cohort. The HESI® did not have any statistically significant relationships with prerequisite courses. The only significant relationship within the HESI® cohort was with "didactic portion of the senior medical- surgical course and higher final cumulative GPA" (Daley et al., 2003, p. 394).

Science grades, in general, have also been studied in relation to the NCLEX-RN® outcome. Roncoli, Listanti, and Falcone (2000) found that there was a significant difference in the science grades and the nursing course grades of those who passed the NCLEX-RN® and those who did not pass. Roncoli, Listanti, and Falcone (2000) also

found those students who received As and Bs in the prerequisite sciences course were more likely to pass the NCLEX-RN® than those who received Cs in the prerequisite science courses.

Another study looking at the science grades and successful completion of the first semester of a nursing program found a "high correlation between the average prerequisite science course grades and the mean pathophysiology grade (r = .77)" and "a moderate positive correlation between mean prerequisite science course grades and mean pharmacology grade (r = .60)" (Potolsky, Cohen, & Saylor, 2003, p. 249).

The Science GPA is another way that science has been scrutinized in regard to NCLEX-RN® passage. Bentley (2006) found that traditional students who had earned a high science GPA were more likely to pass the NCLEX-RN®, but found no such relationship in regard to accelerated students.

Jenks et al. (1989) found no significant relationship between the science GPA and passage of NCLEX-RN®. Jenks et al. (1989) evaluated the use of the pre-admission GPA, total number of credits taken prior to admission to a nursing program, pre-admission science GPA, "level of previous university attended" (p. 113), Mosby AssessTest® scores, as well as, age and gender at graduation to predict NCLEX-RN® results. The best indicator for NCLEX-RN® was identified was the Mosby AssessTest® (r = .730). Jenks et al. (1989) identified the best indicator for NCLEX-RN® failure was the scores at the end of the junior year of the nursing program (93% failure accurately identified; 31% pass accurately identified).

Other Prerequisite Courses

Prerequisite courses other than science courses have also been studied. Psychology is one of those courses. Psychology has not been significantly linked to the passage of NCLEX-RN (Ware, 1996; Beeson & Kissling, 2001). However, Roat (2008) found that psychology was significantly correlated with the nursing cumulative GPA and among the best predictors of nursing GPA. Sociology was found to not be a significant indicator for how far a student would proceed through a nursing program nor how well they would perform on the NCLEX-RN® (Ware, 1996; Beeson & Kissling, 2001; Daley et al., 2003). English and math are also of interest when looking at admitting students to nursing school. Ware (1996) found that neither English nor mathematics was significant in predicting a student's success during nursing school. However, Roat (2008) found that both English and math were significantly correlated with Educational Resources, Inc.'s (ERI) RN Assessment Exam®, cumulative nursing GPA, and success on NCLEX-RN®. However, English and math were not among the best predictors (Roat, 2008).

Previous Degree

The possibility that a previous college degree could affect a student's ability to complete a nursing program and ultimately pass the NCLEX-RN® has been studied. When looking at the previous degree in terms of the RN Assessment Exam®, it was found to have a significant correlation as well as one of the best predictors. The factor of previous degree was also significantly correlated with the nursing cumulative GPA, but not one of the best predictors. However, the previous degree status was not correlated with the passage of the NCLEX-RN® (Roat, 2008). Bentley (2006) found no significant

difference in the pass rate of students with a previous degree and students with a traditional degree. However, Englert (2009) did find a significant difference in the pass rate of students with a previous degree (88%) and traditional students (72.5%).

Theoretical Concepts

Levinson (1986) described adult development in the terms of "life cycles." These "life cycles" follow predictable sequences that are characterized by "qualitatively different phases." Levinson (1986) found that "each period begins and ends at a well-defined average age; there is a variation of plus or minus two years around the mean" (Levinson, 1986, p. 7). The eras of adult development are described as follows:

1. The Early Adult Transition, ages 17 to 22, is a developmental bridge between pre-adulthood and early adulthood.
2. The Entry Life Structure for Early Adult (22 to 28) is the time for building and maintaining an initial mode of adult living.
3. The Age 30 Transition (28 to 33) is an opportunity to reappraise and modify the entry structure and to create the basis for the next life structure.
4. The Culminating Life Structure of Early Adulthood (33 to 40) is the vehicle of completing this era and realizing our youthful aspirations.
5. The Midlife Transition (40 to 45) is another of the great cross-era shifts, serving both to terminate early adulthood and to initiate middle adulthood.
6. The Entry Life Structure For Middle Adulthood (45 to 50), like its counterpart above provides an initial basis for life in a new era.

7. The Age 50 Transition (50 to 55) offers a mid-era opportunity for modifying and perhaps improving the entry life structure.
8. The Culminating Life Structure for Middle Adulthood (55 to 60) is the framework in which we conclude this era.
9. The Late Adult Transition (60 to 65) is a boundary. Between middle and late adulthood, separating and linking the two eras (Levinson, 1986, p. 7).

The "Early Adult Transition" (ages 17 to 22) period is characterized by adapting to changes in interactions with family and friends. This is a time of instability with vacillations between "pre-adulthood" and "early adulthood" (Levinson, 1986). Some of the tasks involved in ending "pre-adulthood" are "moving out of the familial home, becoming financially less dependent, entering new roles and living arrangements in which more autonomous and responsible" (Levinson, Darrow, Klein, Levinson, & McKee, 1978, p. 73). One will also work on becoming more emotionally autonomous as well. Some ways that one will start embracing "early adulthood" is entering college or the military and starting a career (Levinson et al., 1978).

The "Entry Life Structure for Early Adult" (ages 22 to 28) is characterized by having to choose between two opposing ideas of adulthood. First, one wishes to investigate the world and avoid obligations. Contrarily, one yearns for a "stable life structure: becoming more responsible and 'make something of my life.' Each task has sources and supports in the external world and in self" (Levinson et al., 1978, p. 58). The challenge of this phase is to find a balance between stability and exploring the world. The

phase generally ends with the person having made a commitment in the personal life as well as starting a career and becoming involved in the local community. "Occupation and marriage-family are the components most likely to be given central importance" (Levinson et al., 1978, p. 83).

