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Predictors of Success for the National Registry Paramedic Certification Cognitive Examination

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PREDICTORS OF SUCCESS FOR THE NATIONAL REGISTRY PARAMEDIC CERTIFICATION COGNITIVE EXAMINATION

DISSERTATION

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PREDICTORS OF SUCCESS FOR THE NATIONAL REGISTRY PARAMEDIC CERTIFICATION COGNITIVE EXAMINATION

ABSTRACT

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Barry University, 2007

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Purpose

The purpose of this quantitative study was to determine the multiple correlation between five predictors (high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and national EMS program accreditation) and success on the National Registry paramedic certification cognitive examination. In order to assure the best possible patient outcomes, prehospital care should be delivered by highly competent Emergency Medical Services (EMS) providers. Research conducted by Dickison, Hostler, Platt, and Wang (2006) suggested that paramedics graduating from nationally accredited EMS programs have a higher success rate on their initial certification examinations than those who did not attend accredited programs, thereby indicating that these paramedics will comprise a more qualified and competent prehospital workforce.

Method

The population consisted of those paramedic candidates taking the National Registry paramedic cognitive certification examination for the first time. The convenience sample was comprised of participants who voluntarily completed the

anonymous survey delivered via email with all requested information after they completed the certification examination. January of 2007 was the first time the examination was offered on the computer.

The research question addressed whether there is a multiple correlation between high school GPA, paramedic program GPA, type of paramedic program attended, years of EMS experience, attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

Analysis

A multiple linear regression was calculated to predict success on the National Registry paramedic cognitive certification examination based on the independent variables. The ANOVA summary table showed a significance result of .179, which is not statistically significant as it is greater than .05. The multiple regression was not statistically significant overall.

The null hypothesis that predicted no multiple correlation between the five independent variables and the dependent variable was not rejected. Multiple regression and nonparametric chi-square analyses indicated that none of the independent variables, except program GPA, were significantly associated with paramedic candidates' scores on the National Registry paramedic cognitive certification examination.

Summary

This study explored several aspects of EMS education. It can be assumed that this sample may not be representative of the larger population of paramedics nationwide.

More research is needed to investigate the relationships among a larger and more widespread and diverse population.

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No one gets to this point either in life or in their education by themselves. That is why I believe it is of the utmost importance to recognize those people who have helped make us successful.

Family is the heart and soul of life. I want to thank my father, Eugene C. Jackson, who always believed I could be whatever I wanted! To my mother, Norma P. Jackson: Thanks for helping me in so many ways. You always knew I would get here one day, even when I didn't.

To my husband Thomas: Aren't you glad it's finally over? Thank you from the bottom of my heart. There is no way this could have happened without you. To my "kids," especially Patrick and my sister Luciana, and their families: I appreciate your understanding why I couldn't spend the time I wanted to with you. Now that will change!

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Finally, thanks to Dr. Gregg Margolis and his IT staff at the National Registry of EMTs in Columbus, Ohio for supplying the data for this study.

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This study is dedicated to my father, Eugene C. Jackson, and my husband, Thomas Stepanovsky, Jr.

Dad, I love you and miss you every day. I wish you could be here, but I know you are in a better place where there is no suffering. I know you watch over us, and hope I have made you proud of me.

Tom, you are simply the best! I can never tell you how much I appreciate your putting up with me through this challenge. You are the wind beneath my wings! Thank you.

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INTRODUCTION

Background of the Problem

In order to assure the best possible patient outcomes, prehospital care should be delivered by highly competent Emergency Medical Services (EMS) providers. Research conducted by Dickison, Hostler, Platt, and Wang (2006) suggested that paramedics graduating from nationally accredited EMS programs have a higher success rate on their initial certification examinations than those who did not attend accredited programs, thereby indicating that these paramedics will comprise a more qualified and competent prehospital workforce.

Emergency Medical Services was first recognized as an allied health occupation by the American Medical Association in 1975. The Essentials for EMT-Paramedic Programs Accreditation were developed in 1976 and adopted in 1978. In 1995, the Joint Review Committee on Education Programs for the EMT-Paramedic, which has since become the Commission on Accreditation of EMS Programs (CoAEMSP), made these "Essentials" the standard for evaluating programs seeking accreditation (NHTSA, 2000).

There are four levels of EMS providers recognized nationally: First Responder, Emergency Medical Technician-Basic (EMT-B), Emergency Medical Technician-Intermediate (EMT-I), and Emergency Medical Technician-Paramedic (EMT-P or Paramedic). There is a National Standard Curriculum for each level, written by the Department of Transportation through the National Highway Safety and Transportation Administration (NHSTA, 2000). These curricula are usually updated about every ten

years, with the next revisions due in the 2008 timeframe. However, states have not uniformly adopted the National Standard Curricula, nor have they adopted either minimum instructor requirements or requirements for EMS instruction (Veronesi, 1999). As a result, EMS education can be offered anywhere from a fire station to a university setting, with a wide variation in instructor credentials (Davis, 1998).

