

Correlation Between Entry Grade Point Average and First Attempt National Certification

Examination Scores for Graduate Registered Nurse Anesthetists

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Abstract

The National Certification Exam (NCE) administered by the National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA) is the exam nurse anesthesia graduates must pass before entering practice in the United States. Although Entry Grade Point Average (EGPA) is a common criterion used as an indicator of prior academic performance, there is limited data that ties a direct correlation to first-time scores on the NCE. Even though students may successfully graduate from their nurse anesthesia program, there are some who score poorly on their first National Certification Exam attempt. Low first-time NCE scores that do not achieve a passing standard may be of significant financial burden to the graduate and have adverse outcomes for the university, such as a potential negative impact on accreditation status. Therefore, further study regarding data validating if EGPA has a direct correlation with first-time scores on the NCE was indicated.

A literature review was conducted using common databases including PubMed, Google Scholar, and Cumulative Index to Nursing & Allied Health Literature (CINAHL). This scholarly project used a quantitative, retrospective, correlational design that examined data of approximately 175 students from eight separate cohorts that graduated from the nurse anesthesia program between 2012-2019 at AdventHealth University in Central Florida. EGPAs of these students were compared to their first-time NCE scores using de-identified data provided by the Department Chair of the nurse anesthesia program. Statistical Package for the Social Sciences (SPSS) version 21 was used for data analysis. The data from this scholarly concluded that higher EGPAs resulted in overall higher NCE scores. Graduates with NCE scores that were less than 450 had an average EGPA of 3.29. Graduates with NCE scores of 450 or greater had an average EGPA of 3.48.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	2
ABSTRACT.....	3
LIST OF FIGURES AND TABLES.....	6
1. INTRODUCTION.....	7
1.1 Significance and Background of Clinical Program.....	8
1.2 PICOT Search Format Questions	9
1.3 Search Strategies/Results	9
1.4 GRADE Criteria	10
2. LITERATURE REVIEW AND SYNTHESIS OF EVIDENCE.....	11
2.1 Theoretical Framework	11
2.2 Synthesized Literature Review	12
3. APPLICABILITY TO PRACTICE/ PROFESSIONAL GROWTH.....	16
4. PROJECT AIM	17
5. PROJECT METHODS	18
5.1 Planning and Procedures	19
5.2 Project Timeline	21
5.3 Budget/Grant	22
6. RESULTS	23
6.1 Analysis Assumptions	23
6.2 Total NCE Score and EGPA Results.....	25
6.3 Individual NCE Score and EGPA Results.....	25
6.4 Comparison of Total NCE Scores	25

7. DISCUSSION OF RESULTS	26
7.1 Recommendations.....	27
8. LIMITATIONS	28
9. CONCLUSION	30
10. DISSEMINATION	31
11. REFERENCES	32
11. APPENDIX A	35
12. APPENDIX B	40

LIST OF FIGURES/TABLES**Figures**

B1	Correlation of Total NCE Scores and EGPA	26
B2	Standardized Residual and Standardized Predicted Value	26
B3	P Plot of Regression Standardized Residual	27

Tables

B1	Assumption 3	39
B2	Assumption 4	39
B3	EGPA's Correlation to NCE Total Score Variation	39
B4	ANOVA Analysis of EGPA and NCE Total Scores	39
B5	Correlation of EGPA to NCE Total Scores	40
B6	Correlation of EGPA to Individual NCE Scores	40
B7	Correlation of EGPA to Basic Sciences	40
B8	Correlation of EGPA to Equipment, Instrumentation, and Technology	41
B9	Correlation of EGPA to Basic Principles of Nurse Anesthesia	41
B10	Correlation of EGPA to Advanced Principles of Nurse Anesthesia	41

Correlation Between Entry Grade Point Average and National Certification Exam Scores

Evidence emphasizes the use of entry grade point average (EGPA) as a best practice standard in the admission process for graduate nurse anesthesia programs, due to its accuracy at predicting student success (Eaglin, 2017; Hulse, et al., 2007; Ortega, Burns, Hussey, Schmidt, & Austin, 2013). Other common weighted criteria for admission to nurse anesthesia programs include years of clinical experience, science grade point average (SGPA), and Graduate Record Exam (GRE) scores (Ortega, et al., 2013; Wilson, Gibbons, & Wofford, 2015). Despite studies that directly correlate EGPA to students' successful graduation from a program, statistical evidence that correlates it to first-time scores on the National Certification Exam (NCE) administered by the National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA) after graduation is lacking. A calculated score of four domain categories results in an overall pass or fail for the NCE.

Failure to pass the NCE after graduating from a nurse anesthesia program can cause significant financial and emotional strain for the individual. In addition, the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) has a requirement that programs must maintain a calculated 80% pass rate to avoid negative consequences regarding accreditation status (COA, 2020). There are three methods of calculating overall pass rate. Method one calculates the percentage of graduates from the most recent graduation cohort that passed on their first NCE attempt. If less than 80% of the graduates achieved this, method two is utilized (COA, 2020). Method two calculates the number of graduates in the three most recent cohorts who passed on their first NCE attempt (COA, 2020). If there is less than an 80% pass rate using the method two calculation, then method three is utilized, which calculates the number of graduates from the most recent graduation cohort who passed on their first attempt, plus

graduates who passed on their second attempt within 60 days of program completion (COA, 2020). As nurse anesthesia programs continue to have increasing standards and expectations of their students, further evaluation is needed to determine if EGPA accurately correlates to a greater probability of achieving a higher score on the NCE.

Significance and Background of Clinical Problem

Certain admission factors have shown a strong correlation to successful completion of graduate programs including EGPA, clinical experience, and nationally accepted exam scores (Eaglin, 2017, Hulse, et al., 2007; Wilson, 1999; Wilson, Gibbons, & Wofford, 2015). During the admissions and interview process to a nurse anesthesia program, committees attempt to determine the most ideal candidates with the highest chance of successfully graduating (Luce, 2011). Although available evidence helps committees select criteria that correlate to program completion, there is a lack of evidence that demonstrates a direct correlation to how well they will perform on certification exams after graduation.

When a candidate does poorly on the NCE after graduation, it negatively affects the individual and the institution from which they graduated. Scoring poorly on the National Certification Exam leads to multiple attempts, and each NCE attempt costs \$995, which the graduate must pay to the NBCRNA. The candidate faces factors such as unemployment, lack of income, and increasing debt when multiple attempts are needed. The last three nurse anesthesia cohorts from AdventHealth University (AHU) reflected lower first-time pass rates compared to prior cohorts. The data provided by this scholarly project would be beneficial and relevant for AHU's nurse anesthesia program, as it may provide information regarding which candidates have a greater potential for scoring higher on their initial National Certification Exam (NCE) attempt.

PICOT Search Format Questions

Two questions in PICOT format were constructed to assist in a systematic literature review and guide the project innovation. The first question addressed the clinical problem: In students who attended graduate-level healthcare programs (P), does Grade Point Average (GPA) upon admission (I), correlate with first-attempt National Certification Exam scores (NCE) (O).

The second question guided the innovation: In Student Registered Nurse Anesthetists attending the AdventHealth nurse anesthesia program (P), during the 2012-2019 graduating cohorts (T), did Grade Point Average (GPA) upon admission (I) correlate with first-attempt National Certification Exam scores (O)?

Search Strategy/Results

Evidence was gathered utilizing a search strategy that included PubMed, Google Scholar, and CINAHL, where 4,200 articles were initially retrieved. Sixteen articles met the inclusion criteria which included: last twenty years, relevance, abstract, and titles that indicated relation to the proposed PICOT question. Evidence was limited to healthcare professions and studies that observed admission criteria. Of the sixteen articles reviewed, five were published within the last five years. Key search terms included: *grade point average AND student nurse anesthetists AND graduate healthcare professions AND predictor AND success AND pass AND National Certification Exam AND admission requirement*. MESH terms included *admissions, graduate nurse program, success, and grade point average*.