The "Age 30 Transition" (ages 28 to 33) is the period in which one is once again in transition. This period is often seen as the last chance to make changes. During this era, one is "settling down." The tasks of this period are to establish career, family, and society connections (Levinson et al., 1978).

The "Culminating Life Structure of Early Adulthood" (ages 33 to 40) is the period when one is becoming a productive member of society. Generally, one's career, for the most part, is progressing. Family is established. This period is characterized by the stress of responsibility.

The "Midlife Transition" (ages 40 to 45) is another area of transition. This period is characterized by a review of one's life to this point. Once the life review has been completed, one can start to deal with disappointing components of life. This is the first period when one can experience "the mid-life crisis."

The "Entry Life Structure For Middle Adulthood" (ages 45 to 50) is the period in which one is once again trying to find consistency. If a crisis occurs within this period, a person can still make changes in order to fulfill the tasks of life. Some people find this era more satisfying while others find this period more distressing.

The "Age 50 Transition" (ages 50 to 55) is the transition period between middle adulthood and late adulthood. This is another era where one is a risk for experiencing

"the mid life crisis." Levinson et al. (1978) concluded "it is not possible to get through middle adulthood without having at least a moderate crisis in either the Mid-life Transition of the Age Fifty Transition" (p. 62).

The "Culminating Life Structure for Middle Adulthood" (ages 55 to 60) is generally a calm period without any significantly identifiable crisis. The "Late Adult Transition" (ages 60 to 65) is the period where the adult prepares for the ending of life (Levinson et al., 1978). Adult development is characterized by cultural, social, and personality development. Levinson's (1986) theory provides a generalized framework for studying "the profound differences that often exist between classes, genders, and cultures" (p. 8).

Levinson's theory of adult development will offer the theoretical guidance for this study. The life structures are of particular interest and the relationship between the developmental stages and the success on the NCLEX-RN®.

Conclusion

In conclusion, the literature has shown inconsistencies when examining the elements of the admission criteria to nursing programs. Standardized tests have shown some promise as indicators of success during the first semester of a nursing program and as predictors of NCLEX-RN® success, but there are studies to contradict these findings. The pre-admission GPA has also been found to have an impact on the NCLEX-RN® success rate. However, this has been contrasted by a study showing a weak, but significant relationship between the pre-admission GPA and the NCLEX-RN® results.

Another interesting note about the pre-admission GPA is that it has been shown to predict the success during first semester of a nursing program.

Science courses, in general, have been shown to be good indicators for passing NCLEX-RN® as well as first semester success in a nursing program. However, individual courses of microbiology, anatomy and physiology, pathophysiology, and chemistry have shown a mixture of results. The science GPA has also been questionable as to whether or not it can predict passage of NCLEX-RN®.

Other courses taken in the period prior to nursing school could also have an impact on how students learn in nursing school and how they perform on the NCLEX-RN®. Psychology and sociology were found not relevant in the passage of NCLEX-RN®. However, psychology was found to be a good indicator of the Nursing GPA. English and math have been found to have an influence on the RN Assessment Test, nursing GPA, and NCLEX-RN® results.

The attainment of a non-nursing baccalaureate degree has shown to be one of the best indicators of scores on the RN Assessment Test. Previous degrees also significantly impacted the nursing GPA. But, interestingly, the attainment of a previous degree did not indicate NCLEX-RN® passage.

These studies have been conducted in specific institutions and the generalization of these studies to other institutions should be made with caution. Additional research is needed to validate these findings. Special attention should be placed on the variables that have shown favorable, but inconsistent findings. Universities in the state of Georgia have not been previously studied. Therefore, this study contributes data from a regional

university in rural Georgia by examining variables that have shown favorable, but inconsistent findings.

Chapter III

METHODOLOGY

This was a retrospective study in an attempt to identify items within the admission criteria of a selected nursing program within the State of Georgia which would most influence passage of the NCLEX-RN®. This nursing program has two well-defined program choices in which a Baccalaureate of Science in Nursing (BSN) degree maybe obtained. The program choices are the Traditional Track (18 academic month course) and the Accelerated Track (14 academic month course). This study looked at two distinct cohorts within both of these tracks. The first cohort had not taken pathophysiology as a prerequisite course. The second cohort did take pathophysiology as a prerequisite course.

Participants

The sample consisted of a convenience sample of records for the generic and accelerated BSN graduates between summer semester 2006 and summer semester 2010 from a specific College of Nursing at a Regional University in Georgia. Cohort one consisted of BSN graduates who were not required to take pathophysiology as a prerequisite course. Cohort two consisted of BSN graduates who were required to take pathophysiology.

The total sample consisted of records from 347 graduates. The mean age was 24.09 years with an age range from 19 to 53 years and a standard deviation of 5.741 years. The mean age for the traditional cohort that did not take pathophysiology was 22 years.

The mean age for the accelerated cohort that did not take pathophysiology was 28 years. The mean age for the traditional cohort that did take pathophysiology was 24 years. The mean age for the accelerated cohort that did take pathophysiology was 28 years. Students in the age group 17-22 made up 54.2% of the sample. Gender and ethnicity were not collected by the College of Nursing; therefore, gender and ethnicity were not collected for this study.

Instrumentation

Nurse Entrance Test

The NET®, a standardized test, was created and managed by ERI®. Although this test is now defunct, these two cohorts were required to take this test as a part of the admission criteria for the program used in this study. The components of the NET® consist of a Composite score, Reading Comprehension sub-score, Essential Mathematics sub-score, Reading Rates, Test Taking Skills, Stress Level Profile, Social Interaction Profile, and Learning style. For the purpose of this study, Composite score, Essential Mathematics sub-score, and Reading Comprehension sub-score were evaluated. A Reliability Coefficient had been established by ERI® at 0.88. Content validity had also been established by the use of an expert panel. The panel reviewed textbooks, current literature, state professional licensure guidelines, studies by the National Council of State Boards of Nursing, and various nursing curricula to encompass associate degree, diploma, and baccalaureate nursing programs. "Annual review of point biserial correlations of each test and all items guides the review of test items for additional support of content and construct validity" (Simmons & Haupt, 2004, p. 8). The NET® became an obsolete test after ERI® was purchased by Assessment Technology Institute

(ATI®). A discussion with a representative of ATI® revealed that the last online testing date for the NET® was May 31, 2010 (M. Dunham, personal communication, February 1, 2011).