The National Registry of EMTs (NREMT) offers certification examinations for all four levels. Some states offer their own tests for the EMS levels authorized in their respective areas. States such as New York have up to eight different levels of EMS providers. Unfortunately, this causes confusion regarding acquired skills and scope of practice when an EMS provider tries to transfer to another state or jurisdiction (Veronesi, 1999).

Emergency First Responder is considered to be an introductory course to the EMS field. It consists of 48 hours of training. In the past, many Emergency Medical Technician-Basic (EMT-B) programs required this course level as a prerequisite to EMT-B. It is also popular in some areas because anyone age 16 or older can complete the course. The Emergency First Responder is equivalent to someone with advanced first aid training. This level will be renamed Emergency Medical Responder when the new standards are adopted.

The Emergency Medical Technician-Basic (EMT-B) is considered to be the entry level curriculum for EMS. National standards require a minimum of 110 hours of instruction. However, some states such as Florida require a minimum of 250 hours of instruction, or 11 college credits (Florida Department of Education [FDOE], 2005). The

only change projected for the 2008 revision will be dropping Basic from the Emergency Medical Technician name.

Some states have the EMT-Intermediate (EMT-I) level in their EMS systems. There are two versions of this curriculum--the 1985 and the 1999 versions. It is considered a halfway point between the basic and paramedic levels, and it is often considered useful to those states or areas that cannot afford to have a large number of paramedics yet want to have a slightly higher level of prehospital care than the EMT-B. Not all states recognize this level of provider, including Florida. The 2008 standards are not projected to change this level's name.

At this time, the highest level of EMS provider is the EMT-Paramedic (EMT-P), or Paramedic. The paramedic level is an advanced life support provider who can start intravenous lines, is able to administer medications through various routes, can use advanced airway devices, and can monitor, interpret, and defibrillate cardiac rhythms, among other competencies. Educational requirements differ from state to state.

Currently, eight states require paramedics to have a minimum of an associate's degree in EMS in order to sit for the certification examination. The national standard is 1,100 to 1,200 hours (NHSTA, 2000). Florida has adopted this standard. When offered at the community college level, the paramedic certificate is leveled by the Florida Department of Education at 1,100 hours of instruction or 42 college credit hours (FDOE, 2005). The 2008 standards are projected to drop the Emergency Medical Technician prefix from this level, leaving just the term Paramedic. The research for this dissertation

considered predictors of success for the cognitive examination at the paramedic level only.

The proposal for a national certification agency was recommended almost 40 years ago by the Committee on Highway Traffic Safety which eventually became the National Highway Traffic Safety Administration (NHTSA). The Committee proposed the establishment of uniform standards for training and testing of personnel active in the delivery of first aid and emergency response (NREMT, 2006).

Because of this recommendation, the National Registry of Emergency Medical Technicians (NREMT) was established in 1970 in Columbus, Ohio. This is a private company, whose mission is "to provide a valid, uniform process to assess the knowledge and skills required for competent practice required by professionals throughout their careers and by maintaining a registry of certification status" (NREMT, 2006, p. 1).

Problem Statement

Trauma remains the leading cause of death in the United States, up to age 44 years, and is a major cause of death and disability worldwide (Sasser, Varghese, & Kellermann, 2006). Although prevention is the best way to decrease deaths and injuries resulting from trauma, several authors have found that effective prehospital care can minimize the consequences of trauma (Markenson, Reilly, & DiMaggio, 2005; Ridgeway, Hodzovic, Woolard, & Latto, 2004; Sasser et al., 2006; Schmidt, Hickman, Tolle, & Brooks, 2004; Seidel, 1986).

Prehospital medical providers, such as emergency medical technicians and paramedics, triage or sort patients to the appropriate hospital as part of their duties. As

these EMS providers are usually the first to arrive at the scene of an illness or injury, it is imperative that they possess the appropriate level of knowledge and the skills and ability to think critically in order to save citizens' lives. In order to assure the best possible patient outcomes, prehospital care should be delivered by highly competent Emergency Medical Services providers.

Purpose of the Study

The purpose of this quantitative study was to determine the multiple correlation between five predictors (high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and national EMS program accreditation) and success on the National Registry paramedic certification cognitive examination. The researcher compared data gathered from a voluntary computer-based survey (Appendix A) administered via email approximately one week after the certification examination with the first-attempt success rates.

Significance of the Study

This research explored predictors of success for the National Registry paramedic certification cognitive examination. It also discussed the four national types of EMS programs, the history of certification testing for paramedics, the number of states using the National Registry of EMTs certification examination for their state's initial paramedic certification examination, and reported the average first-attempt success rate for states using this examination. It is hoped that a better educated paramedic will be able to make better triage and assessment decisions, thus improving patient outcomes nationwide.

Theoretical Framework

Patricia Benner's nursing theory, *From Novice to Expert*, was the theoretical framework used for this dissertation. There currently are no paramedic or emergency medical services theories, so nursing theory was the most appropriate to use.

Benner's theory was a study of skill development in nursing and research-based interpretations of the nature of clinical knowledge (Benner, 1984). According to Alligood and Tomey (2002), the ongoing development of interpretive phenomenology as a narrative qualitative research method was described and illustrated in each of Benner's knowledge-development publications. Benner's thesis was that caring is central to human expertise and to curing and healing. Her work was research-based and was derived from actual practice.