Six studies directly evaluated predictors of nurse anesthesia program success, five studies evaluated graduate nursing program success, and one study reviewed admission criteria benchmarks for Doctor of Nursing Practice programs. Another study evaluated predictors of success for a single undergraduate nursing program. One study evaluated admission criteria for

physician assistant programs, and one evaluated individual factors that predicted physical therapy students successfully passing the National Physical Therapy Examination (NPTE). An additional study determined factors that showed a correlation between EGPA and Medical College Admissions Test (MCAT) scores with overall medical student success.

GRADE Criteria

For this scholarly project, sixteen studies examining admission criteria in healthcare programs were systematically reviewed for quality of evidence and strength of recommendations by utilizing the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria. GRADE matrix tables are listed in Appendix A. Nine of the sixteen studies were retrospective correlational studies, four were descriptive studies, two were literature reviews, and one was a meta-analysis; therefore, the evidence was given a low rating. Due to a lack of multiple higher-quality studies such as randomized control trials, systematic reviews, or meta-analysis, the review initially reflected a low level of quality evidence. In addition, methodological flaws such as small sample sizes and convenience sampling from one university were found. Furthermore, there were varying methods of analyzing the collected data, rather than a consistent finding of one measurement tool. These factors resulted in a very low quality of evidence. Seven studies used sample sizes of at least 150 students or more, which reflects an increase of quality from very low to a low level. In culmination, the overall quality of the evidence remains low. Furthermore, no studies were found that statistically analyzed pre-admission grade point averages in comparison to national certification exam scores for graduate nurse anesthetists. Therefore, using pre-admission grade point average as an accurate predictor of student nurse anesthetists' scoring higher on the NCE cannot be recommended based solely on the literature review.

Literature Review and Synthesis of Evidence

EGPA as an admission benchmark shows a direct positive correlation in accurately predicting a student's successful completion of a graduate program (Suhayda, Hicks, & Fogg, 2008; Dosch, 2012; Ortega, et al., 2013; Wilson, Gibbons, & Wofford, 2015). For nurse anesthesia students, a passing standard must be reached on the NCE after graduation prior to entry into practice (NBCRNA, 2020). In addition, a program benchmark of maintaining an annual calculated 80% pass rate must be upheld to avoid potential negative effects for accreditation of a graduate nurse anesthesia program (COA, 2020). Although evidence-based admission criteria were used to examine applicants' prior academic success, there remains a gap in the data supporting if the admission criteria accurately correlate to first-time NCE scores following graduation.

Theoretical Framework

Educational theoretical frameworks often suggest that, while several factors play into graduate student success, it is a process that begins prior to the student enrolling in graduate school programs (Kinzie & Kuh, 2016). The theoretical framework for this scholarly project was adapted from Vincent Tinto's Longitudinal Model of Student Retention. The longitudinal framework emphasizes the importance of student academic persistence and supplementation of academic integration to determine student success (Kinzie & Kuh, 2016). Tinto's model theorized that student success is a longitudinal process that is impacted by multiple sources including prior schooling, skills and abilities, and family background (Kinzie & Kuh, 2016). Tinto theorized that academic integration by means of complying with set standards, such as earning passing grades and social integration, are independent practices that lead to institutional and graduation commitments (Alijohani, 2016; Kinzie & Kuh, 2016). The student's individual

perceptions of the importance of continuing his or her education in addition to prior academic experience ultimately determine a student's decision to leave or persevere through higher education. Tinto also emphasized the importance of external factors and initial selection process of the institution (Alijohani, 2016; Kinzie & Kuh, 2016). While Tinto specifically referred to factors influencing student attrition, or failure to succeed, the pre-entry attributes were the main focus of the study.

Synthesized Literature Review

Entry grade point average (EGPA) is defined as a student's cumulative grade point average upon applying to a graduate program. Science grade point average (SGPA) is defined as a student's cumulative grade point average for all undergraduate science courses taken prior to applying to a graduate program (Luce, 2011). Nationally accepted exam scores are standardized tests that are widely accepted for entrance into graduate programs in the United States (Wolkowitz & Kelley, 2010). For the purposes of this scholarly project, student success is defined by successfully completing the graduate-level program in which they are enrolled (Eaglin, 2017; Ortega, Burns, Hussey, Schmidt, & Austin, 2013). The National Certification Exam (NCE) is an exam mandated by the National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA) that nurse anesthesia graduates must pass before certification for entry into practice (NBCRNA, 2020). The passing standard is defined as a minimum calculated score that is required by the NBCRNA that accurately reflects a level of knowledge suggesting competency for entry-level nurse anesthetists (NBCRNA, 2020).

Pre-admission grade point average of at least 3.25 or higher should be strongly considered when choosing which applicants have the greatest probability of succeeding; however, no evidence directly evaluated if undergraduate, cumulative, or science GPA correlated

with higher NCE scores (Eaglin, 2017; Hulse, et al., 2007; Ortega, Burns, Hussey, Schmidt, & Austin, 2013). Evidence using t-tests and chi-squared analysis revealed that each one-point increase in cumulative EGPA reflects both an increased chance of successfully completing a graduate nursing program by as much as 7.12 times, and that students are 4.2 times less likely to experience academic probation (Burns, 2011; Wilson, Gibbons, & Wofford, 2015).

Additionally, for every one-point increase in SGPA, students are three times less likely to experience academic probation (Burns, 2011). The average cumulative EGPA of 3.36, SGPA of 3.30, and undergraduate nursing GPA of 3.36 statistically correlate to student success (Burns, 2011; Luce, 2011; Suhayda, Hicks, & Fogg, 2008; Wilson, Gibbons, & Wofford, 2015). An average cumulative EGPA of 3.25 and undergraduate nursing GPA of 3.00 reflect up to a 99% program success rate (Suhayda, Hicks, and Fogg, 2008). Evidence examining student success in a graduate nursing program lists entry grade point average (EGPA), science grade point average (SGPA), graduate record examination scores (GRE), and years of working as a registered nurse in an intensive care unit as common independent variables, with student success representing the dependent variable (Burns, 2011; Newton & Moore, 2007; Ortega, Burns, Hussey, Schmidt, & Austin, 2013; Suhayda, Hicks & Fogg, 2008). When compared to other admission criteria, EGPA and GRE scores have been identified as the two most statistically relevant criteria in predicting student success (Creech & Aplin-Kalisz, 2010, Eaglin, 2017; Newton & Moore, 2007; Patzer et al., 2017; Suhayda, Hicks, & Fogg, 2007). These requirements are selected by each program and weighted based on importance to assign scores to applicants and determine which ones have the greatest chance of being successful in the program (Mancuso & Udlis, 2012; Suhayda, Hicks, & Fogg, 2008). Although evidence reflects the correlation between EGPA and

student success, data is lacking that assesses the accuracy of EGPA correlating to scores on the NCE for nurse anesthesia graduates.

To measure the success rate of Physical Therapy (PT) graduate students, the undergraduate grade point average of prerequisite courses (UGPA-PC) was determined to be the best predictive variable for successful National Physical Therapy Examination (NPTE) performance, followed closely by EGPA (Wolden, Hill, & Voorhees, 2019). Similarly, EGPA in conjunction with the Medical College Admissions Test (MCAT) has a strong correlation to success in medical school in North America. In Australia, the weighted EGPA consistently correlated with success during all four years of medical school (Sladek, Bond, Frost, Prior, 2016). Medical students with higher GPAs were more likely to have unimpeded progress across the entire program (Sladek, Bond, Frost, & Prior, 2016). The use of multiple selection criteria to predict a higher probability of successfully graduating from entry-level medical courses continues to be supported, with GPA remaining as the single most consistent predictor of performance (Sladek, Bond, Frost, & Prior, 2016).

The NCE is a standardized exam that all nurse anesthesia graduates must take to become certified for entry into practice in the United States (NBCRNA, 2020). The NBCRNA Annual NCE and SEE Report collected and analyzed testing data between September 1, 2018 to August 31, 2019. It found that only 84.3% of candidates passed on their first attempt, and the pass rate decreased with repeat attempts (NBCRNA, 2020). The NBCRNA Annual NCE and SEE Report that collected and analyzed testing data between September 1, 2017 to August 31, 2018 also found an 84.3% first time pass rate (NBCRNA, 2019). From January 1, 2015 to December 31, 2019, the average first-time pass rate was 84.1% (NBCRNA, 2020).

