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Admission Predictors of Student Success on the Physician Assistant National Certifying Exam

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2019

Abstract

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MMSc, Alderson Broaddus College, 2007

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Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

In 2009, a local physician assistant (PA) program lost accreditation due to decreased success in licensure pass rates on the Physician Assistant National Certification Examination (PANCE). In response, the program's admissions committee required additional metrics for accepting quality candidates more likely to pass the licensure examination on the first attempt. The purpose of this study was to gain a better understanding of these metrics, specifically the relationship between demographics, prerequisite admission requirements, and PANCE success. The theoretical framework and conceptual model shaping this study was Bordage's illumination and magnify framework and Swail's geometric model of student persistence and achievement. The purpose of this nonexperimental quantiative study was to investigate the relationhip between the demographic variables, preadmission requirements, and their relationship to predict first-time PANCE success. Using archival data, total sampling ($N = 107$) included all students who took the PANCE from 2012 to 2016. Binary logistic regression results showed that The Graduate Record Examination quantitative reasoning score was statistically significant ($p < .01$), and a poor predictor of success, secondary to not having a significant effect on the odds of observing PANCE success. The overall results did not provide admission predictors of student success on the first-time attempt to pass PANCE. The study has significance for social change in the area of admissions policy development that supports a nonbiased process for the identification and selection of quality PA candidates.

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Section 1: The Problem

In 1968, a local physician and leading visionary in rural medicine founded one of the first physician assistant (PA) programs in the country. The founder recognized a need for PAs to support the delivery of medical care in underserved areas, notably the Appalachian region. The program established in a small, rural private university, became the nation's first bachelor's degree designed to educate PAs. Fifty years later, the program continues to support the need for PAs in the rural parts of the United States (Myers, 1977).

Throughout the local program's history several changes in the student population and the curriculum taught to prepare the PA student for clinical practice have occurred. Originally, candidates for training in the PA program were former military corpsmen or Army combat medics, all of whom were male, and many of whom had recently served in the Vietnam War. Through the years, the student population has transitioned from former military personnel to young adult graduate students who are majority women. In 2017, women composed 75% of all students entering PA program across the nation (Central Application Service for Physician Assistants [CASPA], 2015; Physician Assistant Education Association [PAEA], 2018d).

The program was initially a 5-year program that combined medical science and liberal arts curricula (Myers, 1977). During its 50-year history, the program has undergone significant academic modifications while adhering to a PA education model based on competency (Bushardt, Booze, Hewett, Hildebrandt, & Thomas, 2012). A major

transition occurred in 2004 when the program moved from a 5-year bachelor's degree program curriculum to a 36-month master's degree program curriculum. The current configuration change occurred in 2010 when the program was modified to a 27-month intensive medical science curriculum.

The shortening of the required term to receive a PA degree at the school under study reflects a national trend in PA education in response to the need for more medical professionals, including PAs, to augment the primary physician shortage in order to care for a growing and ageing population in the United States. In fact, with the retirement of the baby boomer generation and the adoption of the Patient Protection and Affordable Care Act (PPACA or ACA) of 2010 (i.e., Obamacare), job growth projections for health care providers is expected to increase by 30% during the next 10 years (U.S. Bureau of Labor Statistics, U.S. Department of Labor, 2016). The increase in population requiring medical care has swelled the demand for advanced practice providers, such as PAs. As Hooker, Cawley, and Everett (2011) noted, the projected need for PAs would increase by 72% by the year 2025 to meet the primary care physician shortage.

The increased national need for PAs has resulted in an expansion in the number of PA programs throughout the United States, as well as an increase in the number of PA applicants; however, the higher number of PA programs still cannot meet the demand. For example, in 2012 there were approximately 176 PA programs nationwide; in 2018, there were 235 accredited programs (ARC-PA, 2018a). The increase in national programs allowed for accommodating approximately 8,000 PA students nationwide, but the

application pool consisted of nearly 26,000 prospective students (CASPA, 2015, 2016). The PA program under study has witnessed an increase in applications from 89 in 2011 to 1855 in 2016, a 400% increase in the course of 5 years. (CASPA, 2016). Yet currently, the program operates with a limited number of cohort student seats (36) available per academic year.

A development that might influence the local program's ability to meet the demand for the projected need of trained PAs is that the number of applicants has increased significantly from 2011 to 2016. The 2011 through 2016 increase in the national applicant pool and the number of applicants to the local program are represented in Figure 1 (CASPA, 2016). A search of the PA program's public information records was conducted in an attempt to find the national applicant pool numbers and the local number of applicants prior to 2011; however, the previous director of the local PA program did not maintain that information.

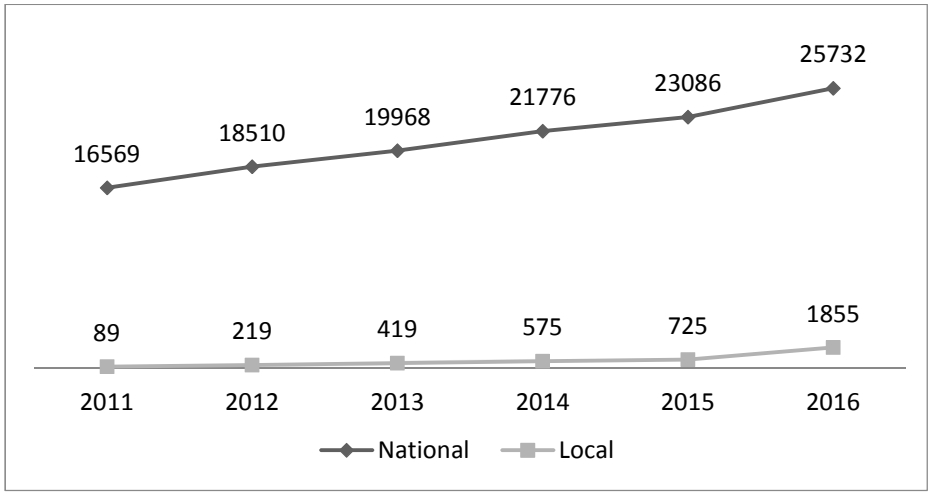

Figure 1. National versus local program applicant pool.

Even though the number of applicants to the local program has increased since 2011, the qualifications of the recent applicants have decreased, namely in grade point average (GPA). When comparing the national applicant pool to the local program applicant pool for 2014 through 2016, as revealed in Figure 2, the GPA qualification has decreased. Information for the National CASPA GPA and the GPA of applicants to the local program is not available prior to 2014 (CASPA, 2016).

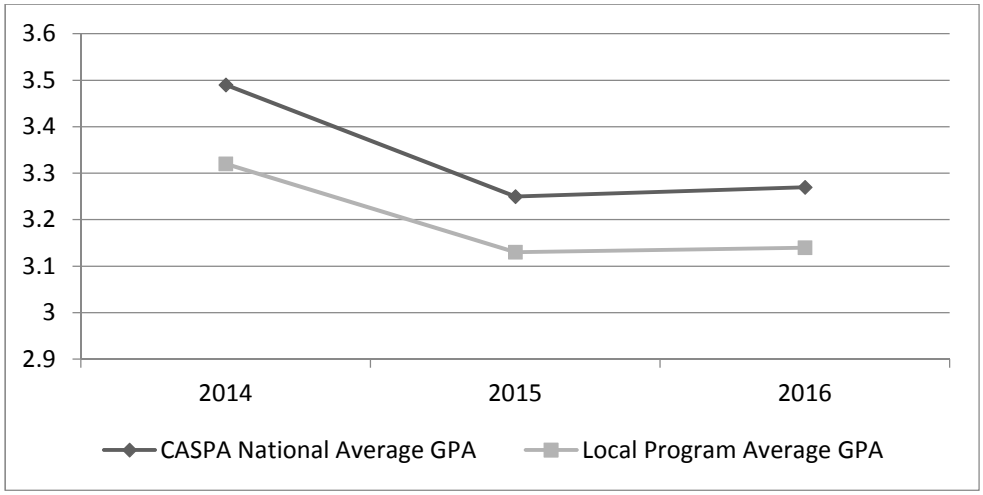

Figure 2. Comparison of CASPA average GPA versus local program average GPA.

In the local PA program, a gap in understanding exists among faculty regarding the predictability between preadmission criteria and PANCE success. This gap in practice may be affecting the ability of the admissions committee to identify and select qualified applicants for the PA program. Much of the gap in practice is related to the lack of data collection and analysis, which must be resolved at the local program.

The local program is confronted with two different issues. First, the local PA program has an issue with the data available. Although application numbers and student

GPA data for each application cycle were tracked and publicly posted at the local program, currently there is no record of the total applications before 2011 (Figure 1). In addition, the applicants' average GPA before 2014 is unavailable (Figure 2) (CASPA, 2016). This issue has hindered the program in its self-assessment process.

The second issue is that the decrease in qualified applicants affects the quality and attrition of admitted students to the program (McManus & Sondheimer, 2017). Minimally qualified applicants can affect PA programs by limiting their ability to meet accreditation requirements related to overall first-time pass rates on the PANCE, which currently is defined as a first-time pass rate equal to or greater than 83% (ARC-PA, 2015). Selecting a minimally qualified candidate can contribute to student attrition from the PA program, which has an adverse effect not only on the student, but also on the PA program as a whole. PA students who do not pass the national certification examination, or those who exit the program due to underperformance, are unable to seek employment or medical licensure as a PA and are often laden with a large amount of debt with limited means to pay off that debt (Baker, 1994).

The 2016 to 2017 graduate catalog stated the tuition and fees for the local PA program, known as a direct cost for the entire program, was $85,780 and continues to increase yearly. In addition to tuition and fees, students must fund living expenses, known as indirect costs, which can be equivalent to the cost of tuition and fees. The total estimated cost for completing the PA program currently can range from $116,000 to $133,000. The amount of debt incurred by a student who cannot pass the national

certification examination has serious, socioeconomic, psychological, and emotional impact on a student's well-being and often their personal self-esteem is distressed (Baker, 1994; Jones, 1986; Larsen, 2002; McClure, 2000).

In addition to the student's burden, educational institutions suffer when selection committees accept an unqualified candidate. Financially, institutions lose out on revenue when students do not complete the program (Jones, 1986). For example, the local PA program reported a loss of 83 students due to academic attrition during the period 2006 through 2016. Due to the disenrollment of these PA students, the institution lost more than $7,000,000 in tuition and fee revenue. In addition to the shortfall of income, faculty and fellow students experience an emotional sense of loss when their classmates fail to progress within the program (Baker, 1994; Larsen, 2002). Faculty members become disheartened when faced with the disappointing reality that their hard work was not adequate in facilitating student success as measured by graduation rates and passage of the PANCE (Baker, 1994).

An additional factor affecting the local program is the decreased academic quality of PA student applicants. For instance, both the program and national average cumulative GPA has trended downward since 2014 (Figure. 2). In contrast, from 2011 to 2016, the national first-time pass rates on the PANCE have continued to remain in the upper 90th percentiles, peaking at 96% in 2016 (National Commission on Certification of Physician Assistants [NCCPA], 2016b; NEJM Knowledge+ Team, 2015). The PANCE scores are important as a significant indicator of a PA program's ability to educate effectively and

maintain its reputation is the program's national certification first-time pass rate (Gonzales, 2014). The program first-time pass rate is monitored by both the National Commission on Certification of Physician Assistants (NCCPA) and the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA), the national accreditation body for PA programs (NEJM Knowledge+ Team, 2015). ARC-PA requires all PA programs to publish their PANCE pass rates and make these rates available to the public (ARC-PA, 2016b, 2017).

Since 2013, in accordance with ARC-PA policy, any PA program that fails to maintain a national certification first-time pass rate of 83% or higher is required to submit additional program analysis (ARC-PA, 2015). Therefore, admissions boards are tasked with recruiting and accepting PA students who are likely to succeed on the PANCE from an applicant pool that has been increasing in quantity (Figure 1) while declining in quality (Figure 2). Thus, a better understanding of the information available to the admissions selection committee, such as demographics, prerequisite admission requirements, and GRE scores is required to support committees in making data driven decisions when selecting students, including infering from the data which students might pass the PANCE.

The ARC-PA requires PA programs to evaluate and assess themselves through continuous data collection and analysis. ARC-PA Standards (2016b) define *analysis* as the “study of compiled or tabulated data interpreting cause and effect relationships and trends, with the subsequent understanding and conclusions used to validate current

practices or make changes as needed for program improvement" (p. 28). This continual process is called program self-assessment and is described by ARC-PA (2017c) as the "review of the quality and effectiveness of the program's educational practices, policies, and outcomes" (p. 3). Program leadership is required to conduct meaningful and continuous program self-assessment, as annotated in ARC-PA standard A2.09d and C1.01 (ARC-PA, 2016b). The self-assessment process is expected to include an analysis of PANCE performance and its correlation to the program's admissions selection process as reported to ARC-PA in Appendix 13H of the PA program's Self Study Report (SSR) and has a direct implication on the program's admissions policy (ARC-PA, 2016b). The quality of the student applying to the local PA school during the period 2006 to 2016 had declined as indicated by high attrition/deceleration rates (23%) and below national average first-time PANCE pass rates as noted in Figure 3. Making the wrong decision in the admissions selection process has a far-reaching and significant effect on the student, the student's faculty, the student's peers, and the university. Consequently, it is imperative that a sound, research-based selection process be studied and admission's policy revised or developed at this PA program to ensure that high-quality students are admitted.

The Local Problem

The problem facing the local PA program is recurrent PANCE first-time pass rates below the national examination pass rate; a red flag for the accreditating body. The admissions committee has aimed to select candidates more likely to succeed on their first

PANCE attempt, yet it was unknown which potential factors contributed to increased and/or decreased first-time pass rates at the local level with regard to admissions policy and procedure. The program's 2006 graduating class was the last PA class to score above the national first-time pass rate. During the following decade, no graduating class in the local PA program had scored at or above the national exam pass rate on the PANCE. Figure 3 reveals that the first-time success rate on the PANCE would decline and then improve, then decline and then improve again, marking an all-time low of 69% in 2013 and remaining below the national average of approximately 96% first-time pass rate (NCCPA, 2013, 2016b). There has been an increase in PANCE performance since 2014. However, the local program has not conducted an analysis as to why this increase has occurred and can make no determination in respect to future PANCE performance (Figure 3) (NCCPA, 2016b).

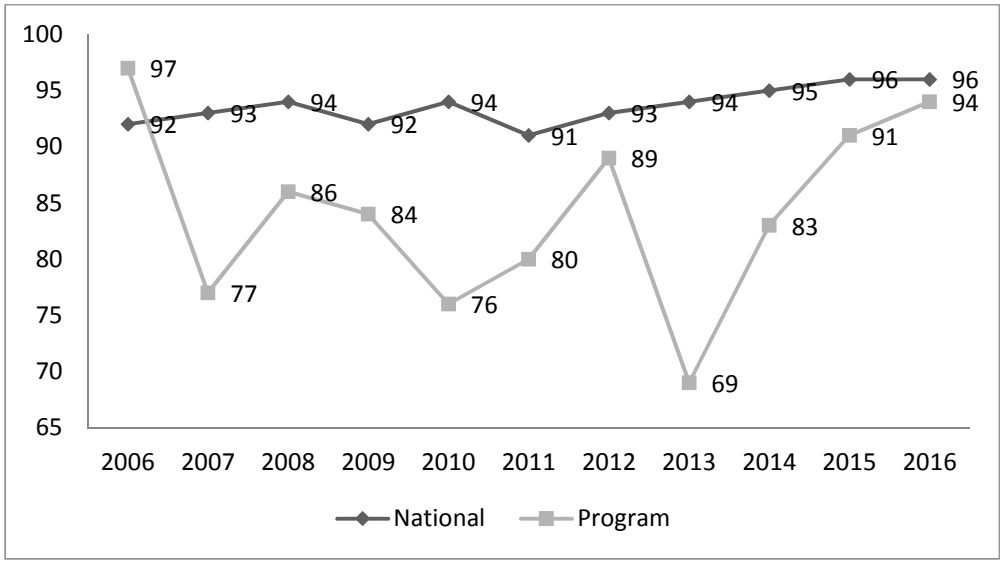

Figure 3. Comparison of national versus program PANCE pass rates by percentage.

During the last decade, there has been no effort to revise the program's admissions requirements or understand the predictability of admissions requirements and PANCE success. Consequently, according to the admissions committee report in 2016, the local program administrators and faculty continued to base admissions requirements and policy standards on past experiences, with complete disregard to any form of data analysis that may have been predictive of PANCE success (M. Holt, personal communication, July 2014). There remains a need for the admissions committee to select candidates more likely to succeed on their first attempt at the PANCE. A better understanding of the predictors of student success on the PANCE must be determined through data collection and analysis, as required by ARC-PA, to select the best-qualified applicants for the program. Recurrent below average national certification pass rates have a direct effect on the PA students and an indirect effect on the program's accreditation status, student recruitment, and retention (Figure. 3) (NEJM Knowledge+ Team, 2015). Based on the consistent below-average performance as compared with the national PANCE pass rates and the cyclical nature of this institution's pass rates, a need exists to revisit the program prerequisites, as well as other factors that might influence the PANCE success rate (Figure. 3).

Academic medicine researchers have previously established a relationship between the different medical program admissions prerequisites and prerequisite predictability when it comes to student certification exam success (Brown, Imel, Nelson, Hale, & Jansen, 2013; Buttina, Wyant, Remer, & Cardom, 2017). The program faculty and administrators

generally define prerequisite requirements, which vary from program to program (Brown et al., 2013). The local PA program's admission requirements include the completion of a bachelor's degree from an accredited university; an appropriate GRE score for analytical writing; prerequisite course GPA of 3.0; CASPA science GPA of 3.0; and a minimum cumulative GPA of 3.0. Prerequisite courses are listed in Table 1.

Given the present issue with cyclical low PANCE first-time pass rates, the admissions requirements at the local program need to be reviewed and augmented with variables that relate to increased PANCE success. Nationally, limited research has been completed on whether or not student demographic variables and prerequisite admissions requirements predict PANCE success when compared with the number of programs that have been developed during the last 10 years. (Andreef, 2014; Butina et al., 2017).

Table 1

Prerequisite Courses

Courses	Semester hours required
Anatomy and physiology I and II	8
Microbiology with a laboratory	4
General chemistry with a laboratory	4
Organic chemistry with laboratory or Biochemistry with laboratory	4
Statistics	3
Upper-level science (must be biology or chemistry courses at the 300 or 400 level)	8

Therefore, the demographic data used consisted of the students' age, gender, ethnicity, state of residence, prior health care experience, type of bachelor's degree major, and undergraduate institution attended to assess whether or not these variables

relate to PANCE success. Also, evaluated were the traditional metrics of prerequisite admission variables, including GRE analytical writing, verbal reasoning, and quantitative reasoning scores; prerequisite GPA; CASPA science GPA; and cumulative GPA. The demographic variables and the prerequisite admission variables are the independent variables. The dependent variable, PANCE success, was defined by either passing or failing the PANCE on the student's first attempt.

Rationale

Evidence of the Problem at the Local Level

After being granted provisional accreditation from ARC-PA in 2010, the 27-month PA program implemented a newly developed admissions process for the 2011 student cohort. The local program continued to use the same admission requirements as in the previous program, prior to 2011, and followed a basic principle of "if the student met the minimum requirements for admission, they should be accepted, and the PA class filled as quickly as possible" (M. Holt, personal communication, July 2014). Before the new admission's process began in Fall 2010, the relationship between preadmission prerequisites and PANCE success had not been examined at the local program leading to an under-appreciation of the predictive relationship between admission criteria and student PANCE success (M. Holt, personal communication, July 2014). The local program's admissions committee recognized in 2010 and again in 2016 a lack of understanding in the predictability of admissions requirements and success on the national certification examination. The local program's faculty and administration

identified the lack of data collection and analysis as it pertains to demographics and admissions prerequisites as a program weakness during its self-assessment process The identified weakness had been previously noted in the 2012 consultant visit report, 2012 admissions committee report and 2016 faculty meeting discussions (M. Holt, personal communication, July 2014). According to the admissions committee report in 2016 there has been no research conducted at the local program level on the predictability of student demographics, GRE scores, or prerequisite admission requirements; and PANCE Success.

Accreditation Review Commission on Education for the Physician Assistant

In 2009, the program underwent an accreditation visit from ARC-PA, which resulted in the program losing its accreditation status. Following the site visit, the site visitors cited 67 observations where accreditation standards were not met. The ARC-PA site visitors noted the lack of analysis on the part of the program administration regarding the admissions standards and PANCE success, along with poor PANCE success among the graduates during their 2009 site visit. Among the other related citations were Standard C1.01, the observation concerning the faculty's collection of graduate data from NCCPA, but the faculty did not analyze the predictors of PANCE success or graduate performance on PANCE. Further observations detailed there was no identifiable process for ongoing program assessment. When referring to ARC-PA Standard A2.11d and A2.22f, -the observation was noted that data analysis was a weakness and absent ongoing analysis of data made it difficult to implement the program's future development. Similar

observations were made during the 2013 site visit to the local program to include the programs poor PANCE performance among graduates and the faculty's lack of data analysis relating to graduate PANCE performance (ARC-PA, 2009, 2013).

Administrators and faculty identify the local problem. Although some improvement has occurred in the first-time pass rates at the local PA program, the pass rates continued to fall below the national average (Figure 3). The two previous program directors stated that a significant factor in the loss of accreditation was poor PANCE performance of graduating students and the nonexistent practice of data analysis by the program faculty. Although the program administration acknowledges in both its 2009 and 2013 self-study report to ARC-PA the need for improvement in the self-assessment process, there was no recognition of the issue of poor PANCE performance. The admissions committee in 2016 admitted to not understanding the relationship that may exist between prerequisite requirements and PANCE success, which hinders both the selection of students and the future development of the local program.

After the loss of accreditation in 2009, a program consultant specializing in PA program development and accreditation was hired to advise the program during its restructuring and provisional accreditation in 2010. The same consultant advised the program in preparation for the accreditation site visit in 2013. The consultant stated to the program administration and faculty during a simulated accreditation visit in 2012 that "there seem to be no good predictors for student success" (Consultant, personal communication, February 2012). The statement was based on the consultant's overall

experience as a former program director and ARC-PA accreditation site visitor. The consultant's statement underscored the gap in practice that exists in the program related to data collection and analysis of possible relationships between admission requirements and PANCE success at the local level and those same issues recognized in other PA programs nationally (M. Holt, personal communication, July 2014; Consultant, personal communication, February 2012). Putting this in perspective, currently 23 PA programs exist on probation nationwide, many for failure to conduct proper self-assessment, poor PANCE results, and lack of analysis with regard to admission predictors (ARC-PA, 2017b, 2017c). The gap in practice or lack of understanding in regards to the predictability of demographics, GRE scores, and admissions prerequisites, as they relate to student PANCE success, underscores the importance for studying these relationships at the local level.

A gap remains in practice in conducting program data analysis and self-assessment at the local program. The lack of a self-assessment within the program, but specifically of the program's admission process and PANCE results, was identified in the 2009 self-study report to the ARC-PA and once again noted in the 2013 self-study report to the ARC-PA (ARC-PA, 2009, 2013).

The lack of program self-assessment of admission variables and their predictability regarding PANCE success is problematic and has contributed to the lack of program public information regarding the graduating classes from 2006 to 2014. Moreover, in the decade since 2006, according to the local program's faculty disscussion

in 2016, there have been no attempts by the program faculty to study the predictability of admission prerequisites and PANCE success. The program's admissions committee requires a method for identifying students who might meet the demands of an academically rigorous PA program and successfully pass the PANCE. Any selection method must be acceptable to the program's stakeholders and maintain its validity and reliability in selecting the most qualified candidate for the program (McManus & Sondheimer, 2017). The local program admissions committee and faculty relied heavily on an admissions rubrics and interview sessions when making admissions decisions. The admissions committee in conjunction with the program faculty developed these rubrics with little to no consideration for how such data can inform or predict a student's ability to successfully complete the program, as well as perform satisfactorily on the PANCE (M. Holt, personal communication, July 2014). Failing to evaluate admissions requirements and make evidence-based change hampers the program admissions committee's ability to recruit, select, and retain qualified students. It may also affect the overall candidate pool by influencing the program's overall reputation and mission, therefore increasing the possibility that well-qualified candidates would be less likely to apply to the program (Butina et al., 2017).

Thus, a need exists to evaluate the admissions criteria to determine effective variables for predicting PANCE success among PA students at the local program. The inability to generalize research results from other programs and contexts, as noted by Brown et al. (2013), contributes to the local gap in practice when it comes to

understanding how preadmission requirements and PANCE success are related. This inability, in turn, affects the program administrator's ability to develop and employ evidence-based admissions policy and the admissions rubrics. The creation of a more efficient admissions rubric based on data analysis and interpretation may provide the admissions committee with a more selective tool for evaluating prospective students for entry into the PA program, thereby increasing the probability of student success.

In summary, a gap exists concerning the predictability between preadmission criteria and PANCE success in the local PA program that has contributed to a gap in practice. This gap in practice may be affecting the ability of the admissions committee to select qualified applicants for the PA program.

Evidence of the Problem From the Professional Literature

A search of the professional literature provides limited published research in the area of the use of prerequisite admission requirements in predicting overall PANCE success. Since 1967, researchers have investigated different areas of preprofessional education and the relationship to overall student program success, which is often defined simply as graduation from a PA program (Butina et al., 2017). The relative lack of literature related to the problem may be a result of the short history of the PA profession, in addition to the small number of programs devoted to the education of PAs during the last 50 years (Andreeff, 2014). Experienced PA educators recognize the challenge faced by the PA education community when it come to understanding the predictability of PANCE success (Ennulat, Garrubba, & Delong, 2011; Yealy, 2017).

Another national issue within PA educational research is the criteria used at each PA program to qualify potential PA students for admissions varies considerably across programs. The difference in admissions standards among programs makes it difficult to generalize between the programs on a national level. Jones and Miller (2002) showed that many different prerequisite criteria were required within the PA programs that existed in 2002. While Jones and Miller's observations are over 15 years old, the ramifications of inconsistent admissions requirements remain today as 235 PA programs, each with their own admission requirements and prerequisite criteria have emerged (PAEA, 2018).

During the 2015 National Physician Assistant Education Association conference, PA educators discussed the implications of nonstandardized admissions requirements, especially as numerous PA programs continue to enter the profession. The expansion of new PA programs is contributing to the inability of PA program administrators to generalize established research across programs regarding the predictability of admissions requirements and PANCE success. To address this issue, in 2018, the PAEA added a question to the annual program director survey concerning the variability of admissions requirements among the PA programs (PAEA, 2018). The difficulty in generalizing admissions standards affects the program under study and contributes to the overall problem and gap in practice for using admissions criteria to predict PANCE success both locally and nationally (Ennulat et al., 2011).