Pre-admission GPA

The Pre-admission GPA was calculated by the following method: number of hours multiplied by the number of quality points for each grade equaled the number of quality points for each prerequisite course. When all the prerequisite course quality points were calculated, the total quality points were divided by the total number of hours equaling the Pre-admission GPA. In areas where specific courses were not required by the College of Nursing, the highest grade for each core area was used. When specific courses were named by the College of Nursing, then that grade was utilized in calculating the Pre-admission GPA. However, if a specifically required course had been taken more than once, all grades were utilized in the Pre-admission GPA.

Science GPA

The Science GPA was calculated by the number of hours multiplied by the number of quality points for the grade equaling the number of quality points for each science course taken. The total number of quality points for all science courses required by the College of Nursing was divided by the total number of hours equaling the Science GPA. However, if a science course was taken more than once, all scores for that course were used in calculating the Science GPA.

Individual Prerequisite Course Grades

The individual prerequisite course grades for Chemistry, Microbiology, Anatomy and Physiology, Pathophysiology, Psychology, English, and Math were the grade given for the course. These letter grades were converted to a scale of zero to four: zero was equal to an F; one was equal to D; two was equal to C; three was equal to B; and four was equal to A. These grades were the final grades for the courses as reported on the transcripts.

National Council Licensure Examination for Registered Nurses

The NCLEX-RN® is reported as pass or fail. The minimum and maximum number of questions range from 75 to 265. There are three rules governing the passage or failure of the NCLEX-RN®. The first rule is the 95% confidence rule which simply states that the test will end when the computer determines with 95% confidence that the individual has exceeded or failed to exceed the passing standard. The second rule, the maximum-length rule, states that the test will end when the individual has taken the maximum number of questions without exceeding the 95% confidence standard. If test performance was at or below the passing standard, the individual fails. If the performance is above the passing standard, then the individual passes. The third rule, the ran-out-of-time rule, states the test will end when the time runs out. If the minimum number of questions has not been taken, the individual fails. If the minimum number of questions has been answered and the passing standard has been met over the last 60 questions, the individual passes. If the minimum number of questions has been answered and the individual drops below the passing standard at least once, the individual fails. The

maximum-length rule and the time-ran-out rule are second chances for individuals who had not clearly exceeded or clearly failed to exceed the testing standard (National Council of State Boards of Nursing [NCSBN®], n.d.).

Procedures

Before any data were collected, an application was submitted to the Institutional Research Board (IRB) of the participating college. This study was found to be exempt from the IRB process because no individual identifiers were collected and this study utilized archival data only (Appendix A).

Demographic data collected was to include age, ethnic origin, and gender. Age groups were formed utilizing Levinson's Developmental Stages. The age groups for this study were: 17-22 years; 23-28 years; 29-33 years; 34-40 years; 41-45 years; 46-50 years; 51-55 years; 56-60 years; and 61-65 years. These age groups were adjusted because of the overlapping age groups in Levinson's theory. The decision to adjust the age groups was based on the premise of allowing the participants the optimal amount of time to complete each stage of development. Ethnic origin and gender were not collected by the College of Nursing; therefore, these variables were not available for collection for this study. NCLEX-RN® results and previous degree status was also collected and entered into Statistical Package for the Social Sciences (SPSS) version 19 (International Business Machines (IBM), United States) as follows: NCLEX-RN® (1) pass, (0) fail, and previous degree (1) yes, (0) no.

Ordinal/interval level data collected included: NET® Composite score, Essential Math Skills sub-score, and Reading Comprehension sub-score, Science GPA,

Preadmission GPA, Chemistry I and II, Anatomy and Physiology I and II, Microbiology, Pathophysiology, Fundamentals of Psychology, English Comprehension, Math, and Statistics.

The members for each cohort were identified and coded as follows: (1) traditional track and did not take Pathophysiology; (2) accelerated track and did not take Pathophysiology; (3) traditional track and took Pathophysiology; (4) accelerated track and took Pathophysiology. Student records and any available database were utilized to collect data. A data collection Excel spreadsheet (Microsoft Corporation version 2007, United States) was utilized in organizing data (See Appendix B).

Statistical Analysis

The data analysis process utilized both descriptive statistics and inferential statistics. Descriptive statistics included mean and standard deviation for age, with a frequency table to examine the age groups for each track. The relative frequency distribution accounted for the actual number of students in each group as well as the percentage of the total sample represented in each group (Bowers, 2002).

The inferential statistics consisted of a logistic regression analysis of the variables. Logistic regression is useful when the dependent variable is dichotomous. Logistic regression is used to describe the relationship between the dependent variable, passage of NCLEX-RN®, and the set of independent variables of the NET® (Composite score, Reading Comprehension sub-score, and Math sub-score), Preadmission GPA, individual Science grade in Chemistry sequence, Microbiology, Anatomy and Physiology sequence, Pathophysiology, essential English grade, prerequisite Math grade, Statistics

grade and fundamental Psychology grade. According to Bowers (2002) logistic regression is used to determine which variables affect the probability of a particular outcome, "maximum-likelihood estimation," in the form of an odds ratio (p. 189-190).

An independent samples Student's *t*-test was used to describe the relationship between cohort groups and passage of NCLEX-RN®. Bowers (2002) asserts that the independent samples Student's *t*-test is a common test used to examine differences between two populations. Munro (2001) states the independent samples Student's *t*-test requires "one nominal level variable, with two levels as the independent variable" (p. 125).