The total calculated NCE score that determines student competency is calculated from four weighted domain category scores which include: Basic Sciences (25%), Equipment, Instrumentation, and Technology (15%), General Principles of Anesthesia (30%), and Anesthesia for Surgical Procedures and Special Populations (30%). During NBCRNA's fiscal year 2019 between the dates of September 1, 2018-August 31, 2019, in an interpretive guide regarding the NCE and SEE, the NBCRNA reported a mean total score of 493.7 with a standard deviation of 46.5. The mean basic science score was 500.5 with a standard deviation of 63.0. The mean equipment, instrumentation, and technology score was 503.7 with a standard deviation of 73.0. The mean general principles of anesthesia score was 496.9 with a standard deviation of 58.1. The mean anesthesia for surgical procedures and special populations score was 493.1 with a standard deviation of 57.4. The NCE score is determined based on correct or incorrect responses by the test taker and the degree of difficulty for each question (NBCRNA, 2019). The NCE calculates a numerical score using Item Response Theory, and it determines the test taker's ability estimate to determine whether the candidate can proceed to the next question. The NBCRNA is able to determine if the candidate's performance is competent or incompetent between 100-170 questions (NBCRNA, 2020). The maximum number of questions available is 170, within which a pass or fail decision is reached based on the calculated ability level (NBCRNA, 2020). The minimum score needed to pass the NCE exam is a total score of 450 or greater (NBCRNA, 2020). The candidate will only see if he or she passed or failed; the calculated scores of each domain and total score are available to the Program Administrator (NBCRNA, 2020).

As of January 1, 2019, the cost of each NCE attempt is \$995, which is an increase from the previous \$725 initial fee and \$625 repeat exam fee for the prior ten years (NBCRNA, 2020).

Although there is not a mandated wait time between test attempts, the candidate must reapply for eligibility and is limited to four attempts within the first two years after program completion (NBCRNA, 2020). Therefore, graduates may experience a significant financial burden if they successfully complete nurse anesthesia programs but are unable to pass the National Certification Exam. In addition, low pass rates may negatively impact accreditation status of nurse anesthesia programs. All nurse anesthesia programs must achieve a calculated average of 80% pass rate per cohort on the National Certification Exam, per the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) (COA, 2020). There is limited evidence that specifically identifies any consistent pre-admission variable that shows direct correlation to first-attempt scores on the NCE. However, scientific principles are heavily incorporated into NCE questions, and evidence suggests that prior academic performance in science categories is the most predictive admission factor regarding improved performance on the NCE (Zaglaniczny, 1992).

Applicability to Practice/Contribution to Professional Growth

Traditional admission criteria reflect accurate predictors of student success in completing nurse anesthesia programs. However, some graduates are unsuccessful upon their first attempt at becoming certified. There is insufficient evidence that supports using undergraduate grade point average in order to predict first-time scores on the National Certification Exam (NCE) for graduate nurse anesthetists. Due to the significant burdens of students being unable to achieve certification after graduating from an accredited nurse anesthesia program, it is prudent to determine if a statistically significant correlation exists between the use of EGPA and first-time scores on the NCE. In addition, establishing correlation between EGPA and NCE scores will help universities determine with greater accuracy which admission criteria should be weighted

heavier when considering the probability of an individual completing the program and scoring higher on the NCE upon the first attempt.

Project Aim

The purpose of this scholarly project was to determine if a statistically significant correlation exists between EGPA and first attempt NCE scores. To determine this, EGPAs for the cohorts of AdventHealth University (AHU) nurse anesthesia graduates between 2012-2019 were compared to the graduates' four domain scores and total NCE score on their first attempt. Consistent admission EGPA data prior to the 2012 graduating cohort was not available; therefore, cohorts that graduated prior to 2012 were excluded from this scholarly project. This project used a multiple linear regression analysis to examine each domain, which helped to determine if a correlation existed between scores with only certain categories of the exam versus the calculated total NCE score. A Microsoft Excel spreadsheet of de-identified EGPA and corresponding NCE scores from past cohorts that graduated between 2012-2019 was provided by the nurse anesthesia Program Administrator of AdventHealth University. All deidentified information was shared with the two students conducting this project, via a password protected cloud that will auto-delete after five years. Temporary access to the deidentified data was granted to Dr. Roy Lukman in order to perform the statistical analysis. The deidentified variables that were included in the Excel spreadsheet were EGPA, individual NCE domain scores, and the total NCE score. A Pearson R correlational and multiple regression statistical analysis was used to examine the correlation between the provided data, with assistance of statistician Dr. Roy Lukman. A secondary project aim was to make appropriate evidence-based recommendations regarding admission criteria that correlate to NCE success based on findings. The project objectives are delineated here.

Objective 1 – The researchers will synthesize available literature determining if evidence shows that EGPA has a correlation to student success and higher National Certification Exam scores.

Objective 2 – The researchers will determine if there is a correlation between EGPA and first-time NCE scores within the 2012-2019 AHU nurse anesthesia graduation cohorts by August 2020.

Objective 3 – The researchers will make recommendations for the optimal use of EGPA scores as an influencing factor on AHU NAP admission decision-making and its potential implications.

Project Methods

After IRB approval, a quantitative, retrospective, correlational design was utilized to determine whether a relationship existed between the graduates' EGPA upon acceptance to the nurse anesthesia program and their first attempt NCE scores. This scholarly project did not require informed consent, since it was a retrospective review of deidentified data and did not involve human subjects. This scholarly project utilized a convenience sample of the entry GPAs for the 2012-2019 graduation cohorts of the AHU nurse anesthesia program (NAP) in Orlando, Florida, and compared them to the respective first-time scores on the NCE. The sample included graduates in consecutive cohorts from the AHU Master of Science in Nurse Anesthesia (MSNA) program who graduated between 2012-2019, consisting of eight cohorts with a total of 175 graduates. The inclusion criteria were accepted full-time students with documented EGPAs upon acceptance to the university, students who successfully graduated from AHU's NAP, and graduates who had available first attempt NCE scores. If a student was dismissed from the program, but was later re-admitted and graduated, that student was included if all other inclusion criteria were met. Exclusion criteria were any records with missing EGPAs or first-attempt NCE scores and students who did not successfully complete the MSNA program. Academic success

was defined as the student graduating from the program versus being dismissed or withdrawing from the program and not returning. Data sources included the Program Administrator's and the Program Admission Coordinator's computerized student database with the individual student records and scores. All EGPA's and NCE scores were provided and fully de-identified by the AHU Program Administrator prior to provision of the data or performance of any evaluation or analysis by the scholarly project team. In addition, all data was accessed through a password protected cloud that will auto-delete after 5 years. This cloud was constructed with assistance from the AHU Information Technology department. After the data was received in the de-identified Excel spreadsheet, it was then statistically analyzed by Dr. Lukman. SPSS Version 21 was utilized to conduct a Pearson R correlational analysis, with a multiple regression analysis to evaluate the individual NCE domain scores. The statistical analysis was reviewed for correlations between EGPA and each NCE domain score from each graduate's first NCE attempt.

Planning and Procedures

Formal one-hour interviews were audio recorded in meeting rooms at the AHU campus in June 2019 with each key player to gain insight about possible barriers and limitations to performing this study. The key players consisted of Dr. Alescia DeVasher Bethea, who is the Program Administrator for AHU's nurse anesthesia program, Dr. Sarah Snell, who is an AHU assistant professor for the nurse anesthesia program, and Ms. Dana Williams, who was the nurse anesthesia program's Admission Coordinator, to discuss what components could influence or hinder success of this proposal. Ms. Dana Williams was selected as she obtained retrospective information of past cohorts including admission data entry, such as EGPA. Dr. Alescia DeVasher Bethea was selected due to her access to NCE scores of past cohorts. In addition, they

were able to provide insight regarding the process for researchers accessing this type of deidentified information. Dr. Snell was interviewed to gain faculty insight as to her thoughts on current admission criteria and ability to predict success, as well as information on formalities of how to prepare for Institutional Review Board (IRB) submission.