The ability for a student to apply to PA programs is enhanced by CASPA, a web-based and nationally used application service for PA admissions. The admissions process

has also become more competitive, as the number of applicants continues to increase annually (Figure. 1). The burden placed on admissions committees across PA programs in student selection is hindered by the lack of data analysis and understanding in the predictability of PANCE success (Ennulat et al., 2011; Yealy, 2017).

Much of the published research regarding preadmission requirements and PANCE success are limiting in that they most often focus on the differences in preadmission requirements among programs or are limited to a single program or population (Andreeff, 2014; Brown et al., 2013; Butina et al., 2017). There is difficulty generalizing research findings from one program to another due to inconsistent admission requirements for PA programs nationally (Brown et al., 2013).

Definition of Terms

Academic summary sheet: The academic summary sheet is an instrument produced by the local university's register's office for use in the local PA program's admissions process. The sheet includes the prerequisite grade point average, cumulative grade point average, Central Application Service for Physician Assistants (CASPA) science grade point average, and prerequisite course work completed by the student.

Accreditation Review Commission on Education for the Physician Assistant (*ARC-PA*): "The accrediting agency that protects the interests of the public and physician assistant profession by defining the standards for PA education and evaluating PA educational programs within the territorial United States to ensure their compliance with those criteria" (ARC-PA, 2017, p. 1, 2017a).

Age: The age of the student at the time of enrollment into the PA program as determined by the registrar's office based on information within the student management system. Age is a continuous variable defined at the time of enrollment in the PA program.

Central Application Service for Physician Assistants (*CASPA*): CASPA is the application service for all students in the United States applying to PA programs nationwide, and operated by the Physician Assistant Education Association (PAEA) (CASPA, 2015).

Cumulative grade point average (*cGPA*): The cumulative grade point average for a student's undergraduate academic work as determined by CASPA (CASPA, 2015).

Educational Testing Service (*ETS*): The administrators of the graduate record examination used for graduate-level admissions (Educational Testing Service [ETS], 2016).

Ethnicity: The ethnicity of the student as determined by the registrar's office based on information within the student management system. Gender was a dichotomous variable defined as either Caucasian or other than Caucasian.

Gender: The gender of the student as determined by the registrar's office based on information within the student management system. Gender was a dichotomous variable defined as either male or female.

Graduate Records Exam (GRE) Analytical Writing (AW): The GRE analytical writing score of the student as recorded by CASPA. GRE analytical writing score is a continuous variable defined at the time of enrollment in the PA program (CASPA, 2015).

Graduate Records Exam (GRE) Quantitative Reasoning (QR): The GRE quantitative reasoning score of the student as recorded by CASPA. GRE quantitative reasoning score is a continuous variable defined at the time of enrollment in the PA program (CASPA, 2015).

Graduate Records Exam (GRE) Verbal Reasoning (VR): The GRE verbal reasoning score of the student as recorded by CASPA. GRE verbal reasoning score is a continuous variable defined at the time of enrollment in the PA program (CASPA, 2015).

Health care experience (HCE): The health care experience as determined by the registrar's office based on information within the student management system. Healthcare experience was a dichotomous variable defined as either Yes HCE or No HCE.

Home state: The permanent state of residency as determined by the registrar's office based on information within the student management system. Home state was a dichotomous variable defined as either home state (WV) or other than home state (non-WV).

National Commission on Certification of Physician Assistants (*NCCPA*): "The National Commission on Certification of Physician Assistants is the only certifying organization for physician assistants in the United States" (National Commission on Certification of Physician Assistants [NCCPA], 2016a, p. 1).

PANCE Success: A student, passing the national certification examination for physician assistants on the first attempt (ARC-PA, 2017a).

Physician assistant (*PA*): A nonphysician medical provider educated at the graduate level (ARC-PA, 2017a).

Physician Assistant Clinical Knowledge Rating and Assessment Tool (*PACKRAT*): The PACKRAT is a two-stage self-assessment examination developed by PAEA, to test the medical knowledge level of PA students in the didactic and clinical years (PAEA, 2017).

Physician Assistant Education Association (*PAEA*): "PAEA is the only organization representing PA educational programs nationwide. PAEA's mission is to pursue excellence, foster faculty development, advance the body of knowledge that defines quality education and patient-centered care, and promote diversity in all aspects of physician assistant education" (Physician Assistant Education Association [PAEA], 2017, p.1).

Physician Assistant National Certifying Examination (*PANCE*): The national certification exam required of all physician assistant graduates to practice medicine and gain medical licensure in the United States (NCCPA, 2016b).

Physician Assistant Program (*PAP*): A professional program of study designed to train the non-physician medical provider at the graduate level and accredited by ARC-PA (ARC-PA, 2017).

Prerequisite grade point average (*pGPA*): The prerequisite grade point average as determined by the registrar's office based on student performance in the prerequisite courses as required for admission to the PA program.

Science Grade Point Average (*sGPA*): Central application service for PAs calculated science GPA. This number represents the student's total science cumulative grade point average for post-baccalaureate and undergraduate school as determined by CASPA. This average is computed by summing the points earned for each science course and dividing this number by the science semester hours attempted in postbaccalaureate and undergraduate schools (CASPA, 2015).

Type of bachelor's degree: The type of bachelor's degree of the student as determined by the registrar's office based on information within the student management system. Type of bachelor's degree was a dichotomous variable defined as either Bachelor of Arts (BA) or Bachelor of Science (BS).

Undergraduate institution: The undergraduate institution of the student as determined by the registrar's office based on information within the student management system. The undergraduate institution was a dichotomous variable defined as either in state institution (WV) or outstate institution (non-WV).

Undergraduate major: The undergraduate major of the student as determined by the registrar's office based on information within the student management system. Undergraduate major was a dichotomous variable defined as either hard sciences or not hard sciences. Hard sciences, for example, are biology, chemistry, anatomy, and physics. Not hard sciences are english, psychology, and sociology.

Significance of Study

An understanding of the relationship between demographics, prerequisite admission requirements, GRE scores, and PANCE success will assist the program administrator in determining which students are more likely to meet the program's academic demands and successfully pass PANCE, resulting in an improved program national PANCE performance rate. Input is an essential aspect of output quality or outcome (Scheerens, Luyten, & Van Ravens, 2011). As the student applicant pool widens and the local program continues to fall short in meeting the national PANCE first-time pass rate, the admissions committee's ability to determine the best candidates for admission to the PA program becomes critical to future program success.

Moreover, the study is significant in potentially helping PA students succeed. Durning et al. (2015) related that the most crucial indicator of medical competence is board certification and that a specific cost to the provider occurs when they are unable to become certified. Dr. Andreeff, a scholar who investigates PANCE pass rate prediction from prerequisite data, stated while at the national conference of PAs in 2015 that "Identifying predicting factors of PANCE passage may help to identify a student's ability to pass the PANCE early in the curriculum, as well as improve program quality and graduate success" (Strong, 2015, p. 1). Thus, identifying candidates who can succeed in the PA program through appropriate admissions policy and rubrics may help PA students, as well as program administrators.

In order to identify prospective candidates, the local PA program admissions committee requires a valid, evidence-based admissions rubric. Brateanu, Yu, Kattan, Olender, and Nielsen (2012) conducted a retrospective study and developed a nomogram to predict the probability a physician in a graduate medical education program would pass the internal medicine examination. Although the internal medicine examination and PANCE are two different examinations, PAs are trained in the medical model, and PANCE certification is similar to medical board certification, allowing for comparison of the two populations. The study result supports using an established admissions rubric for the evaluation of preadmission requirements thereby allowing admissions committees to identify students who will gain licensure exam success. The present study is therefore significant in providing evidence to facilitate the creation of this rubric at the local level.

Scholars have noted the need for further research into demographic and prerequisite variables that influenced PANCE success. Both Andreeff (2014) and McDaniel, Thrasher, and Hiatt (2013) related gaps of research in their selected areas and advocated continued research into identifying admission factors that related to PANCE success. Jones, Simpkins, and Hocking (2014) also noted the need for continued research into the significant variables that relate to PANCE success. The present study may help to shape the future of PANCE success for the local program by improving understanding of factors related to PANCE success and by allowing for an adjustment of admission practices by identifying which demographic and admission criteria best predict PANCE

success. This identification may reduce student failure rates and improve overall program outcomes (Buytendijk & Trepanier, 2010).

Research Question and Hypotheses

PA program administrators who seek to meet the growing demand for PAs require additional information regarding preadmission requirements and national certification exam success. Exploratory research into the demographic variables of home state, age, gender, ethnicity, undergraduate major, type of bachelor's degree (BA or BS), undergraduate institution, and health care experience (HCE); and the cognitive variables of GRE Analytical Writing, GRE Verbal Reasoning, GRE Quantitative Reasoning, Prerequisite GPA, CASPA Science GPA, and Cumulative GPA, and their predictability of PANCE success is required to fill the gap in practice within the local program, contributing to a better understanding of which qualifications establish the foundation for student success and PA certification. Nationally, some research into the preadmission criteria exists, but the ability for program administrators to generalize the research findings is hampered by the different standards for admission used among the various programs (Andreeff, 2014; Andreef, Frydrych, & Shutts, 2015; Asprey, Dehn, & Kreiter, 2004b). The requirements for the various programs are so widespread that researchers find it difficult to generalize any one program's finding with other programs nationwide (Brown et al., 2013; Higgins et al., 2010). Researchers (e.g., Andreeff, 2014; Higgins et al., 2010; Jones, Simpkins, & Hocking, 2014) have reported that there might be a relationship between demographics, preadmission requirements, and PANCE success.

The research question is designed to address the various relationships between these variables at the local level.

RQ: To what extent do one or more of the below variables, individually or in combination, have significant value in predicting students' success in the passing of the PANCE on the first attempt:

(a) home state;

(b) age;

(c) gender;

(d) ethnicity;

(e) undergraduate major;

(f) type of bachelor's degree (BA or BS);

(g) undergraduate institution;

(h) health care experience (HCE);

(i) GRE Analytical Writing;

(j) GRE Verbal Reasoning;

(k) GRE Quantitative Reasoning;

(l) Prerequisite GPA;

(m) CASPA Science GPA;

(n) Cumulative GPA

H_0: One or more of the above variables, individually or in combination, do not have significant value in predicting students' success in the passing of the PANCE on the first attempt.

H_a: One or more of the above variables, individually or in combination, do have significant value in predicting students' success in the passing of the PANCE on the first attempt.

The research design employed in this study was a non-experimental, ex-post facto because the data variables were evaluated following their normal occurrence (McMillan & Schumacher, 2001). Archival data available for graduates of the PA program beginning with the 2006 graduating class were used. The retrospective predictive design is consistent with Bordage's (2009) research focusing on the relationship between the student demographics, GRE scores, preadmissions requirements (the independent variables) and PANCE success (the dependent variable).

Binary logistic regression was used to predict the probability of passing PANCE. Binary logistic regression predicts the relationship between independent variables, also known as predictors, and a dependent variable that is dichotomous. A dichotomous variable has two options such as pass or fail, yes or no, 1 or 0, etc. The independent variables can be either continuous or categorical. For the logistic regression used in this study, passing PANCE is defined as equal to 1 and failing PANCE as equal to 0 (Garson, 2011).

Similar to linear regression, logistic regression produces a predictor equation. The logistic regression equation produces the logarithm of the odds for the value labeled 1, which is Passing PANCE. The probability of that value labeled 1, Passing PANCE, can vary between 0 and 1. The mathematical logistic function converts the log-odds to probability (Garson, 2011).

For this project, a forward (stepwise) binary logisitc regression model was employed. Forward (stepwise) is a method of adding a variable to an equation based on the significance of the score statistic. In addition, once a variable is added to an equation, it can be removed based on the probability of the likelihood ratio statistic (George & Mallery, 2016).

The research site is the Physician Assistant Program at a small rural health-related and professional private university. The different independent variables of demographics, prerequisite admissions requirements, GRE scores, and the dependent variable of PANCE success were examined (see Table 2). My purpose of the study was to investigate the predictability of the student demographics, preadmission requirements, and GRE scores on the PANCE performance for PA students attending a 27-month graduate PA program. The variables that will be examined are listed in Table 2.

Table 2

List of Variables

Independent variables	Dependent variable
Home state	PANCE success (pass or fail)
Age	
Gender	
Ethnicity	
Degree	
Major	
Institution	
Health care experience (HCE)	
GRE analytical writing	
GRE verbal reasoning	
GRE quantitative reasoning	
Prerequisite grade point average	
CASPA science grade point average	
Cumulative grade point average	

Review of the Literature

Introduction

PA education has been in existence for approximately 50 years, with the first PA class graduating from Duke University in 1967 and the founding of the program under study in 1968. The ever-increasing shortage of medical physicians since the late 1970s has driven the increase in PA programs and the demand for PAs to enter the professional medical workforce (Whitcomb, 2007). As such, PA education has undergone numerous changes since its foundation, with strengthening accreditation standards and increased demands to meet those standards (ARC-PA, 2016a).

The research literature on the predictability of PA preadmission requirements is limited, suggesting some potential variables that may influence PANCE success, while in other allied health professions the literature shows a relationship between prerequisite

requirements for admission and their respective certifying examinations (Brown et al., 2013). Furthermore, the research in medical fields indicates that minority status (Andriole & Jeffery, 2012) and science GPA (Rhoades, Gallemore, Gianturco, & Osterhout, 1974) were indicators of licensure exam success.

The literature on PA programs in particular revealed some potential variables that may relate to PANCE success. Demographic variables included age (Andreeff, 2014; Andreeff et al., 2015; Kotun, 2011); type of bachelor's degree and major (Kotun, 2011; Oakes, MacLaren, Gorie, & Finstuen, 1999); gender (Oakes et al., 1999); and previous experience (Keene, Petrusa, Carter, & Schmidt, 2000; Oakes et al., 1999). It may be that previous context, such as home state and bachelor's degree institution, may influence the prior educational experiences of PA students, therefore leading to the inclusion of these variables. Cognitive variables identified in the PA literature included GRE scores (Hocking & Piepenbrock, 2010; Jones et al., 2014; Keene et al., 2000; Kotun, 2011); Verbal, but not Quantitative or Analytical GRE scores (University of Kentucky, 2014); cumulative GPA (Ennulat et al., 2011; Keene et al., 2000); and science GPA (Andreeff, 2014; Keene et al., 2000). Alternatively, some researchers have found no correlation between preadmission requirements and PANCE success (Hooker, Hess, & Cipher, 2002; Imel, Jansen, Nelson, & Brown, 2012). Therefore, there are mixed results regarding the influence of demographics and prerequisite requirements as they relate to PANCE success (Jones et al., 2014).

Researchers have established the need to understand demographic and preadmission requirements that relate to PANCE success within specific contexts, although the literature is fraught with contradictions about what factors may do so (Andreeff, 2014; Andreeff et al., 2015; Jones et al., 2014). All PA programs use a combination of prerequisite requirements in determining the qualification of their applicants for admission to the respective program, but these requirements vary widely from program to program. Researchers at these institutions conducted studies regarding prerequisite requirements and PANCE success, often including intervening variables in their analysis. Higgins et al. (2010) noted that while some prerequisite requirements "were not significant predictors across programs" there "was significance in certain individual institutions" (p. 10). The importance of understanding the differences between programs and the student population supports the premise that within a single program there exist local problems not entirely comparable to other programs nationwide since each program looks at prerequisite admission requirements differently (Brown et al., 2013).

While research in different areas of PA education has improved over the years, research on specific areas is often deficient and limited (M. Holt, personal communication, July 2014). In 1995, there were only 61 PA programs in the nation compared to the 235 programs that exist today, and the program focus was the clinical training of future PAs and not the scholarship or research activity that is more common

today (American Academy of Physician Assistants [AAPA], 2016; ARC-PA, 2016a; PAEA, 2017).

Research in specific areas of PA education is often sparse. As a result, the following literature review includes sources from allied health and professional medical literature when required incorporation is necessary to meet scholarly demands. Variables revealed in the literature were examined as to whether or not the variables relate to student PANCE success predictability. In the next section, the theoretical framework and a general review is presented.

Theoretical Framework

The theoretical framework supporting this study and uncovered in the literature was Bordage's (2009) illuminate and magnify framework. Bordage is often cited in the medical education literature and is a contributor in medical education practices regarding conceptual theory and its use in medical education (Bunniss & Kelly, 2010). Bordage's framework set the stage for the development of research studies across the medical education field by identifying those areas essential to program success through the illuminate and magnify framework.

Bordage (2009) provided a theoretical structure to illuminate and magnify the program's gap in practice in understanding the relationship between demographics, admission requirements, GRE scores, and student PANCE success. The framework suggests a broad overview of a problem, which in the case of the program is a lack of understanding of the relationship between preadmission requirements and PANCE

success. Bordage's (2009) theory to formulate the research questions after examining the local problem was adopted for this study. By illuminating the problem, a better understanding of the gap in practice concerning the predictability of demographics, admission prerequisites, GRE scores, and PANCE success was gained.

The magnify aspect of Bordage's framework focused on the individual variables of the problem that influence the dependent variable and overall outcome, further allowing the identification of the problem with concentration on the individual variables which may be predictive or provide solutions (Bordage, 2009). Understanding this concept, a list of variables included in the prerequisite requirements, while identifying the other variables that may be predictive but not necessarily a part of the prerequisite requirements, was developed. This approach used the concept to develop the structure, determine the content of the study, and identify the methodology to be used in accordance with Bordage, Lineberry, and Yudkowsky's (2016) guidelines. Finally, the concept was used in the interpretation of the results (Bordage, Lineberry, & Yudkowsky, 2016).

Bordage's (2009) framework guided the development of the research question in the present study by focusing on the admission requirements that may predict PANCE success. The present study contributed to knowledge through a better understanding of the overall problem and established a framework by which the PA program faculty may employ this knowledge for the improvement of the program and overall student success.

The conceptual model for this study is the geometric model of student persistence and achievement (Swail, 2004). The concept is based on a triangular framework comprised of three sides with the student at the center. The three sides of the triangle include cognitive factors, social factors, and institutional factors that comprise the foundation of student success in education. Cognitive factors include such things as academic rigor, quality of learning, content, and knowledge. Social factors include educational legacy, maturity, social coping skills, cultural values, education skills, and goal commitment, while institutional factors are academic services, curriculum and instruction, recruitment and admissions, social services, and financial aid (Swail, 2004). The model provides institutions the framework with which to assess students' suitability for admissions.

In the geometric model, both cognitive factors and social factors play a significant role in determining the suitability of the qualified applicant and their admission to the PA program (Swail, 2004). Each student brings to the program admission process different combinations of cognitive and social factors (Swail, 2004). These factors include the student's GPA, academic background, course performance, and GRE scores, each of which can be included either as a cognitive factor or social factor within the geometric model. All these factors are readily available to the admission committee in determining the suitability of a candidate for the PA program (Swail, 2004).

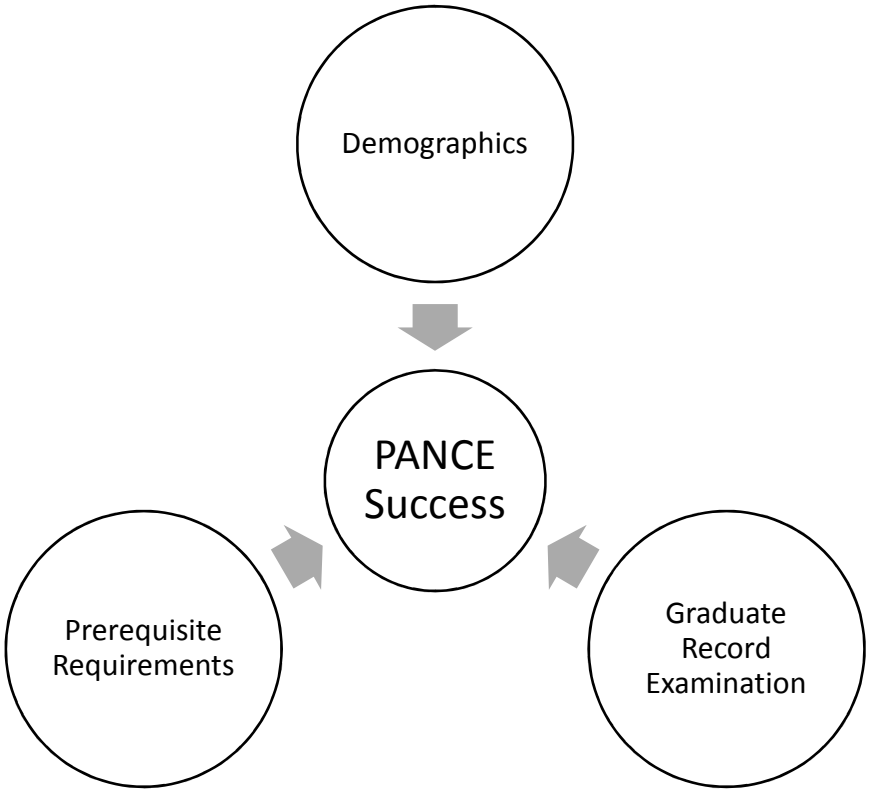

Figure 4. Concept model for the study.

Thus, for this study, the cognitive and social factors of the geometric model as determined through a review of the literature were those factors that comprise a student's preadmission requirements supporting the selection of a candidate with the highest potential for PANCE success. Currently, institutional factors are not considered in the program admission process andwere excluded from consideration in this research study.

The purpose of my present study was to examine the predictability of the student demographic variables, preadmissions requirement variables, and GRE scores on PANCE success (Figure 4). The framework supports the validity of the predictability of the variables through the interpretation of the results to either support or deny the null

hypothesis (Kane, 2002). These frameworks enable a focus on students as the foundation of the study while developing a better understanding of the preadmission requirements and their predictability of PANCE success and closing the evidence-based practice gap that currently exists among the faculty.

General Review

I began researching peer-reviewed articles for information related to other types of investigations with similar populations as the PA program and similar research or practices. First, I used the local database, which includes the *Cochrane Library* and *ProQuest Medical Library,* in conjunction with the resources in the Walden University Library. Second, I conducted this search using the following search terms: PA admission standards, the relationship between admission requirements and PANCE success, admission predictors of PANCE success, admission predictors of PA program success, and PA program success. The articles were collected and sorted by theme, based on the following variables; demographics, grade point average, graduate record examination, and PANCE.

My purpose of the study was to develop an understanding of the predictability of the demographic variables, prerequisite admission requirement variables, and GRE score variables on PANCE success for PA students at a 27-month graduate PA program. The academic intensity of a PA program requires the selection of the best-qualified and academically prepared students while maintaining both academic and professional standards. The rubric the admissions committee at the local school uses is not evidence-

based, and in general, the school in question requires more rigorous self-assessment processes. The process is important not only for maintaining accreditation, in determining the admissions criteria that should be used for selecting the best quality students for the program—those students who can achieve national average PANCE first time rates (ARC-PA, 2013; M. Holt, personal communication, July 2014; McManus & Sondheimer, 2017).

The ARC-PA accreditation standards regulating PA education are currently in their fourth edition having been published in March 2010 and revised in 2016. Standard C1.01 stated, "the program must implement an ongoing program self-assessment process that is designed to document program effectiveness and foster program improvement" (ARC-PA, 2016b, p. 20). A PA program must develop a self-study evaluation system to comply with this accreditation standard. The local program currently has such a system, and though lacking in many contributing areas, has an established data collection plan, data warehouse plan, and assessment plan. Data collection and maintenance enables the faculty of the program to gather information regarding demographics, prerequisite requirements, GRE scores, and PANCE pass rates (Parkhurst, 2003).

The overall purpose of the NCCPA is to set a national standard PA competence level through certification while ensuring emerging professionals meet the expected levels of professional competency in medical knowledge and skills before entering medical practice (Hooker, Carter, & Cawley, 2004; National Commission on Certification of Physician Assistants [NCCPA], 2016). "ARC-PA is the sole accrediting

agency responsible for establishing the standards for US PA education and for evaluating programs to ensure the confidence with the standards" (Jones, 2007, p. 883).

The lack of understanding of how admissions prerequisite requirements affect the program's ability to recruit and retain PA students who will successfully pass PANCE affects the program's overall reputation and mission, as schools may lose accreditation if they do not maintain the ARC-PA's mandated PANCE pass rate of 83% or greater. Under the terms of their school's accreditation, program administrators have a responsibility to research the predictive value of requirements for admission and gain an understanding of how those predictive requirements affect PANCE examination success (ARC-PA, 2015a).

While considering the relationship between prerequisite requirements and PANCE success, it was found that researchers had explored the likelihood of multiple variables predicting passage and failure of PANCE. Those variables included demographic variables, the Physician Assistant Clinical Knowledge Rating and Assessment Tool (PACKRAT) examination, and other didactic examinations of the student's knowledge base during their educational training, prerequisite preadmission GPA, and overall GPA. In the next section, topics related to student demographics, student GPA, and GRE scores are covered in the following literature review.

The Role of Demographics in PANCE Success

Home state. Since 2013, there has been increasing concern among the PA program faculty in regards to the academic preparation of incoming graduate students

from the institution's home state. There exists an assumption among the local program faculty that students from the institution's home state, or Appalachia in general, are at risk for failing the PANCE or do not pass PANCE and are unsuccessful in meeting the program goals and outcomes. The graphical information to include permanent student residence is readily available from CASPA and last reported on in the PA literature by Ruback et al. in 2007. The faculty would like to determine if home state residency is a predictive indicator for PANCE success to better understand that variable and mitigate its effect on future students.

Age. Several researchers have indicated that age may play a role in PANCE success. In a predictive study, Kotun (2011) revealed a relationship between demographically older students and PANCE success within a sample of 435 PA students. Andreeff (2014) and Andreeff et al. (2015) determined that age was a statistically significant negative regression coefficient in the relationship between prerequisite grades and PANCE success. Asprey, Dehn, and Kreiter (2004a) conducted a retrospective 3 year cohort study which determined that older students performed at a weaker rate on the PANCE than younger students did ($p < .0001$) (Asprey, Dehn, & Kreiter, 2004a). Based on the evidence found in the professional literature, age was included as a demographic variable in the present study.

Gender. Currently, the profession is moving away from the predominantly nontraditional ex-military male student of the 1970s and toward the young female student of the 21st century. According to NCCPA (2013), there has been a demographic shift in

the PA profession from a predominantly male group to a predominantly female group. As per 2013 report, women made up 66% of the professional population while men contributed to 34% of the PA population. During the last twenty years, a shift in the PA population occurred under the age of 40, where females make up approximately two-thirds of the professional community when compared to their male counterparts nationally.