In conclusion, this retrospective study evaluated the relationship between the pre-admission variables: NET® scores (composite, reading, math), five science scores (Chemistry sequences, Microbiology, Anatomy and Physiology sequence), four prerequisite course grades (Fundamentals of Psychology, English Comprehension, Math, Statistics), previous baccalaureate degree, science GPA, and pre-admission GPA. This study used logistic regression to analyze the relationship between these variables and the NCLEX-RN® results.

Chapter IV

RESULTS

This chapter presents the statistical analysis of the data collection process. Descriptive statistics were utilized to define the population of the sample. Inferential statistics were used to look at the relationship between the NCLEX-RN® and the predictor variables.

The purpose of this study was to analyze the admission criteria for two cohorts of baccalaureate nursing students. The first cohort consisted of the students who were admitted prior to the use of Pathophysiology as a prerequisite course. The second cohort consisted of the students for which Pathophysiology was a prerequisite requirement. The predictor variables were: (a) Nurse Entrance Test (NET®) scores which include a Composite score, Reading Comprehension sub-score, and Math Skills sub-score; (b) Science GPA; (c) Pre-admission GPA; (d) individual prerequisite science course grades (Chemistry I and II, Microbiology, Anatomy and Physiology I and II, and Pathophysiology); (e) grades in Psychology, English, Math, and Statistics; and (f) previous degree. The outcome variable was first time success on National Council Licensure Examination for Registered Nurses (NCLEX-RN®). The sample consisted of the records from graduates between summer semester 2006 through summer semester 2010 from a College of Nursing at a Regional University in Georgia. All data were collected and entered into SPSS®. Unfortunately, the sample of students who had

successfully completed Pathophysiology as a prerequisite course (n = 28) was only 8.1% of the total sample. Therefore, pathophysiology had to be removed as a predictor and as a defining characteristic of the sample. The removal of pathophysiology changed the research question.

Research Questions

1. Does the pre-admission criteria which include: (a) English model (NET® Reading score and English Comprehensive course grade); (b) Math model (NET® Math score, prerequisite math course grade, and statistics course grade); (c) Science model (average grade for chemistry sequence, average grade for anatomy and physiology sequence, and microbiology course grade); (d) Test model (NET® Composite score, NET® Reading score, and the NET® Math score); (e) Previous Degree/Pre-admission GPA model (previous baccalaureate degree status and Pre-admission GPA); (f) Science GPA; and (g) Psychology predict NCLEX-RN® success?
2. Is there a difference in the NCLEX-RN® success between students in the traditional track and students in the accelerated track?

Descriptive Statistics

Descriptive statistics of mean and standard deviation were performed on each variable. The NET® Composite score mean was 76.19 with a standard deviation of 8.54. The NET® Reading sub-score was 69.49 with a standard deviation of 10.51, and the NET® Math sub-score was 82.37 with a standard deviation of 11.85.

The mean for the Pre-admission GPA was calculated to be 3.40 with a standard deviation of 0.32. Science GPA mean was also found to be 3.25 with a standard deviation of 0.48. Pre-admission variables were also examined for mean and standard deviation. English Comprehensive course grade was found to have a mean of 3.39 with a standard deviation of 0.69. Math course grade mean was 3.3 with a standard deviation of 0.75. Statistics course grade mean came to 3.23 with a standard deviation of 0.78. Psychology course grade had a mean score of 3.42 with a standard deviation of 0.68. Chemistry courses average grade had a mean of 3.42 with a standard deviation of 0.60. The average score for Anatomy and Physiology mean was 3.15 with a standard deviation of 0.66. Microbiology course grade mean was 3.22 with a standard deviation of 0.72.

Inferential Statistics

English Model

Direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of the two English measures: NET® Reading score and English Comprehensive score. Missing data for the variable were excluded by case-wise exclusion. There were 277 included cases in the analysis; whereas, 70 cases were excluded.

A test of the full model with both predictors against a constant-only model was statistically significant, X^2 (N = 277) = 9.995, p = .007, indicating that the predictors, as a set, reliably distinguished between those students passing NCLEX-RN® and those not passing. The variance in the NCLEX-RN® status accounted for by the English model is extremely low [Cox & Snell R^2 = .035 (i.e., 3.5% of the variance in NCLEX-RN® status is accounted for by the two predictors)]. Prediction of NCLEX-RN® results by this model

was one-sided. The prediction rate for those students who passed was 100% (230 out of 230). However, the predictor rate for those students who did not pass NCLEX-RN® was 0% (0 out of 47). The overall predictor rate of 83% is consistent with the statistical significance of the model; the disparity in the accuracy of prediction for the two different categories is consistent with the poor overall goodness-of-fit for the model as indicated by the Hosmer and Lemeshow test X^2 (N = 277) = 6.8, p = .558.

Tests on the individual regression coefficients (Table 1) indicated only NET® Reading score as a significant predictor *Wald* (1) = 9. 218, p = .002. Although statistically significant, the ratio for NET® Reading score is only 1.049. This relatively low ratio indicates that the odds of passing only increases by a factor of 1.049 for a 1% point increase in NET® Reading score. For every 5% point increase in NET® Reading score the chances for passing NCLEX-RN® increases by factor of 1.26.

Table 1

English Model

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	NET®_Read	.047	.016	9.218	1	.002	1.049	1.017	1.081
	E_Comp	.075	.203	.136	1	.712	1.078	.724	1.604
	Constant	-1.869	1.212	2.376	1	.123	.154		

a. Variable(s) entered on step 1: NET®_Read, E_Comp.

Math Model

A direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of three math measures: NET® Math, math course score, and statistics course score. Missing data for all variables were excluded by case-wise exclusion. There were 270 included cases; whereas, 77 cases were excluded.

A test of the full model with all three predictors against a constant-only model was statistically significant, X^2 (N = 270) = 11.798, p = .008, indicating that these predictors, as a set, reliably distinguished between those students passing NCLEX-RN® and those students who did not pass NCLEX-RN®. The variance in the NCLEX-RN® status accounted for by Math model is very small [Cox & Snell R^2 = .043 (i.e., 4.3% of the variance in NCLEX-RN® status is accounted for by the three predictors)]. Predictor success was one-sided as the predictor rate for those who passed was 100% (224 out of 224). However, the predictor rate for those who did not pass was 0% (0 out of 46). The overall prediction rate was 83%, which sounds impressive and is consistent with the statistical significance of the model. The disparity in the accuracy of the prediction for the two different categories is consistent with the poor overall goodness-of-fit for the model as indicated by the Hosmer & Lemeshow test X^2 = (N = 270) = 9.835, p = .277.