Chinn (1985) stated that Benner's research offered a radically different approach from the cognitive rationalist quantitative paradigm prevalent during the 1970s and 1980s. Benner published her work in 1984. Her research constituted an interpretative turn or a move away from epistemological, linear, analytical, and quantitative methods toward a new direction of ontological, hermeneutic, holistic, and qualitative approaches.

Benner (1989) believed that practice and theory are interrelated and interdependent. They form a dialogue between practice and theory that creates new possibilities. Benner viewed practice as a way of knowing in its own right. Her approach to articulated nursing practice was developmental and interpretive.

Benner (1984) described nurses as passing through five levels of development: novice, advanced beginner, competent, proficient, and expert (Benner, 1984). Each step

builds upon the other, and abstract principles are refined and expanded by experience. Because of the expanding experience level, the nurse gains clinical expertise. The five different levels

> reflect changes in three general aspects of skills performance. One is a movement from reliance on abstract principles to the use of past concrete experience as paradigms. The second is a change in the learner's perception of the demand situation, in which the situation is seen less and less as a compilation of equally relevant bits, and more and more as a complete whole in which only certain parts are relevant. The third is a passage from *detached* observer to *involved* performer. The performer no longer stands outside the situation but is now engaged *in* the situation (Benner, 1984, p. 13).

Cody and Mitchell (2002) found other health disciplines are turning to the study of lived experience. They concluded that the suppression of human science, leading to theory-laden knowledge, imperils nursing as a practice of being with, witnessing, and co-creating quality of life as lived by nurses. They stated that theories live in the actions of those who support them; thus, any place where people see human care has the potential to support a human science-based nursing practice.

Dracup and Bryan-Brown (2004) discussed Benner's theory as related to critical care nurses, a practice similar to that of paramedics. They described the expert as one who can "integrate various aspects of patient care into a meaningful whole" (Dracup & Bryan-Brown, 2004, p. 449). They presented the novice as one who focuses "on mastering the technical aspects of care" (p. 449). An expert, on the other hand,

"integrates knowledge of …physiology and pathophysiology to assess symptoms and guide patient care; the expert has gone beyond the tasks to read and respond to the whole picture" (Dracup & Bryan-Brown, 2004, p. 449).

Benner's theory can be applied to paramedic practice because as paramedics become more experienced, they too develop intuition, commonly called a "gut feeling," about patients, their condition, and sometimes even their progression of illness/injury. This is the same novice-to-expert progression Benner discussed regarding critical care nurses and their experience levels. Benner's theory also applies because the clinical attributes of the positions of critical care nurse and paramedic are very similar, as are the types of patients for whom they care.

Research Question and Hypotheses

The following research question and hypotheses were addressed in this study:

Research Question. What is the multiple correlation between high school grade point average (GPA), paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination?

Research Hypothesis. There is a multiple correlation between high school GPA, paramedic program GPA, type of program attended, years of EMS experience, attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

Null Hypothesis. There is no multiple correlation between the high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

The dependent or criterion variable was the successful certification as measured by a score on the National Registry paramedic cognitive examination. Only the first attempt at the cognitive examination was assessed for this study, as that is how accredited programs report their success rates.

The independent or predictor variables were GPA upon high school graduation, type of paramedic program attended, final GPA upon completion of the paramedic program, number of years of experience as an EMT-Basic (EMT-B) and EMT-Intermediate (EMT-I), and attendance at a paramedic program that was nationally accredited. Rationale for attending the type of program the paramedic graduate attended was asked via a multiple choice questionnaire (Appendix A).

Definition of Terms

Emergency Medical Services (EMS) – For this study, the researcher adopted the meaning of EMS as defined by the Institute of Medicine as follows:

> [EMS] encompasses the initial stages of the emergency care continuum. It included emergency calls to 9-1-1; dispatch of emergency personnel to the scene of an illness or trauma; and triage, treatment, and transport of patients by ambulance and air medical service. The speed and quality of EMS services are critical factors in a patient's ultimate outcome. For patients who cannot breathe,

> are in hemorrhagic shock, or are in cardiac arrest, the decisions made and actions taken by EMS personnel may determine the outcome as much as the subsequent hospital-based care-and may mean the difference between life and death. (Committee on Committee on the Future of Emergency Care, 2006, p. 1)

The National Registry of Emergency Medical Technicians (NREMT) – The National Registry of EMTs (NREMT) is a private organization whose mission is

> to serve as the national EMS certification organization by providing a valid, uniform process to assess the knowledge and skills required for competent practice required by EMS professionals throughout their careers and by maintaining a registry of certification status. (NREMT, 2006, para. 1)

The National Registry hopes to become the national certifying organization for the entire United States and its territories, one of the tenets of the *EMS Agenda for the Future.*

Currently, 46 states use the services of NREMT in one form or another as their initial certification examination for EMS providers. Maine, Florida, and Illinois use only the National Registry for EMT-Basic certification. Alaska, California, Washington, DC, Indiana, Maryland, New Mexico, Pennsylvania, Virginia, and Washington use NREMT services only for paramedic certification (NREMT, 2006). Once certified, however, far fewer states require individuals to maintain their National Registry certification to continue employment. It is up to each state to determine recertification requirements. The average first attempt success rate is 56% (NREMT, 2006).