In 1999, Dorothy Oakes and a group of researchers from Baylor University looked at their ability to predict PANCE success of the students at the interservice PA program located at Fort Sam Houston, Texas. Using demographic variables, the researchers concluded that for the interservice PA program, demographic variables are significant and correlate with PANCE success. The variables for that program were "education, the service component of Army National Guard, pay grade of E7 and gender" (Oakes et al., 1999, p. 68). The findings supported the need to understand demographics and relationship to PANCE success. However, it is noted that these results applied only to the interservice PA program investigated by the Oakes' team and that differences exist currently at the local PA program under study in terms of demographics and preadmission requirements, particularly with regard to the increasing numbers of women in the PA profession (NCCPA, 2013). Asprey et al. (2004a) determined through a retrospective study ($n = 9247$) that women performed better than men on the PANCE ($p < .001$) (Asprey et al., 2004a). As a result, gender was another demographic variable in the present study.

Ethnicity. Caucasian individuals overwhelmingly dominate the PA profession. Caucasian PAs comprise an approximate 85%, while Asian and African-American minorities make up 5.2% and 4.1%, respectively (NCCPA, 2013). The lack of diversity may lead to potential barriers for minority students (Andriole & Jeffery, 2012).

It is important to understand whether and how racial dynamics may influence PA education, given Andriole and Jeffery's (2012) research regarding the influence of gender on medical school licensure performance. Andriole and Jeffery published research on medical school students who initially failed Step 1 of the United States medical licensing examination (USMLE), but who were attempting to pass the clinical knowledge section of the step 2 medical examination. Medical students and PA students are similar in both education and training, requiring the same prerequisite education. The only major difference is the shorter duration of PA education. Additional related aspects are the knowledge and testing requirements for USMLE Step 2 clinical knowledge and PANCE. The findings support the belief that students performing better than average in the areas of verbal reasoning, science GPA, and the Medical College Admission Test (MCAT) are more likely to pass Step 2. Students with lower MCAT scores and those coming from underrepresented minority backgrounds are at a higher risk for failing Step 2. I concluded that there might be a correlation between underrepresented minorities, or specific demographics within the PA program, and PANCE success rate. This particular relationship has not been explored within the local program itself, and the article supports further research into this area, as represented by the present study.

Educational experience. The importance of a student's institution and degree foundation was explored in Kotun (2011) and Imel et al. (2012). Kotun (2011) researched two-year health related degree programs and the relationship to PA program and PANCE success. Results of the correlational study showed no significant statistical difference between the two groups (n = 435), those with associate degrees in health-related occupations (n = 51) and those without (n = 384). Kotun's study supports the inclusion of demographic data and GRE scores, adding a consideration to the program requiring a bachelor's degree for entry and the consideration of those with master's degrees. Does the degree determine success on PANCE? A student's foundational degree was included in the relevant demographics research during this study.

There is limited research on the predictability of institution and PANCE success. However, Imel et al. (2012) noted the need to consider students who take their PA prerequisite courses at two-year colleges. While two-year college attendance by pre-PA students were not considered in this research study, it does open the door for possible future research when considering a student's academic training before entering the PA program and future PANCE success.

Health care experience. Prior health care experience has always had a role in PA education (Hegmann & Iverson, 2016). The first PA students were prior military medical personnel that helped to found the profession. From the beginning prior health care experience was seen both as a positive and negative influence when considering students for admission. Prior health care experience can give a student the foundation needed to

grow and learn in their new profession, while hindering that growth, as students may find it difficult to set aside their old skills in order to learn the skills needed to become a successful PA (Meyers, 1977). Recently, Oakes et al. (1999) determined that military experience in medical service related to increased PANCE success, while Hegmann and Iverson (2016) found no correlation between prior health care experience and student performance on clinical rotation.

Discarded demographic variables. Bourne, Arend, Johnson, Daher, and Martain (2006) examined the relationship between personality traits and PA success, as measured by the Physician Assistant Clinical Knowledge Rating and Assessment Tool (PACKRAT), which is similar to PANCE. There was no relationship between personality characteristics and PACKRAT success (Bourne, Arend, Johnson, Daher, & Martain, 2006). Furthermore, examining the results of the study and understanding the similarities between PACKRAT and PANCE, I determined not to evaluate student personality characteristics when considering preadmission requirements and PANCE success. Further investigation into the relationship between test anxiety, personality characteristics, and the student's ability to perform on the PACKRAT should be considered a worthwhile topic for future research.

Significant contradictions and mixed findings concerning the influence of demographic variables on PANCE success were presented in the literature. Contrary to the before mentioned findings, for example, Jones, Simpkins, and Hocking (2014) noted that noncognitive traits (i.e., demographics) have limited use in determining whether a

student is successful in passing their examination. Previously, Hooker et al. (2004) found no significant difference between PANCE success and student demographics, while the relationship between admission requirements and PANCE success was minimal. McDaniel et al. (2013), who discussed the noncognitive factors utilized in the admissions process, further found no predictability or correlation between noncognitive factors and PANCE success.

Both Jones et al. (2014) and McDaniel et al. (2013) pointed to the potential use of cognitive factors in understanding and predicting PANCE success. In the next section, the cognitive factor of GPA, its relationship to the admissions process and use as a predicting factor in the overall success of students as stated in the supporting literature will be discussed.

Grade Point Average

When further considering a student's foundation in the process of selection, it was found that Leinster (2013) discussed the educational selection process and the selection of the right student to enroll in a medical training program. The selection process as described is not much different from the selection process used in PA education preselection of candidates. There are prerequisite requirements, healthcare experience, and science education to include courses in biology and chemistry that are required. These elements are all associated with a long history of how to select the best candidate for medical school. The importance of the PA candidate selection is examined in Dr. Myers's book, *The Physician Assistant*, whereas today as in 1968 remains a highly

competitive process, focused on a student's prior academic performance, especially in the sciences and mathematics, with consideration for the student's GPA. One of the commonly used prerequisites for consideration in a medical and PA program admissions process is the student's GPA.

Cumulative GPA. Luce (2011) presented the importance of the cumulative GPA in the selection of pre-candidates for a PA program. Specifically, Luce demonstrated that a correlation existed between preadmission GPA and academic difficulty with a prescribed PA curriculum. Given that academic success should translate to PANCE success in a program designed to prepare students for the PANCE, Luce's research suggests that a correlation exists between preadmission candidates' GPA and the candidates' future PANCE success.

Ruback et al. (2007) investigated the central application service for PAs over the last five years and the implications regarding admissions into PA programs. The article published in the *Journal of Physician Assistant Education* is the foundational document that initially set the local program's admission standards in 2007 (M. Holt, personal communication, July 2014). The 5-year report related an overall national GPAs range between 3.23 to 3.25, while science GPA was 3.10 to 3.11 and non-science GPA 3.34 to 3.37. The program's use of reported data for the determination of preadmission criteria that is over ten years old supported the need for a clearer understanding of current student population GPAs, specifically the relationship between prerequisite GPA and PANCE success. Providing administrators the ability to select better-prepared students for entry

into PA education could improve the first-time pass rate on the national certification examination and improve program reputation.

Converse to Luce (2011) and Ruback et al. (2007), Imel et al. (2012) further investigated the relationship between preadmission criteria, postadmission didactic GPA, and PANCE scores. Imel's et al. study results did not support the correlation of preadmission criteria to PANCE success for his institution, but his finding does not exclude its use in the research study on the local program. The literature supported the inclusion of cumulative GPA in the study.

Science GPA. Historically, the medical literature showed that "the admission process for most medical schools has been significantly redefined to select the good basic science student who will survive the difficult 'biological science' curriculum of most medical schools" (Rhoades, Gallemore, Gianturco, & Osterhout, 1974, p. 1119). In admissions at the local school, this factor is measured by science GPA. Andreeff (2014) noted that PA education researchers had not yet adequately considered the role of science GPA in predicting PANCE success.

Researchers have supported the use of science GPA in predicting PANCE success. Andreeff (2014) conducted a retrospective study at the author's local university cohort (n = 155) and used a multiple regression model to determine if there existed a relationship between certain preadmission requirements, including undergraduate science GPA and PANCE success. Using the prerequisite grades for both biochemistry (p = .01) and pathophysiology (p < .001), the research showed a significant positive regression

coefficient in predicting PANCE success. These results were later confirmed in the 2015 subsequent study (n = 204), where an additional program was added to the initial study with a population (n = 155) (Andreeff et al., 2015). Similarly, the MEDEX study found a positive relationship between science GPA and PANCE success (University of Kentucky, 2014). The literature supported the inclusion of science GPA in the study.

Cumulative and science GPAs. Durning et al. (2015) conducted a study at the Uniform Service University, School of Medicine. They employed prerequisite indicators to help predict specialty board certification. Those parameters included undergraduate grade point average, science grade point average, demographics, and medical college admissions test scores. Research supports the determination that medical college admissions test scores and the GRE scores are not comparable. The use of such admission tests set the stage for their utilization in the admissions process. Durning and team further concluded that undergraduate GPA and science GPA were far more critical predictive factors in a student's success than medical college admissions test scores. As many similarities exist between physicians and PAs, including rigorous medical education with different periods of duration and the same basic curriculum, it may be that cumulative GPA and science GPA similarly influence licensure performance among PAs, as evidenced in Durning's study. The study supports the idea that there is a relationship between admission GPAs and PANCE success while excluding any intervening variables, thus maintaining the proposed use of prerequisite GPA as a determinant of future success on the PANCE.

Jones et al. (2014) analyzed the similarities between the PA and physical therapist admissions process and the variance in certifying exam performance by both groups. Concerning PA students, Jones discussed the predictors of academic success relating to both cognitive and noncognitive variables. According to Jones et al., no correlation exists between PANCE performance and undergraduate GPA in some cases, yet findings by other institutions do profess a relationship between GPA and GRE scores and PANCE success. Brown et al. (2013) determined that no relationship existed among PANCE performance and students' undergraduate GPA.

The above section reveals the mixed findings of the GPA research. In the following section, the student cognitive capability, as indicated by the GRE, and its relationship to PANCE success will be examined in the current literature.

Graduate Record Examination

Standardized testing has been the cornerstone of graduate success prediction for the last 80 years (Kuncel & Hezlett, 2007). The GRE was initially developed in 1936 by the leading academics of the Ivy League graduate schools in the hopes that the examination would aid in the selection of students who wish to pursue graduate education and ease the burden of graduate selection committees. After a series of experimental tests by 1946, the examination was used as an indicator of a student's preparation to attend graduate school (Vaugan, 1946). The GRE continues to be the primary examination tool used to predict success in graduate studies and is used in the admissions process for graduate education across the United States. Currently the GRE is comprised of three

sections, which are verbal reasoning, quantitative reasoning, and analytical writing (ETS, 2016).

While no longer the primary admissions tool for graduate medical education since the development of the Medical College Admission Test (MCAT) (Rhoades et al., 1974; Vaugan, 1946), PA programs continue to use the GRE nationally as does the admissions committee in the local program (CASPA, 2016). Since the transition of the PA professional education model from the bachelor's degree to the master's degree, the majority of institutions that offer PA education have adopted the GRE as a measure of a candidate's ability to perform graduate level work. In 2010, Hocking and Piepenbrock (2010) reported that 47% of all PA programs nationwide use the GRE in their admissions process. Since that time, PA programs have continued to grow, and the use of the GRE has grown with them. The issue, as Hawkins reported, is that PA programs do not use the GRE as recommended by the Educational Testing Service (ETS). ETS (2016) recommends that a base score of 150 in both the quantitative reasoning and verbal reasoning subject areas be used in determining an applicant’s suitability for graduate studies. In addition, ETS in 2016 recommended a score of 4 to 4.5 be utilized in the analytical writing area. Hocking and Piepenbrock (2010) further noted that based on ETS recommendations, the GRE should not be used as the sole determining factor on whether a candidate should be offered or denied admission to a program.

There continues some debate over the use of means scores in considering the suitability of candidates for admission to PA programs, mainly due to the different

standard scoring system employed by the various programs in their admission's process. The ability to use the GRE as a predictive measure to determine PANCE success is analyzed at the local level. Hocking and Piepenbrock (2010) supported the deduction that the analysis and the ability to predict PANCE success by using individual program's prerequisite requirements should be performed at the local program level and not analyzing these relationships is a local problem.

The difficulty arises from correlating national data to local program data since the various PA programs use a different set of standard scores for the GRE in their admission's process. Questions continue to exist regarding the validity of the GRE used during the selection process in medical education. There exists limited data available relating to the use of the GRE among PA programs nationwide. In order to better understand the available research regarding the GRE's ability to predict graduate success, in this case, PANCE success, similar programs such as allied health programs and science programs were explored.

Several researchers have supported the use of the GRE to predict success in various degree programs. For example, Phillips and McAuliffe (2004) investigated the GRE in predicting psychology graduate program outcomes and the implication in program use as an admission's standard. In a research report, ETS (2005) discussed the overall findings of a collaborative validity study, which reported, "that GRE scores and undergraduate grade point averages do predict a variety of outcomes of graduate school" (cited in Burton & Wang, 2005, p. 38). Bridgeman, Burton, and Cline (2008) looked at

GRE scores and GPA, reporting a correlation between “top quartile of GRE scores were more than five times as likely to earn 4.0 averages compared to students in the bottom quartile” (p. 13). These changes were demonstrated among the different sciences like biology and chemistry.

When considering research outside the medical science field, there exist other professional programs where the fundamental premise that standardized admission tests for graduate education are an accurate predictor of future success and as such may be a more precise predictor of student success than their prerequisite grade point averages (Kuncel & Hezlett, 2007). How this relates specifically to PA education is unclear, since PA programs as a whole do not use the same scoring variables when considering GRE scores in the admissions of their applicants.

Kotun (2011) determined predictability between higher GRE scores and PANCE success ($p = 0.00$) for students who had both science and non-science degree experiences. In response to their low pass rates, MEDEX Northwest (as cited in University of Kentucky, 2014) conducted a study that showed the limited use of GRE scores in predicting the PANCE pass rate. Like the local program, MEDEX Northwest has a long history of PA education and some similarities. When looking at the graduate record examination scores, the "Pearson correlation scores indicate that PANCE scores are not correlated with GRE analytical or quantitative scores ($p = 0.76$ and $p = 0.158$ respectively). GRE verbal scores did correlate with PANCE scores ($p = -.038$)” (p. 3). The difference between this study and the local problem is MEDEX Northwest identified

four score categories within their analysis of PANCE scores, while the local program research focused on the student outcome of PANCE pass or failure.

Use of Preadmission Criteria to Predict PANCE Success

Often, the recommendation for admission committees is to take a holistic approach in evaluating PA candidates. For example, Keene et al. (2000) conducted a study in a university's PA program to investigate the applications of faculty review regarding prerequisite requirements and their ability to predict PA school success in conjunction with the interview process. The program used very similar variables to the local program that included undergraduate GPA, natural science GPA, total GRE score, and previous healthcare experience hours. The conclusion of the study was "to affirm the use of subjective reader evaluation of applicant files and admission processes" (p. 160) and set the stage for the utilization of these variables in the admissions process.

However, understanding the role of various demographic and preadmission criteria on eventual PA success, including performance on the PANCE, is a valid focus for PA admission committees. Massey, Lee, Young, and Holmerud's (2013) research validated the relationship between formative and summative results and the PANCE results, which demonstrates the continued focus of most PA programs on the intervening variable measures to predict PANCE success, while often overlooking preadmission criteria, which set the foundation for student success in a PA program.

The focus on licensure has been demonstrated to influence PA practice positively. Arbet, Parle, and Lathrop (2012) confirmed the use of the national certification

examination for PAs, which is currently employed in the United States, and the increased use across Europe with the introduction of the PA into the European medical system, as an international pool in the assessment of PA competency internationally. PANCE is more commonly recognized as the standard method for measuring PA competence both here in the United States and abroad. There has long been a trend in medical education overall for the establishment of competence and its relationship to performance (Rethans et al., 2002).

Another potential issue for PA schools is the lack of reliable data. Cook, Andriole, Durning, Roberts, and Triola (2010) detailed the strengths and weaknesses of databases, currently available information, and the use of demographics. Examples of these demographics include GRE, undergraduate degree, grade point average, ethnicity, state of residence, and gender. The development of any database was of benefit in the research analysis and outcomes in any PA program. The use of such a database is lacking at the current local level, affecting the program's ability to conduct adequate research into indicators of future PANCE success.

It is necessary for the administration of any PA program to understand the fundamental foundational requirements required for a PA student to be successful in their PA education and PANCE success (Geremia & Kohlhepp, 2005). Historically standard admission procedures have relied heavily upon a candidate's GPA and GRE scores. Programs have long struggled to select appropriate, high-quality students. Each program has developed its unique admission process based on candidate population and selection

criteria (Skaff, Rapp, & Fahringer, 1998). For the local program under study, there exists a need to explore the problem further to gain an understanding of the relationship of demographics, prerequisite GPA, and GRE scores to PANCE success and to thoroughly explore and understand that this trend is similar to those seen among the medical schools (Dixon, 2012).

Review of Literature Summary

The review of the literature showed that through the years, researchers have examined different aspects of demographics, grade point averages, and GRE scores when determining either program success defined as graduation or PANCE success. No single study can be generalized to the overall PA applicant population due mostly to the different admission standards established by each program. However, after careful review of multiple studies, there is evidence to consider the factors of preadmission requirements, GRE scores, and demographic data as they relate to PANCE success (Kindle & Brock, 2018). With this in mind and understanding the gap in practice currently in the local program, the review of the literature supported the inclusion of demographics, preadmission requirements, and GRE scores in this study to determine the relationship to PANCE success.

Implications

Since the admission of cohort 2014, the local program has seen a shift in the quality of its candidate population. As shown previously in figure 2, the candidate pool has been less qualified with respect to traditional measures, such as GPA. Continual

concern for below average PANCE first-time pass rate success has led to the need to study the stated research question. The intent is to better understand the predictability of the demographic variables, preadmission requirement variables, and GRE score variables on the PANCE success rates within the local program.

The admission of unqualified candidates may be a contributing factor to the program's continued poor performance rate on the PANCE, with the first-time pass rate being continually below national first-time pass rate since 2006, and falling as low as 69% in 2013 (NCCPA, 2016b). Admitting unqualified candidates may have contributed to the program's overall five-year, 2012 to 2016, first-time average pass rate being well below the national average as seen in Table 3 (NCCPA, 2016b).

Table 3

Comparison of National Versus Local Program PANCE 5-Year Average Pass Rate

5-year first time pass rate	PANCE 5-year pass rate
National	94%
Local program	85%

These pass rates are public record and published on the internet program web page as per ARC-PA accreditation standard A3.14 (ARC-PA, 2016b). The policy dictates the full disclosure of first-time pass rates to pre-PA candidates who are considering the PA program for professional education. Eventually, this investigation will contribute to the revision of the program's admissions policy and rubric development adding in the decision-making process in the selection of the best-qualified applicants to the PA program. The admissions committee will redesign the current admission's rubric and set

a new standard or confirm the current standard of prerequisite coursework required for consideration and admission into the PA program.

Therefore, improving admissions criteria and rubrics to admit students who are more likely to be successful on the PANCE could help improve the program student outcomes and program reputation thus attracting more candidates that are qualified.

Summary

Since 2006, there have been a cyclical low PANCE first-time pass rates at a local PA program, which caused the program to remain below the national exam pass rate. The continued poor performance resulted in the school's loss of accreditation in 2009. The program was then reorganized, but the program has yet to conduct an evidence-based self-evaluation of the admissions predictors that may increase PANCE success. The lack of self-evaluation of appropriate admissions criteria limits the program administrator's ability to screen candidates for selection to the program and results in a gap in practice. The research findings of the study will help to either confirm or improve the current preadmission standards used in the selection of entering PA students who have a higher probability of obtaining first-time PANCE success. Overall, the importance of understanding the relationship between the preadmission requirements and PANCE success enhances a program administrator's ability to admit students with the greatest probability of PANCE success. In this section, the methodology, research design and approach, setting and setting, data collection and analysis strategies, limitations, and ethical considerations are discussed.

Section 2: The Methodology

Introduction

My purpose in this study was to investigate the predictability of student demographic variables, preadmission requirement variables, and GRE score variables on determining PANCE success for PA students at a 27-month graduate PA program. I used a quantitative methodology with a predictive design and a retrospective predictive approach using archival data available for graduate students from the PA program. Using the quantitative method of predictive analysis provides for a better understanding of the local problem of PANCE success. In this section, I discuss the research design and approach, setting and population, data collection and analysis strategies, limitations, and ethical considerations.

Research Design and Approach

I selected a quantitative methodology for this study. A quantitative methodology is appropriate for studies where statistical analysis is conducted on numerical data to test measurable hypotheses (Goertz & Mahoney, 2012; Howell, 2010; Rawbone, 2015). A quantitative methodology was best suited for this study because the variables of interest were quantified for use in the study. I considered but did not select a qualitative or mixed methodology for this study because the aim of the study involves predictive relationships numerically measurable variables rather than an in-depth exploration of participants' experiences or perceptions.

I used a nonexperimental design for this study because I did not manipulate the variables of interest (McMillan & Schumacher, 2001; Price, 2012). This type of design was appropriate for archival data and facilitates assessment of the relationship between variables (Landrum & Garza, 2015; Pearl, Brennan, Journey, Antill, & McPherson, 2014). Using this approach, I assessed the presence of the relationship between demographics, preadmission requirements, GRE scores, and PANCE success.

A predictive design is appropriate in the evaluation of relationships between a set of independent variables and one dependent variable (Field, 2013). In alignment with a predictive design, I assessed the predictive power of the variables associated with entrance into the PA program and the success on the PANCE examination for all graduating students from the PA program. For this study, the graduating students included the classes of 2006 through 2016.

The population consisted of students who had completed the PA program and had taken the PANCE examination. After recieveing IRB approval, I collected data from an archival database maintained by the PA program as reported by CASPA and NCCPA. This single archival dataset contains all the variables of interest and was extracted from a PA program database. I conducted a binary logistic regression analysis to assess the predictive power of the student demographic variables, prerequisite GPA, cumulative GPA, CASPA science GPA, and GRE scores on the student's success of the PANCE. Binary logistic regression predicts the relationship between independent variables, known as predictors, and a dependent variable that is dichotomous. A dichotomous variable has

two options such as pass or fail, yes or no, 1 or 0, etc. The independent variables can be either continuous or categorical, such as GPA and GRE scores. In this logistic regression, passing PANCE is equal to 1 and failing PANCE is equal to 0 (Garson, 2011). I determined that binary logistic regression was the most appropriate statistical analysis for this study because the research aim involves predicting a dichotomous outcome (passing or failing the PANCE) using multiple predictor variables (Menard, 2009). I did not select a multiple linear regression because this analysis requires the dependent variable to be a continuous level of measurement (i.e., interval or ratio).

Similar to linear regression, logistic regression produces a predictor equation. This logistic regression equation produces the logarithm of the odds for the value labeled 1, which is Passing PANCE. The probability of that value labeled 1, Passing PANCE, can vary between 0 and 1. The mathematical logistic function converts the log-odds to probability (Garson, 2011).

For this project, I used a forward (stepwise) binary logisitc regression model. Forward (stepwise) is a method of adding a variable to an equation based on the significance of the score statistic. In addition, once a variable is added to an equation, it can be removed based on the probability of the likelihood ratio statistic. In a forward (stepwise) binary logistic regression, an analysis occurs first where no independent variables are added to the equation. This first analysis is called Step 0. Step 0 does not have an independent variable and only has the regression constant. In the next phase of the modelling of this regression equation, called Step 1, the variable with the highest

score statistic will be added to the regression equation. This newly added independent variable may be removed in a subsequent step if the likelihood ratio statistic is significantly affected (George & Mallery, 2016).

For the binary logistic regression analysis, I used the IBM Statistical Package for Social Sciences (SPSS) (Arbuckle, 2010; McRoberts, 2011). When performing a binary logistic regression analysis in SPSS, the software provided the following: (a) a case summary listing the variables included in the study, (b) a step 0 classification table which provides the accuracy if no independent variables are included in the regression equation, (c) a step 0 regression equation with no independent variables included, (d) a step 0 list of variables which are not included in the regression equation, (e) the Step 1 omnibus tests of the models which provides information on the statistical significance of Step 1, (f) A model summary which includes the Nagelkerke R^2, (g) Hosmer and Lemeshow Test, which is a goodness of fit test and evaluates how well the equation predicts the observed outcomes, (h) a Step 1 classification table that provides the accuracy when the first independent variable is included in the regression equation, (i) the Step 1 logistic regression, which contains an independent variable, and (j) a Step 1 list of variables which are not included in the regression equation.

Setting and Sample

The setting of this study was a small rural liberal arts university that offers a PA program. The population (*N*) included past students from the PA program who matriculated in the cohort classes of 2006 through 2016 and who took the PANCE (*N* =

388). I used total population sampling, which included all students who took the PANCE examination for the first time only after graduating from the program ($N = 388$). The PA program's archival database provided the sample. This type of sampling was justifiable because the data are readily available for analysis. Excluded from the analysis were any cases in the sample with missing values. The remaining data was then assessed for outliers. The definition of an outlier is any standardized value that falls more than +/-3.29 standard deviations from the sample mean (Tabachnick & Fidell, 2013). Any outliers identified by this criterion were further reviewed to determine if the values represented accurate and valid data points.

I used Minitab 17 to determine the sample size given the established parameters for the analysis (McCrum-Gardner, 2010). The minimal sample size was determined to be 194, based on the original total population of 388. I selected a confidence interval of 95%, a large effect size (w = 0.5), and margin of error of 5% (e = 0.05) for the data analysis. A large effect size was selected for the analysis because I expected student demographic variables, prerequisite GPA, cumulative GPA, CASPA science GPA, and GRE scores to strongly predict students' success on the PANCE (Andreeff, 2014; Andreeff et al., 2015). The confidence interval of 95% represents the likelihood that the sample mean is estimates of the population mean (Tabachnick & Fidell, 2013). I selected an alpha of 0.05 because it indicates a 5% chance of stating statistical significance when there is no effect in the population (Field, 2013), and established the power for the

analysis at 1.0, which exceeded Cohen's (1992) suggestion for a power of .80. I obtained site approval and Walden University IRB approval before collecting any archival data.

Instrumentation and Materials

The archival data used for this study was maintained in the local PA program database and used in the analysis. CASPA and NCCPA provided the data within the School of Physician Assistant Studies database. NCCPA reported the PANCE scores to the local program and were made available in the database. CASPA reported the student demographics, prerequisite GPA, and GRE scores to the local program, but some of this information was not available in the dataset.