Tests on the individual regression coefficient (Table 2) indicated that NET® Math is a significant predictor *Wald* (1) = 4.138, p = .42. Although statistically significant the odds ratio for NET® Math is 1.030. This relatively low ratio indicates that the odds for passing only increases by a factor of 1.030 for every 1% increase in NET® Math score.

An increase of 5% in the NET® Math score increases the odds of passing by factor of 1.16.

Tests on individual regression coefficients also indicated statistics course grade is a significant predictor *Wald* (1) = 4.067, p = .44. Although statistically significant the odds ratio for statistics is only 1.557. This relatively low ratio indicates that the odds for passing only increases by a factor of 1.557 for a one letter grade increase in the statistics score. A two letter grade increase in statistics score will increase the odds of passing by a factor of 2.43.

Table 2

Math Model

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	NET®_Math	.029	.014	4.138	1	.042	1.030	1.001	1.059
	Math	.070	.231	.091	1	.763	1.072	.682	1.686
	Stat	.443	.220	4.067	1	.044	1.557	1.013	2.395
	Constant	-2.422	1.252	3.742	1	.053	.089		

a. Variable(s) entered on step 1: NET®_Math, Math, Stat.

Science Model

A direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of three science measures: chemistry average, anatomy and physiology average, and microbiology grade. Missing data for all variables were excluded by case-wise

exclusion. There were 306 included cases in the analysis; whereas, 41 cases were excluded.

A test of the full model with all three predictors against a constant-only model was not statistically significant, $X^2 = (N = 306) = 6.735$, $p = .081$, indicating that the predictors, as a set, did not reliably distinguish between those students passing the NCLEX-RN® and those not passing the NCLEX-RN®. However, tests on the individual regression coefficients (Table 3) indicated Anatomy and Physiology average grade as a significant predictor *Wald* (1) = 4.692, $p = .030$.

Therefore, a direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of the Anatomy and Physiology average. Missing data for the variable was excluded by case-wise exclusion. There were 307 included cases in the analysis; whereas, 40 cases were excluded.

A test of the individual predictor against a constant-only model was statistically significant, X^2 (N = 307) = 4.227, $p = .040$, indicating that the predictor did reliably distinguish between those students passing the NCLEX-RN® and those not passing the NCLEX-RN®. The variance in NCLEX-RN® status accounted for by Anatomy and Physiology average grade is very small [Cox & Snell $R^2 = .014$ (i.e., 1.4% of the variance in NCLEX-RN® status is accounted for by the predictor)]. Prediction of NCLEX-RN® results were one-sided. Although the prediction rate for those students who passed was 100% (256 out of 256), the prediction rate for those students who failed was 0% (0 out of 51). The overall prediction rate of 83.4% sounds impressive. The disparity in the accuracy of the prediction for the two different categories is not consistent with the

overall goodness-of-fit for the model as indicated by the Hosmer & Lemehow test X^2 (N = 307) = 16.982, p = .009.

Tests on the individual regression coefficient (Table 4) indicated Anatomy and Physiology average is a significant predictor *Wald* (1) = 4.175, p = .041. The odds ratio for Anatomy and Physiology average is 1.615. This extremely low ratio indicates that the odds for passing NCLEX-RN® increases by a factor of 1.615 for each one point increase in the Anatomy and Physiology average. For every five point increase in Anatomy and Physiology average the chances for passing NCLEX-RN® increases by a factor of 11.023.

Table 3

Science Model

							Exp	95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	(B)	Lower	Upper
Step 1[a]	Micro	.025	.237	.011	1	.916	1.025	.645	1.631
	Chem_Avg	-.363	.285	1.622	1	.203	.696	.398	1.216
	A_P_Avg	.561	.259	4.692	1	.030	1.753	1.055	2.912
	Constant	1.078	1.183	.830	1	.362	2.938		

a. Variable(s) entered on step 1: Micro, Chem_Avg, A_P_Avg.

Table 4

Anatomy and Physiology Average

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	A_P_Avg	.480	.235	4.175	1	.041	1.615	1.020	2.559
	Constant	.131	.726	.033	1	.856	1.141		

a. Variable(s) entered on step 1: A_P_Avg.

Test Model

Direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of three test measures: NET® Math scores, NET® Reading scores, and NET® Composite scores. Missing data for all variables were excluded by case-wise exclusion. There were 279 included cases in the analysis; whereas, 68 cases were excluded.

A test of the full model with all three predictors against a constant-only model was statistically significant, X^2 (N = 279) = 21.64, $p < .001$, indicating that the predictors, as a set, reliably distinguished between those students passing the NCLEX-RN® and those not passing. The variance in NCLEX-RN® status accounted for by Test model is rather small (Cox & Snell R^2 = .075 (i.e., 7.5% of the variance in NCLEX-RN® status is accounted for by the three predictors). Prediction of success on NCLEX-RN® was somewhat uneven. Although, the prediction rate for those students who passed was 100% (232 out of 232), the prediction rate for those students who failed was only 4.3% (2 out of 47). The overall prediction rate of 83.9% sounds impressive and is consistent with the statistical significance of the model; however, the disparity in the accuracy of prediction

for the two different categories is consistent with the poor overall goodness-of-fit for the model as indicated by the Hosmer and Lemeshow test X^2 ($N = 279$) = 6.41, p = .601).

Tests on the individual regression coefficients (Table 5) indicated only NET® composite scores as a significant predictor *Wald* (1) = 4.78, p = .029. Although statistically significant, the odds ratio for NET® composite is only 1.187. This relatively low ratio indicates that the odds of passing only increases by a factor of 1.187 for a one point increase in NET® composite score. An increase of five points in the NET® composite score increases the odds of passing by a factor of 2.35.