Paramedic Program Type – The literature did not classify types of paramedic education. This study categorized paramedic education into four types. They included (1)

community college/university, (2) vocational/technical school, (3) hospital/agency based, and (4) proprietary/for-profit.

High School Grade Point Average (GPA) - High School GPA was defined as the cumulative grade point average upon graduation from high school.

Paramedic Program Grade Point Average - Program GPA was defined as the cumulative grade point average upon completion of the subject's paramedic program.

EMS Experience - Years of EMS field experience was defined as the number of years the subject self-reported working or volunteering as an EMT-Basic and/or EMT-Intermediate. Certification as either an EMT-B or EMT-I is required nationally before applying to a paramedic program. However, some students move directly from one to the other with no additional field experience other than what was required in their initial training program.

Paramedic program type, high school GPA, program GPA, EMS experience and attending a nationally accredited paramedic program as the independent variables were used to predict whether or not a successful score would be obtained on the National Registry paramedic certification cognitive examination. The score on the NREMT examination was the dependent variable.

Success on the NREMT Paramedic Cognitive Certification Examination – Success on the NREMT examination was defined as a score on the first attempt at taking the cognitive examination. The passing standard is considered to be 0.95 logits plus 1.65 times the standard error of measurement. This formula is used because the computer-based examination became an adaptive versus linear true test theory examination

beginning January, 2007 (P. Dickison, personal communication, October 9, 2006). The passing test score on the pencil and paper written examination was 70 overall, and the test taker had to pass each section.

Assumptions

Several assumptions were made in this study. The primary assumptions were that the subjects would agree to participate in the survey and answer the questions honestly. Another was that the National Registry paramedic certification cognitive examination is indeed a valid and reliable measure of the ability of paramedics to reflect cognitive knowledge at the entry level (NREMT, 2006). The final assumption was that paramedics have a positive attitude regarding participation in research and are willing to contribute to the betterment of the vocation.

Limitations of the Study

A potential limitation to the study was the sample. Participation in the computer-based survey by paramedic candidates was voluntary, and was a convenience sample as only candidates from a limited time period were surveyed. A further potential limitation was that it may not be possible to make generalizations from the findings of this study since there were a limited number of participants. In addition, not all areas of the country were represented as this was a convenience sample. The use of multiple regression analysis may also limit the ability to make generalizations from the study findings. When a new group of subjects is used, the ability to generalize previous findings is determined by the similarity of the initial group to the subsequent group (Fraenkel & Wallen, 2006).

The last potential limitation was that reliability of the examination may vary due to the NREMT changing from a pencil and paper test to a computer-based examination. This change made the test an adaptive rather than a linear examination. The adaptive format used by the NCLEX-RN (the Nursing licensure examination) changes the number of questions each person receives based on the difficulty of the questions and the success of the test taker in answering them. However, NREMT has beta-tested the computer-based test bank for two months and has established a .89 reliability coefficient. Beta-testing was accomplished by adding approximately 10 to 15 questions per certification examination that were not scored as part of the final aggregate result. These questions were then reviewed by the psychometrician to determine validity and reliability (P. Dickison, personal communication, October 9, 2006).

Setting

Paramedic candidates took the cognitive examination via computer at any of the Pearson-VUE testing centers located across the United States after the appropriate application and validation process had been completed. Approximately one week after completing the examination, the researcher sent each candidate an email supplied by the National Registry with the seven-question survey (Appendix A) to the candidate's email address indicated at the time of the examination. A brief explanation of the research study was offered, and the candidate had the option of participating in the study. Since the NREMT traditionally posts examination results within two business days of the exam date, there was no impact on the candidate if he or she did not wish to participate in the study.

Once the subject completed the survey and sent it back to the NREMT, Dr. Gregg Margolis, Director of Research for the NREMT, matched the subject's examination score with the survey results, and sent it to the researcher. No identifying information was sent with the results, so confidentiality and anonymity was maintained.

Chapter Summary

This section introduced the problem that was studied and identified the constructs that were investigated. Even though there has been little research conducted on paramedics and other prehospital care providers, some of the current literature from nursing and other fields may be applied when attempting to predict what indicators are useful for determining paramedic candidates' ability to success the National Registry paramedic certification cognitive examination on the first attempt.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

The purpose of this chapter is to provide a review and discussion of the literature as it pertains to this study. Before attempting to determine predictors of success for the National Registry paramedic certification cognitive examination, it is first necessary to understand the background of current EMS education, and then gain a perspective of predictors of success for other professions.