The implementation plan for the project was to conduct a thorough literature review of recent and past studies that examined cumulative or science GPA and the correlation with student success in graduate healthcare programs. To perform the retrospective, correlational study, after IRB approval, an Excel spreadsheet was created by Dr. Alescia DeVasher Bethea that contained deidentified student data of the variables being examined from the 2012-2019 graduation cohorts which was accessed through the confidential cloud. Temporary access to the cloud was given to Dr. Roy Lukman in order to perform the statistical analysis. The data collection sheet consisted of the following variables: EGPAs, individual NCE domain scores, and the total NCE scores. All cohorts were blended together on the deidentified data collection sheet to further protect graduates' identity. Next, the EGPAs were compared with the paired first attempt NCE scores. SPSS was then used by a statistician to perform a Pearson R correlation analysis of the AHU data to determine the strength of relationship between two variables. A multiple regression was performed for each NCE domain score to determine if a correlation exists. The results were used to compare and contrast with the findings from the review of literature. Finally, recommendations regarding the use of the EGPA as a future admission criterion were determined.

The greatest resource that was needed for this project was AHU nurse anesthesia program faculty and project committee members' dedicated time. Data was collected by Dr. Alescia DeVasher Bethea and Ms. Dana Williams in Spring 2020. In addition, a password protected

cloud was created by AHU IT personnel where the de-identified data is stored, which will be auto deleted in 5 years to protect the confidentiality of the data. The only people with access to this cloud are Dr. Alescia DeVasher Bethea and the two students who conducted this study. Temporary access was granted to Dr. Roy Lukman for the statistical analysis. AHU school-affiliated computers were used to gather the data in an Excel spreadsheet. Finally, Dr. Roy Lukman used the Statistical Package for the Social Sciences (SPSS) Version 21 and performed a multiple regression analysis of the de-identified data.

The unpredictable barriers were the AdventHealth University Scientific Review Committee (SRC) and Institutional Review Board (IRB) approvals. However, after submitting to the AdventHealth University SRC and IRB, the project was approved by SRC with recommendations. The IRB determined the study as Quality Improvement/Quality Assessment (QI/QA), and was granted exemption from further review. Facilitators included direct connection to the Program Administrator and Program Admission Coordinator, access to a statistician, and access to an IT department which assisted in developing the secure cloud for storing data. In addition, the project committee members consisted of professionals with background knowledge and familiarity on this topic.

Project Timeline

The timeline for completion of this scholarly project started with the literature review. The draft proposal for the scholarly paper was completed by July 26, 2019. Once the literature review and project proposal were completed, the IRB application was submitted December 5, 2019. The project implementation phase was started on January 24, 2020, when approval from AHU's IRB was granted. After approval, a password protected Microsoft Team was created and set to auto delete in 5 years. The deidentified data regarding the GPA and NCE scores was

placed on an Excel spreadsheet and uploaded to the password protected Microsoft Team by AHU's Program Administrator on March 4, 2020. The de-identified data was statistically analyzed with the assistance of AHU faculty member and statistician, Roy Lukman on March 23, 2020. Utilizing the statistical analysis, AHU's data of past graduates' entry GPAs in comparison to their NCE scores upon first attempt at taking the NCE was examined and summarized. The AHU results were then compared and contrasted to national research findings. A final manuscript outlining results, findings, limitations, conclusions, and applicability to CRNA practice was created by June 2020. Application for professional dissemination through the Florida Association of Nurse Anesthetists (FANA) Annual Meeting poster session of 2020 was completed by September 1, 2020. FANA accepted the submission, and the poster was included in the virtual FANA Annual Meeting on October 10-11, 2020. In addition, application for professional dissemination through the AANA Foundation for the Assembly of Didactic & Clinical Educators in February 2021 was completed by September 15, 2020. The AANA has selected the poster, and it is scheduled to be virtually presented on February 21, 2020.

Budget/Grant

There was a \$25 application fee associated with applying for the poster presentation through the AANA Foundation for the Assembly of Didactic and Clinical Educators (ADCE). In addition, there was a conference fee of \$100 to attend and subsequently present at the FANA Annual Meeting. Due to both conferences being held virtually because of the COVID-19 pandemic, there were no travel and lodging costs. At this time, no research grants will be pursued for this scholarly project. Additional resources that were needed for this scholarly project are listed under "Planning and Procedures."

Results

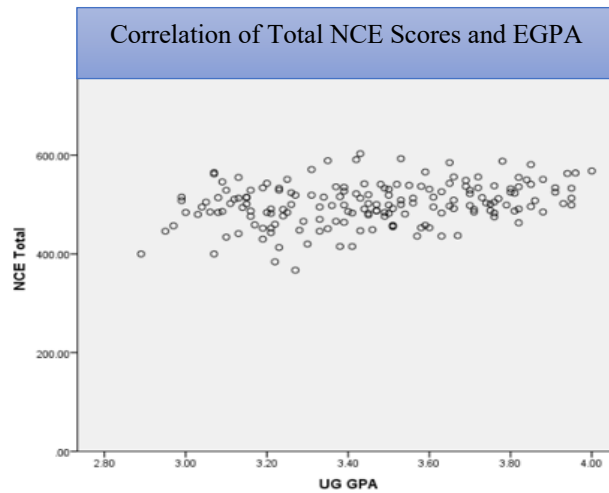
Data was collected from 175 AdventHealth University nurse anesthesia students from cohorts that graduated in 2012 through 2019. After performing a Casewise Diagnostics, student number 54 was determined to be an outlier, and therefore was eliminated. The analysis was performed from data collected from the remaining 174 students. First, a Pearson R correlational linear regression analysis was performed to determine if there was a predictive correlation between the total NCE score and EGPA. Second, a linear regression analysis was conducted to evaluate if there was a predictive correlation between the individual NCE scores and EGPA.

Analysis Assumptions

For this analysis, the total NCE score was the dependent variable, while EGPA was the independent variable. Six assumptions in total were made. First, it was assumed that the dependent variable is continuous. Second, it was assumed that the independent variable was continuous. Both assumptions were upheld as evidenced by the scatterplot visually indicating a linear relationship between both variables (See Figure B1). The third assumption was that there was an independence of observation errors. This assumption was upheld as evidenced by a Durbin Watson value of 2.058 (See Appendix B, Table B1). The fourth assumption was that there was absence of outliers. Casewise diagnostics determined that the only outlier within the dataset was Student Number 54 (See Appendix B, Table B2). This datum was removed from the analysis. The fifth assumption was that there was homoscedasticity, showing that there was homogeneity of variance among the data and that the variance around the regression line represents the same value for all predictor variables. This would indicate more precise estimations. This assumption was upheld as evidenced by visual analysis of a scatterplot that examined standardized residual on the y axis and standardized predicted values on the x axis

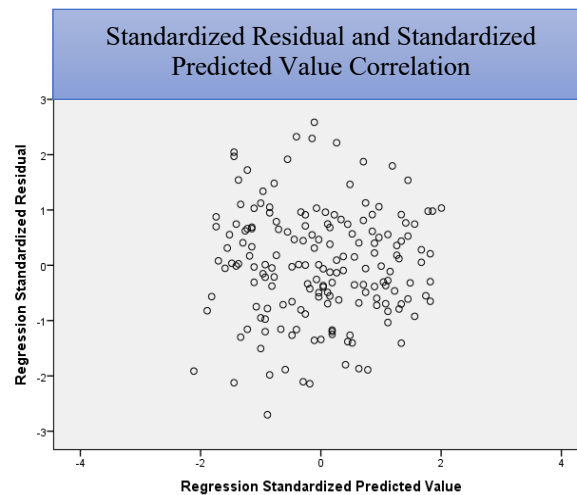
(See Figure B2). The final assumption was normality of residuals. This assumption was upheld as evidenced by visual inspection of a normal probability plot (See Figure B3).