Table 5

Test Model

								95% C.I. for EXP (B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	NET®_Comp	.171	.078	4.783	1	.029	1.187	1.018	1.384
	NET®_Read	-.038	.040	.900	1	.343	.963	.890	1.041
	NET®_Math	-.051	.040	1.616	1	.204	.950	.878	1.028
	Constant	-4.422	1.456	9.217	1	.002	.012		

a. Variable(s) entered on step 1: NET®_Comp, NET®_Read, NET®_Math.

Previous Degree/Pre-admission GPA

A direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of the two measures of previous degree status and Pre-admission GPA. Missing data for all variables were excluded by case-wise exclusion. There were 306 included cases in the analysis; whereas, 41 cases were excluded.

A test of the full model with both predictors against a constant-only model was approaching significance, X^2 (N = 306) = 5.825, p = .054, indicating that the predictors, as a set, reliably distinguished between those students who passed NCLEX-RN® from those not passing NCLEX-RN®. The variance in NCLEX-RN® status accounted for by Previous Degree/Pre-admission GPA model is extremely small [Cox & Snell R^2 = .019 (i.e., 1.9% of the variance in the NCLEX-RN® status is accounted for by the two predictors)]. Prediction of success on NCLEX-RN® was one sided. Although the prediction rate for those students who passed was 100% (255 out of 255). The prediction rate for those students who did not pass was 0% (0 out of 51). The overall prediction rate of 83.3% sounds impressive and is consistent with the statistical significance of the model; however, the disparity in the accuracy of the prediction for the two different categories is consistent with the poor overall goodness-of-fit for the model as indicated by the Hosmer & Lemeshow test X^2 (N = 306) = 6.717, p = .567.

Tests on the individual regression coefficients (Table 6) indicated previous degree status as the only statistically significant predictor *Wald* (1) = 3.867, p = .049. The odds ratio for previous degree status is 2.124. This ratio indicates the odds for passing NCLEX-RN® increases by a factor of 2.124 for having a previous degree over those students who did not have a previous degree.

Table 6

Previous Degree/Preadmission GPA Model

								95% C.I. for EXP (B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Prev_degree	.753	.383	3.867	1	.049	2.124	1.002	4.500
	Pre_Admit_GPA	.788	.510	2.392	1	.122	2.199	.810	5.971
	Constant	-1.245	1.733	.516	1	.472	.288		

a. Variable(s) entered on step 1: Prev_degree, Pre_Admit_GPA.

Science GPA Model

Direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of the Science GPA measure. Missing data for the variable was excluded by case-wise exclusion. There were 308 included cases; whereas, 39 cases were excluded. A test of the predictor against a constant-only model was not statistically significant, $X^2 = 2.070$, $p = .150$.

Psychology

Direct logistic regression analysis was performed on NCLEX-RN® status as the outcome of the psychology measure. Missing data for the variable were excluded by case-wise exclusion. There were 300 included cases; whereas, 47 cases were excluded. A test of the predictor against a constant-only model was not statistically significant, $X^2 = .205$, $p = .650$.

Traditional vs. Accelerated

An independent sample Student's *t*-test was conducted to determine the effect of the track of education (traditional vs. accelerated) on the NCLEX-RN® result. Those participants who completed nursing education via the accelerated track (M = .89, SD = .316) had similar passing rates as those students in the traditional track (M = .81, SD = .392), t (204.014) = ¯1.807, p = .072.

Conclusion

Evaluation of the relationship between predictors and outcome of NCLEX-RN® found a statistically significant relationship in the English model, Math model, and Test model. Previous degree/Pre-admission GPA model was approaching significance. Science model did not show a statistically significant relationship. However, Anatomy and Physiology was a significant predictor within the Science model. Upon analysis of Anatomy and Physiology as a separate model, it was found to be a significant predictor of NCLEX-RN® success. In the assessment of the relationship between chosen track of study (traditional vs. accelerated) and NCLEX-RN® outcome, no statistically significant relationship could be found.

Within each model, statistically significant predictors were found. Within the English model, NET® Reading score was the individual predictor which showed a statistically significant relationship. NET® Math score and statistics course grade were both statistically significant in the Math model. The Previous degree/Pre-admission GPA model had previous degree as the significant predictor. NET® Composite score was the significant predictor in the Test model.

Each model also had predictors that were not statistically significant in the relationship with NCLEX-RN® outcome. In the English model, English Comprehension course grade was not a significant predictor. The math course grade was not significant within the math model. Pre-admission GPA was not a significant predictor in the previous degree/pre-admission GPA model. While NET® English and Math scores were significant within the English and Math models respectively, neither were statistically significant indicators within the Test model. With the exception of Anatomy and Physiology, the Science model was not a statistically significant predictor (Chemistry average and Microbiology).

Chapter V

DISCUSSIONS

The purpose of this retrospective study was to examine the relationship between pre-admission criteria and the NCLEX-RN®. The pre-admission variables consisted of: (a) Nurse Entrance Test (NET®) scores which include a Composite score, Reading sub-score, and Math sub-score; (b) Science GPA; (c) Pre-admission GPA; (d) individual prerequisite science course grades (Chemistry, Anatomy and Physiology, and Microbiology); (e) grades in Psychology, English, Math, and Statistics; and (f) previous degree.

In reviewing the predictors of NCLEX-RN® success, English model, Math model, Test model, and Previous Degree/Pre-admission GPA model were all statistically significant predictors of NCLEX-RN® success. However, Science model was not a statistically significant predictor of NCLEX-RN® success. But, Anatomy and Physiology was a significant predictor within the Science model. Anatomy and Physiology was then evaluated as a separate model and found to be a statistically significant model.