Validity and Reliability

In every research project, reliability and validity must be ensured. To control validity, internal and external threats to validity were minimized. Internal validity is the degree to which extraneous variables have been accounted for or controlled. External validity is the ability to generalize the results to other people and settings (Tabachnick & Fidell, 2013). The potential threats to internal validity in this proposed study were history effects, selection bias, and expectancy bias (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001). History effects refer to an event that happened in the past that may influence the experiment (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001). In my research study, because I used archival data, the history effects would have already occurred, and I had no control over their effect (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001).

Reliability is the accuracy of the instrument while validity is the degree to which a concept is measured in a study (Tabachnick & Fidell, 2013). To control reliability, I used preexisting archival data with no direct instrumentation used. Data was extracted from the PA program's current archival database and provided by the program. The data are derived from verified CASPA, ETS, and NCCPA information. These factors support the reliability of the instrumentation and collected archival data (Creswell, 2009, 2012). The GRE is considered a reliable predictor of graduate success (ETS, 2016). The GRE in combination with a student's GPA contribute to the students' predictability of graduate school success and adds validity to both the use of the GRE and GPA in predicting PANCE success.

Expectancy bias and selection bias occurs when the personal characteristics of the researcher influences the study or the researcher induces bias based on the selection of subjects. Both types of bias can invalidate the results of the study (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001). To minimize expectancy bias and selection bias, I included all individuals who met the selection criteria of attending the local PA program and who took the PANCE examination in the cohort classes of 2006 through 2016.

In addition to threats to internal validity, the threats to external validity, which is the ability to generalize the results to other people and settings, was considered (Tabachnick & Fidell, 2013). The two subsets of external validity are population validity and ecological validity. Population validity deals with how closely the sample represents

the population (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001). The threat to population validity were minimized because the sample included the population ($N = 388$).

Ecological validity, or the degree to which the results can be generalized across different settings, is influenced by the use of experimental design, but I used a nonexperimental design that minimizes the threat to ecological validity in this study (Babbie, 2010; Gurnsey, 2018; McMillan & Schumacher, 2001). Once data collection began, a process of double-checking information entered into the Excel spreadsheet was conducted to maintain the validity and reliability of the data and instrumentation. Each variable collected from the archival database is identified and defined in the following paragraphs below.

Demographics

For the purpose of my study, I considered demographics a part of admissions data and included age, gender, ethnicity, home state, college degree, major, institution, and healthcare experience before or at the time of the matriculation into the PA program. I considered each form of data as nominal data except for age, which was handled as ratio data. Age was collected as students' chronological age in full years at the time of matriculation. Gender was defined as male or female. The ethnicity was defined as either Caucasian or not Caucasian. College degree was defined as the type of degree earned at matriculation, with response options including Bachelor of the Arts or Bachelor of Science. Academic major was divided into hard science or not hard science with the

discretion to create additional categories such as biology, chemistry, and physiology, for example, to meet a more fundamental research need when qualifying the student's majors. The use of demographics in relationship to PANCE success was demonstrated in previous research studies (Asprey et al., 2004b). The use of demographics at the local level is poorly understood, and further research is needed to fill the gap in practice currently affecting the program.

Prerequisite GPA

The university's registrar's office calculates prerequisite GPA by reviewing the student's transcript and identifying the required prerequisite courses (see Table 1) the student completed to meet the admissions requirements. The information is reported via the academic summary sheet produced by the register's office to the program admissions committee for use in the candidate selection process. Prerequisite GPA was a continuous variable.

Cumulative GPA

Cumulative GPA is calculated by CASPA and reported on the CASPA application to the program administration. CASPA verifies the completed academic coursework before being released with the candidate's application to the program. Only the cumulative grade point average for a student's undergraduate degree was considered in this study (CASPA, 2015, 2016). Cumulative GPA was a continuous variable

Science GPA

CASPA calculates science GPA for all completed science level courses on the CASPA application. Examples of science courses include anatomy and physiology, general chemistry, organic chemistry, biochemistry, and microbiology. The science GPA is reported via the academic summary sheet to the program for candidate selection (CASPA, 2015, 2016). Science GPA was a continuous variable.

Graduate Record Examination

Currently the local program only requires analytical writing score for use in the admissions process. Students are required to submit an analytical writing score for admission to the PA program via official documentation from Educational Testing Service (ETS, 2016). The admissions committee 2016 report states there is no minimum score required for admissions to the local program. Both quantitative reasoning and verbal reasoning scores are collected by the program but are not used in the admissions process. In additional to analytical writing, I assessed the contribution of GRE verbal reasoning and quantitative reasoning to the likelihood of PANCE success. ETS updated the GRE in August 2011 resulting in a new scoring system. All GRE scores were entered as interval data for the study.

PANCE Success

The dependent variable is PANCE success and was treated as a dichotomous variable with categories of pass or fail. Program graduates are eligible to take the PANCE up to six times following graduation before either being disqualified from further testing

or reapplying to a PA program and completing the program for a second time. For this study, only the first-time test results were considered. PANCE results are provided to the program via the NCCPA portal (NCCPA, 2016b). The programs are required to post such data on their websites so that students may have access to program performance. All information is password-protected on the NCCPA portal, and only the local program pass rates along with national cumulative pass rates are published on the program website (ARC-PA, 2016b).

Data Collection and Analysis

Data Collection

Before any data collection commenced, I obtained local institutional site IRB approval and Walden University IRB approval. The local PA program maintained the data required to conduct the study in their database. The local PA program de-identified the data to maintain student confidentiality. The existing data from the archival database was used in the analysis. The data within the School of Physician Assistant Studies database was derived from CASPA and NCCPA. NCCPA reported the PANCE scores to the local program and were available in the database. CASPA reports the student demographics, prerequisite GPA, and GRE scores to the local program, but some of this information was not available in the dataset.

I organized the data in an Excel spreadsheet, coded the data, and imported the data into SPSS for management and analysis. The data retained in a password protected electronic format in accordance with Walden University's IRB guidelines and local

program guidelines and will be disposed of per the university's IRB guidelines. Data will be stored securely for 5 years. At the end of this time, electronic erasure and material shredding will be used to destroy the data.

Data Analysis

On receipt of the dataset, the variables were identified and coded for entry into IBM's Statistical Package for the Social Sciences (SPSS) for analysis for the initial total population sample ($N = 388$). The interval variables were age, GRE verbal reasoning score, GRE quantitative reasoning score, GRE analytical writing score, CASPA Science GPA, Cumulative GPA, and Prerequisite GPA. The categorical variables were home state (non-WV = 0; WV = 1), gender (female = 0; male = 1), ethnicity (non-white = 0; white = 1), health care experience (none = 0; yes = 1), type of bachelor's degree (BA = 0; BS = 1), undergraduate major (non-hard sciences = 0; hard science = 1), undergraduate institution (outstate = 0; instate = 1), and PANCE (fail = 0; pass = 1). After coding, the data were imported into SPSS. Next, the data were assessed for missing cases and outlying values. Because I did not know the condition of the archival database, once granted access, I assessed the quality of the data. On review of the dataset, I discovered that only the PANCE data were available for the 2006 through 2008 cohorts and limited information was available for the 2009 through the 2016 cohorts. Based on this information, I eliminated cases from the cohorts 2006 to 2008 from the data set, which left 280 cases remaining. In order to accomplish the binary logistic regression analysis, the data set cannot contain missing data. Therefore, I performed a missing values analysis

on the data set. Cases missing any data points were identified and removed from the dataset (Tabachnick & Fidell, 2013), which resulted in a final data set of 107 cases.

The data were assessed for outliers. An outlier was defined as any standardized value which falls more than +/- 3.29 standard deviations from the sample mean (Tabachnick & Fidell, 2013). Any outliers identified by this criterion were further reviewed to determine if the values represented accurate and valid datapoints. Next, the interval data were evaluated for normality between the independent and dependent variables to ensure that the data were selected from a normally distributed population (Statistics Solutions, 2013). In order to accomplish the binary logistic regression analysis, the data must be normally distributed (Tabachnick & Fidell, 2013). I used the Shapiro-Wilk test to check for normality. A significant Shapiro-Wilk test indicates that the data are not normally distributed.

The data analysis procedure for the research question is described below:

RQ: To what extent do one or more of the below variables, individually or in combination, have significant value in predicting students' success in the passing of the PANCE on the first attempt:

(a) home state;

(b) age;

(c) gender;

(d) ethnicity;

(e) undergraduate major;

(f) type of bachelor's degree (BA or BS);

(g) undergraduate institution;

(h) health care experience (HCE);

(i) GRE Analytical Writing;

(j) GRE Verbal Reasoning;

(k) GRE Quantitative Reasoning;

(l) Prerequisite GPA;

(m) CASPA Science GPA;

(n) Cumulative GPA

H_0: One or more of the above variables, individually or in combination, do not have significant value in predicting students' success in the passing of the PANCE on the first attempt.

H_a: One or more of the above variables, individually or in combination, do have significant value in predicting students' success in the passing of the PANCE on the first attempt.

The research question involved the predictive relationship between the student prerequisite admission requirements, GRE scores, and demographic characteristics for the PA program and their ability to predict passing or failing of the PANCE on the first attempt. The prerequisite admission requirements are an undergraduate degree, GRE analytical writing score, prerequisite course GPA, CASPA science GPA, and cumulative undergraduate GPA. The GRE scores are GRE verbal reasoning and quantitative

reasoning scores. The student demographic characteristics are age, gender, ethnicity, home state, college degree, major, institution, and healthcare experience before or at the time of the matriculation into the PA program.

I conducted a binary logistic regression analysis to address the research question. Binary logistic regression analyses are appropriate for hypotheses intended to assess the predictive relationship between independent variables and a dichotomous categorical dependent variable (Stevens, 2009). The categorical dependent variable is PANCE success, which I defined as pass or fail. The binary logistic regression analysis was used to assess the odds of one of two outcomes (i.e., categories of the dependent variable) due to the combination of predictor variables (Field, 2013). The χ^2 coefficient and the *p*-value was used to assess the statistical significance of the model containing all the predictor variables using the Hosmer and Lemeshow Test as reported. The alpha level for the analyses was set at .05. Using a 50% cut off, I stated the logistic regression equation's sensitivity and specificity. I reported the Nagelkerke R^2 which represents the amount of variation in the dependent variable that is accounted for by the independent variable, and the Exp (β) to describe the odds for each predicted variable (Tabachnick & Fidell, 2013). For the logistic regression, a forward (stepwise) binary logisitic regression model was employed. The logistic regression determined the log odds of an occurrence happening (Garson, 2011).

Assumptions, Limitations, and Delimitations

I conducted the research study with the assumption that all information gathered from the PA program database is accurate. The data are derived from the information provided by CASPA, ETS, and the NCCPA, which was collected and verified by the PA program administration. I assumed that there was no significant change to the curriculum in the PA program and no adjustment to the preadmission requirements used to determine entry into the PA program which would affect the cohorts included in the study. I reviewed and confirmed that admission requirements have remained stable over this period of time. I assumed there has been a change in the applicant population over the last few years and that the admissions committee continued to strive to select the best quality students for the program. My study also assumed that the undergraduate CASPA GPAs and prerequisite course grades from the different undergraduate schools are equivalent.

The analysis of demographic characteristics separately from the admission requirements and GRE scores poses a limitation to the study. Analyzing these variables separately does not allow for the assessment of the potential influence of demographics on PANCE success in the presence of the other data, and vice versa. A data limitation was the quality of the PA program database. The study was delimited by its focus on one PA program. To maintain the feasibility of the study due to the financial and time restraints, the study was limited to the local program only. The population of the study

included only those graduates who have taken the PANCE during the period 2006 through 2016.

Protection of Participants' Rights

Before data collection, institutional IRB approval and Walden University IRB approval was sought and approved (Walden IRB approval No. 09-17-18-04001917). Following approval, access to the archival data was requested and granted. There were no active human or animal participants in this study. The data contained no personal or identifying information, having been removed by the program's administrative staff before being released for the study. The study site organization name or personnel working for the local organization will not be named in the final doctoral project report. All students entering the local PA program sign a release allowing for the use of their information for research purposes. Every effort was used to maintain strict security and confidentiality of all information gathered during the research study. The data is secured via the use of a password-protected computer and locked in a secure file cabinet.

Data Analysis Results

This section presents the results of the data analysis for the research question related to the predictability of the student demographic variables, prerequisite GPA, cumulative GPA, science GPA, and GRE scores on the student's success of the PANCE. This section begins by presenting the descriptive statistics and then the binary logistics regression. Results presented include means, standard deviations, and binary logistic regression analyses.

Table 4

Missing Values Count for the Variables

Variables	*N*	Missing count	Missing percent
Home State	280	0	0.0
Age	280	0	0.0
Gender	280	0	0.0
Ethnicity	280	0	0.0
Health Care Experience	278	2	0.7
GRE Verbal Reasoning	131	149	53.2
GRE Quantitative Reasoning	131	149	53.2
GRE Analytical Writing	128	152	54.3
CASPA Science GPA	280	0	0.0
CASPA Cumulative GPA	235	45	16.1
Prerequisite GPA	108	172	61.4
Type of Bachelor's Degree	107	173	61.8
Undergraduate Major	107	173	61.8
Undergraduate Institution	107	173	61.8
PANCE Success	280	0	0.0

The revised dataset included 280 students who were admitted into the PA program from 2009 to 2016. Of those students, considering first-time exam takers only, 44 failed PANCE while 236 passed PANCE. In order to accomplish the binary logistic regression analysis, the data set could not be missing any data. Each subject in the dataset must have a value for each of the variables. If any variable is missing data, then that individual subject must be removed from the dataset (Table 4) (Tabachnick & Fidell, 2013).

After evaluation of the missing values count, the dataset was further reduced to account for the number of cases missing data for prerequisite GPA, type of degree, type

of major, and the undergraduate institution. This further reduced the dataset to a total sample size of 107 cases ($N = 107$). Table 5 presents the variables for the final reduced dataset with complete data consisting of 14 independent and 1 dependent variable ($N = 107$).

Table 5

The Final Variables for the Reduced Dataset

Variable	*N*
Home State	107
Age	107
Gender	107
Ethnicity	107
Health Care Experience	107
GRE Verbal Reasoning	107
GRE Quantitative Reasoning	107
GRE Analytical Writing	107
CASPA Science	107
CASPA Cumulative	107
CASPA Prerequisite GPA	107
Type of Bachelor's Degree	107
Undergraduate Major	107
Undergraduate Institution	107
PANCE Success	107

Outliers. Once the sample size had been established ($N = 107$), evaluation of outliers was performed. Univariate outliers were examined for home state, age, gender, ethnicity, health care experience, GRE verbal reasoning, GRE quantitative reasoning, GRE analytical writing, CASPA Science GPA, Cumulative GPA, Prerequisite GPA, Type of bachelor's degree (BA versus BS degree), Undergraduate major (Hard Sciences

versus non-Hard Science major) and undergraduate institution (instate versus outstate). An outlier was defined as any standardized value which falls more than +/- 3.29 standard deviations from the sample mean (Tabachnick & Fidell, 2013).

Table 6

Number of Outliers Detected for Independent Variables

Variable	No. of Outliers
Home State	0
AGE	10
Gender	0
Ethnicity	0
Health Care Experience	0
GRE Verbal Reasoning	0
GRE Qualitative Reasoning	0
GRE Analytical Writing	0
CASPA Science GPA	0
Cumulative GPA	0
Prerequisite GPA	0
Type of Bachelor's Degree	7
Undergraduate Major	6
Undergraduate Institution	0

The number of outliers per variable is listed in Table 6. Outliers were identified for age (n = 10), type of bachelor's degree (BA versus BS degree; n = 7), and Undergraduate major (Hard Sciences versus non-Hard Science major; n = 6). After reviewing the data points, I determined the flagged values were accurate and valid by confirming the data with the local program as reported by CASPA. Once accuracy was verified, the values were retained in the dataset (Witte & Witte, 2004).

Table 7 reveals the descriptive statistics for the interval variables. Table 7 shows the frequency, minimum, maximum, mean, standard error of the mean, and standard deviation. Table 8 reveals the category names and frequencies for the categorical variables.

Table 7

Descriptive Statistics for Interval Variables

Variable	*N*	Minimum	Maximum	*M*	S.E.	*SD*
Age	107	20	48	23.86	0.47	4.88
GRE Verbal Reasoning	107	136	163	149.47	0.50	5.20
GRE Quantitative Reasoning	107	136	166	148.82	0.57	5.88
GRE Analytical Writing	107	3	6	3.76	0.05	0.56
CASPA Science GPA	107	2.88	4.00	3.31	0.02	0.26
Cumulative GPA	107	3.01	4.00	3.41	0.02	0.24
Prerequisite GPA	107	2.85	4.00	3.41	0.03	0.28

Table 8

Descriptive Statistics for Categorical Variables

Categorical variable	Category name	*N*
Undergraduate Institution	Non-WV Institution	71
	WV Institution	36
Gender	Female	70
	Male	37
Ethnicity	Non-White	15
	White	92
Health Care Experience	No Health Care Experience	25
	Previous Health Care Experience	82
Type of Bachelor's Degree	Bachelor of Arts Degree	7
	Bachelor of Science Degree	100
Undergraduate Major	Non-Hard Sciences	6
	Hard Sciences	101
Home State	Not WV	77
	WV	30

Distribution. A Shapiro-Wilk test was conducted to determine if the data distributions for home state, age, gender, ethnicity, health care experience, GRE verbal reasoning, GRE quantitative reasoning, GRE analytical writing, CASPA Science GPA, Cumulative GPA, Prerequisite GPA, Type of bachelor's degree (BA versus BS degree), Undergraduate major (Hard Sciences versus non-Hard Science major), undergraduate institution (instate versus outstate), and PANCE; pass or fail were significantly different from a normal distribution. The results indicated that GRE verbal ($W = 0.981$, $p = .142$), and quantitative scores ($W = 0.988$, $p = .459$) followed a normal distribution while the remaining variables were not normally distributed ($p < .05$). Table 9 presents the results of the Shapiro-Wilk normality tests. Pallant (2013) stated that with a large sample size, such as samples with more than 30 participants, non-normality is typically not

problematic. Stevens (2009) posited that the *F* test is typically robust to violations of normality, even with slight consequence to the Type I error rate as a result of non-normality.

Table 9

Shapiro-Wilk Test Results

Variable	W	df	*p*
Home State	0.562	107	.000*
Age	0.594	107	.000*
Gender	0.601	107	.000*
Ethnicity	0.412	107	.000*
Health Care Experience	0.524	107	.000*
GRE Verbal Reasoning	0.981	107	.142
GRE Quantitative Reasoning	0.988	107	.459
GRE Analytical Writing	0.920	107	.000*
CASPA Science GPA	0.897	107	.000*
Cumulative GPA	0.961	107	.003*
Prerequisite GPA	0.946	107	.000*
Type of Degree	0.266	107	.000*
Undergraduate major	0.242	107	.000*
Undergraduate Institution	0.596	107	.000*
PANCE success	0.381	107	.000*

*$p < .05$.

The research question addressed to what extent are the variables significant predictors of students' success in the passing of the PANCE on the first attempt. The dependent variable was operationalized as failure versus success in passing the PANCE on the first attempt. The results of the analysis of the binary logistics regression model using a forward (stepwise) selection approach are presented. Table 10 is the case summary table, which reveals that all 107 complete records were included in the analysis.

A binary logistic regression was conducted to examine whether home state, age, gender, ethnicity, health care experience, GRE verbal reasoning, GRE quantitative reasoning, GRE analytical writing, CASPA Science GPA, Cumulative GPA, Prerequisite GPA, Type of bachelor's degree (BA versus BS degree), Undergraduate major (Hard Sciences versus non-Hard Science major), undergraduate institution (instate versus outstate) had a significant effect on the odds of observing PANCE Success (The reference category for PANCE pass was 1 and PANCE Failure was 0). All 107 cases were selected for inclusion in the logistic regression analysis.

Table 10

Case Summary of Pass PANCE versus Fail PANCE

Cases		*N*	*%*
Selected Cases	Included in Analysis	107	100.0
	Missing Cases	0	0.0
	Total	107	100.0
Unselected Cases		0	0.0
Total		107	100.0

In a forward (stepwise) binary logistic regression, an analysis occurs first where no independent variables are added to the equation. This first analysis is called Step 0. Step 0 does not have an independent variable and only has the regression constant. In the next phase of the modelling of this regression equation which is called Step 1, a variable with the highest Wald statistic will be added to the regression equation. This newly added independent variable may be removed in a subsequent step if the likelihood ratio statistic is significantly affected.

Table 11 presents the Step 0 classification table. Step 0 is the condition where none of the independent variables are entered into the regression equation. The Step 0 classification table reveals that the overall binary logistic regression model correctly predicted 87.9% of PANCE first-time pass results. The false positives make up 12.1% of the data. False positive errors are those errors where the model predicts passing PANCE even though the individual did not pass PANCE.

Table 11

Step 0 Classification Table

			Predicted PANCE Pass-Fail		
	Observed		Fail PANCE	Pass PANCE	Percentage correct
Step 0	PANCE Success	Fail PANCE	0	13	0.0
		Pass PANCE	0	94	100.0
		Overall Percentage			87.9

Table 12 presents the Step 0 logistic regression equation. In Step 0, no independent variables are added to the regression equation. At this point in the analysis, the logistic regression equation is log-odds of Passing PANCE = 1.978.

Table 12

Step 0 Variables in the Logistic Regression Equation

	Variable	B	S.E.	Wald	df	*p*	Exp(B)
Step 0	Constant	1.978	0.296	44.698	1	0.000	7.231

Table 13 reveals the Step 0 variables that are not in the regression equation. In Step 1, the independent variable with the highest Score statistic will be added to the regression equation and will be analyzed for statistical significance. The variable with the highest Score statistic (7.645) is the GRE Quantitative Reasoning. The GRE Quantitative Reasoning variable has the lowest significant level at .006.

Table 13

Step 0 Variables not in the Logistic Regression Equation

	Variables	Score	df	*p*
Step 0	Home State	0.797	1	0.372
	Age	0.054	1	0.816
	Gender	0.099	1	0.754
	Ethnicity	0.023	1	0.880
	Health Care Experience	0.453	1	0.501
	GRE Verbal Reasoning	7.253	1	0.007
	GRE Quantitative Reasoning	7.645	1	0.006
	GRE Analytical Writing	4.230	1	0.040
	CASPA Science GPA	0.395	1	0.530
	Cumulative GPA	0.258	1	0.611
	Prerequisite GPA	0.502	1	0.479
	Type of Bachelor's Degree	0.032	1	0.858
	Undergraduate Major	0.122	1	0.727
	Undergraduate Institution	2.705	1	0.100

Table 14 reveals the chi-square analysis of the logistic equation with the added independent variable GRE Quantitative Reasoning. The Step 1 model is statistically significant at $p = .004$. This means that by adding the independent variable GRE Quantitative Reasoning to the equation, the regression equation is statistically significant.

Table 14

Step 1 Omnibus Test of Model Coefficients

		x^2	df	*p*
Step 1	Step	8.334	1	0.004
	Block	8.334	1	0.004
	Model	8.334	1	0.004

Table 15 presents the R^2 values for the Step 1 regression model. The Nagelkerke R^2 was .143. The Nagelkerke R^2 is similar in meaning to the linear regression Adjusted R^2 (Garson, 2011). This amount suggested that the regression model accounted for approximately 14.3% of the variance in the dependent variable.

Table 15

The R^2 Values for the Regression Model

Step	-2 Log likelihood	Nagelkerke R^2
1	70.824	0.143

Table 16 presents the results of the Hosmer and Lemeshow Test which is a goodness of fit test selected by the SPSS when performing a logistic regression analysis. The goodness of fit test evaluates how well the equation predicts the observed outcomes. The test should be greater than 0.05 (Garson, 2011). This test resulted in a Hosmer-Lemeshow x^2 (8, N = 107) = 7.444, p = .490, which is greater than the established 0.05, reveals that the data fits the model.

Table 16

Results of the Hosmer and Lemeshow Test

Step	x^2	df	*p*
1	7.444	8	0.490

Table 17 presents the Step 1 classification table. Step 1 is the condition where the variables are entered into the regression equation. The Step 1 classification table reveals, similarly to the Step 0 classification table that the overall regression model correctly predicted 87.9% of PANCE results, with false positives make up 12.1% of the data. The Step 1 Classification Table is exactly the same as the Step 0 Classification Table. This means that even though the independent variable GRE Quantitative Reasoning was added to the regression equation, the predictability of the regression equation did not change.

Table 17

Step 1 Classification Table

			Predicted PANCE Pass-Fail		
	Observed		Fail PANCE	Pass PANCE	Percentage correct
Step 0	PANCE Success	Fail PANCE	0	13	0.0
		Pass PANCE	0	94	100.0
		Overall Percentage			87.9

Table 18 presents the results of the binary logistic regression analysis. The results indicate that only one variable, GRE Quantitative Reasoning, was statistically significant ($p = .008$) and was retained in the binary logistic regression equation. The logistic

regression equation is log-odds of Passing PANCE = -21.969 + [0.163 (GRE Quantitative Reasoning Score)]. This model can be used to predict the probability that a subject will pass PANCE on the first attempt. The model predicts that when GRE Quantitative Reasoning score increases by 0.163 points, the odds ratio of passing PANCE is 1.177 times as likely.

Table 18

Step 1 Variables in the Logistic Regression Equation

	Variables	B	S.E.	Wald	df	*p*	Exp(B)
Step 1	GRE QR	0.163	0.062	7.014	1	0.008	1.177
	Constant	-21.969	8.947	6.030	1	0.014	0.000

Using a 50% cut off, the logistic regression equation's sensitivity, or its ability to predict PANCE Success, was 87.9% and the specificity, or ability to correctly predict failing PANCE, was 0%. This reveals that the binary logistic regression equation is a poor predictor of selecting individuals who will not pass PANCE. However, the results should be interpreted with caution because there were very few students in this analysis that did not pass PANCE ($N = 107$; Pass, $n = 94$; Failure, $n = 13$).

For the research question, only GRE Quantitative Reasoning was found to be a statistically significant ($p = .008$) variable and included in the logistic regression equation. Thus, GRE quantitative reasoning score is a significant predictor of selecting individuals who will not pass PANCE.

Table 19 reveals the Step 1 variables which are not in the regression equation. The variable with the highest Score statistic (1.471) is the GRE Verbal Reasoning;

however, it is no longer statistically significant at .225. Thus, no other variables will be included into the logistic regression model equation. Table 19 reveals that no other variables were statistically significant. The significance values ranged from .225 to .940 and exceeded the alpha of .05 which was used to indicate statistical significance.