Figure B1



Visual inspection of the scatterplot indicated a linear relationship between the NCE Total and EGPA

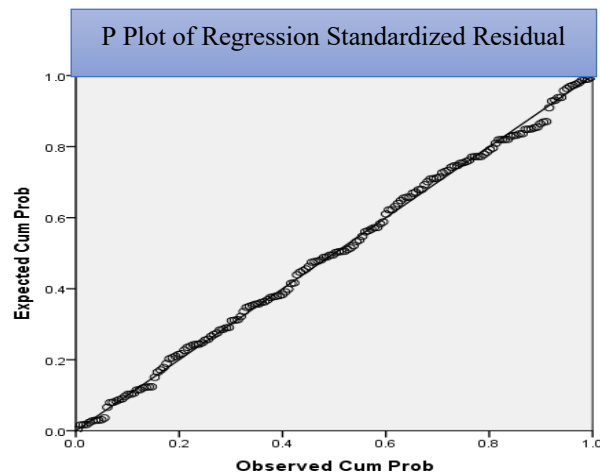
Figure B2



Dependent Variable: NCE Total
Visual homoscedasticity

S

Figure B3



Dependent Variable: NCE Total
Normal distribution of a normal probability plot

Total NCE Score and EGPA Results

EGPA accounted for 8.6% of the variation in the Total NCE scores as evidenced by an adjusted R^2 value of .086 and a Durbin-Watson value of 2.088 (See Appendix B, Table B3). ANOVA regression analysis revealed that there was a statistically significant linear relation between EGPA and Total NCE scores with a predictive ability of 9.06% (r value = .301 and $p < .005$) (See Appendix B, Table B4).

Individual NCE Score and EGPA Results

A 2-tailed t test indicated there were significant relationships between each possible pair (see Appendix B, Table B6). Therefore, a partial 2-tailed t test correlation was conducted to further investigate the correlation between EGPA and each category. Correlation between EGPA and Basic Principles of Nurse Anesthesia, when controlling for all other categories, revealed there is a statistical correlation with a predictive ability of 2.96% (r value = .172 and p value = .024) (See Appendix B, Table B7). Correlation between EGPA and Basic Sciences, when controlling for Equipment, Instrumentation, and Technology; Advanced Principles of Nurse Anesthesia, and Basic Principles of Nurse Anesthesia, revealed statistical significance was not achieved (r value = .120; $**p$ value = .119) (See Appendix B, Table B8). Correlation between EGPA and Equipment, Instrumentation, and Technology, when controlling for all other categories, revealed statistical significance was not achieved (r value = .057; $**p$ value = .456) (See Appendix B, Table B9). Correlation between EGPA and Advanced Principles of Nurse Anesthesia, when controlling for other categories revealed statistical significance was not achieved (r value = .107, $**p$ value = .164) (See Appendix B, Table B10).

Comparison of Total NCE Scores

For total NCE scores less than 450 ($N=20$), the average EGPA was 3.29, with a range of 2.89 to 3.67 and standard deviation of 0.214, based on a 4.00 scale. For total NCE scores greater

than 450 (N=154), the average EGPA was 3.48, with a range of 2.97 to 4.00 and standard deviation of 0.269, based on a 4.00 scale. The EGPAs ranged from 2.97 to 4.00. A t-test for equality of means was performed and revealed that students who earned a total NCE score of 450 or greater had a significantly higher EGPA.

An EGPA of 3.75 or higher showed an average total NCE score of 521. An EGPA of 3.50 to 3.74 showed an average total NCE score of 506. An EGPA of 3.25 to 3.49 showed an average total NCE score of 499. An average EGPA of 3.00 to 3.24 yielded an average total NCE score of 490. Finally, an EGPA of 2.99 or less yielded an average total NCE score of 465 or less. EGPAs of 3.75 or higher showed a statistically significant correlation to increased total NCE scores when compared to EGPAs of less than 3.75.

Discussion, Applicability to Practice, and Contribution to Professional Growth

Best practice suggests that EGPA should be considered in the admission process for graduate nurse anesthesia programs, as it has been shown to significantly correlate to a student's academic success. However, evidence is lacking that pertains to statistical correlation between EGPA of nurse anesthesia students and their first-time total NCE scores after graduation. Failure to pass the NCE can cause significant negative implications for the graduate and the anesthesia program.

Based on the statistical findings, EGPA had a significant correlation with total NCE scores. A minimum total score of 450 or greater is needed to pass the NCE. In this study, based on the average EGPAs and average NCE scores, higher EGPAs correlated with higher total NCE scores. A total NCE score of 450 or greater was associated with higher EGPAs. There were four subcategory NCE scores that were evaluated for any significant correlation to EGPA which were Basic Sciences; Equipment, Instrumentation, and Technology; Advanced Principles of Nurse

Anesthesia, and Basic Principles of Nurse Anesthesia. The only independent NCE subcategory found to significantly correlate with EGPA was Basic Principles of Nurse Anesthesia. While each subcategory is calculated into the overall total NCE score, there is not a minimum score required within each subcategory to pass the NCE.

In respect to this scholarly project's first PICOT question, applying this data to other graduate-level healthcare programs is limited due to the small sample size and homogenous nature of the population sample. In respect to this scholarly project's second PICOT question, the collected data showed statistical significance in support of EGPA correlating to the first-attempt total NCE score for the 2012-2019 graduating cohorts of AdventHealth University's nurse anesthesia program.

Recommendations

The statistical analysis of this study suggests a significant correlation with EGPA and Total NCE scores. Therefore, the researchers recommend EGPA to continue to be a weighted criterion for admission to AHU's nurse anesthesia program. The data showed that 3.48 was the average EGPA that resulted in a Total NCE score of 450 or greater on the graduate's first NCE attempt, with a standard deviation of 0.269. Therefore, the researchers recommend an admission criterion of 3.21 EGPA, which is one standard deviation less than the average, rather than the current minimum 3.00 EGPA, to increase the possibility of admitting students who are more likely to achieve a Total NCE score of 450 or greater on their first attempt. The lowest EGPA found to achieve a 450 or greater on their initial NCE attempt was 2.97. However, EGPAs ranging from 0.00 to 2.99 only represented 2.9% of the collected data. EGPAs ranging from 3.00 to 3.24 and 3.25 to 3.49 represented 24.7% and 27.0%, respectively, of the collected data. The findings of this study corresponded closely with the published evidence, which suggested

3.25 to be used as a minimum EGPA for admission to nurse anesthesia programs. Therefore, in conjunction with evidence-based practice, the researchers strongly recommend utilization of 3.21 as a minimum EGPA for admission to AHU's nurse anesthesia program, when weighing EGPA with other admission criteria. The researchers also recommend evaluating science GPA as an admission criterion due to its positive correlation in the literature.

Several possible reasons exist as to why the subcategory NCE scores were not as affected by EGPA when compared to the Total NCE score. It is common for individual students to study anesthesia topics and possess greater understanding in certain areas. Ultimately, where they lack understanding in one area, they may make up for greater knowledge in other areas. Factors such as previous clinical experience, time lag between graduation and date of initial NCE examination, as well as chosen methods to review for the NCE may also play roles in subcategory NCE scores.

Limitations

A limitation to this project included not being able to assess further breakdowns of EGPA, such as entry science grade point average or nursing cumulative grade point average, due to this data not being available. In addition, the retrospective data containing EGPA's were calculated from cumulative undergraduate GPAs, so if students had previously taken any graduate-level courses, those were not included in the EGPA calculation. Furthermore, it was not possible to account for the level of difficulty that each university utilizes for their undergraduate studies. Certain GPAs may have been more or less challenging to achieve depending on the university that the student attended for his or her undergraduate degree.

Other factors that could have influenced the outcomes of first-time NCE scores from past AHU cohorts include different methods of NCE preparatory systems that were used by the AHU

MSNA Program for different cohorts throughout 2012-2019. There are a variety of preparatory systems including Apex Anesthesia, Valley Anesthesia, Core Concepts, and the NBCRNA's Self Evaluation Exam (SEE). Each university and student may choose various programs to help prepare for the NCE, which could impact potential correlation. The AHU graduate cohorts of 2012-2019 all participated in a 3-day on-campus course by Core Concepts during the final year of their respective program enrollment; however, Apex Anesthesia was also utilized for the cohorts of 2018 and 2019. Furthermore, some students may decide to participate in one or more alternative board review systems, in addition to what is conducted through the Nurse Anesthesia Program. NBCRNA data demonstrated a strong, positive correlation between students who score at least 437.5 on the SEE during year 2 or 3 of the program, with subsequently passing the NCE on their first attempt (NBCRNA, 2020). Data collected by the NBCRNA found that up to 41% of variation in NCE scores can be directly correlated with performance on the SEE exam (NBCRNA, 2020). This study only applied to SEE data obtained after September 1, 2016, following changes made by NBCRNA to the SEE exam. An additional limitation was the deidentified data contained a mixture of graduates from multiple cohorts, which limits the ability to determine if one cohort showed a stronger correlation.