Background of Present EMS Education

Unlike other allied health professions, EMS is still most commonly taught in a non-academic setting, such as a fire station, fire/EMS academy, or EMS service provider setting (Ruple, Frazer, Hsieh, Bake & Freel, 2005). Ruple et al. (2005) also found that only 26.5% of EMS education was in the community college and less than 5% in a four-year college or university setting. This is in stark contrast to all other allied health professions, which require at least an associate's degree to sit for the certification examination. Most of the educators reported teaching part-time with 73% working 20 hours or less per week. Two-thirds of responding instructors earned less than $10,000 annually from employment in EMS education.

An article by Veronesi (1999) mentioned the continual battle over exactly what level of education is best for EMS providers. He cautioned against the battle the nursing profession engaged in several years ago when trying to have two levels of registered nurses based on type of program attended. As both paramedic and registered nurse

graduates take the same examination for their respective boards, there should be only one type of certification/licensure.

Veronesi (1999) stated there is too much variability in EMS education. Nursing solved that problem by requiring the associate's degree as the entry level for registered nurses. A paramedic can sit for the examination with a certificate or an associate's degree from a regionally accredited educational institution, a diploma from a proprietary or agency-based program, or a certificate of completion from a vocational school. Most of the paramedic education programs are not nationally accredited through the Committee on Accreditation of EMS Programs (CoAEMSP) (Dickison et al., 2006). Furthermore, not every state has adopted the same version of the National Standard Curriculum. Veronesi stated the inconsistency in EMS education should "stop immediately" (Veronesi, 1999, p. 63).

Available resources for instructors were also found to be problematic. Ruple et al. (2005) discovered less than half of the respondents reported having access to support services, such as staff assistants (38%), legal advisors (13%), or librarians (19.5%). Of greater concern was the report that only 31% of EMS educators answering the survey had specially trained instructors available to assist students needing help with math, reading, or comprehension (Ruple et al., 2005).

Another difference in EMS versus other allied health instruction was the lack of academic preparation of the instructors. Only 20% of those responding reported that an academic degree was required. However, 82% stated that the specialty course instructor certifications, such as Advanced Cardiac Life Support, International Trauma Life

Support, and Pediatric Education for Prehospital Providers/Pediatric Advanced Life Support, etc., were required for their positions. Ruple et al. (2005) discovered that for most respondents, EMS field experience was more important than educational credentials in obtaining instructor positions.

The EMS Agenda for the Future

The *EMS Agenda for the Future* (2000) listed a vision for EMS education with a target date of 2010. This document was authored by the National Highway Transportation and Safety Administration (NHTSA). The *Agenda*, as it is known in the EMS field, stated that EMS education should be of "high quality" and should "excel beyond minimum educational standards" (NHTSA, 2000, p. 33). It should also be "recognized as an achievement worthy of formal academic credit" (NHTSA, 2000, p. 33). In fact, when discussing paramedic programs, the *Agenda* listed the following goal: Advanced level EMS education should be "sponsored by institutions of higher education, and most is available for college credit." Later in the document, a recommendation for EMS programs found in the *Agenda* is "increased EMS education program academic affiliation" (Cason, 2006; NHTSA, 2000, p. 35).

In fact, one of the limitations of EMS education cited in the *Agenda* is that the EMS educational process has developed separately from the formal post-secondary education system. As a result, EMS personnel who desire a college degree have been excluded in the past and continue to be excluded based on the type of program they attended. Obtaining a degree would only serve to advance EMS as a profession (NHTSA, 2000).

Veronesi (1999) agreed with NHTSA and the *Agenda* when he stated "for EMS to advance as a profession, however, education must advance first. In the future, strong consideration must be given to requiring an associate's degree as entry level for EMT-paramedic training (Veronesi, 1999). He believed that programs created with the degree requirement will only serve to "deliver a higher quality entry-level paramedic" (Veronesi, 1999). As with any other allied health profession, EMS cannot expect to be treated as professionals rather than technicians until the leadership adopts formal entry-level educational standards (Veronesi, 1999).

National Accreditation for EMS Programs

The *Agenda* calls for one national accreditation agency. In fact, such an organization already exists. It is called the Commission on Accreditation of EMS Programs (CoAEMSP), and it accredits only paramedic programs at this time. CoAEMSP will begin accrediting other levels of EMS providers in the near future. There are currently just over 250 EMS programs accredited by CoAEMSP. Dickison et al. stated that "along with certification and licensure, accreditation is a tool intended to help ensure that a well-prepared and qualified workforce is available to provide health care services" (Dickison et al., 2006, p. 226).

In an article addressing program accreditation's effect on the National Registry paramedic certification cognitive examination, Dickison et al. (2006) found that there was a positive relationship (45.81% success rate for accredited programs versus 10.4% success rate for non-accredited programs). If mandatory national EMS program accreditation becomes a reality, only students who graduated from those programs will be

allowed to sit for the paramedic certification examination. Dickison et al. reviewed 12,773 cases. Most of the subjects were male with a mean age at the time of the test of 31 ± 8 years. The overall success rate for all subjects was 55.4%. Of all predictors measured, increased levels of education were found to be the most strongly associated with a successful success rate on the examination (Appendix B).