Table 19

Variables not in the Logistic Regression Equation

	Variables	Score	df	*p*
Step 1	Home State	0.133	1	0.716
	Age	0.006	1	0.940
	Gender	0.257	1	0.612
	Ethnicity	0.055	1	0.814
	Health Care Experience	0.034	1	0.855
	GRE Verbal Reasoning	1.471	1	0.225
	GRE Analytical Writing	1.184	1	0.276
	CASPA Science GPA	0.286	1	0.593
	Cumulative GPA	0.006	1	0.936
	Prerequisite GPA	0.144	1	0.704
	Type of Bachelor's Degree	1.143	1	0.285
	Undergraduate Major	0.096	1	0.756
	Undergraduate Institution	1.441	1	0.230

Discussion

In Section 2, summarized the purpose of the study, the key results, the connections to prior research, and the inference of my research. In addition, in Section 2, I discussed the limitations of this research and offers suggestions for future research.

The purpose of my study was to evaluate variables collected during the admissions process to predict if students will pass the PANCE on the first attempt. The research question assesses the ability of these variables to predict passing PANCE. This

research question provides information regarding the importance of a standardized entrance test and other variables for PA students.

Key Findings and Connections to Previous Research

Many previous studies found conflicting results as to whether demographics, preadmissions prerequisites, like GPA and GRE scores were an indicator of passing PANCE in PA programs (Andreeff, 2014; Andreeff et al., 2015; Brown et al., 2013; Butina et al., 2017; Ennulat et al., 2011). Given mixed results from other studies and the gap in practice concerning research on the admissions predictors of PANCE success within the local PA school, my study evaluated if the demographics and preadmissions prerequisites used in the selection process and GRE scores were predictors of student's PANCE success. There is no absolute predictive indictor of PANCE success when considering demographics, preadmissions prerequisites, and GRE scores in a setting where all students are admitted with a 3.0 GPA and graduate from the local PA program.

Research Question Alignment

The research question asked to what extent do one or more of the variables, individually or in combination, have significant value in predicting students' success in the passing of the PANCE on the first attempt. The logistic regression revealed in Table 18 that only one variable, GRE Quantitative Reasoning, was statistically significant in being able to differentiate between passing PANCE and failing PANCE. The 13 other independent variables were found to be not statistically significant in their ability to differentiate between students that passed PANCE and students that did not pass PANCE.

Specifically, my study revealed a Nagelkerke R^2 of .143. The Nagelkerke R^2 can range from 0 to 1 and tries to approximate the variance in the model (Garson, 2011). Since the Nagelkerke R^2 is low, the model does not account for much variance in predicting the passing of PANCE on the first attempt.

In terms of the present study, a good logistic regression equation is supposed to be able to predict the probability that a subject will pass PANCE or fail PANCE. Of the 107 students with a GRE Quantitative Reasoning score, zero students had a probability of less than 50 percent of not passing PANCE on the first attempt. The equation predicts that the majority (100%) of students will pass PANCE, which was not the case, as thirteen students failed PANCE on the first attempt. Of the thirteen students that did not pass PANCE, the binary logistic regression equation predicted that all thirteen had a greater than 50 percent probability of passing PANCE, yet none of those students passed PANCE on the first attempt. Using a 50% cut off, the logistic regression equation sensitivity is 87.9%, and the specificity is 0%. Therefore, my binary logistic regression equation using the current dataset is a poor predictor of identifying individuals who will not pass PANCE. However, the above results can be misleading because only a small number of students (n = 13) did not pass PANCE.

Table 20

Comparison of Significant Findings from the Study Compared to Previous Research on Predictors of PANCE Success

Moore research (2018)	Previous research
Found GRE QR to be a predictor in passing or failing PANCE	Adds to Hocking and Peipenbrock (2010) and Kuton (2011) found that higher GRE scores predict passing PANCE Does not support Oakes et al. (1999) findings that demographic variables are correlated with PANCE success. Supports Kotun (2011) and Imel et al. (2012) findings that educational experience is not statistically significant Does not support Luce (2011), Andreeff (2014) Butina et al. (2017), Higgins et al. (2010), and Kindle and Brock (2018) findings that preadmission GPA is a predictor of future PANCE success Supports Brown et al. (2013) findings that there is not a relationship between undergraduate GPA and PANCE success

Table 20 compares my findings to those of previous studies. Using binary logistic regression, Hocking and Peipenbrock (2010) and Kuton (2011) found that higher GRE scores predict passing PANCE. The present study findings partially supported the extant literature, but only regarding the GRE Quantitative Reasoning score—the verbal scores did not predict PANCE success in the present study.

Delimitations and Limitations

A few factors limit my study. The study is delimited by its focus on the local PA program. Therefore, a potential limitation is the lack of generalizability. Other PA programs may not be able to extrapolate the results to their applicants, and data from other programs may have produced different results.

The study is restricted to the variables examined in the local PA school's admission process. The independent variables used in my study are those that the local program has collected over the last 5 years during the admissions process. Other unknown variables could predict PANCE pass rates, such as the number of health care hours a student has accrued or the student's specific undergraduate institution (McDaniel, Thrasher, & Hiatt, 2013).

The most significant limitation to this study was the program's lack of self-assessment. As explained earlier, a gap in practice exists at the local program. I was unaware until conducting this study how significant that gap in practice was as it affected all areas of self-assessment, not just the collection and analysis of data. It became evident from the data provided by the local program that few, if any, data were collected prior to 2009 and data collection remained limited in the cohorts until 2013 in regards to demographics and preadmission variables. The lack of commitment to the program self-assessment process in the areas of data collection and analysis continues in the program. While it appears that data collection improved in 2011, the local program's gap in practice limited the available data, and thereby the final total sample size in this study.

Based on the lack of available data and admissions requirements, sample size and characteristics are a limitation of this study. I had to eliminate 179 students, the majority from the 2006, 2007, and 2008 cohorts, from the study due to a lack of data. Had the data for the 179 students been available, the results may have been different. Further, the admissions process of selecting students may influence the statistical analysis. Students with low GRE scores and low GPAs (below 3.0) are not generally admitted into the PA school due to the competitiveness of the admissions process and the challenging nature of the program. The strictly noncognitive selection process could have skewed the results.

The variables used by the program, including GPA and GRE scores, have limitations. For GPA, faculty members at the different undergraduate institutions may have employed different grading criteria. These grading criteria may affect the student's undergraduate CASPA GPA. The variance in grading standards is difficult to account for in the process. My study assumed that the undergraduate CASPA GPAs and prerequisite course grades from the different undergraduate schools are equivalent, yet this assumption may not be true. This limitation is inherent in all studies that use GPA as a variable. Another potential limitation was that the GRE scores were recalibrated in 2013. This study uses only the newly calibrated GRE scores, and the results can therefore not be generalized to the old GRE scores (ETS, 2016).

Conclusion

The purpose of this retrospective cohort study was to develop a research-based understanding of the predictive power between prerequisite admission requirements,

listed in Table 3, and PANCE success for PA students at a 27-month graduate PA curriculum to compensate for a gap in practice in the admissions process. The methodology for this research study included a retrospective cohort study quantitative predictive analysis using binary logistic regression. Using the quantitative method of predictive analysis provided for a better understanding of the local problem of PANCE success. Archival data are available for the graduate students from the classes of 2006 through 2016. The data consisted of student demographics, grade point averages, and GRE scores which comprise the independent variables, and PANCE success, which is the dependent variable. An Excel spreadsheet of archival data was developed as the core instrumentation for the collection of data for the study. The research design, setting, and population of the proposed study were described in this section. The instrumentation, data collection and analysis, and ethical considerations were detailed.

My research found that the logistic regression equation is a poor predictor of selecting individuals who will not pass PANCE. While the GRE qualitative reasoning score was found to be statistically significant ($p < .01$), it is a poor predictor of success, in that it did not have a significant effect on the odds of observing PANCE success. The overall results are inconclusive, supporting the null hypothesis. The study conclusion is the null hypothesis is confirmed when considering the local population and PANCE success. There are no admission prerequisite predictors of student success on the PANCE, first-time pass, based on the current data available at the local program.

Section 3: The Project

Introduction

In consideration of the project study results and review of the professional literature, my project is a policy recommendation to improve the admissions process at the local program. The policy recommendation paper is based on the study findings and a review of the current professional literature as it pertains to PA program and graduate admissions standards. The goals of the policy are to limit bias in the admissions process through the development of an admissions rubric, increase applicant quality, and diversity by developing a holistic approach to the admissions process while supporting the program's goals and mission.

Rationale

The project approach, a policy recommendation, stemmed from the need for revisions to admissions processes at the local PA school. Admissions requirements were developed in a meeting with the program coordinator in 2012, as a revision following the loss of accreditation and redevelopment of the current local program in 2010. The meeting resulted in recommendations to require a minimum of 3.0 cumulative GPA, GPA for the screening of applicants, and the consideration of adding a point in the scoring process for those students who scored a higher GPA in the last 60 credit hours of academic performance. The consultant further related that no reliable evidence supported the use of any certain prerequisite courses and recommended microbiology with lab, general chemistry with lab, genetics, anatomy, and physiology.

Further, the consultant recommended that the program should continue to require a bachelor's degree for admission to the program, 40 hours of PA shadowing, three letters of recommendation, health care experience preferred but not required, and a supplemental application process. According to the local program faculty report in 2016, the admissions committee's goal should be to meet weekly to review the approximately 1,000 to 2,000 applications received each application cycle with 36 students selected to that year's cohort. During the period 2006 through 2016, the admissions requirements for the local program as listed in the local PA program brochure included the prerequisite courses, as listed in Table 1, three letters of recommendation, a personal statement, 40 hours of PA shadowing, and the GRE analytical writing score. The admissions director compiles application information and oversees the admissions process other than the interview itself. There has been no change in the admissions process since 2010.

I determined that there are no admission predictors of student success on the Physician Assistant National Certifying Exam. Drawing on this conclusion, an admissions policy based solely on the variables of GPA and GRE scores may not be the best method when determining the selection of applicants for the local PA program. Therefore, the project is an admission policy recommendation in support of admissions standards that include cognitive and noncognitive variables presented to the program administration and faculty for consideration in support of the local program's mission.

Review of the Literature

I began researching peer-reviewed articles for information related to other types of investigations with similar populations as the PA program and similar research or practices, focusing on the development of an admissions policy recommendation for the local program. First, I used the local database, which includes the Cochrane Library and ProQuest Medical Library, in conjunction with the resources in the Walden University Library and Google scholar. Second, I conducted this search using the following search terms: policy recommendation paper, white papers, executive summary, academic policy design, policy brief, policy proposal, policy paper components, writing a policy recommendation, what is a policy recommendation, policy presentation, and policy proposal development. A typical theoretical model used in academic policy development is the instrumental-rational model. The instrumental-rational model begins with framing practices that make outcomes valid and states that the ground-up approach should be used in the policy development process (Colebatch, 2018; Turnbull, 2018).

Defining Policy Recommendation

A policy recommendation is a written summary prepared for an audience, often called stakeholders, that has the authority when it comes to decision-making in reference to policy within an organization. It is a form of problem-solving and discussion consisting of a structure which includes an issue, analysis, and recommendation, while using local research conclusions and context of the issue to facilitate the policy-making process (French-Constant, 2014; How to write a policy recommendation, 2019). Policy

recommendations are sometimes referred to as decision memorandum, policy proposals, policy briefs, or “White papers” and are a standard method within organizations used to present information to enact change (American Institute of Aeronautics and Astronautics [AIAA], 2017; Collins, 1993; French-Constant, 2014; Policy Brief, n.d.).

Although an effective method of informing stakeholders of research, a policy recommendation often addresses issues and the need for policy change within an organization (AIAA, 2017; French-Constant, 2014; Musandu, 2013). They are used to communicate effectively to stakeholders' actionable information which focus on specific issues. (Policy Brief, n.d.). Policy recommendations are developed to present relevant solutions to the issues with recommendations supported by the research and evidence from the professional literature, while answering the question on how the policy affect the department or institution. When defining a policy recommendation it is critical to understand the policy decision-making process at the local institution and who are the stakeholders (French-Constant, 2014).

Stakeholders. Consideration as to the target audience is an important consideration when writing a policy recommendation (Lavis et al., 2003). Stakeholders are the individuals that have the authority to affect policy and enact change within an organization (Public Health in Ireland, 2015). An understanding of the target audience/stakeholders is crucial in the development and presentation of the proposal. Stakeholder engagement is critical in policy development and action lending to an effectively written policy. A policy recommendation should be proposed as soon as the

research is completed and address the policy issues to the stakeholder. (French-Constant, 2014; How to communicate your roadmap to stakeholders, 2019).

Writing a Policy Recommendation

When developing the policy recommendation, it is essential to understand the policy context, knowledge landscape, and any significant networks (French-Constant, 2014). A good policy recommendation provides the stakeholders with the information necessary to make decisions both in a positive manner and effectively. When writing the recommendation, it is important to know your audience, identify the problem, and propose a solution. Addressing the policy recommendation to the target audience is critical (Cairney, 2017; Musandu, 2013). A strong policy recommendation targets the audience and is brief. The issue or problem should be stated at the beginning and end of the policy recommendation, be analytical and objective (Wong, Green, Bazemore, & Miller, 2017).

A white paper is a common form of policy recommendation. White papers provide decision-makers with the information necessary to decide policy, and should include analytical research and policy recommendations (Herman, 2013). Stakeholders prefer policy recommendations that are short, concise, and timely, allowing them to be read by a stakeholder in a 30-60-minute timeframe (French-Constant, 2014). French-Constant (2014) related that a policy recommendation should be short and concise "in the times it takes to drink coffee over breakfast" (p. 6). While a policy recommendation normally is 1 to 4 pages (1000- 2000 words) in length, a white paper is written to address

more complex issues and may require greater length to cover all the necessary material (AIAA, 2017; Cairney, 2017; French-Constant, 2014; Wong et al., 2017). Policy recommendations should target a specific audience, and in academia are more often the faculty and administrators of a local program (Wong et al., 2017).

Research and evidence. Areas to consider when writing a policy recommendation are the problem, solution, facts, review of the professional literature, research analysis, and significance (Davidson, 2018; Lavis et al., 2003; Rajabi, 2012). Policy recommendations are supported by evidence, reinforced by the professional literature and current actionable research (Lavis et al., 2003; Wong et al., 2017). The use of facts and research adds credibility and lends validation to a policy recommendation (Davidson, 2018). Recommendations are written for the proposed target audience and developed to support the environment the actionable research is to affect (Lavis et al., 2003).

Language. Proposals are written using precise language, with attention to being succinct and emphasize the research conclusions that affect the current or proposed policy (Policy Brief, n.d.). A policy recommendation is written in the present or future tense, which supports concise, direct, and timely decision-making by stakeholders (Collins, 1993; Rajabi, 2012; Scotten, 2011). When writing use active voice words like engage, and incorporate, while preserving a professional but not too technical style, if needed, supply a terminology appendix. (French-Constant, 2014; Musanda, 2013). Characteristics of a policy recommendation are accuracy, conciseness, efficiency,

effectiveness, and readability (Davidson, 2018; How to write a policy recommendation, 2019). The policy recommendation should have a specific audience, be clear, concise, and easy to read while addressing the need for policy change. Policy recommendations need to be timely and credible (French-Constant, 2014). Policy recommendations are concise and contain simple, understandable language, while presenting research findings to stakeholders and offering recommendations for change (Cairney, 2017).

Structure. Recommendation paper length should be at minimum 1-3 pages include a cover sheet, purpose, background, and recommendation. Reference information and terminology should be provided to the stakeholders (AIAA, 2017; Musandu, 2013). An example of a policy recommendation structure is presented in Table 21, while an alternate structure is presented in Table 22.

Table 21

Structure of a Policy Recommendation Paper

1. Executive Summary/purpose statement
2. Body
    a. Background
        i. Current policy
        ii. Why being do this way
    b. Analysis
        i. Why is a policy not working
        ii. Why do we need an alternative
    c. Policy options
        i. Discuss a few alternatives and their implications
    d. Recommendations
        i. Provide recommendations and how it can be implemented
3. Conclusion
    a. Summarize analysis and recommendation
4. Appendix

(Scotten, 2011)

Table 22

Structure of an Alternate Policy Recommendation Paper

1. Title
2. Executive Summary
3. Introduction/Summary of the Problem
4. Methods, Approaches, and Results/Body
5. Conclusions
6. Policy recommendations
7. References
8. Acknowledgments

(French-Constant, 2014)

A policy recommendation provides an overview of a problem, analysis, actionable research and recommendations. Some policy recommendations may include a stakeholder chart, outlining the policy options, in the options section and will include some elements while excluding other elements of the recommended structure based on the target audience (Herman, 2013). The chart allows the stakeholders to visualize the positive and negatives of the different options. There are specific formats for white papers when used for policy recommendation. That format may include, a title, executive summary, scope of the problem, policy alternatives, recommendations, appendices, and cited sources (AIAA, 2017; French-Constant, 2014). The executive summary is the most essential part of the white paper. The basic structure of the white paper in Table 23. (Herman, 2013).

Table 23

Structure of a White Paper

1. Executive summary
2. Introduction / Background
3. Methodology
4. Literature Review
5. Analysis of findings or Evidence
6. Policy recommendations
7. Implementation
8. Conclusion
9. Appendices
10. Bibliography

(Herman, 2013)

The introduction should be concise, followed by the problem statement and analysis (Collins, 1993).

The policy recommendation is written in a way to inform decision makers and make compelling arguments for support of a policy or recommend a change in policy, while noting the parts of the current polices that may or may not meet expectation (Musandu, 2013). A recommendation is tailored to the local audience and issue, and may or may not include all the listed components of the recommend structure (AIAA, 2017; Collins, 1993; French-Constant, 2014; Herman, 2013; Musandu, 2013).

Recommendations. Research should support the recommendations. The policy recommendation should provide at least three recommendations that are actionable (Musandu, 2013). The objectives of the policy recommendation should be clearly stated with a maximum of 3 options included with the appropriate analysis. Next, the recommendations should follow, each as a standalone, actionable item (Collins, 1993).

The recommendation presentation and assessment process of any policy recommendation should be explicit and quantifiable (Duggan, 2018).

Presenting a Policy Recommendation

A policy presentation is a popular method of disseminating information learned during a research study. Often the presentation will follow a four-step process 1) define the problem 2) state the policy 3) make the case 4) discuss the impact and make recommendations (Wong et al., 2017). Its primary purpose is to inform stakeholders with the information necessary to make well-informed decisions in a time efficient manner (Rajabi, 2012). The presenter should have credibility (Lavis et al., 2003). Use visual aids to increase understanding of the recommendation and provide data to the stockholders (Davidson, 2018). Use a fact-based approach when presenting to the stakeholders. Present specific policy recommendations and courses of action (Scotten, 2011). The primary method of presenting information across academia today is Microsoft's PowerPoint™ (Schoeneborn, 2013). A PowerPoint™ presentation is an effective means of professional communication, information transfer, and documentation within an organization (Schoeneborn, 2013). An understanding of the target audience is crucial in the presentation of the policy recommendation (French-Constant, 2014). Remember, whom your audience is when presenting the policy recommendation (AIAA, 2017). Use a template if available from your institution. The policy presentation should use the active voice, be concise, and clear in its purpose. Distribution should be either by hard copy or by email. Select the audience to read the policy recommendation if not pre-selected. Have

hard copies available at the policy recommendation presentation (French-Constant, 2014; How to communicate your roadmap to stakeholders, 2019).

Communicate policy recommendations effectively to ensure stakeholder "buy-in", while anticipate questions and concerns; be able to provide specific examples. Visual aids assist in maintaining the audience attention while reinforce the recommendations and key points of the policy recommendation. Prepare and present using the recommended methodology of plan, prioritize, and execute as illustrated in Figure 5 (How to communicate your roadmap to stakeholders, 2019)

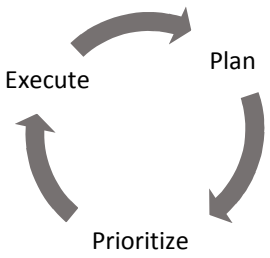

Figure 5. How to communicate your roadmap to stakeholders.

Conclusion

Know the audience; do the research, pre-write the proposal, revise, and edit. Proposals are written to suit the environment and the stakeholders involved in the decision-making process (Writes, 2016). A policy recommendation is a systemic approach for the engagement of stakeholders for the purpose of decision-making and informing stakeholders, while providing them with background, analysis options, and

recommendations (The SURE Collaboration, 2011). Stakeholders have to care about the problem in order to support a solution and are key to policy success (Cairney, 2017).

Project Description

The project is an admissions policy recommendation paper. A policy recommendation paper serves the purpose of providing information to a group of stakeholders to inform them of an issue and provide possible solutions. The paper provides all the necessary information needed to make well-informed decisions (Duggan, 2018). The recommendation paper can provide feedback in reference to a particular question being asked by the stakeholders. A recommendation paper should provide information and feedback on the question being researched, the data, the analysis, solutions to identified outcomes, and any conclusions drawn for the project study. Recommendations are based on the project study findings and current professional literature. The paper was presented to the program administration and faculty for action in updating the local programs admissions policy. In the end, a recommendation paper should provide all the necessary information for stakeholders to make a well-informed decision (Duggan, 2018; Jen, 2007).

Needed Resources

Time and timing were the greatest resources need to complete the project. First, I needed time to complete the recommendation write-up and prepare the presentation. Second, the write-up and presentation needed submitted to the faculty and administration for review with enough time for the policy to be enacted before the start of the next

admissions cycle while ensure compliance with ARC-PA standards. Faculty and administrative support needed to support the purposed project, and "buy-in" to the Holistic admissions policy proposed. A new admissions policy required legal review for compliance with current laws. Support from Informational Technology was required to update the program website and other admissions documents which are made available to the public. Much of the support was attained from the local program faculty, the admissions committee, and the university's admissions department.

Existing Supports

The local program has a standing admissions committee made up of faculty, admission personnel, and the registers office. The local program has a full-time graduate admission coordinator. Additional support comes from the university's admissions and enrollment department. There are established relationships with the internal university departments and colleges. The internal relationships support recruitment from within the university. Externally, relationships exist with the other local state universities for recruitment purposes. CASPA and PAEA have admission support available for the local program. All these resources can contribute to the local program's improvement of the admissions process.

Potential Barriers

The first potential barrier is timing. PA education at the local program is a chaotic environment. Based on a 27-month cycle for each cohort there is little time for modifications to policy. Few faculty members have working knowledge of the

admissions process. These faculty many resist the change in admissions policy (Duncan-Hewitt, 1996). They will need convincing that the propose change is good for the program. Fear of retaliation could be a concern when dealing with an administration resistant to change. Number of faculty and administrators involved in the program's admissions process may not be enough to support changes in the interview and chart review process. Money constraint and fear in the ability to fill the program's cohort each year may hamper the programs ability to move forward with a new holistic admissions process.

Potential Solutions to Barriers

When dealing with time and timing issues, good effective planning is needed to support the policy recommendation. An effectual presentation, which explains the admissions process, and the proposed admission changes adding to faculty and administrator knowledge and commitment to the proposed change. Requesting support from the other departments, like admissions to increase the numbers needed to support the proposed changes. Maintain a positive outlook when dealing with those policy aspects that support the admissions process. Be respectful, nonjudgmental of past events and focus on maintaining the good the improving the process were needed. A non-threatening environment. Have a plan for the success of the process, at the local program and university level (Keenan, 2018). Provide good feedback to the stakeholder through the weekly admissions meeting, and annual retreats. Good local program monetary

management and increased recruitment efforts by the local program. All of these actions can reduce the potential barriers of program admissions success.

Proposal for Implementation

The policy recommendation paper and presentation will be presented at the next program self-study retreat, hopefully in Fall 2019 or Spring 2020. I will provide the stakeholders with a copy of the recommendation and present the information using a power point presentation. There will be allotted time for discussion, question and feedback. Following the presentation, stakeholders will be given an anonymous web-based survey. The web-based survey will be used to assess the faculty "buy in" for the recommended policy. Final decision of the recommended policy changes to the admissions policy will be by stakeholder vote the following college faculty meeting. The admission policy recommendation if approved will become effective for the following admission's cycle, and evaluated on an annual basis.

Project Evaluation Plan

The admissions policy will be evaluated on an annual basis with the goal to compare admissions data, student's graduation rates, and PANCE success. The goals of the admissions policy will serve as the primary method for evaluating the effectiveness of the admissions process at the local program (Caffarella & Daffron, 2013). Both National and local program data was gathered the analyzed for each cohort, the national data will come from the CASPA. At the three-year and five-year mark following the introduction of the adopted policy by the program, the data will be gathered and summarized as a

complete cohort population to access for trends and predictability as it lends to program and student success. Stakeholders include administration, faculty, and students.

Project Implications

The implications of the study overall are the development and implementation of a non-bias admissions process with the goal of increasing student academic success and program diversity. Improved student diversity supports the programs goals, while supporting the need for a more diverse PA provider workforce in society. In addition, increased diversity in the local PA program may increase the number of PA providers in the underserved areas of Appalachia (Kindle & Brock, 2018). The goals of the policy are to limit bias in the admissions process, increase applicant quality, and increase program diversity, supporting the program's goals and mission.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

Strengths

My project was based on quantitative research and the current professional literature. During the process, I developed a greater understanding of admission predictors of student success when considering the reliability of admissions prerequisite predictability and PANCE success. I collected and analyzed the data, determining conclusions based on the analysis, from which I developed an action plan. The action plan is a policy recommendation paper for a new admissions process. The recommendation will be proposed to the local program faculty and administration. They in turn may develop the new policy based on a recommendation founded in research.

Limitations

The administration and faculty could disregard the admission's policy recommendation. Stakeholders within the program or institution may be reluctant to change the current admission practice. Stakeholders would include faculty, program administration, institutional administration, and students. Another limitation could be budgetary, and the administration fear that changes to the admissions process could affect class size, or lend to an increase in student attrition. Time is a limitation since changes to an admission practice must be made in the interim of the admissions cycle and reported to CASPA in the Fall prior to the change in order for the change to go into effect for the next admissions cycle. The policy recommendations will only be presented at the local

level with no plan to present to the national PA educators. Thus, limiting the possible impact of the project to the local program.

Recommendations for Alternative Approaches

The population could be increased to include the students in the upcoming academic years. Alternative approaches to the problem could include the intervening variables taken from the student's time in the PA program, such as faculty teaching strategies, student educational requirements, clinical medicine course grades, PACKRAT scores or Final Cumulative GPA. Consideration could be given to the population of students who did not graduate from the program and the current project study variables used to predictor academic success as opposed to PANCE success. Admissions data could be included as predictors of academic failure resulting in dismissal from the program. Fewer independent variables could be used in the study in relation to the dependent variable; PANCE success. Future researchers might focus on the problem more broadly, among other programs of similar size and location in the predictive study. The admissions predictors' assessment must continue here at the local program in accordance with ARC-PA accreditation standards (ARC-PA, 2016b).