English Model

The English model, consisting of NET® Reading and English Comprehension, was a statistically significant predictors of NCLEX-RN® success ($p = .007$). However, it was not a predictor of students who were not successful on NCLEX-RN®. This discrepancy between the prediction of success and failure on the NCLEX-RN® could be

related to the mean NET® Reading score being 69.49% and an English Comprehension mean score of 3.39 (SD 0.69). A mean English Comprehension score of "B" indicates that the students should have a sufficient grasp of the English language which should be related to success on the NCLEX-RN®. Even though mean NET® Reading score appears to be lower than expected, Rubino (1998) found that students who scored 50% or better on the NET® Reading should be able to read and understand the assignments in nursing school; therefore, they should be the best prepared to pass the NCLEX-RN®. NET® Reading score was the only statistically significant predictor (p = .002) within the English model. The finding of NET® Reading as the significant predictor is consistent with findings by Roat (2008), Sayles et al. (2003), and Rubino (1998).

Reading Comprehension course grade was not found to be a significant individual predictor that is consistent with findings of Higgins (2005). However, Roat (2008) found English course grade to be one of the best predictors of NCLEX-RN® success. The discrepancy between these findings could be related to the growing problems in public schools and new laws such as "No Child Left Behind." While some students have benefited from this law, the average reading scores of 17-year-olds has fallen 3 points between 1999 and 2004 (White, n.d.). Teaching adults reading comprehension has become a lucrative Internet business as evidenced by the number of Internet businesses dedicated to teaching reading comprehension.

Math Model

The Math model, consisting of NET® Math score, math course grade, and statistics course grade, was statistically significant (p = .008) in relation to NCLEX-RN®

success. Conversely, the model was not an indicator of students who would not pass NCLEX-RN®. Predicting students who failed NCLEX-RN® on the first attempt continues to be ineffective. Mean score for NET®® Math (82.37), Math course grade mean (3.3), and statistics course grade mean (3.23) are indicative of students with a strong math background. A strong math background has been shown to have a significant relationship with students who pass NCLEX-RN® over students who do not pass the NCLEX-RN® (Roat 2008).

NET® Math (p = .042) and statistics course grade (p = .044) were both statistically significant indicators within the Math model. NET® Math scores were related to the NCLEX-RN® to a level of statistical significance, which is consistent with Roat (2008) and Sayles et al. (2003). However, statistics as a significant indicator of NCLEX-RN® success differs from the findings of Seldomridge and DiBarttolo (2004). The study of statistics develops analytical thinking skills. Analytical thinking skills are important in nursing in that it helps the student to learn to understand cause and effect relationships (Sheahan, 2011).

Science Model

The Science model, consisting of Chemistry average course grade, Anatomy and Physiology average course grade, and Microbiology course grade, did not have a statistically significant relationship (p = .081) with the NCLEX RN® success. However, the individual predictor of Anatomy and Physiology average did show a significant relationship (p = .030) with NCLEX-RN® success. When Anatomy and Physiology average course grade was run as a separate model, it remained a statistically significant

predictor (p = .040) of NCLEX-RN® success. Based on this model, the prediction of students who will not pass NCLEX-RN® remains a challenge. The mean of Anatomy and Physiology average score was 3.15 (SD = 0.66). A solid foundation in anatomy and physiology would lead one to expect that the students should be able to be successful in nursing courses and be able to pass NCLEX-RN®. Anatomy and Physiology as a statistically significant relationship with NCLEX-RN® is consistent with Higgins (2005) and Roat (2008). However, Roat (2008) found that anatomy and physiology was not one of the best predictors of NCLEX-RN® success. This discrepancy in the findings could be related to the changes in the NCLEX-RN® test plan between the studies. The National Council of State Boards of Nursing revises the NCLEX-RN® test plan every three years to reflect changes in practice of recently licensed nurses as well as changes in technology NCSBN®, 2010).

Test Model

The Test model was found to be statistically related ($p < .001$) to the passage of NCLEX-RN®. Yet again, the prediction of students who would not pass NCLEX-RN® was vastly different from the prediction of those students who would pass NCLEX-RN®. NET® Composite score was the individual predictor (p = .029) most associated with passage of NCLEX-RN®. NET® Composite score was statistically significant in the relationship with NCLEX-RN® is consistent with Sayles et al. (2003). In contrast, Roat (2008) and Rubino (1998) found NET® Reading and NET® Math scores as predictive, but not the NET® Composite score. This difference may be related to the version of NET® that the participants had taken. ERI analyzed test items every year and revisions were

made as needed (Simmons et al., 2005). Another factor to take into consideration is that the NCLEX-RN® test plan changes every three years (NCSBN®, 2010). Finally, NET® Composite score includes the NET® Math and NET® Reading scores, as well as Reading Rates, Test-Taking Skills, Stress Level Profile, Social Interaction Profile, and Learning style. The NET® Math score and NET® Reading score being included as part of the NET® composite score may have affected the outcome of this model.

Previous Degree/Pre-admission GPA

Previous Degree/Pre-admission GPA model was shown to be approaching statistical significance ($p = .054$) in relationship to NCLEX-RN® success. Once again, predicting students who would not pass NCLEX-RN® was not successful. The mean pre-admission GPA of 3.40 shows that students who were admitted to the College of Nursing had a "B" or better average prior to being admitted to the College of Nursing. The strict admission criterion makes it difficult to separate those students who would pass NCLEX-RN® from those students who would not pass NCLEX-RN®.

Previous degree was the significant predictor ($p = .049$) related to NCLEX-RN® success. Therefore, those students who had a previous degree were more likely to pass NCLEX-RN® no matter which degree tract they had chosen (traditional or accelerated). This finding was consistent with Englert (2009); however, Englert (2009) found that all the students with a second degree were also in an accelerated program. Students with a previous degree tend to be more mature than students who do not have another degree (Englert, 2009). Roat (2008) found previous degree to be a significant predictor of nursing GPA, but not a significant predictor of NCLEX-RN® success. In contrast,

Bentley (2006) found that previous degree was not a significant indicator of NCLEX-RN®® results.

Science GPA/Psychology

Neither Science GPA (p = .150) nor Psychology course grade (p = .650) was a significant indicator of NCLEX-RN® status. Lack of a significant relationship between Science GPA and passage of NCLEX-RN® is consistent with finding of Jenks et al. (1989). The absence of a significant relationship between Psychology course grade and NCLEX-RN® success is consistent with conclusions by Ware (1996), and Beeson and Kissling (2001).