The *Agenda* cited that the absence of a structured education system has resulted in inequity or variability in EMS education programs and licensing standards from state to state. This is true even though there is a National Standard Curriculum for each level of EMS provider. Even with the use of this curriculum, there is still no uniformity in the quality and length of programs (NHTSA, 2000; Veronesi, 1999).

The lack of a mandatory national EMS program accreditation process for all paramedic programs has contributed to the problem. Without a formal EMS education system, there remain "inconsistencies among the various curricula and difficulties in the ability to bridge from one level of EMS provider to another" (NHTSA, 2000, p. 35). NHTSA recognizes only four levels of prehospital emergency services provider – First Responder, Emergency Medical Technician-Basic, Emergency Medical Technician-Intermediate, and Emergency Medical Technician-Paramedic. There has been some discussion about a fifth level called Advanced Paramedic; however, no action has been taken to date.

Besides promoting one national accreditation for all EMS education programs, *The EMS Agenda for the Future* called for a national examination for each level of prehospital providers, similar to the National Council Licensure Examination for

Registered Nurses (NCLEX-RN). One national examination would allow easier reciprocity from state to state when prehospital providers move or transfer, as well as ensuring common entry-level competencies throughout the country. The individual states would still have the authority through their medical directors to include higher level skills with the appropriate education, as long as they do not cross over into a higher scope of practice for EMS providers as determined by the National Standard Curriculum for that level.

The Institute of Medicine Report

In June 2006, the Committee on the Future of Emergency Care in the United States Health System, part of the Institute of Medicine, published a report on the state of emergency medical services in the United States as part of a series on emergency care. One book was dedicated to emergency medical services. Cited as "a critical component of our nation's emergency and trauma care system, providing response and medical transport to millions of sick and injured Americans each year," the EMS system was found to be fraught with problems especially in the last few years (Committee on the Future of Emergency Care, 2006, p. 11). Some of the identified problems included the high degree of variability of EMS systems across the country, decreased federal funding for EMS, and a high degree of speculation regarding which type of EMS system is the most efficient and cost-effective with little evidence to support any of them.

Although many EMS systems are part of fire departments, an average of 80% of 911 calls are EMS-related (Committee on the Future of Emergency Care, 2006). As 89% of EMS is delivered through these fire-based agencies, which often focus more on

firefighting than medical care, there remains considerable skepticism about whether or not this is the best means of providing emergency medical care (Committee on the Future of Emergency Care, 2006, p. 43).

The Institute of Medicine Report listed six major systemic problems regarding the delivery of emergency medical care in the United States. These problems are insufficient coordination, disparities in response time, uncertain quality of care, lack of readiness for disasters, divided professional identity, and limited evidence base. The problem most relevant to this study was the divided professional identity.

The Committee stated that EMS is a unique profession because it has aspects of both public safety and medical care. This disparity can even be seen in the education system, as EMS education is not uniformly offered in any one program type. Even at the community college level, EMS programs are offered either as an allied health program or as part of a public safety academy. The authors cited that among public health agencies, EMS personnel are not afforded the same career ladder and respectability as police or firefighters. The same dilemma occurs in allied health, where physicians and nurses receive more respect than EMTs and paramedics. Salaries for EMS providers also remain traditionally lower than either their public safety or allied health counterparts (Committee on the Future of Emergency Care, 2006).

Part of the disparity in respect and wages is due to the inconsistency of EMS education. The Committee discussed potential improvements in Chapter Four of their book. They cited several of the publications mentioned in this study, such as the *EMS*

Agenda for the Future. Shown below as Table 1 are the education system goals as proposed in the *EMS Agenda for the Future* and in the Committee's report.

Table 1
EMS Agenda for the Future Education System Goals

- Ensure the adequacy of EMS education programs
- Update education core content objectives frequently enough so that they reflect patient EMS healthcare needs
- Incorporate research, quality improvement, and management learning objectives in higher level EMS education
- Commission the development of national core contents to replace EMS program curricula
- Seek accreditation of EMS education programs
- Establish innovative and collaborative relationships between EMS education programs and academic institutions
- Recognize EMS education as an academic achievement
- Develop bridging and transition programs
- Include EMS-related objectives in all health professionals' education

SOURCE: NHTSA, 1996.

The Committee also concurred with the *EMS Agenda for the Future* in that even though there is a national standard curriculum, following this curriculum alone was not sufficient for educating an EMS professional and called for a national EMS program accreditation.

The Allied Health Professions Training Act

After the passage of The Allied Health Professions Training Act in 1966, more types of allied health programs began to appear in the United States. Throughout the past three decades, these health professions have evolved from training via on-the-job experience to education in institutions of higher learning. By 1980 more than half of all allied health training programs were found in collegiate settings, since they offer the opportunity for formal academic degrees (Stokes, 2004). In order for EMS to become a viable profession similar to nursing and other health occupations, its education should be delivered through the collegiate setting (Veronesi, 1999).

Unfortunately, the EMS vocation is not yet covered under The Allied Health Professions Training Act. This is a priority that the National Association of EMS Educators has incorporated into its list of goals. Possible roadblocks include the fact that there is no common level of education required for paramedics, nor are all programs accredited. EMS has the only allied health program that does not require accreditation to sit for the certifying examination.