A limitation regarding the NCE individual domain scores was that for the 2018 and 2019 cohort scores, the NBCRNA changed the titles of two of the domains. In 2018, the NBCRNA conducted a national professional practice analysis study to analyze the knowledge, skills, and abilities that are necessary for entry-level practice for nurse anesthetists. Prior to 2018, the categories for NCE were Basic Sciences (25%); Equipment, Instrumentation, and Technology (15%); Basic Principles of Anesthesia (30%), and Advanced Principles of Anesthesia (30%). The current categories include Basic Sciences (25%), Equipment, Instrumentation, and

Technology (15%), General Principles of Anesthesia (30%), and Anesthesia for Surgical Procedures and Special Populations (30%). NBCRNA stated that no significant changes were made to these categories, but reported the new labels reflected the knowledge areas more accurately (NBCRNA, 2017). However, minor adjustments were made to the content outline within some of the broad categories (NBCRNA, 2017). A new “imaging” subdomain was added under Equipment, Instrumentation, and Technology. Enhanced recovery after surgery (ERAS) and several topics relating to Professional Issues were also added under General Principles of Anesthesia, including ethical considerations, legal issues, and safety and wellness (NBCRNA, 2017).

Another limitation included a small sample size and convenience sampling due to this project only gathering data from one university in the United States, without comparison to similar programs at other institutions. Therefore, the results of this study are not generalizable to other nurse anesthesia programs. In addition, strict student confidentiality in adherence with the AHU IRB’s policy limited the amount of information the researchers were able to obtain and analyze.

Conclusion

Evidence shows that EGPA has a significant correlation to a graduate student’s overall academic success. Limited evidence is available to support if EGPA has statistical significance in correlation to first-time total NCE scores for nurse anesthesia graduates. Therefore, two PICOT questions were created to assist in a systematic literature review and guide the project innovation. The first PICOT question asked if EGPA correlated to first-attempt scores on NCE for students who attended graduate-level healthcare programs. The second question asked if

EGPA correlated with first attempt NCE scores for Student Registered Nurse Anesthetists who attended AdventHealth University's nurse anesthesia program during the 2012-2019 cohorts.

The data collected from this scholarly project concluded that there is a positive, linear correlation indicating that higher EGPA's resulted in overall higher total NCE scores for AdventHealth's nurse anesthesia graduates who were in the 2012-2019 cohorts. While the data showed statistical significance for total NCE scores, the only subcategory that showed statistical significance was Basic Principles of Nurse Anesthesia. However, the total NCE score is what ultimately dictates a successful NCE; therefore, EGPA should be considered for admission into the AHU nurse anesthesia program.

Dissemination

Dissemination is planned for Fall 2020 – Spring 2021 at AHU. The three key audiences for this research project include: the AHU nurse anesthesia Program Administrator, the Program Admission Coordinator, and full-time AHU Nurse Anesthesia faculty members. The two student researchers collaborated with key stakeholders, including the project chair and the other project committee members to develop recommendations. A poster presentation is anticipated for March 2021 that disseminates results of the scholarly project to AHU faculty and students. This scholarly project was selected for presentation at the FANA Annual Meeting and was virtually presented on October 10 and October 11, 2020. In addition, this scholarly project was selected by the AANA Foundation for a virtual poster presentation at the Assembly of Didactic and Clinical Educators meeting. The virtual poster presentation will take place on February 21, 2021.

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Appendix A

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: Examining the relationship between admission criteria and student progression/completion of NP programs</p> <p>Study Two: Part II consists of admission criteria to DNP programs across the nation including entry GPA, GRE, degree requirements, clinical hours, and prerequisite courses</p>	<p>Study One: <u>Primary Outcome:</u> Comparing admission criteria such as GRE, BSN GPA, and program GPA to success rates <u>Secondary Outcome:</u> Comparing other variable factors such as change in program concentration, age, repeated courses, and admission type to program completion</p> <p>Study Two: <u>Primary Outcome:</u> To report the most frequently used admissions criteria for doctoral nursing programs across the country.</p> <p><u>Secondary Outcome:</u> Discussion on studies that have researched the predictability of common admission criteria and their ability to be predictors of success</p>	<p>Study One: <u>Subjects:</u> 150 Master's Nurse Practitioner student records randomly selected with various concentrations</p> <p><u>Setting:</u> A 4-year university in southern United States (not named)</p> <p>Study Two: <u>Subjects and Setting:</u> Data was collected exclusively through 137 University's websites over a 6-month period. 35 schools were randomly selected to ensure data accuracy.</p>	<p>Study One: Chi-Square Logistic Regression analysis One-way SPSS software for data analysis Pearson correlation</p> <p>Study Two: PASW Statistics 18 (SPSS 18). Descriptive statistics including frequencies, percentages, means, and standard deviations for admission criteria.</p>	<p>Study One: Statistical significance with program completion correlating to type of admission, age, GRE scores, and change in program concentration ($p < .05$). BSN GPA did not show statistical significance in predicting success</p> <p>Study Two: Admissions criteria based on GRE (about 43%), GPA (average of 3.0 ± 0.19), clinical experience (only 1/3 of schools overall), and prerequisites (56.7%). Studies have shown GRE to not be an accurate predictor of success, while undergraduate GPA correlates strongly.</p>	<p>Study One: <u>Methodological flaws:</u> Limited sample size</p> <p><u>Inconsistency:</u> Findings are inconsistent when compared with other studies</p> <p><u>Indirectness:</u> Not attributable to specialties such as anesthesia</p> <p><u>Imprecision:</u> Missing confidence interval</p> <p><u>Publication bias:</u> None</p> <p>Study Two: <u>Methodological flaws:</u> Convenience sampling; Heterogeneity of samples</p> <p><u>Inconsistency:</u> None</p> <p><u>Indirectness:</u> Not specific to NCE scores.</p> <p><u>Imprecision:</u> None</p> <p><u>Publication bias:</u> None</p>
Design				Implications	
<p>Study One: Retrospective, Predictive Correlational Study</p> <p>Study Two: Cross-sectional, descriptive qualitative study</p>				<p>Study One: Conflicting report that GPA does not accurately reflect success.</p> <p>Study Two: Similar admissions criteria across the U.S. Some criteria do not predict student success.</p>	