Traditional vs. Accelerated

The relationship between the educational track (traditional vs. accelerated) and NCLEX-RN® success was not found to be statistically significant (p = .072). Lack of difference between traditional track and accelerated track students in relation to success on NCLEX-RN® is congruent with finding of Bentley (2006).

Research Implications

The purpose of this study was to evaluate the relationship of NCLEX-RN® success and the pre-admission criteria: (a) NET® scores which include a Composite score, Reading sub-score, and Math sub-score; (b) Science GPA; (c) Pre-admission GPA; (d) individual prerequisite science course grades (Chemistry, Anatomy and Physiology, and Microbiology); (e) grades in Psychology, English, Math, and Statistics; and (f) previous degree. In evaluating this criterion, models were created. A relationship was established between English model, Math model, Test model, and Previous Degree/Pre-admission

GPA model. Anatomy and Physiology was also identified as a significant predictor of NCLEX-RN® success even though the Science model and the Science GPA model were not statistically significant in relation to the NCLEX-RN® result. Within the English model, NET® Reading score was the significant indicator. Math model had NET® Math score and Statistics course grade as significant indicators. NET® Composite Score was the significant indicator in Test model. Previous degree was the significant indicator in the Previous Degree/Pre-admission GPA model. The models as an aggregate support previous research; therefore, this study adds support to the current body of knowledge.

Implications for Future Research

Because the NET® has become a defunct test, this study should be repeated using the TEAS® which took the place of the NET®. Pathophysiology should be studied as a predictor of NCLEX-RN®. English Comprehension scores should be re-evaluated and differentiate when English is a foreign language. Sciences scores should be re-assessed with consideration given to the type of institution from which transfer credits were received.

Limitations

The limitations of this study would be the generalization of the sample. Even though the sample consisted of all students who graduated between summer semester 2006 and summer semester 2010, the NCLEX-RN® status was not known for all the students. Some NET® scores were not available. If graduates did not take NCLEX-RN® in Georgia, the NCLEX-RN® results were not attainable. Any data that was not available for collection could have impacted the results of the study.

Conclusion

The purpose of this study was to evaluate the admission criteria as a predictor of NCLEX-RN® success. In evaluating the specific models, this study found the English model, Math model, Test model, and Previous Degree/Pre-admission GPA model were significant models related to NCLEX-RN® success. The inability to predict failure to pass NCLEX-RN® on the first attempt could be related to the high average mean scores. Each of the models (English, Math, Test, Previous Degree/Pre-admission GPA) showed a low variance of the NCLEX-RN® result.

Even though the Science model did not show a significant relationship with NCLEX-RN® success, Anatomy and Physiology average grade was a significant indicator of NCLEX-RN® success. Other significant indicators that were found within the models were: (a) NET® Reading in the English model; (b) NET® Math and Statistics course grade in the Math model; (c) NET® Composite score in the Test model; (d) Previous degree in the Previous Degree/Pre-admission GPA model.

With the nursing shortage, nursing faculty are faced with sorting through applicants to pick the students who have the best chance to complete the nursing program, pass NCLEX-RN®, and become nurses with a professional license. This study has added to the existing database in support of this admission criterion as a solid basis for selecting students for enrollment into this College of Nursing. However, further research into the relevance across nursing curriculums of other Colleges and Schools of Nursing is suggested.

This College of Nursing should repeat this study using the TEAS®. Once the findings are replicated, the predictors that were shown to be statistically significantly related to NCLEX-RN® success (anatomy and physiology average grade; statistics course grade; previous non-nursing baccalaureate degree; and TEAS® composite, math, and reading scores) should be weighed higher in the admission evaluation process. It may not be enough to raise the general standards like the pre-admission GPA. A more in-depth examination of individual grades such as statistics and anatomy and physiology appears to be warranted. An effort to recruit students who already hold a non-nursing baccalaureate degree should be undertaken. The use of the reading portion as well as the math and composite scores on the TEAS® should be considered as a part of the admission evaluation process if the study using the TEAS® is consistent with this study.

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APPENDIX A:

IRB Exemption

Institutional Review Board (IRB)
for the Protection of Human Research Participants

PROTOCOL EXEMPTION REPORT

PROTOCOL NUMBER: IRB-02686-2011 **INVESTIGATOR:** Susan Blankenship

PROJECT TITLE: Linking Admission Criteria to Passage of NCLEX-RN

DETERMINATION:

√ This research protocol is exempt from Institutional Review Board oversight under Exemption Category(ies) 4. You may begin your study immediately. If the na ure of the research project changes such that exemption criteria may no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research.

☐ Exemption of this research protocol from Institutional Review Board oversight is pending. You may not begin your research until you have addressed the following concerns/questions and the IRB has formally notified you of exemption. You may send your responses to irb@valdosta.edu.

ADDITIONAL COMMENTS/SUGGESTIONS:

Although not a requirement for exemption, the following suggestions are offered by the IRB Administrator to enhance the protection of participants and/or strengthen the research proposal. If you make any of these suggested changes to your protocol, please submit revisions so that IRB has a complete protocol on file.

Barbara H. Gray Date: 4/24/12
Barbara H. Gray, IRB Administrator

Thank you for submitting an IRB application.
Please direct questions to irb@valdosta.edu or 229-259-5045.

cc: Dr. Anita Hufft (Dean – CON)
Dr. Deborah Weaver (Advisor)

APPENDIX B:

Collection Tool

Student #	Age	Previous Degree	NET Comp	NET Read	NET Math	Science GPA	Pre-admit GPA	Chem 1	Chem 2	Micro	A&P 1	A&P 2	Patho	Psych	English	Math	Stat	NCLEX

APPENDIX C:

Permission to Conduct Study

From: Anita G. Hufft

Sent: Friday, April 15, 2011 2:48 PM

To: Susan M. Blankenship

Cc: Nicole P. Gunn

Subject: RE: IRB Application - Admission Criteria and NCLEX-RN

You have my permission to access student records, consistent with measures to protect right of students as required by research ethics standards.