With the revamping of the Higher Education Act, much more attention is being paid to the accountability of post-secondary institutions for student academic performance. Robbins, Allen, Casillas, Peterson, and Le (2006) cited a six-year graduation rate of 53% from four-year schools and 34% from some two-year institutions. Several studies (Carey, 2004 and Swail, 2004) noted a concern that students are not adequately prepared to meet the challenges they face when entering college. As a result, some researchers (Stedman, 2003 and Hearn & Holdsworth, 2002) have suggested tying

federal and state funding to student outcomes. This could especially impact the community colleges due to their open admissions philosophy, as they attract more students with lower GPAs than four-year colleges and universities who usually have selective admissions.

Grade Point Average as a Predictor of Success

There were several studies that discussed grade point average as a predictor of success with mixed results. This section presents some of the authors and the results of their studies. Since there is little EMS research, literature from several professions as well as allied health was reviewed.

Robbins et al. (2004) agreed with much of the literature they reviewed and suggested that there were three outcomes identified as predictors of college success. They included academic performance which could include individual as well as cumulative GPA, retention (i.e., whether a student returned for a second year), and persistence to degree attainment (i.e., the amount of time before a degree is awarded).

Bretz (1989) completed a meta-analysis regarding the use of college grade point average (GPA) as a predictor of success after graduation (Table 2). The results were mixed, showing that overall no significant relationship existed while subgroup analyses of success in business and education suggested that significant relationships did exist. He also found that a limitation to his study was the large amount of qualitative data in the journals with little empirical or quantitative data available.

Table 2
Meta-Analysis Results from Bretz's 1989 Study

Studies	d	Vd	Ve	Vg	SDg	95% CI
Combined	.39	.102	.006	.096	.31	-.22
Business	.60*	.054	.004	.050	.22	.16<g<1.03
Teaching	.36*	.066	.049	.017	.13	.10<g<.61
Engineering, Science, Medicine	.27	.153	.025	.128	.36	-.43<g<.97
Others	.09	.006	.002	.004	.06	-.02<g<.21
Graduate GPA only	.73**	.04	.027	.013	.11	.51<g<.95
*p < .05	**p < .01					

The overall meta-analysis indicated that no significant relationship existed between college GPA and job success. The *d* value of .39 was not significant at the alpha level of .05. However, subgroup analysis suggested that significant relationships did exist for predicting success in business ($d = .6$, $p < .05$) and teaching ($d = .36$, $p < .05$) (Bretz, 1989).

When discussing engineering, medicine and other science professions, Bretz's study found that while GPA was "barely significant" in explaining starting salary, actual hours worked while in school and the subject's age were "far better predictors" (Bretz, 1989). He explained this as the "human capital" gained by working and attending school simultaneously, and found it was more valuable than GPA in the market. The more hours worked while in school, the higher the starting salary was likely to be. Bretz also found that no form of GPA was significant in explaining salary growth. Once employed, the number of hours worked and the length of tenure at the organization were "significantly positively related" to salary growth (Bretz, 1989).

Bretz's premise was supported in another study that found "significant differences" in the predictive validity of the GRE for graduate students. There was a large

variation between older and younger students, with the validity drastically decreasing when evaluating older students. Predictors such as salary, professional esteem, and honor societies were more valid indicators for success or achievement in later life (House, 1989).

Reviewing teacher success on their certification examinations, Burke cited the University of Minnesota study that found that the SAT test is a valid predictor of success in college and degree attainment for educators. He found that on the LAST (liberal arts and sciences test) and the ATS-W (teaching theory and practice test), the SAT was the strongest predictor of success. High school GPA, which was found to be the best predictor of success in college, was not a predictor of future success on either test (Burke, 2005).

Margolis and Wagoner (2004) discussed the relationship between high school class rank and how well paramedic graduates performed on the paramedic national certification written examination. They found a strong correlation between the graduates' self-reported high school class rank and the first-time success rate on the written portion of the examination (Table 3).

Table 3 *High School Ranking vs. Success Rates*			First Time Success		First Time Non-success	
Self Reported High School Class Rank	n	%	n	%	n	%
Bottom 10%	94	1.6	55	58.5	39	41.5
Lower 20%	223	3.9	113	50.7	110	49.3
Middle 40%	2,234	38.7	1,305	58.4	929	41.6
Upper 20%	1,926	33.4	1,291	67.0	635	33.0
Top 10%	1,297	22.5	1,029	79.3	268	20.7
Chi-square = 185.63 ($p \leq 0.001$)						

In their 2002 study, 5,774 of 8,176 (70.6%) first-attempt NREMT paramedic certification written examination candidates reported their high school class rank. Over half of the respondents (55.9%) reported graduating in the top 30% of their high school class, with only 5.5% in the lower 30% (Margolis and Wagoner, 2004).

A study was also conducted in Australia to predict EMS students' success during the first year of school. When examining EMS students' academic performance, previous healthcare-related experience, post-secondary education, background (rural vs. urban), student entry type (age), and gender were all significant predictors of success. Grade point average was significantly related to the previously-mentioned factors. Specifically, those students who had worked in health care, had completed at least one year of post-secondary education, were male, and were 20 years of age or older tended to succeed during this four-year study (Madigan, 2006).