Scholarship, Project Development and Evaluation, and Leadership and Change

Scholarship

I learned, as a scholar, that success in doctoral writing is a process dependent on many factors. First, I realized that there exists a different approach when you compare medical writing to nonmedical writing. The transition to the APA method of citations and

scholar writing was a challenge. I had to change the way I think about and present ideas based on the audience the writing is attended for, and consider the different approaches for presenting information. Second, I had to relearn the different methods of data analysis and how to report those findings so that an audience could understand what was done and the result. I spend hours reviewing literature and assessing the value to the current study. Third, that the process is hard work, time consuming and draining. Preparation is the key in conducting research, along with the use of available resources. I hope to continue my scholarly efforts in the future and continue to focus on the growth of my profession and its diversity. Commitment is required to the study by both the researcher and the site, in order to obtain the best possible outcome. Finding an answer is the goal.

Project Development and Evaluation

A gap in practice when it comes to data collection and analysis at the local level affects the ability of the program to make well-informed decisions and changes necessary to be successful. An inaction in change effects all the stakeholders and overall the mission. The project study adds to the body of scholarship and understanding both at the local program level and PA profession. The project development itself, has contributed to my understanding of the local program's gap in practice, the overall admissions process, and predictors of student success. This understanding creates a foundation for future research in the area of student success. Project study outcomes include a better understanding of what factors predict student success on PANCE and will support development of a holistic admissions process.

I found that as a practitioner understanding the gap in practice, the study results, and the target audience is important when deciding which genre of project to select. I chose a policy recommendation paper to present my findings and recommendations on the proposed changes to the local programs admissions policy. The admissions committee employs the use of evidence-based decision making and the presentation of the project's findings will invoke discussion of the issue and enable the stakeholders to draw conclusions. The conclusions drawn from the study will help to develop an action plan to develop a holistic admissions policy and support social change within the local program.

A project developer requires an understanding of the project and the information to be presented. I researched the different methodologies of data presentation, understanding that there may be some resistance to change within the local program. I knew the audience, and understood that to be effective the policy recommendation would need to be short and to the point. I would use the data results from the study and information from the professional literature to support my recommendation. The policy recommendation was the most effective method for disseminating the findings of the study while supporting social change at the local program.

An evaluation of the admissions process needs to be supported by the administration and faculty. A timeline established to review and assess the process to ensure support of program mission and goals. Program administrators and faculty need the ability to conduct data analysis and implement changes to the program to ensure continued program success. Leadership must take ownership of the process and dedicate

themselves to the change necessary to improve program outcomes and support student success. The overall outcome of the project study was a better understanding of the admission predictors of PANCE success in the local program.

Leadership and Change

Competency-based leadership is instrumental in any organization. Competency can encompass many elements and be developed through education and experience. As a future academic leader, I must set an example and by doing so influence others through my actions. Maintaining a clear focus, caring and communicating with our administrators, faculty, and students builds the groundwork for trust in the local program. The project study helped me to gain the credibility need to affect the program in a positive way. I gained new knowledge and experiences, which in turn have helped me to become a better academic leader at our program. I hope to be a role model for others who seek their doctoral education and continue to add to the body of research within my profession.

Reflection on Importance of the Work

A gap in practice exists within the local program that significantly constrains the program's ability to conduct self-assessment. There are integral parts to the self-assessment process, each part playing a critical role independent on the other. Self-assessment begins with data collection followed by analysis. Based on the analysis, faculty draws conclusions and develops an action plan. The absence of any one part of the process handicaps the program's ability to make decisions based on accurate

information and analysis. I learned that good decision-making must be based on good information that is current and concise. Any future policy within the program must begin with understanding how that program was assessed through data collection and analysis drawing of conclusions and development of action plans. Future research would support the growing profession population and add to a better understanding of what preadmissions traits support student success in the program and on the PANCE.

Implications, Applications, and Directions for Future Research

Implications

The project study supports the need for social change at the program and professional level. Within the program, a holistic admissions policy would allow for the selection of a more diverse student population. Increasing opportunities for those students from marginalize populations and support the call from the PA professional organizations for a more diverse work force (Lohenry, Bradley-Guidry, & Ijams, 2018). A more diverse student population would improve program's values, goals and mission, while contributing to overall program success (Barnett, Hibbard, & Alexander, 2018; Bruce & Stopper, 2018; Lohenry et al., 2018). Future research would focus of the more diverse population and the relationships to program graduation rates and PANCE success.

Applications

Application of the suggested admissions policy recommendation would support the development of a program action plan. An action plan would support the program

requirement of compliance with the ARC-PA accreditation standards, closing the program's gap in practice, and the local program s mission and goals for increased diversity. The project study would address the "gap in practice" that exists in the local program and the increased insight gained by the research study into the admissions predictors of PANCE success. ARC-PA (2016b) states in standard C1.01, "The program must implement an ongoing program self-assessment process that is designed to document program effectiveness and foster program improvement" (p. 21). The program is required by accreditation standards to conduct self-assessment and make improvements to the program as necessary. Further, ARC-PA (2016b) standard C1.02 states, "The program must apply the results of ongoing program self-assessment to the curriculum and other dimensions of the program" (p. 21). Admissions practices are a part of the other dimensions noted by ARC-PA. A review of admissions practices is required by ARC-PA and of benefit to the program and students.

Annually and periodically during a program's accreditation cycle, reports are required to be submitted. These reports have an effect on the program's ability to operate and graduate students. C2.01 states "The program must prepare a self-study report as part of the application for continuing accreditation that accurately and succinctly documents the process, application and results of ongoing program self-assessment" (ARC-PA, 2016b, p. 21). Further, the action plan would address the need for diversity in the workforce through the development of a holistic admissions policy supporting the program mission and goals.

Directions for Future Research

Future researchers should replicate the study at the same site, after improvements to data collection. In my study, I found that 62% of the data were missing due to lack of information regarding the students' GRE scores, CASPA science GPA, prerequisite GPAs, undergraduate degree, and undergraduate institution. Some findings, like the lack of relationship between GPA and PANCE, seemed to contradict a body of literature; although this contradiction was present in other studies, the finding is still contentious. It would be interesting to reevaluate the data again in a few years to see if the results are similar.

The results of my quantitative data collection found that the binary logistic regression equation involving the 14 variables is a poor predictor of selecting individuals who will not pass PANCE. The reason for being such a poor predictor of selecting non-passing students may be due to the small number of non-passing students in my study, or it may be because the 14 variables may not be the main cause for failing PANCE. There may be other non-academic issues or external environmental factors that may be causing these students to not to pass PANCE. Future study in this area is warranted.

Another potential study would be to perform multiple imputations on the missing data. With this new data set, I could compare the results to the current model.

Looking beyond the current variables in the study, there may be other variables that might be indicators of passing or failing PANCE. Other variables to consider would be PA program test scores, PA program grade point average, number of repeated

undergraduate courses, number of withdrawn from undergraduate courses, number of failed undergraduate courses, number of undergraduate credit hours achieved number of undergraduate colleges the individual attended or number of advanced placement credits for undergraduate courses. Also, there may be environmental factors, which may affect passing PANCE. These factors could be marital status, living with children, the noise level at home, having a quiet place to study, having time to study, etc. Other areas of interest are the relationship between admissions predictors and academic failure within the PA program, to include academic probation and remediation.

Conclusion

Physician Assistant program admissions processes are very competitive, with more applicants than there are available seats. The PA admission committees must choose, from a myriad of well-qualified applicants, those students whose applications indicate that the student can meet the demands of PA education and be successful in passing the PANCE. However, quantitative data analysis indicated that none of the 14 variables considered by a local PA program for admissions adequately predicted students' PANCE success. In addition, since the reason students do not pass PANCE may be related to non-academic issues, PA schools should consider gathering information to evaluate the effects of non-academic life issues like coping skills, stress, lack of sleep, and nostalgia on their students as well (Abdulghani et al., 2014; Kogan, McConnell, & Schoenfeld-Tacher, 2005).

Overall, the results of this research study increase the current knowledge of PA program selection variables and the importance of those variables. It provides PA program admission committees with additional tools to improve their student selection process. My recommendation to PA program administrators and faculty is that the admission committees should review this study for applicability for their program and selection of their applicants during the admissions process, and consider the recommendations provided in the admissions policy recommendation paper. In this way, the local PA program can increase diversity while maintaining student and programmatic success, while addressing the dire need for PAs within the rural, underserved area of the United States.

References

Abdulghani, H. M., Abdulmajeed A. A., Khalil, M. S., Ahmad, F., Ponnamperuma, G. G., & Amin, Z. (2014). What factors determine academic achievement in high achieving undergraduate medical students? A qualitative study. *Medical Teacher*, *36*(1), S43-S48. doi:10.3109/0142159X.2014.886011

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2009). *Site Visit Report 2009.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant. Retrieved from local program institutional archive.

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2013). *Site visit report 2013.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant. Retrieved from local program institutional archive.

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2015). *Notes to programs.* Retrieved from http://www.arc-pa.org/acc programs/acc resources.html

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2015a). *PANCE required report.* Retrieved from http://www.arc-pa.com/acc_programs/acc_resources.html

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2016a, March). *Notes to program* . Retrieved from http://www.arc-pa.org/acc programs/acc resources.html

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2016b, March). *Accreditation standards for physician assistant education* (4th ed.). Johns Creek, GA: ARC-PA. Retrieved from http://www.arc-pa.org/accreditation/standards-of-accreditation/

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2017, May 22). Home/ARC-PA. Retrieved from http://www.arc-pa.org

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2017a). *Notes to program; Fall 2017.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant.

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2017b). *Notice of actions; Accreditation-probation status.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant.

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2017c) "Ongoing Program Self-Assessment." *Completing-the-Self-Study-Report-PAEA2017.pdf.* Retrieved from http://www.arc-pa.org/wp-content/uploads/2017/11/Completing-the-Self-Study-Report-PAEA2017.pdf

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). (2018a). *Notes to program; Spring 2018.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant.

American Academy of Physician Assistants. (2016, October). *Milestones on PA history.* Retrieved from https://www.aapa.org/WorkArea/DownloadAsset.aspx?id=2147485191

American Institute of Aeronautics and Astronautics (AIAA). (2017). Policy paper guidelines. Public Policy Committee, *American Institute of Aeronautics and Astronautics.* Retrieve from https://www.aiaa.org/

Andreeff, R. (2014). Predictors of student success on the physician assistant national certifying examination. *Journal of Physician Assistant Education*, *25*(3), 36-39. doi:10.1097/01367895-201425030-00008

Andreeff, R., Frydrych, L., & Shutts, G. (2015). Predictors of PA students success on the PANCE: An expanded look. *Journal of American Academy of Physician Assistants*. American Academy of Physician Assistants. doi:10.1097/01.JAA.0000470510.26700.05

Andriole, D. A., & Jeffery, D.B. (2012, April 1). A national cohort study of U.S. medical school students who initially failed Step 1 of the United States Medical Licensing Examination. *Academic Medicine*. St. Louis, MO. doi:10.1097/ACM.0b013e318248dd9c

Arbet, S., Parle, J., & Lathrop, J. J. (2012). UK and US physician assistant student performance on an international test of core biomedical science knowledge. *Internet Journal of Allied Health Sciences and Practice*, *10*(3), 1-6. Retrieved from https://nsuworks.nova.edu/ijahsp/vol10/iss3/5/

Arbuckle, J. L. (2010). *IBM SPSS Amos 19 user's guide.* Crawfordville, FL: Amos Development Corporation.

Asprey, D., Dehn, R., & Kreiter, C.(2004a). The impact of age and gender on the physician assistant national certifying examination scores and pass rates. *Journal of Physician Assistant Education, 15*(1), 38-41. doi:10.1097/01367895-200415010-00006

Asprey, D., Dehn, R., & Kreiter, C. (2004b). The impact of program characteristics on the physician assistant national certifying examination scores. *Perspective on Physician Assistant Education*, *15*(1), 33-37. doi:10.1097/01367895-200415010-00005

Babbie, E. R. (2010). *The Practice of Social Research*, 12th edition. Cengage Learning. Retrieved from https://epdf.pub/the-practice-of-social-research-12th-edition.html

Baker, T. C. (1994). *The relationship between preadmission requirements and student success in Maryland community college nursing programs.* (Doctoral dissertation, University of Maryland College Park, 1994), Dissertation Abstracts International, 56, 01A.

Barnett, J., Hibbard, S., & Alexander, L. (2018, October) *Strength lies in differences: Promoting inclusion excellence in admissions*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Bordage, G. (2009). Conceptual frameworks to illuminate and magnify. *Medical Education*, *43*, 312-319. doi:10.1111/j.1365-2923.2009.03295.x

Bordage, G., Lineberry, M., & Yudkowsky, R. (2016). Conceptual frameworks to guide research and development (R&D) in health professions education. *Academic Medicine, 91*(12), 2. doi:10.1097/acm.0000000000001409

Bourne, K. C., Arend, W., Johnson, D., Daher, N. S., & Martain, B. (2006). The influence of personality characteristics and test anxiety on physician assistant clinical knowledge rating and assessment tool (PACKRAT) performance. *Journal of Physician Assistant Education*, *17*(4), 42-46. doi:10.1097/01367895-200617040-00029

Brateanu, A., Yu, C., Kattan, M. W., Olender, J., & Nielsen, C. (2012). *A nomogram to predict the probability of passing the amercican board of internal medicine examination.* Retrieved from http://dx.doi.org/10.3402/meo.v17i0.18810

Bridgeman, B., Burton, N., & Cline, F. (2008). *Understanding what the numbers mean: A straightforward approach to GRE predictive validity.* Princeton, NJ: Educational Testing Service.

Brown, G., Imel, B., Nelson, A., Hale, L. S., & Jansen, N. (2013). Correlations between PANCE performance, physician assistant program grade point average and selection criteria. *Journal of Physician Assistant Education*, *24*(1), 42-44. doi:10.1097/01367895-201324010-00006

Bruce, C. & Stopper, C. (2018, October) *Use of holistic admissions*. Poster session presented at the 2018 PAEA Education Forum, Anaheim, CA.

Bunniss, S., & Kelly, D.R. (2010). Research paradigms in medical education research. *Medical Education*, *44* (4), 358-66. doi:10.1111/j.1365-2923.2009.03611.x

Burton, N. W., & Wang, M. (2005). *Predicting long-term success in graduate school: A collaborative validity study.* Princeton, NJ: Educational Testing Service. doi:10.1002/j.2333-8504.2005.tb01980.x

Bushardt, R. L., Booze, L. E., Hewett, M. L., Hildebrandt, C., & Thomas, S. E. (2012). Physician assistant program characteristics and faculty credentials on physician assistant national certifying exam pass rates. *Journal of Physician Assistant Education*, *23*(1), 19-23. doi:10.1097/01367895-201223010-00003

Butina, M., Wyant, A. R., Remer, R., & Cardom, R. (2017). Early predictors of students at risk of poor PANCE performance. *Journal of Physician Assistant Education*, *28*(1), 45-48. doi:10.1097/JPA.0000000000000107

Buytendijk, F. & Trepanier, L. (2010). *Predictive analytics: Bringing the tools to the data.* Redwood Shores, CA: ORACLE.

Caffarella, R. S., & Daffron, S. R. (2013). *Planning programs for the adult learners: A practical guide.* San Francisco, CA: Jossey-Bass .

Cairney, P. (2017, October 11). *Writing-theory-driven-policy-analysis.* Retrieved from https://paulcairney.files.wordpress.com/2017/11/writing-theory-driven-policy-analysis-10-11-171.pdf

Central Application Service for Physician Assistants (CASPA). (2015). *Central Application Service for Physician Assistants.* Retrieved from https://caspa.webadmit.org

Central Application Service for Physician Assistants (CASPA). (2016). *Central Application Service for Physician Assistants*. Retrieved from https://caspa.webadmit.org

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159. Retrieved from https://psycnet.apa.org/record/1992-37683-001

Colebatch, H. K. (2018) Questioning policy design: Theory and practice. *Public Policy and Administration,33*(4), 365-383. University of Manchester, UK. doi:10.1177/0952076717709525

Collins, J. J. (1993). *Policy Paper Format.* Retrieved from http:/www.drworley.org/Theses/PolicyPaper.doc

Cook, D. A., Andriole, A. A., Durning, S. J., Roberts, N. K., & Triola, M. M. (2010). Longitudinal research databases in medical education: Facilitating the study of educational outcomes over time and across institutions. *Academic Medicine*, *85*(8), 1340-1346. doi:10.1097/ACM.0b013e3181e5c050

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* (3rd, ed). Thousands Oaks, CA: SAGE Publications.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* (Laureate custom ed.). Boston, MA: Pearson Education.

Davidson, A. (2018, June 25). *How to write a policy proposal*. Retrieved from https://classroom.synonym.com/how-to-write-a-policy-proposal-12082415.html

Dixon, D. (2012). Prediction of osteopathic medical school performance on the basis of MCAT score, GPA, sex, undergraduate major, and undergraduate institution. *Journal of the American Osteopathic Association*, *112*(4), 175-181. Retrieved from https://pdfs.semanticscholar.org/4726/5159444b6c0896c437ba124490760074a672.pdf

Duggan, T. (2018). *Steps to take in writing a recommnedation report.* Retrieved from http://work.chron.com/steps-writing-recommnedation-report-28828.html

Duncan-Hewitt, W. C. (1996) Designing admissions criteria: A framework. *American Journal of Pharmaceutical Education*, *60*(summer). Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.567.7418&rep=rep1&type=pdf

Durning, S. J., Dong, T., Hemmer, P.A., Gilliland, W. R., Cruess, D. F., Boulet, J. B., & Pangaro, L. N. (2015). Are commonly used premedical school or medical school

measures associated with board certification. *Military Medicine*, *180*(4:18), 18-23. doi:10.7205/milmed-d-14-00569

Educational Testing Service. (2016, April 16). *ETS GRE*. Retrieved from http://www.ets.org/gre

Ennulat, C. W., Garrubba, C., & Delong, D. (2011). Evaluation of the multiple variables predicting the likelihood of passage and failure of PANCE. *Journal of Physician Assistant Education*, *22*(1), 7-18. doi:10.1097/01367895-201122010-00003

Field, A. (2013). *Discovering statistics using IBM SPSS Statistics* (4th ed.). Thousand Oaks, CA: Sage.

French-Constant, L. (2014). How to plan, write, and communicate an effective policy brief: Three steps to success. *Policy Brief Week. Research to Action*. Retrieved from https://www.researchtoaction.org/wp-content/uploads/2014/10/PBWeekLauraFCfinal.pdf

Garson, D. (2011). *Logistic regression*. Retrieved from http://faculty.chass.ncsu.edu/garson/PA765/logistic.htm

George, D. & Mallery, P. (2016). *IBM SPSS statistics 23 step by step*, 14th edition. New York, NY: Routledge.

Geremia, M. M., & Kohlhepp, W. C.(2005). The education of the pre-physician assistant student: The Quinnipiac University entry-level master's physician assistant program. *Perspective on Physician Assistant Education*, *16*(1), 41-43. doi:10.1097/01367895-200516010-00011

Goertz, G., & Mahoney, J. (2012). *A tale of two cultures: Qualitative and quantitative research in the social sciences*. Princeton, NJ: Princeton University Press.

Gonzales, P. (2014, March 5). *Reputation and ARC-PA accreditation*. Retrieved from https://doseofpa.blogspot.com/2014/03/choosing-right-physician-assistant.html

Gurnsey, F. N. (2018) *Statistics for research in psychology*. Thousand Oaks, CA: Sage

Hegmann, T., & Iverson, K. (2016) Does previous healthcare experience increase success in physician assistant training. *Journal of the American Academy of Physician Assistants*. doi:10.1097/01.JAA.0000483097.66394.45

Herman, L. (2013). *Tips for writing poliy papers: A policy lab communications workshop.* Retrieved from https://www-cdn.law.stanford.edu/wp-content/uploads/2015/04/White-Papers-Guidelines

Higgins, R., Moser, S., Dereczyk, A., Canales, R., Stewart, G., Schierholtz, C.,…Arbuckle, S. (2010). Admission variables as predictors of PANCE scores in physician assistant programs: A comparison study across universities. *Journal of Physician Assistant Education*, *21*(1), 10-17. doi:10.1097/01367895-201421010-00002

Hocking, J. A., & Piepenbrock, K. (2010). Predictive ability of the Graduate Record Examination and its usage across physician assistant programs. *Journal of Physician Assistant Education*, *21*(4), 18-22. doi:10.1097/01367895-201021040-00002

Hooker, R. S., Carter, R., & Cawley, J. F. (2004). The national commission on certification of physician assistants: History and role. *Perspective on Physician Assistant Education*, *15*(1), 8-15. Retrieved from https://pahx.org/wp-content/uploads/2016/12/NCCPA_History_Article-1.pdf

Hooker, R. S., Cawley, J. F., & Everett, C. M. (2011). *Predictive modeling the physician assistant supply: 2010-2025.* Washington, DC: Association of Schools of Public Health. doi:10.1177/003335491112600513

Hooker, R. S., Hess, B., & Cipher, D. (2002). A comparison of physician assistant programs by national certification examination scores. *Perspective on Physician Assistant Education*, *13*(2), 81-86. doi:10.1097/01367895-200213020-00002

How to communicate your roadmap to stakeholders. (2019, April 16). *How to communicate your roadmap to stakeholders* Retrieved from https://www.productplan.com/communicate-roadmap-stakeholders/

How to write a policy recommendation. (2019, April 16). *How to write a policy recommendation* Retrieved from https://web.uvic.ca/~sdoyle/E302/Notes/Policy Recommendation.html

Howell, D. C. (2010). *Statistical methods for psychology* (7th ed). Belmont, CA: Wadsworth Cengage Learning.

Imel, B., Jansen, N., Nelson, A., & Brown, G. R. (2012). Correlations of pre-admission criteria and post-admission didactic GPA to physician assistant national certifying examination results. *8th Annual GRASP symposium, Wichita State University* (pp. 84-85). Department of Physician Assistant, College of Health Professions. Retrieved from https://soar.wichita.edu/handle/10057/5773

Jen, R. (2007). *How to provide effective feedback to team members.* Paper presented at PMI® Global Congress 2007—Latin America, Cancún, Mexico. Newtown Square, PA: Project Management Institute.

Jones, B. J. B. (1986). *The relationship of demographic/personal, academic, and personality factors to academic performance in freshman medical students.* (Doctoral dissertation, Kent State University, 1986), Dissertation Abstracts International, 47, 261.

Jones, P. E. (2007). Physician assistant education in the United States. *Academic Medicine*, *82*(9), 882-887. doi:10.1097/ACM.0b013e31812f7c0c

Jones, P. E. & Miller, A. A. (2002). Physician assistant eduction: A call for standardized prerequisites. *Perspective on Physician Assistant Education*, *13*(2), 114. doi:10.1097/01367895-200213020-00027

Jones, P. E., Simpkins, S., & Hocking, J. A. (2014). Imperfect physician assistant and physical therapist admissions process in the United States. *Journal of Educational Evaluation for Health Professions*, *11*(11), 1-7. doi:10.3352/jeehp.2014.11.11 Retrieve from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4040496/

Kane, M. (2002). Validating high-stakes testing programs. *Educational Measurement: Issues and Practic*, 31-41. doi:10.1111/j.1745-3992.2002.tb00083.x

Keenan, C. (2018) Giving and receiving feedback. In Kayingo, G., & Hass, V. M., *The health professions educator: A practical guide for new and established faculty* (pp. 297-304). New York: Springer Publishing Company, LLC. doi:10.1891/9780826177186.0031

Keene, M. G., Petrusa, E. R., Carter, R. D., & Schmidt, M. B. (2000). Is faculty review of applications worth the effort. *Perspective on Physician Assitant Education*, *11*(3), 157-160. doi:10.1097/01367895-200011030-00002

Kindle, M. &. Brock, D. (2018). Admissions best practices. In Kayingo, G., & Hass, V. M., *The health professions educator: A practical guide for new and established faculty* (pp. 327-343). New York: Springer Publishing Company, LLC. doi:10.1891/9780826177186.0031

Kogan, L. R., McConnell, S. L., & Schoenfeld-Taner, R. (2005). Veterinary Students and Non-academic Stressors. *Journal of Veterinary Medical Education*, *32*(2), 193-200. doi.org/10.3138/jvme.32.2.193

Kotun, D. E. (2011). *Associate degrees in health related occupations as predictors of success in physician assistant programs* (Doctoral dissertation, University of South Florida). Retrieved from http:// scholarcommons.usf.edu/etd/3190

Kuncel, N. R., & Hezlett, S. A. (2007). *Standardized tests predict graduate students' success.* Retrieved from http://www.sciencemag.org

Landrum, B., & Garza, G. (2015). Mending fences: Defining the domains and approaches of quantitative and qualitative research. *Qualitative Psychology, 2*(2), 199-209. doi:http://dx.doi.org/10.1037/qup0000030

Larsen, J. T. (2002). *Predictors of academic difficulty in first- and second-year medical students.* (Doctoral dissertation, Texas Tech University), Dissertation Abstracts International, 63, 06A.

Lavis, J. N., Robertson, D., Woodside, J. M., McLeod, C. B., Abelson, J., & Knowledge Transfer Study Group (2003). How can research organizations more effectively transfer research knowledge to decision makers?. *Milbank quarterly*, 81(2), 221–172. doi:10.1111/1468-0009.t01-1-00052

Leinster, S. (2013). Selecting the right medical student. *BMC Medicine*, *11*, 245-248. Retrieved from http://www.biomedcentral.com/1741-7015/11/245

Lohenry, K., Bradley-Guidry, C., & Ijams, S. (2018, October) *Diversity and inclusion: Creating excellence from classrooms to clinics.* Presented at the 2018 PAEA Education Forum, Anaheim, CA.