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: To identify cognitive and noncognitive factors that may predict student success and to identify students possibly at risk for failure so that interventional measures can be designed and implemented to promote success and reduce attrition</p> <p>Study Two: To determine if both undergraduate grade point average (UGPA) and Graduate Record Examination (GRE) scores are predictive of graduate school success.</p>	<p>Study One: <u>Primary Outcome:</u> To determine if cognitive factors such as critical thinking and non-cognitive factors measured with anxiety and locus of control tests correlated to student success.</p> <p><u>Secondary Outcome:</u> To examine student success when considering other variables such as GRE (verbal and quantitative scores), age, and gender.</p> <p>Study Two: <u>Primary Outcome:</u> To determine the relationship between UGPA and GRE scores and to explore the feasibility of using only the UGPA to determine success.</p>	<p>Study One: <u>Subjects:</u> Convenience sample of 46 students enrolled in the US Army Graduate Program in Anesthesia Nursing (USAGPAN)</p> <p><u>Setting:</u> US Army Graduate Program in Anesthesia Nursing (USAGPAN)</p> <p>Study Two: <u>Subjects:</u> Total sample size 120 students, 14 were excluded from the analysis and 134 were used in the analysis</p>	<p>Study One: Non-cognitive: State-Trait Anxiety Inventory (STAI) tool (test/retest stability coefficients = 0.765), Rotter Locus of Control Scale (test/retest reliability = 0.72), age and gender Cognitive indicators: Watson-Glaser Critical Thinking Appraisal (WGCTA) tool, GRE verbal score and GRE quantitative score Logistic regression used to analyze relationship between multiple cognitive and noncognitive factors.</p> <p>Study Two: Data were analyzed using SPSS version 11.5. Regression analyses were used to examine various cut scores on UGPA to predict GRE</p>	<p>Study One: STAI had uniformly high results (coefficient of 0.90). Analysis of the non-cognitive model with WGCTA resulted a p value .054, indicating WGCTA was insignificant. Overall predictive value of the model 84.62%, Specificity 93%, sensitivity 70% When omitting WGCTA, model resulted a p value of 0.012, indicating statistical significance of locus of control. Overall predictive value 84.21% sensitivity 91%, and specificity 71%.</p> <p>Study Two Mean GPA 3.43 (SD = .30), GRE scores; verbal (M=450.2; SD=72.6), quantitative (M=499.2; SD=91.0), analytical (M=548.8; SD=115.4). Adequate UGPA for success was 3.2-3.3.</p>	<p>Study One: <u>Methodological flaws:</u> Convenience sample. STAI testing discriminatory of persons with neuropsychiatric history (I.E history of untreated anxiety) <u>Inconsistency:</u> Only 38 students completed non-cognitive assessments, and only 26 completed WGCTA <u>Indirectness:</u> Study does not directly assess NCE scores as to measure success. <u>Imprecision:</u> Small sample size <u>Publication bias:</u> None</p> <p>Study Two: <u>Methodological flaws:</u> Does not state where research was conducted <u>Inconsistency:</u> of the 134 students 14 were excluded due to missing UGPA or GRE individual scores <u>Indirectness:</u> None <u>Imprecision:</u> None <u>Publication bias:</u> None</p>
<p>Design</p> <p>Study One: Longitudinal, nonexperimental, prospective, descriptive study</p> <p>Study Two: Regression analysis study</p>	<p><u>Secondary Outcome:</u> To determine whether graduate applicants with low UGPAs also had low GRE scores and put them at risk for poor graduate outcomes.</p>	<p><u>Setting:</u> One graduate nursing program. Study does not mention which school it was or where it was located.</p>		<p>Implications</p> <p>Study One: External locus of control were 2 times more likely to succeed. Overall, gender, locus of control, and GRE scores correlated with highest odds ratio of succeeding.</p> <p>Study Two: No evidence found that GRE was essential for admission to a doctoral-level nursing program</p>	

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: Evaluating the components of admission policy and their ability to predict program success</p> <p>Study Two: Evaluating the components of admission policy and their ability to predict program success and who add to nursing workforce diversity</p>	<p>Study One: <u>Primary Outcome:</u> To investigate what combination of factors such as nursing GPA, undergraduate GPA, current GPA predicts success.</p> <p><u>Secondary Outcome:</u> To investigate whether factors such as experience in specialty care, and duration of experience predicts success.</p> <p>Study Two: <u>Primary Outcome:</u> To determine if the last 60-credit GPA, admission essay score, average recommendation letter score were predictors of success</p> <p><u>Secondary Outcome:</u> To determine if demographic data such as race, age, and gender are predictors of success.</p>	<p>Study One: <u>Subjects:</u> 37 students: 35 female, 2 male; 34 white/non-Hispanic, 2 Hispanic/Latino, 1 unknown. Mean age was 32.32 years</p> <p><u>Setting:</u> Midwestern University graduate nursing school</p> <p>Study Two: <u>Subjects:</u> 5 consecutive cohorts of DNP students. 86.2% female, 13.8% male, and 23.4% minority. Ages; 54.2% of students were 25-40 years old, 39.9% were 41-60 years, and 5.9% were over 60 years.</p> <p><u>Setting:</u> 4-year graduate program at a midwestern public university.</p>	<p>Study One: IBM SPSS was used to conduct a multiple regression analysis</p> <p>Study Two: Data was put in an Excel spreadsheet and exported to SPSS software for statistical analysis</p>	<p>Study One: Admission GPA had highest importance in success ($\beta = .63$, $t = 7.31$, $p < .001$) Second strongest predictor nursing GPA ($\beta = .37$, $t = 4.03$, $p < .001$), Third strongest predictor UGPA ($\beta = .17$, $t = 2.02$, $p < .05$).</p> <p>Study Two Last 60-credit GPA with a p value of .047. Each one tenth of a point increase in GPA had a 56.3% better chance of graduating on time. Age with a p value of .031 each additional year of age graduating on time go down by 4.8%. Race significance; African-American .050 level, and Hispanic category is .009 level</p> <p>Implications</p> <p>Study One: Graduate GPA is twice as powerful predictor for success as nursing GPA and UGPA four times as powerful predictor for success</p> <p>Study Two: Most significant factor for success was the UGPA.</p>	<p>Study One: <u>Methodological flaws:</u> Limited sample size <u>Inconsistency:</u> None <u>Indirectness:</u> Did not consider threshold for prior GPAs <u>Imprecision:</u> Small sample size <u>Publication bias:</u> None</p> <p>Study Two: <u>Methodological flaws:</u> Limits generalizability of findings to other programs. Does not state where research was conducted. <u>Inconsistency:</u> None <u>Indirectness:</u> Did not measure interaction between race, age, gender, and measures such as GPA. <u>Imprecision:</u> None <u>Publication bias:</u> none</p>
Design					
<p>Study One: Multiple regression analysis study</p> <p>Study Two: Multinomial logistic regression analysis</p>					

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: Evaluating if practice with computer-based testing (CBT) to higher proficiency scores on the National Certification Exam (NCE)</p> <p>Study Two: Evaluating the components of admission policy and their ability to predict program completion and National Certification Exam success rate</p>	<p>Study One: <u>Primary Outcome:</u> Achieving higher percentage of NCE pass rates on first attempt after practice with computer-based testing</p> <p><u>Secondary Outcome:</u> To determine effect of GPA (grade point average) on NCE scores.</p> <p>Study Two: <u>Primary Outcome:</u> Evaluating implication of admission criteria such as undergraduate grade point average (GPA) and Graduate Record Examination (GRE) to completion of the nurse anesthesia program</p> <p><u>Secondary Outcome:</u> Evaluating first-time pass rates on National Certification Exam to undergraduate GPA and GRE scores</p>	<p>Study One: <u>Subjects:</u> 205 student nurse anesthetist graduate records, obtained from the Council on Certification of Nurse Anesthetists</p> <p><u>Setting:</u> Records were from a single university, not specified</p> <p>Study Two: <u>Subjects and Setting</u> Literature review including 19 lower level evidence sources. Eight sources reviewed solely nurse anesthesia programs, nine involved graduate nursing programs non anesthesia specific, and two involved graduate nursing programs with SRNAs (student registered nurse anesthetists). Most studies were descriptive as it is not possible or ethical to conduct randomized control trials for this.</p>	<p>Study One: eZ.exam was used for hourly and final course exams. NCE Proficiency Scores were compared. Descriptive statistics were calculated for each group. T test used to detect significant differences between computer-based training and paper-based group. ANCOVA (analysis of covariance) was performed to verify benefit of practice in any subgroups. SPSS used as an aid to statistical calculation.</p> <p>Study Two: Search Strategy using databases such as PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), ProQuest, and Google Scholar. Refined to articles that met inclusion criteria. Evidence evaluated according to Melnyx and Fineout-Overholt grading criteria. Descriptive Statistics used to compare.</p>	<p>Study One: Mean NCE proficiency score was 2.68, with a 95% confidence interval (CI) between 2.54-2.82. Paper-based group had a proficiency score of 2.36 (95% CI between 2.22-2.50). GPA had the highest correlation with NCE score ($r = .518$, $P < .01$) when compared to all other available variables. GPA also increased explanatory power of the model (R^2 increased from .022 to .315).</p> <p>Study Two GPA has a significant correlation to success in graduate nursing programs and pass rate on NCE. GRE showed lack of substantial evidence correlating to success. Conflicting data comparing critical care experience and number of years out of school to program success and pass rates on NCE</p>	<p>Study One: <u>Methodological flaws:</u> Convenience sampling, small sample size,</p> <p><u>Inconsistency:</u> None</p> <p><u>Indirectness:</u> None</p> <p><u>Imprecision:</u> Only 146 NCE scores analyzed out of the 205 collected</p> <p><u>Publication bias:</u> None</p> <p>Study Two: <u>Methodological flaws:</u> Heterogeneity</p> <p><u>Inconsistency:</u> None</p> <p><u>Indirectness:</u> None</p> <p><u>Imprecision:</u> None</p> <p><u>Publication bias:</u> None</p>
Design				Implications	
<p>Study One: Retrospective Case Control Study</p> <p>Study Two: Literature Review</p>				<p>Study One: Both CBT and GPA correlated with higher scores and first-time pass rate on NCE for student nurse anesthetists. However, CBT only improved scores for students with GPA <3.50</p> <p>Study Two: Overall evidence supports undergraduate GPA as an admission criterion while GRE may be dependent on how long applicant has been out of educational setting and should be explored to possibly be revised as a criteria basis.</p>	