Luce, D. (2011). Screening applicants for risk of poor academic performance: A novel scoring system using preadmission grade point averages and graduate record examination scores. *Journal of Physician Assistant Education*, *22*(3), 15-22. doi:10.1097/01367895-201122030-00002

Massey, S. L., Lee, L., Young, S., & Holmerud, D. (2013). The relationship between formative and summative examination and PANCE results: A multi-program study. *Journal of Physician Assistant Education*, *24*(1), 24-34. doi:10.1097/01367895-201324010-00004

McClure, L. H. (2000). Student indebtedness: The challenge of financing an optometric education. *Optometric Education, 25*(2), 45-53. Retrieved from https://journal.opted.org/the-journal-of-optometric-education/optometric-education-vol-25-no-2-2000/

McCrum-Gardner, E. (2010). Sample size and power calculations made simple. *International Journal of Therapy and Rehabilitation, 17*(1), 10-14. doi:10.12968/ijtr.2010.17.1.45988

McDaniel, M. J., Thrasher, A., & Hiatt, T. (2013). The use of noncognitive factors in physician assistant admissions. *Journal of Physician Assistant Education*, *24*(1), 15-23. doi:10.1097/01367895-201324010-00003

McManus, I. C., & Sondheimer, H. M. (2017). Student Selection. In J. A. Dent, *A Practical Guide for Medical Teachers* (pp. 324-331). London, England: Elsevier.

McMillan, J. H., & Schumacher, S. (2001). *Research in Education: A Conceptual Introduction* (Fifth ed.). New York, NY: Longman.

McRoberts, M. (2011). SPSS predictive analytics. *Smarter software for a smarter planet*. IBM Corporation.

Menard, S. (2009). *Logistic regression: From introductory to advanced concepts and applications*. Thousand Oaks, CA: Sage Publications.

Musandu, N. (2013, July 16). *How to write actionable policy recommnedations*. Retrieved from https://www.researchtoaction.org/2013/07/how-to-write-actionable-policy-recommendations/

Myers, H. C. (1977). *The physician's assistant.* Parsons, WV: McClain Printing Company.

National Commission on Certification of Physician Assistants. (2013). *2013 Statistical profile of certified physician assistants.* Altanta, GA. Retrieved from https://prodcmsstoragesa.blob.core.windows.net/uploads/files/2013StatisticalProfileofCertifiedPhysicianAssistants-AnAnnualReportoftheNCCPA.pdf

National Commission on Certification of Physician Assistants.(NCCPA) (2016). *About Us: Purpose and Passion*. Retrieved from https://www.nccpa.net

National Commission on Certification of Physician Assistants. (NCCPA) (2016a). *National Commission on Certification of Physician Assistants* Retrieved from https://www.nccpa.net

National Commission on Certification of Physician Assistants. (NCCPA) (2016b, March 08). *Five year first time taker summary report*. Retrieved from https://www.nccpa.net/Program/PassRateReport

NEJM Knowledge+ Team. (2015, February 12). *How to become a physician assistant (PA-C)*. Retrieved from http://knowledgeplus.nejm.org/become-physician-assistant-pa-c/

Oakes, D. L., MacLaren, L. M., Gorie, C. T., & Finstuen, K. (1999). Predicting success on the physician assistant national certifying examination. *Perspective on Physician Assistant Education*, *10*(2), 63-69. doi:10.1097/01367895-199910020-00001

Pallant, J. (2013). *SPSS Survival Manual* (5th ed.). New York, New York: McGraw-Hill

Parkhurst, D. C. (2003). Development of a self-study evaluation system. *Perspective on Physician Assitant Education*, *14*(4), 235-239. doi:10.1097/01367895-200314040-00006

Pearl, A., Brennan, A., Journey, T., Antill, K., & McPherson, J. (2014). Content analysis of five occupational therapy journals, 2006–2010: Further review of characteristics of the quantitative literature. *American Journal of Occupational Therapy, 68*(4), 115-123. doi:10.5014/ajot.2014.009704

Phillips, D. R., & McAuliffe, K. (2004). The validity of the graduate record examination in predicting school psychology graduate programs outcomes: A conditional probability analysis. *School Psychologist*, *58*(2), 56-61. doi:10.1037/e537442009-001

Physician Assistant Education Association. (2017). *Physician Assistant Education Association*. Retrieved from https://www.paeaonline.org

Physician Assistant Education Association. (2018). *Program director annual survey*. Philadelphia, PA: Physician Assistant Education Association. Retrieved from https://www.paeaonline.org

Physician Assistant Education Association. (2018c) *PA admissions handbook*. Retrieved from https://www.PAEAonline.org/resources/admissions-handbook/

Physician Assistant Education Association. (2018d). *By the numbers: Student report 2: Data from the 2017 matriculating student and end of program survey*. Washington, DC: PAEA. doi:10.17538/SR2018.0002

Policy Brief. (n.d.). Retrieved April 16, 2019, from The Writing Center: University of North Carolina at Chapel Hill: https://writingcenter.unc.edu/policy-briefs/

Public Health in Ireland. (2015). *Public Health in Ireland.* Retrieved from https://www.cardi.ie/publications/10guidelinesforwritingpolicyrecommendations

Price, P. C. (2012). *Research methods in psychology: Core concepts and skills*. Irvington, NY: Flat World Knowledge.

Rajabi F. (2012). Evidence-informed Health Policy Making: The Role of Policy Brief. *International Journal of Preventive Medicine*, *3*(9), 596–598. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445273/

Rawbone, R. (2015). Doing a successful research project—using qualitative or quantitative methods. *Occupational Medicine*, *65*(2), 169–170. doi:10.1093/occmed/kqu188

Rethans, J. J., Norcini, J. J., Baron-Maldonado, M., Blackmore, D., Jooly, B. C., LaDuca,…Southgate L. H. (2002). The relationship between competence and performance: Implications for assessing practice performance. *Medical Education*, 901-090. doi:10.1046/j.1365-2923.2002.01316.x

Rhoades, J. M., Gallemore, J. L., Gianturco, D. T., & Osterhout, S. (1974). Motivation, medical school admissions, and student performance. *Journal of medical education*, *49*(12), 1119-1127. doi:10.1097/00001888-197412000-00002

Ruback, T., Coombs, J., Keck, M., McDaniel, M. J., Barwick, A., Kang, S., & Liang, M. (2007). Central application service for physician assistants: Five-year report. *The Journal of Physician Assistant Education*, *27*(1), 52-59. doi:10.1097/01367895-200718030-00007

Scheerens, J., Luyten, H., & Van Ravens, J. (Eds.). (2011). *Measuring educational quality by means of indicators*. 35-50. Springer. doi:10.1007/978-94-007-0926-3-2

Schoeneborn, D. (2013). The pervasive power of power point: How a genre of professional communication permeates organizational communication. *Organization Studies*, *34*(12), 1777-1801. doi:10.1177/0170840613485843

Scotten, A. G. (2011, February 11). *Wriing effective policy papers: Translating academic knowledge into policy solutions*. Retrieved from https://cmes.arizona.edu/sites/cmes.arizona.edu/files/Effective%20Policy%20Paper%20Writing.pdf

Skaff, K. O., Rapp, D, A., & Fahringer, D. (1998). Predictive connections between admissions criteria and outcomes assessment. *Perspective on Physician Assistant Education*, *9*(2),

75-78. Retrieved from http://www.paeaonline.org/index.php?ht=d/ContentDetails/i/59837

Statistics Solutions. (2013). *Normality*. Retrieved from http://www.statisticssolutions.com/academic-solutions/resources/directory-of-statistical-analyses/normality/

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed.). Mahwah, NJ: Routledge Academic.

Strong, C. (Ed.). (2015). Science course performance may predict PANCE success. *Clinical Advisor*, 1-3. Retrieved from https://www.clinicaladvisor.com/home/meeting-coverage/aapa-2015-annual-meeting/science-course-performance-may-predict-pance-success/

Swail, W. S. (2004). *The art of student retention: A handbook for the practitioners and administrators.* Austin, TX: Educational Policy Institute.

Tabachnick, B.G., & Fidell, L. S. (2013). *Using multivariate statistics*, 6th ed. Boston, MA: Pearson

The SURE Collaboration. (2011, November). SURE guides for preparing and using evidence-based policy briefs: Informing and engaging stakeholders. The SURE Collaboration. Retrieved from https://www.evipnet.org/sure

Turnbull, N. (2018). Policy design: Its enduring appeal in a complex world and how to think it differently. *Public Policy and Administration*, 33(4), 357–364. https://doi.org/10.1177/0952076717709522

U.S. Bureau of Labor Statistics, U.S. Department of Labor. (2016). *Physician assistants*. Retrieved from http://www.bls.gov/ooh/healthcare/physician-assistants.htm

University of Kentucky. (2014). *Physician assistant national certification exam.* Retrieved from https://www.ky-haverkamp.com/edrm-600.html

Vaugan, K. W. (1946). The graduate record examination as an aid in the selection of medical students. *Journal of the Association of American Medical Colleges*, *21*(3), 129-146. doi:10.1097/00001888-194605000-00001

Whitcomb, M. E. (2007). The shortage of physicians: A challenge for the physician assistant profession. *Journal of Physician Assistant Education*, *18*(1), 5-6. doi:10.1097/01367895-200718010-00001

Witte, R. S., & Witte, J. S. (2004). *Statistics*. Hoboken, NJ: John Wiley & Sons.

Wong, S. L., Green, L. A., Bazemore, A. W., & Miller, B. F. (2017). How to write a health policy brief. *Families, Systems, & Health*, *35*(1), p. 21-24. doi:10.1037/fsh0000238

Writes, L. (2016, May 9). *How to write a proposal*. Retrieved from https://owlcation.com/academia/How-To-Write-A-Proposal-Essay

Yealy, J. (2017). *Roadmap for success: The application of predictive analytics to the physician assistant education admissions process* (Doctoral dissertation, Trident University International) ProQuest Dissertations Publishing 10616289. Retrieved from https://search.proquest.com/openview/92d78adba59d8fef61eaa7052dfe369c/1?pq-origsite=gscholar&cbl=18750&diss=y

Appendix A: The Project

Shaping the future by understanding the past

An admission's policy recommendation

Thomas F. Moore, MS, MMSc, PA-C

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Executive Summary

The goal of the policy recommendation is to limit bias in the admissions process, increase applicant quality, and increase program diversity, supporting the program's goals and mission.

Background

There exist two historical issues in the local PA program. The first problem facing the local PA program is recurrent PANCE first-time pass rates below the national exam pass rate, which is a red flag for the accreditation body. The program's 2006 graduating class was the last physician assistant class to score above the national first-time pass rate. During the following decade, no graduating class in the local PA program had scored at or above the national exam pass rate on the PANCE (ARC-PA, 2013, 2015a; National Commission on Certification of Physician Assistants [NCCPA], 2016b).

The second is a gap in understanding among faculty regarding the predictability between preadmission criteria and PANCE success. During the last decade, there has been no effort to revise the program's admissions requirements or understand the predictability of admissions requirements and PANCE success. This gap in practice is affecting the ability of the admissions committee to identify and select qualified applicants for the PA program. Much of the gap in practice is related to the lack of data collection and analysis, which must be resolved at the local program.

Consequently, the local program administrators and faculty continued to base admissions requirements and policy standards on past experiences, with complete

disregard to any form of data analysis that may have been predictive of PANCE success (M. Holt, personal communication, 2014).

Methodology

The purpose of the project study was to investigate the predictability of student demographic variables, preadmission requirement variables, and GRE score variables on determining PANCE success for PA students at a 27-month graduate PA program. A quantitative methodology with a predictive design and a retrospective predictive approach using archival data available for graduate students from the physician assistant (PA) program. Using the quantitative method of predictive analysis provides for a better understanding of the local problem of PANCE success.

Literature Review

Primary evidence from the professional literature

I began researching peer-reviewed articles for information related to other types of investigations with similar populations as the PA program and similar research or practices, focusing on the development of an admissions policy recommendation for the local program. First, I used the local database, which includes the Cochrane Library and ProQuest Medical Library, in conjunction with the resources in the Walden University Library and Google Scholar. Second, I conducted this search using the following search terms: graduate school admissions policy, PA program admissions policy, Grade point average, Graduate Record Examination, healthcare experience requirements, graduate recruitment of PA students, underrepresented minority students in the PA profession,

holistic admissions process, and Professional program admissions practices. Articles that represented different areas of professional schooling, for example, medical school, dental school, physical therapy, and other Allied health professions were considered. The articles were collected and sorted by theme, based on the following variables; cognitive traits, noncognitive traits, and admissions standards.

Since the founding of the first PA programs in 1968, the majority of PA programs focus on generalists or primary care curriculum. In its infancy the PA profession drew most of its applicants from the military, most being veteran medical corpsmen or medics recently released from active duty after service in the Republic of Vietnam or other overseas areas. Over the last 50 years, the diversity of the profession has continued to change, as applicants are younger and predominantly female. Areas of concern continue to be diversity and integration of minorities, underrepresented populations, and underserved areas. The selection of the best-qualified and capable applicant is crucial not only during the admissions process but also in meeting student and program learning outcomes and goals (Perry & Breitner, 1982). The following literature review discusses typical and holistic admissions processes, their strengths and weaknesses, and cognitive and noncognitive selection factors and methods, to lay the foundation for the policy recommendation project.

Program Accreditation Requirements in Admissions

Accreditation Review Commission on Education for the Physician Assistant (ARC-PA) (2016b) mandates that programs have policies and established fair practices in admissions processes. Specifically, Standard A3.13 states "the program announcements and advertising must accurately reflect the program offered" (p.14); Standard A3.14 that "the program must publish its accreditation status, success in meeting its goals" and "the PANCE first time pass-rate for the most recent five graduating classes" (p.14); Standard A3.15 that "the program must define, publish, and make readily available to prospective students admission related information to include: admission and enrollment practices that favor specified individuals or groups, requirements regarding prior education or work experience, policies and procedures concerning awarding or granting advanced placement, required academic standards for enrollment and any required technical standards for enrollment" (p.14); and Standard A3.16 that "the program must make student admission decisions in accordance with clearly defined and published practices of the institution and program" (p.14).

Therefore, PA programs have to work within the guidelines published by ARC-PA by accurately providing transparent information about accreditation, student outcomes, and admissions. However, the ARC-PA does not discuss specific admissions requirements or guidelines. These decisions are left to the discretion of the schools.

Admissions Processes and Recruitment

Application processes. The PA application process is a straightforward endeavor, and today is completed through the CASPA (CASPA, 2015, 2016; McManus & Sondheimer, 2017). The program should have a clear process of selection, and that process should be assessed for validity, reliability, feasibility, and acceptability. To comply with ARC-PA (2016a) transparency standards, program websites should be clear and concise with the necessary information presented to help in the recruitment of perspective student. Other areas of the website should be devoted to the admissions process with program requirements and expectations listed for the student's information.

According to the local program's admissions committee, the preponderance of communication between perspective students and the local program is in written form, by social media, email, or letter correspondence. The next most common is telephonically followed by an on-site visitation by prospective students. Due to the increasing number of local PA program applications annually (Figure 1.); the program should maintain records of any correspondence with a student (Kindle & Brock, 2018). Those records should be maintained in one location under the responsibility of a graduate admission coordinator. A valid admissions policy will address the admissions process and who is responsible for the process.

Applicant selection. Nationally, no single standard exists for the selection of students for admission into PA programs (Ennulat, Garrubba, & Delong, 2011). In PA programs in the United States, 69% of programs have a rolling admissions process, and

92% use the CASPA application service (Physician Assistant Education Association, 2018, 2018a). The local program admissions cycle is a rolling admissions process, which opens in late April and closes on March 1 of the following year. Generally, admissions staff reviewed applications, mostly based on cognitive variables like GPA or GRE scores. After a preliminary selection, most applicants undergo some form of the interview process, which includes a one-on-one interview, the group interview, and the multiple-mini interview. The literature supports the use of the multiple-mini interview for reliability and validity (Kindle & Brock, 2018).

Candidate selection is a complicated process. Under ARC-PA (2016b), clear policies must be in place to avoid litigation involving the selection process for high-stakes programs. Whatever processes the program uses this process must be assessed and monitored for functionality and best practices. The majority of all PA program candidates are undergraduate students who have never faced the difficulty of professional graduate education. Based on the findings of the quantitative study, no variable will determine that a successful undergraduate student will turn into successful PA student. What a program can do is develop admissions policies and procedures to help improve the probability of selecting the best-qualified candidate for their program (Houpt, Gilkey, & Ehringhaus, 2015).

Holistic admissions process. The changing climate of the PA profession both academically and clinically has caused a shift in the way PA educators view the admissions process. The holistic admissions process is defined as the “university

admissions strategy that assesses an applicant's unique experiences alongside traditional measures of academic achievement such as grades and tests scores" (Urban Universities for Health, as cited in Kindle & Brock, 2018, p. 327). In other words, PA professional organizations are beginning to review both the cognitive and noncognitive variables used in the selection of applicants for admissions into PA programs and are using the new PA graduate competencies as a guideline (Physician Assistant Education Association, 2018b). These competencies focus more on the noncognitive traits of applicants critical to successful PA practice. Examples of these traits include critical thinking, communication, adaptability, and self-discipline (Goldgar, VanderMeulen, Synder, & Kohlhepp, 2018). Currently, 76% of established PA programs and 80% of provisional programs have adopted a holistic admissions process (Coplan & Stoehr, 2018).

There have been some positive outcomes of the shift to holistic admissions. Coplan and Stoehr (2018) indicated that students admitted using the holistic approach were just as successful as those students admitted using the traditional admissions approach (e.g., focus on GPA). There was no statistical difference between those students admitted using a holistic approach and those admitted using the traditional admission practice in regards to their overall admissions GPA or academic success rate. However, the matriculation of a diverse student population using the holistic approach resulted in a significant increase in program diversity and student success ($p < .01$). Van den Brink and Jans (2018) similarly conducted a study of a PA class in the Netherlands over a ten year period, 2004 through 2014. The study involved the selection and success of PA

students who were admitted on the alternate track, without a bachelor's degree, using an alternate assessment tool that accounted for five personality traits; extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. Then, Van den Brink and Jans (2018) compared the nontraditional students to those students with a Bachelor's degree who were admitted to the PA program (n = 1241). The study supported the use of a holistic approach to admissions as the researchers found no significant difference between the two groups. Similarly, some research suggested PA educators support the move away from a pure cognitive admissions process, to a holistic type process based more on noncognitive traits identified as critical to PA practice and founded on the new PA graduate competencies (Goldgar et al., 2018).

One positive aspect of social change and the use of a holistic admissions process is an increase in diversity. Diversity adds to classroom enrichment and PA program performance (Felix et al., 2012; Lohenry, Bradley-Guidry & Ijams, 2018). The introduction of diverse students often leads to stability and increased classroom performance and improves program outcomes (Bruce & Stopper, 2018; Felix et al., 2012). In addition, Funk, Knott, Burdick, and Roberts (2018) indicated that an alternate pathways program at DePaul University increased the diversity of both minority and first-generation students without influencing program metrics.

Barnett, Hibbard, and Alexander (2018) proposed that diversity and inclusion should be a part of every PA program's values, goals, and mission based on five years of holistic approach, considering non-academic factors such as age, military service,

socioeconomic status, life experience, underrepresented minority, and underrepresented community, which led to increased overall student academic success. Furthermore, they recommend revisions of program admissions websites to include photos and a statement from students and program faculty who fit the inclusive model stating, “You can be what you can’t see” (Barnett, personal communication, October 25, 2018). However, Coplan and Stoehr (2018) reviewed admissions process by PA programs nationwide and revealed that while 221 of the 238 PA programs in the United States use some form of a holistic process, there continues to be a struggle with the recruitment and enrollment of underrepresented minority students. Specifically, academic variables like GPA appear to be the most common barrier between the holistic and traditional approach to admissions.

In conclusion, the time and resources necessary for conducting a holistic approach to the admissions process were outweighed by the benefit of a more diverse and inclusive student population resulting in program and student success.

Programs must have clear goals in their application process, resulting in the selection of the best-qualified applicants. These goals should include both cognitive and noncognitive admission criteria. Moving to a more holistic admissions process, with lesser consideration of strict cognitive standards like GPA, is therefore supported by the literature as well as the findings of my study, and will form the base of the policy recommendation.

Cognitive Traits in Admissions Processes

Traditional PA programs across the nation use cognitive qualities in the admissions selection process for their respective programs (Brenneman et al., 2018; Kindle & Brock, 2018). Metrics of cognitive student performance often center on academic achievement. Methods of assessing academic achievement include GPA, Degrees, Awards, Certifications, Licensure, research publications, and presentations. Honda, Patel-Junankar, Baginski, and Scott (2018) conducted a study to assess their local program's admission variables as predictors to student success. They relate in their study that comparison among programs is difficult due to the individual nature of each program and the variables that exist within their admissions process and that the literature contained very few articles when it came to the relationship between admission variables and PANCE success.

GPA. Historically, GPA has been used as a predictor of student success in professional programs (Schmalz, Rahr, & Allen, 1990). As of 2015, 93% of PA programs in the United States required a minimum GPA for admissions (Physician Assistant Education Association, 2017a). While some studies show undergraduate GPA to be a predictor of PANCE success, other studies, including my study, are not as conclusive. Honda, Patel-Junankar, Baginski, and Scott (2018) assessed a cohort of 147 students from the classes of 2012 through 2014 and used a least-squares regression linear model to analyze the student's demographics, academic, and social, economic variables as predictors for PANCE success. Their findings showed undergraduate GPA to be a

significant predictor of PANCE success ($p < .01$). These findings were supported by Andreeff (2014), Butina, Wyant, Remer, and Cardon, (2017), Higgins et al. (2010), and Kindle and Brock (2018).

The GPA and subsets of GPA, like science GPA and prerequisite GPA, contribute to an understanding of an applicant's abilities when evaluating an application (Kindle & Brock, 2018). Foundational coursework GPA was the best indicator of PANCE success (Butina, Wyant, Remer, & Cardom, 2017; Hale & Brown, 2017). The breakdown of PANCE requirements does not necessarily reflect the importance of science GPA, as indicated by GPA requirements by PA schools presented in Table A1.

Table A1.

Minimum Required GPA by Category

	n (*P*)	Range	M	SD	Median
Cumulative GPA	159	2.50-3.60	2.99	0.13	3.00
Science GPA	105	2.60-3.40	2.99	0.13	3.00
Prerequisite GPA	35	2.33-3.20	2.98	0.16	3.00

Physician Assistant Education Association (2017a).

The professional literature continues to support the use of GPA as an indicator of student success in the program, while its value in predicting PANCE success remains unclear (Brown et al., 2013; Jones, Simpkins, & Hocking, 2014). Similarly, in the present study, GPA was not a predictor of PANCE success. Based on the literature, the local program should continue to consider undergraduate GPA as an indicator of program success, yet also consider other factors in the move towards a holistic approach.

Standardized exams (GRE). The GRE has been the traditional graduate admissions examination and is used by the majority of PA programs (n = 155) in the nation (Hocking, & Piepenbrock, 2010; Kindle & Brock, 2018; PAEA, 2017a). Those programs are requiring the general GRE, consisting of a verbal reasoning, quantitative reasoning, and analytical writing score, as part of their admissions process (PAEA, 2017a). The mean scores and ranges accepted by programs are listed in Table A2. However, the predictability between GRE scores and PANCE success is varied among the individual programs nationally, while verbal and quantitative reasoning scores are mildly related to overall PANCE success (Butina et al., 2017; Higgins et al., 2010). My study found a significant relationship between quantitative GRE scores and PANCE success that only weakly predicted PANCE success.

Table A2.

Minimum Required GRE Scores for Admission

	n (*P*)	Range	M	SD	Median
GRE Verbal Reasoning	14	130-155	148	6.31	150
GRE Quantitative Reasoning	14	130-155	146	6.28	147
GRE Analytical Writing	16	2.0-5.0	3.56	0.73	4.0

Physician Assistant Education Association (2017a)

There are some other methods of standardized assessment for admission, although they are used infrequently. Only 3 % of PA programs require a standardized exam other than the GRE. These other exams focus on the basic science foundation a student should have when entering a PA program (Physician Assistant Education Association, 2017a). According to the Physician Assistant Education Association (2017a), 55 % of PA

programs surveyed (n = 186) require a writing sample as part of their admission's process.

In conclusion, professional literature supports the use of the GPA as a performance indicator (Burton, & Wang, 2005). Studies agreed that prerequisite GPA was an appropriate indicator of PANCE success (Andreeff, 2014; Butina et al., 2017; Hale & Brown, 2017; Higgins et al., 2010; Honda, Patel-Junankar, Baginski, & Scott, 2018; Kindle & Brock, 2018). The primary standardized method used in graduate admissions assessment is the GRE (Kuncel & Hezlett, 2007). There is research to support the use of GPA and a standardized exam like the GRE in conjunction when selecting candidates for admissions into a PA program and as a mild predictor of PANCE success (Bridgeman, Burton, & Cline, 2008; Duncan-Hewitt, 1996; Kotun, 2011). Both an applicant's GPA and GRE scores should be considered in the admissions process and included in any development of an admissions policy.

Noncognitive Traits in Admissions Processes

Demographics and diversity. Any use of demographics in the admissions process must be consistent with the university, state, and federal policies (Kindle & Brock, 2018). Asprey, Dehn, and Kreiter (2004a) researched PANCE success and the relationship to age and gender (n = 9247). They determined that older students had a higher failure rate on PANCE then the younger students ($p < .0001$).

Furthermore, men failed more than women within the same population (Asprey, Dehn, & Kreiter, 2004a). Coplan, Bautista, and Dehn (2018) discovered that the

percentage of minority students decreased as the PA profession move toward a master's level education. These findings suggest that the traditional student in PA school, that is, young, white females, tend to complete PA school, complete licensure, and seek out further education.

These differences may stem from unconscious bias in the system, as bias, whether real or imaginary, may result in self-doubt in students' ability to be successful (Odom, Roberts, Johnson, & Copper, 2007). Grewal (2013) wrote about the ramifications of bias in the academic setting. Expanding on the idea of unconscious bias, Grewal explains how in our everyday lives, unconscious bias plays a role in how we select people for positions. Unconscious bias can play a role in the selection or admissions process when faculty unknowingly reject candidates for their program based not on the merits of the applicant but on an unconsciously formed belief. These beliefs often are unintentional but may affect underrepresented populations in the academic setting. By recognizing that unconscious bias exists, administrators can promote social change by incorporating faculty development that allows faculty to understand their bias and change their mentality. Administrators should establish policies that set criteria for the selection of applicants and standards for who will conduct interviews and take part in the admissions selection process. These actions reduce unconscious bias and improve diversity.

Working to address unconscious bias by considering students outside the traditional PA student profile may improve diversity. This is important because ARC-PA (2018b) in January 2020 plans to publish the new accreditation standards, which will

include the goal to improve diversity within the PA profession. The new accreditation standard, A3.12, addresses the diversity issue and states, "The Program must demonstrate an active commitment to attracting and retaining a diverse student and faculty population" (p. 7). Approximately 65% of programs consider applicants from certain groups like veteran status, underserved area, economically disadvantaged, rural, and educationally disadvantaged (PAEA, 2017a). Many programs will, therefore, need to consider whether and how they will attract, admit, and educate a more diverse population of students.