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: To validate a decision-making algorithm for admitting master's students to an advanced practice program in nursing</p> <p>Study Two: To identify factors contributing to high attrition rates for student nurse anesthetists in uniformed services.</p>	<p>Study One: <u>Primary Outcome:</u> To determine success rates when students met minimum entry GPA scores and to compare and contrast significance of undergraduate cumulative grade point average (UGPA) to undergraduate nursing grade point average (NSGGPA).</p> <p><u>Secondary Outcome:</u> To evaluate the significance of Graduate Record Examination (GRE) scores when students meet both GPA requirements.</p> <p>Study Two: <u>Primary Outcome:</u> To determine if cognitive factors such as Undergraduate Grade Point average (UGPA), and Graduate Record Examination (GRE) scores predict success in academic programs</p> <p><u>Secondary Outcome:</u> To determine if non cognitive factors such as demographics, age, social, and psychological factors predict success in academic programs</p>	<p>Study One: Subjects: 738 master's level nursing students between the years 1999-2004</p> <p><u>Setting:</u> Rush University College of Nursing, Master of Nursing Program</p> <p>Study Two: <u>Subjects:</u> 180 students who matriculated to the USUHS RNA program between 2005 and 2011</p> <p><u>Setting:</u> Uniformed Services University of Health Sciences at the Daniel K. Inouye Graduate School of Nursing in Bethesda, Maryland</p>	<p>Study One: t-test analysis: revealed independent variables (CUMGPA, NSGGPA, and GRE) could be predictive of dismissal status on a univariate basis Chi-square analysis: To compare students with a GPA <3.25 and/or NSGGPA <3.0 and their success or dismissal. Second chi-square analysis to compare influence of both GPA and GRE scores</p> <p>Study Two: Qualitative data were analyzed using content analysis inductively derived and defined by 2 reviewers (a CRNA and a qualitative data expert/nurse practitioner).</p> <p>A data analyses were conducted using SAS software (SAS Institute Inc) with an α level of .05, two-tailed</p>	<p>Study One: When students only met 1 of 2 GPA requirements, dismissal rate was 15 times higher than if students met both criteria. When looking at all three independent variables, if students only met one variable, dismissal rate was 7 times higher than students who met at any combination of at least two criteria.</p> <p>Study Two Female were 3.32 times more successful than males ($p=.01$) with 3.32x more success rate. Each additional year in age equaled a 13% decrease in success odds ($p<.01$). Higher UGPA increased odds of success by 7.12 times ($p=.04$). Higher analytic ($p=.04$), and GRE ($p<.01$) scores increased odds of success. 19 students unsuccessful due to family or personal problems.</p> <p>Implications</p> <p>Study One: When considering NSGGPA, GRE, and UGPA average, the combination of any two were as successful at predicting success when compared to using all three.</p> <p>Study Two: Female gender, younger age, higher UGPA, and GRE scores had greater success rates. Personal and family tribulations accounted for largest withdrawal or dismissal.</p>	<p>Study One: <u>Methodological flaws:</u> Convenience sampling</p> <p><u>Inconsistency:</u> None</p> <p><u>Indirectness:</u> Not attributable to specialties such as anesthesia. Not specific to NCE scores.</p> <p><u>Imprecision:</u> No confidence interval, no p values</p> <p><u>Publication bias:</u> None</p> <p>Study Two: <u>Methodological flaws:</u> Convenience Sampling</p> <p><u>Inconsistency:</u> None</p> <p><u>Indirectness:</u> Not comparing results to NCE scores</p> <p><u>Imprecision:</u> Lack of confidence intervals</p> <p><u>Publication bias:</u> None</p>
Design					
<p>Study One: Did not state, but appears to be a retrospective cross-sectional study</p> <p>Study Two: Retrospective cohort study</p>					

Appendix B

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.305 ^a	.093	.088	40.60252	2.058

a. Predictors: (Constant), EGPA

b. Dependent Variable: NCE Total

Table B1: Assumption 3, No observation errors (residuals)

Casewise Diagnostics

Case Number	Std. Residual	NCE Total	Predicted Value	Residual
54	-3.084	367.00	492.2111	-125.21108

a. Dependent Variable: NCE Total

Table B2: Assumption 4, No Outlier in Data

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.301 ^a	.091	.086	39.57543	2.088

a. Predictors: (Constant), EGPA

b. Dependent Variable: NCE Total

Table B3: EGPA's Correlation to NCE Total Score VariationANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	26910.479	1	26910.479	17.182	.000 ^b
Residual	269388.946	172	1566.215		
Total	296299.425	173			

Table B4: ANOVA Analysis of EGPA and NCE Total Scores

** The regression model equation is $Y' = 342.003 + 46.265(X)$, where Y' is the predicted NCE Total score and X is the given UG GPA.

Table B5: Correlation of EGPA to NCE Total scores

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	342.003	38.729		8.831	.000	265.557	418.449
EGPA	46.265	11.161	.301	4.145	.000	24.234	68.295

a. Dependent Variable: NCE Total

Table B6: Correlation of EGPA to Individual NCE Scores

		Basic Sciences	Technology	Basic Principles	Advanced Principles
Basic Sciences	Pearson Correlation	1	.221**	.363**	.357**
	Sig. (2-tailed)		.003	.000	.000
	N	174	174	174	174
Technology	Pearson Correlation	.221**	1	.307**	.357**
	Sig. (2-tailed)	.003		.000	.000
	N	174	174	174	174
Basic Principles	Pearson Correlation	.363**	.307**	1	.492**
	Sig. (2-tailed)	.000	.000		.000
	N	174	174	174	174
Advanced Principles	Pearson Correlation	.357**	.357**	.492**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	174	174	174	174

**. Correlation is significant at the 0.01 level (2-tailed).

Table B7: Correlation of EGPA to Basic Sciences

Control Variables		EGPA	Basic Sciences
Technology & Basic Principles & Advanced Principles	Correlation	1.000	.120
	<u>EGPA</u> Significance (2-tailed)	.	.119
	df	0	169
	Correlation	.120	1.000
	<u>Basic Sciences</u> Significance (2-tailed)	.119	.
	df	169	0

Table B8: Correlation of EGPA to Equipment, Instrumentation, and Technology

Control Variables		EGPA	Technology
Basic Principles & Advanced Principles & Basic Sciences	Correlation	1.000	-.057
	<u>EGPA</u> Significance (2-tailed)	.	.456
	df	0	169
	Correlation	-.057	1.000
	<u>Technology</u> Significance (2-tailed)	.456	.
	df	169	0

Table B9: Correlation of EGPA to Basic Principles of Nurse Anesthesia

Control Variables		EGPA	Basic Principles
Advanced Principles & Basic Sciences & Technology	Correlation	1.000	.172
	<u>EGPA</u> Significance (2-tailed)	.	.024
	df	0	169
	Correlation	.172	1.000
	<u>Basic Principles</u> Significance (2-tailed)	.024	.
	df	169	0

Table B10: Correlation of EGPA to Advanced Principles of Nurse Anesthesia

Control Variables		EGPA	Advanced Principles
Basic Sciences & Technology & Basic Principles	Correlation	1.000	.107
	<u>EGPA</u> Significance (2-tailed)	.	.164
	df	0	169
	Correlation	.107	1.000
	<u>Advanced Principles</u> Significance (2-tailed)	.164	.
	df	169	0