Several factors might influence nontraditional students' enrollment in PA school. Lopez, Wadenya, and Berthold (2003) investigated the variables associated with minority recruitment into the nation's dental programs. In 2003, there existed a significantly low number of minority students in the dental profession when compared to the nation's minority population. The disparity is similar to the current PA professional population where first-year PA students only comprise of approximately 17.8% of PA students (PAEA, 2018a). Lopez et al. (2003) found that minority students recognized diversity and inclusion as an important aspect of any program they would consider entering and significant to their success. They also identified mentoring in the recruiting process. In order for a program to attract minority students, administrators must develop an admissions plan where the recruitment of underrepresented students is a goal, and provide the necessary support via mentoring and financial assistance to be successful (Lopez, Wadenya, & Berthold, 2003). Odom, Roberts, Johnson, and Cooper (2007)

examined the barriers affecting minority students seeking professional medical education. These barriers included social support, financial issues, cultural biases, and professional role models. As in Lopez et al.'s (2003) study, participants noted the importance of role models.

Another element that may influence diversity in PA schools is cost. Lopez et al. (2003) and Odom et al. (2007) indicated that financial aid was a key factor for the student participants in their studies. The admissions process for a pre-PA student is financially demanding and includes the cost of applying through the CASPA system, travel costs for interviewing at the specific programs, and the cost of securing a seat if offered admissions. The average program deposit required to secure a seat is $500 but can range up to $1,500 (PAEA, 2017a). The 2018- 2019 tuition and fees for the local PA program, known as a direct cost for the entire program, was $97,895 and continues to increase yearly, as do the indirect costs. The total estimated cost for completing the local PA program currently can range from $133,000 to $185,531 as stated in the local PA program graduate catalog.

Clinical experience and shadowing. Currently, 59 % of PA programs in the United States require healthcare experience, while 27% recommend it for admissions consideration (PAEA, 2017a). Hegmann and Iverson (2016) conducted a study into the relationship between healthcare experience and PA program success during the clinical year at their local program. Healthcare experience for the study was defined as direct-patient care experience. The retrospective study (n = 124) used data collected over - five

years from the CASPA application service. Limitations of the study were the local program and the exclusion of students from the population with no healthcare experience. While the study indicated the importance of healthcare experience overall, the findings were not significant for determining student success in the program of study. My project study reinforced these findings. Finally, healthcare experience while beneficial is not a predictor of PANCE success and should not be a limiting factor when considering a candidate for admissions into a PA program.

Personal/professional characteristics. Another noncognitive admissions factor is personality and professional traits. Bajwa, Yudkowsky, Belli, Vu, and Park, (2017) supported the use of professional traits during the admissions process. Consideration could be the use of a personality test, like the Computer-based Assessment for Sampling Personal characteristics (CASPer) test. The CASPer exam is a scenario-based examination that evaluates situational judgment. Dore, Reiter, Kreuger, and Norman (2016) correlated student performance on the CASPer to student success on the personal/professional areas of the Medical Council of Canada Qualifying Examination (MCCQE). Dore et al. (2016) found a significant gap in the admissions process among Canadian medical schools that did not assess personal or professional traits. These traits could not be distinguished by cognitive variables like GPA or MCAT scores. Further, the current practice of interviewing candidates using the different techniques, like a multiple-mini interview, did not assess the personal or professional traits of an applicant's during the admissions process. Dore et al. (2016) study (n = 277) concluded CASPer results to

be significant ($p = 0.038$; $p = 0.014$) for the two personal trait areas of the MCCQE, thus predictive for student success on the MCCQE.

Letters of reference and personal statements are other methods of assessing personal and professional characteristics. Nationally, 91% of PA programs require two or more letters of reference (PAEA, 2017a). These letters often are written by academic professionals familiar with the applicants' academic histories or by medical professionals, the applicants may have worked with currently or in the past. Moreover, 170 programs require some form of personal statement with students' applications (PAEA, 2017b, 2018, 2018a, 2018c). The personal statements are approximately 250 to 500 words in length and are often reviewed by the admissions committee. Both the personal statement and letter of recommendation continue to be a part of the national trend among PA programs (CASPA, 2016; PAEA, 2017b). The literature notes little value in the letters of recommendation and the personal statement in the admissions process when it comes to the predictive value of student success (Kindle & Brock, 2018; Salvatori, 2001).

Finally, an applicant's history of leadership, service, and volunteering are a part of the CASPA application and often considered in the admissions process (CASPA, 2016). Examples of these traits include mission trips, medical volunteering, and a position of leadership like the class president or team coach. These types of experiences help to shape compassion, empathy, and responsibility. These are important traits to consider in the future medical professional (Kindle & Brock, 2018).

Future consideration should be given to the use of the CASPer in conjunction with a student's personal statement and letters of recommendation. The CASPer would provide a standardized method of assessment in the area of non-cognitive traits relevant to the practice of medicine and used in conjunction with the personal statement and letters of recommendation when considering an applicant for admission into the program.

Interview Process. After application review, interviews provide a sense of a person's personal and professional characteristics. On-site interviews are conducted by 98% of the current programs nationally and often used in the holistic admissions process. The personal interaction between the applicant and interviewers allows for the evaluation of personal attributes (Kindle & Brock, 2018; PAEA, 2017b, 2018c). The types of interview differ among the programs (Table A3) and many programs use a combination of these interview types.

Table A3

Type of Interview by Program Nationally

Type of interview	Percentage by program
Individual	73%
Group	50%
Multiple, mini-group interview (MMI)	26%
other	3%

Physician Assistant Education Association (2017a)

Strengths of the on-site interview process were the ability to interview more qualified applicants, collaborative student selection among the faculty, the ability to examine the applicants in the program setting, and increased cohort cohesion. The weaknesses included increased planning requirements, increased resources, and increased

time. The technique of group interviews allowed for a more robust admissions process with an increase in noncognitive factors. In 2017, 60% of the surveyed applicants were very satisfied with the group interview process, and the programs related a more highly qualified cohort (Denler & Kindle, 2018).

In conclusion, the interview process is an important aspect of the admissions process (Salvatori, 2001). While not currently used often by programs nationally, the literature supports the inclusion of the multiple-mini group interview technique (PAEA, 2017a, 2017b)

The Gap in Practice. The problem facing our PA program is recurrent PANCE first-time pass rates below the national exam pass rate. This problem is aided by the gap in practice in understanding the admissions predictors of PANCE success, through a lack of data collection and analysis. The ARC-PA (2016b) standards below outline the self-assessment process required of accredited PA programs:

> ARC-PA standard C1.01 The program must implement an ongoing program self-assessment process that is designed to document program effectiveness and foster program improvement. (p. 21)

> ANNOTATION: A well-designed self-assessment process reflects the ability of the program in collecting and interpreting evidence of student learning, as well as program administrative functions and outcomes. The process incorporates the study of both quantitative and qualitative performance data collected and critically analyzed by the program. The process provides evidence that the program gives careful thought to data collection, management, and interpretation. It shows that outcome measures are used in concert with thoughtful evaluation about the results, the relevance of the data and the potential for improvement or change. (p. 21)

> C1.02 The program must apply the results of ongoing program self-assessment to the curriculum and other dimensions of the program. (p. 22)
>
> C2.01 The program must prepare a self-study report as part of the application for continuing accreditation that accurately and succinctly documents the process, application, and results of ongoing program self-assessment. The report must follow the guidelines provided by the ARC-PA and, at a minimum, must document. (p.22)
>
> ANNOTATION: The ARC-PA expects results of ongoing self-assessment to include critical analysis of student evaluations for each course and rotation, student evaluations of faculty, failure rates for each course and rotation, student remediation, student attrition, preceptor evaluations of students', preparedness for rotations, student exit and/or graduate evaluations of the program, the most recent five-year first time and aggregate graduate performance on the PANCE, sufficiency and effectiveness of the faculty and staff, and faculty and staff attrition. (p. 22)

In conclusion, continued data collection and analysis is required by ARC-PA. The program's admissions committee needs a selection method for identifying students who meet the demands of an academically rigorous PA program and can successfully pass the PANCE on the first attempt. The program must evaluate through data collection and analysis; the admissions requirements, and make evidence-based decisions to recruit, select, and retain qualified students.

Evidence from the Study

The purpose of this retrospective cohort study was to develop a research-based understanding of the predictive power between prerequisite admission requirements, listed in Table 3 of the project study, and PANCE success for physician assistant students at a 27-month graduate physician assistant curriculum to compensate for a gap in practice in the admissions process. The methodology for this research study included a

retrospective cohort study quantitative predictive analysis using binary logistic regression and using the quantitative method of predictive analysis provided for a better understanding of the local problem of PANCE success. Archival data are available for graduate students from the classes of 2006 through 2016. The data consisted of student demographics, grade point averages, and GRE scores, which comprise the independent variables, and first-time PANCE success. My research found that the logistic regression equation is a poor predictor of selecting individuals who will not pass PANCE. While the GRE qualitative reasoning score was found to be statistically significant ($p < .01$), it is a poor predictor of success, in that it did not have a significant effect on the odds of observing PANCE success. The overall results are inconclusive. There are no admission prerequisite predictors of student success on the first-time attempt to pass PANCE based on the current data available at the local program.

Current Admissions Policy

The current admissions policy is established by the local PA program based on two phases; selection for interview and selection for admission. The two major components in the selection for interview phase are GPA and GRE score. GPA component is further broken down into the three types of GPA's; Prerequisite GPA, CASPA science GPA, and Cumulative GPA. A 3.0 is required in all three categories in order to be considered for an interview and possible admission into the PA program. The other component is the GRE analytical writing score. A score of 3.0 or higher is required for selection

The local program admissions committee and faculty relied heavily on an admissions rubrics and interview sessions when making admissions decisions. The current admissions policy does not take into consideration a holistic approach to admissions. Underrepresented groups within the PA profession may be excluded from the selection process.

Policy Recommendation

1. Recommendation for continued use of Grade Point Average and Graduate Record Examination.

The professional literature supports the use of GPA in the admissions selection process. The program should continue to use the prerequisite GPA, CASPA science GPA, and Cumulative GPA in the consideration process. The minimum GPA required in each should be 3.0. These recommendations are supported by Andreeff (2014), Butina et al. (2017), Higgins et al. (2010), Honda, et al. (2018), Kindle and Brock (2018), and Physician Assistant Education Association (2017a).

The professional literature and research support the use of GRE scores. Currently, only the GRE analytical writing score is used on the selection process and that 3.0 continue to be the minimum score (PAEA, 2017a). It is further recommended that the quantitative reasoning and verbal reasoning scores be added to the selection process. The verbal reasoning minimum score to be established at 142 and quantitative reasoning score at 140 (Table A2) (PAEA, 2017a).

2. Recommendation for the establishment of a holistic admissions process.

The professional literature supports a holistic admissions process in order to decrease unconscious bias, increase diversity, and support social change. An applicant's background, health care experience, history of leadership, service, and volunteering will be considered in the admissions process. Examples of these traits include mission trips, medical volunteering, and a position of leadership like the class president or team coach. These types of experiences help to shape compassion, empathy, and responsibility. These are essential traits to consider in the future medical professional (Kindle & Brock, 2018). Future consideration will be given to the use of the CASPer in conjunction with a student's personal statement and letters of recommendation. The literature supports the inclusion of the multiple-mini group interview technique (PAEA, 2017a, 2017b)

3. Recommendation for annual data collection and analysis.

The program will conduct data collection and analysis of the admissions process on an annual basis, with a composite of data analysis every five years as required by ARC-PA and supported by the professional literature.

Implementation of the Policy Recommendations

The local program has a standing admissions committee made up of faculty, admission personnel, and the office of the register. The local program has a full-time graduate admission coordinator. Additional support comes from the university's admissions and enrollment department. There are established relationships with the

internal university departments and colleges. The internal relationships support recruitment from within the university. Externally, relationships exist with the other local state universities for recruitment purposes. CASPA and PAEA have admission support available for the local program. All these resources can contribute to the local program's improvement in the admissions process.

Proposal for Implementation. The policy recommendation paper and presentation will be presented at the next program self-study retreat, hopefully in Fall 2019 or Spring 2020. I will provide the stakeholders with a copy of the recommendation and present the information using a power point presentation. There will be allotted time for discussion, question, and feedback. Following the presentation, stakeholders will be given an anonymous web-based survey. The web-based survey will be used to assess the faculty "buy-in" for the recommended policy. The final decision of the recommended policy changes to the admissions policy will be by stakeholder vote the following college faculty meeting. The administration, admissions committee, and faculty would be responsible for the implementation of the new policy. The admission policy recommendation if approved, will become effective for the following admission's cycle, and evaluated on an annual basis.

Potential Barriers. The first potential barrier is timing. PA education at the local program is a chaotic environment. Based on a 27-month cycle for each cohort, there is little time for modifications to the policy. Few faculty members have a working knowledge of the admissions process. The administration and faculty who have been at

the local program before 2006 support the current admissions policy and feel the policy does not require any change or update. These faculty will resist the change in admissions policy (Duncan-Hewitt, 1996). They will need convincing that the proposed change is good for the program. Fear of retaliation could be a concern when dealing with an administration resistant to change. The number of faculty and administrators involved in the program's admissions process may not be enough to support changes in the interview and chart review process. Money constraint and fear in the ability to fill the program's cohort each year may hamper the programs ability to move forward with a new holistic admissions process.

Potential Solutions to Barriers. When dealing with time and timing issues, good effective planning is needed to support the policy recommendation. An effectual presentation, which explains the admissions process, and the proposed admission changes, enhances stakeholder knowledge and commitment to the proposed change. Administrators will require support from the other departments, like admissions to increase the numbers needed to support the proposed changes. Maintain a positive outlook when dealing with those policy aspects that support the admissions process. Be respectful, nonjudgmental of past events, and focus on maintaining the good of improving the process where needed. Have a plan for the success of the process, at the local program and university level (Keenan, 2018). Provide useful feedback to the stakeholder through the weekly admissions meeting, and annual retreats, while supporting local program financial management and increased recruitment efforts by the

local program. All of these actions can reduce the potential barriers to program admissions success.

Conclusion

The implications of the study overall are the development and implementation of a non-bias admissions process to increase student academic success and program diversity. Improved student diversity supports the goals of the program, while also supporting the need for a more diverse PA provider workforce in society and increased diversity in the local PA program may increase the number of PA providers in the underserved areas of Appalachia (Kindle & Brock, 2018). The goals of the policy are to limit bias in the admissions process, increase applicant quality, and increase program diversity, supporting the program's goals and mission.

References

Accreditation Review Commission on Education for the Physician Assistant.(ARC-PA) (2013). *Site visit report 2013.* Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant. Retrieved from local program institutional archive.

Accreditation Review Commission on Education for the Physician Assistant. (ARC-PA) (2015a). *PANCE required report.* Retrieved from http://www.arc-pa.com/acc_programs/acc_resources.html

Accreditation Review Commission on Education for the Physician Assistant. (ARC-PA) (2016a, March). *Notes to program* . Retrieved from http://www.arc-pa.org/acc programs/acc resources.html

Accreditation Review Commission on Education for the Physician Assistant. (ARC-PA) (2016b, March). *Accreditation standards for physician assistant education*, 4th Ed. Johns Creek, GA: ARC-PA. Retrieved from http://www.arc-pa.org/accreditation/standards-of-accreditation/

Accreditation Review Commission on Education for the Physician Assistant. (ARC-PA) (2018a). *Notes to program*; Spring 2018. Johns Creek, GA: Accreditation Review Commission on Education for the Physician Assistant.

Accreditation Review Commission on Education for the Physician Assistant. (2018b, October) *ARC-PA update: Accreditation standards draft 5th edition review*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Andreeff, R. (2014). Predictors of student success on the physician assistant national certifying examination. *Journal of Physician Assistant Education*, *25*(3), 36-39. doi:10.1097/01367895-201425030-00008

Asprey, D., Dehn, R., & Kreiter, C.(2004a). The impact of age and gender on the physician assistant national certifying examination scores and pass rates. *Journal of Physician Assistant Education, 15*(1), 38-41. doi:10.1097/01367895-200415010-00006

Bajwa, M.N., Yudkowsky, R., Belli, D., Vu, N. V., & Park, Y. (2017) Improving the residency admissions process by integrating a professionalism assessment: a validity and feasibility study. *Advances in Health Sciences Education.* March 2017, *22*(1), 69-89. doi:10.1007/s10459-016-9683-8

Barnett, J., Hibbard, S., & Alexander, L. (2018, October) *Strength lies in differences: Promoting inclusion excellence in admissions*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Brenneman, A. E., Goldgar, C., Hills, K. J., Synder, J. H., VanderMeulen, S. P., & Lane, S. (2018) Noncognitive attributes in physician assistant education. *Journal of Physician Assistant Education*, *29*(1), 25-34. doi:10.1097/JPA.0000000000000187

Bridgeman, B., Burton, N., & Cline, F. (2008). *Understanding what the numbers mean: A straightforward approach to GRE predictive validity.* Princeton, NJ: Educational Testing Service. Retrieved from https://www.ets.org/Media/Research/pdf/RR-08-46.pdf

Brown, G., Imel, B., Nelson, A., Hale, L. S., & Jansen, N. (2013). Correlations between PANCE performance, physician assistant program grade point average and selection criteria.

Journal of Physician Assistant Education, *24*(1), 42-44. doi:10.1097/01367895-201324010-00006

Bruce, C. & Stopper, C. (2018, October) *Use of holistic admissions*. Poster session presented at the 2018 PAEA Education Forum, Anaheim, CA.

Bunniss, S. & Kelly, D. R. (2010), Research paradigms in medical education research. *Medical Education*, 44, 358–366. doi:10.1111/j.1365-2923.2009.03611.x

Burton, N. W., & Wang, M. (2005). *Predicting long-term success in graduate school: A collaborative validity study.* Princeton, NJ: Educational Testing Service. Retrieved from https://www.ets.org/Media/Research/pdf/RR-05-03.pdf

Butina, M., Wyant, A. R., Remer, R., & Cardom, R. (2017). Early predictors of students at risk of poor PANCE performance. *Journal of Physician Assistant Education*, *28*(1), 45-48. doi:10.1097/JPA.0000000000000107

Central Application Service for Physician Assistants (CASPA). (2015). *Central Application Service for Physician Assistants*. Retrieved from https://caspa.webadmit.org

Central Application Service for Physician Assistants (CASPA). (2016). *Central Application Service for Physician Assistants*. Retrieved from https://caspa.webadmit.org

Coplan, B., Bautista, R., & Dehn, R. W. (2018) PA program characteristics and diversity in the profession. *Journal of the American Academy of Physician Assistants, 31*(3), 38-46. doi:10.1097/01.JAA.0000530295.15656.51

Coplan, B., & Stoehr, J. (2018, October) *Holistic admissions and diversity in PA programs*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Denler, K., & Kindle, M. (2018) *Effective interviewing beyond the MMI*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Dore, K. L., Reiter, H. I., Kreuger, S., & Norman, G. R. (2016) CASPer, an online pre-interview screen for personal/professional characteristics: prediction of national licensure scores. *Advances in Health Science Education*. Springer Science+Business Media, Dordrecht. doi:10.1007/s10459-016-9739-9

Duncan-Hewitt, W. C. (1996) Designing admissions criteria: A framework. *American Journal of Pharmaceutical Education*, *60*(summer). Retrieve from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.567.7418&rep=rep1&type=pdf

Ennulat, C. W., Garrubba, C., & Delong, D. (2011). Evaluation of the multiple variables predicting the likelihood of passage and failure of PANCE. *Journal of Physician Assistant Education*, *22*(1), 7-18. doi:10.1097/01367895-201122010-00003

Felix, H., Laird, J., Ennulat, C., Donkers, K., Garrubba, C., Hawkins, S., & Hertweck, M. (2012) Holistic admissions process: An initiative to support diversity in medical education. *Journal of Physician Assistant Education*, *23*(3), 21-27. doi:10.1097/01367895-201223030-00004

Funk, P. E., Knott, P., Burdick, L., & Roberts, M. (2018) Development of a novel pathways program for pre-health students by a private four-year university and a private health professions university. *Journal of Physician Assistant Education*, *29*(3), 150-153. doi:10.1097/JPA0000000000000218

Goldgar, C., VanderMeulen, S., Synder, J., & Kohlhepp, W. (2018, October) *Using PA graduate competencies to prioritize cognitive and noncognitive variables in the selection of applicants for practice in 2025*. Presented at the 2018 PAEA Educational Forum, Anaheim, CA.

Grewal, D. K. (2013). How to recognize and address unconsious bias. In L. W. Roberts, *The academic medicine handbook: A guide to achievement and fulfillment for academic faculty* (pp. 405-412). New York, NY: Springer.

Hale, L. S., & Brown, G. R. (2017) Similar findings regarding predictors of PANCE performance. [Letter to the Editor]. *Journal of Physician Assistant Education*. *28*(3),124. doi:10.1097/JPA.0000000000000131

Hegmann, T., & Iverson, K. (2016) Does previous healthcare experience increase success in physician assistant training. *Journal of the American Academy of Physician Assistants*. *29*(6), 54-56. doi:10.1097/01.JAA.0000483097.66394.45

Higgins, R., Moser, S., Dereczyk, A., Canales, R., Stewart, G., Schierholtz, C.,…Arbuckle, S. (2010). Admission variables as predictors of PANCE scores in physician assistant programs: A comparison study across universities. *Journal of Physician Assistant Education*, *21*(1), 10-17. doi:10.1097/01367895-201021010-00002

Hocking, J. A., & Piepenbrock, K. (2010). Predictive ability of the Graduate Record Examination and its usage across physician assistant programs. *Journal of Physician Assistant Education*, *21*(4), 18-22. doi:10.1097/01367895-201021040-00002

Honda, T., Patel-Junankar, D., Baginski, R., & Scott, R. (2018) Admissions variables: Predictors of physician assistant student success. *Journal of Physician Assistant Education*, *29*(3), 167-172. doi:10.1097/JPA0000000000000212

Houpt, J. L., Gilkey, R. W., & Ehringhaus, S. H. (2015) *Learning to lead in the academic medical center: A final word to applicants and search committees: Picking the right people for leadership roles the first time* (pp. 131-132). Springer International Publishing, Switzerland. doi:10.1007/978-3-319-21260-9_15

Jones, P. E., Simpkins, S., & Hocking, J. A. (2014). Imperfect physician assistant and physical therapist admissions process in the United States. *Journal of Educational Evaluation for Health Professions*, *11*(11), 1-7. Retrieve from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4040496/

Keenan, C. (2018) Giving and receiving feedback. In Kayingo, G., & Hass, V. M., *The health professions educator: A practical guide for new and established faculty* (pp. 297-304). New York: Springer Publishing Company, LLC.

Kindle, M. &. Brock, D. (2018). Admissions best practices. In Kayingo, G., & Hass, V. M., *The health professions educator: A practical guide for new and established faculty* (pp. 327-343). New York: Springer Publishing Company, LLC. doi:10.1891/9780826177186.0031

Kotun, D. E. (2011). *Associate degrees in health related occupations as predictors of success in physician assistant programs* (Doctoral dissertation, University of South Florida). Retrieved from http:// scholarcommons.usf.edu/etd/3190

Kuncel, N. R., & Hezlett, S. A. (2007). *Standardized tests predict graduate students' success.* Retrieved from http://www,sciencemag.org

Lohenry, K., Bradley-Guidry, C., & Ijams, S. (2018, October) *Diversity and inclusion: Creating excellence from classrooms to clinics*. Presented at the 2018 PAEA Education Forum, Anaheim, CA.

Lopez, N., Wadenya, R., & Berthold, P.(2003) Effective recruitment and retention strategies for underrepresented minority students: perspectives from dental students. *Journal of Dental Education* October, *67* (10). 1107-1112. Retrieved from http://www.jdentaled.org/content/67/10/1107.long

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: Analysis and Applications.* Cambridge, UK: Cambridge University Press. doi: 10.1017/cbo9780511753831

McManus, I. C., & Sondheimer, H. M. (2017). Student Selection. In J. A. Dent, *A Practical Guide for Medical Teachers* (pp. 324-331). London, England: Elsevier.

National Commission on Certification of Physician Assistants. (NCCPA) (2016b, March 08). *Five year first time taker summary report*. Retrieved from https://www.nccpa.net/Program/PassRateReport

Odom, K. L., Roberts, L. M., Johnson, R. L., & Cooper, L. A. (2007) Exploring Obstacles to and Opportunities for Professional Success Among Ethnic Minority Medical Students. *Academic Medicine*, *82*(2). 146-153. doi:10.1097/acm.0b013e31802d8f2c

Perry, H. B., & Breitner, B. (1982) *Physician assistants: Their contribution to health care*. Human Sciences Press. New York, NY. Retrieve from https://www.worldcat.org/title/physician-assistants-their-contribution-to-health-care/oclc/7552719

Physician Assistant Education Association. (2017a) *By the numbers: Curriculum report 1: Data from the 2015 prerequisite survey*, Washington, DC. doi:10.17538/CR1.2017

Physician Assistant Education Association (2017b) *PA admissions handbook*. Retrieved from https://paeaonline.org/resources/admissions-handbook/

Physician Assistant Education Association. (2018). *Program director annual survey*. Philadelphia, PA: Physician Assistant Education Association. Retrieved from https://paeaonline.org/research/program-report/

Physician Assistant Education Association. (2018a) *By the numbers: Program report 33: Data from the 2017 Program Survey*, Washington, DC: PAEA. doi:10.17538/PR33.2018

Physician Assistant Education Association. (2018b) *Core competencies for new physician assistant graduates.* Retrieved from https://www.PAEAonline.org/wp-content/uploads/2018/09/core-competencies-for-pa-grads-20180919.pdf

Physician Assistant Education Association. (2018c) *PA admissions handbook*. Retrieved from https://www.PAEAonline.org/resources/admissions-handbook/

Salvatori, P. (2001). Reliability and validity of admissions tools used to select students for the health professions. *Advances in Health Sciences Education*, *6*,159-175. Retrieved from https://link.springer.com/article/10.1023%2FA%3A1011489618208

Schmalz, G. M., Rahr, R. R., & Allen, R. M. (1990). The use of pre-admission data to predict levels of success in selected allied health students. *Occupational Therapy Journal of Research*, *10*(6), 367-376. Retrieved from https://search.proquest.com/docview/910976352?accountid=26218

Van den Brink, G., & Jans, E. (2018) Predictors of successful completion of the master of physician assistant studies in the Netherlands. *Journal of Physician Assistant Education*, *29*(3), 135-137. doi:10.1097/JPA.0000000000000216