The HOBET as a Predictor of Success

Werfel and Prosek (2007) looked at a different indicator of success for paramedic candidates taking the NREMT written certification examination. They used the HOBET, or Health Occupations Basic Entry Test as one of several independent variables.

The HOBET provides an objective measurement of critical reading ability and compares the test taker's ability against the level of mastery required for success in college. Second, the HOBET evaluates the student's level of success with basic mathematics, the math necessary to function, not only in academic courses, but also in clinical practice following college. Third, the HOBET determines the student's effective speed in reading college level material. Last, the HOBET identifies how the student

approaches study, in general, and identifies which learning approach is most effective. The authors chose this exam because paramedic students at their institution are required to take it as an entrance examination for the program.

Predictors of Success for Other Health Professions

Other studies have been done on predictors of success, including standardized testing, in health occupations other than EMS. Smith and Garrison (2005) used five data sets and explored the bidirectional relationship between standardized tests and various indicators of success. They found that there is limited usefulness in the standardized tests, especially when the data are disaggregated by gender, race, or ethnicity. The authors felt that using standardized testing as the main indicator of success for college admission, for example, could lead to many deserving and capable students not being admitted. Their conclusion was that there was little or no relationship between SAT scores and cumulative college grades. Looking at both liberal arts and Research I institutions showed students getting As were just as likely to come from the lowest as the highest SAT quartile. There was, however, a small positive relationship between SAT math scores and GPA for students in selective science institutions (Smith & Garrison, 2005).

One of the limitations Smith and Garrison noted was the use of standardized testing as a predictor of success in college, when the literature demonstrated that many studies that used traditional regression analysis were mildly positive for success in the first year of college only. They also found as the success measures became more long-term, and as other factors mentioned earlier were considered, the power of the test often declined in significance (Smith & Garrison, 2005).

Although no profession presented a large body of literature regarding predictors of success for their certification examinations, the medical community had the most studies. An analysis by Gough and Hall (1975) found that clinical competency for medical students, rather than academic performance, was a stronger predictor than standardized testing.

A review of medical students in the United Kingdom found that the strongest predictor of success on the third year objective structured clinical examination for 738 students attending a single medical school between 1994 and 1997 was end-of-program GPA. Socio-economic status and type of school attended were not found to be significant. Also, male students and those from an ethnic minority were associated with "relatively poor performance" in this study (Lumb & Vail, 2004, p. 1002).

Stern, Frohna, and Gruppen (2005) looked at predictors of professional behavior in medical students. Although not directly related to success on the certification examination, professional behavior is attributable to success in the profession. No data from admissions materials, including high school GPA and the MCAT (Medical College Admissions Test), were found to be significant. Instead, failure to complete required course evaluations and failure to report immunization compliance were the highest predictors of professional behavior (Stern et al., 2005).

When looking at dental hygiene students, Holt (2005) examined student retention strategies as related to student attrition, academic standards, re-entry policies, and clinical remediation. This qualitative study had an 80% return response rate. She found that academic difficulties, specifically a program GPA less than 2.0 on a four point scale in

either one class or overall, and discipline or professional policy issues were the highest predictors of failure of dental hygiene students at her particular institution (Holt, 2005).

Agreeing with Holt's study, a different set of authors discovered similar results when examining predictors of success of dental assisting students on their national board examination. In their study, they found that program GPA "was a significant predictor of all of the subsections of the dental assisting national board" rather than the mock examinations held during the course of their program (MacMillan & Fujita, 2005, p. 25).

Sayles, Shelton and Powell (2003) examined predictors of success for nursing students on the NCLEX-RN examination, which is the registered nurse national licensure examination. Using inferential statistics, they found the successful candidates were primarily female (82.4%) and Caucasian (85.3%). Of the 78 graduates studied, approximately 33.2% had prior health-care experience, such as EMS, licensed practical nurse, radiology technician, or respiratory therapist. The healthcare background proved to be the strongest predictor of success on the NCLEX-RN in this particular study. Variables in the study that proved not to be statistically significant included gender, overall program GPA, mock boards, ACT scores, number of repeated classes, and grades from pre-nursing and all other nursing courses before the final semester (Sayles et al., 2003).

Industry-Based Certifications

Wilcox (2006) discussed industry-based certifications (IBCs) for use in secondary and post-secondary institutions. These IBCs can be either an alternative or supplement to

what are considered more traditional credentialing systems, such as postsecondary degrees, state licenses, and apprenticeships.

There were several reasons cited for the heightened interest in IBCs by industry. These include the need for program relevancy, accountability, consistency of results, nationally portable credentials, controlling educational costs, and coherent programs of study. One of the most important benefits to employers is the provision of a standard that can be used to benchmark a candidate who has little or no previous work experience (Wilcox, 2006).

An example of industry-based certifications in EMS is the availability of a paramedic certificate which enables the graduate to sit for the certification examination in most states. In Florida the paramedic certificate is also an occupational completion point for the associate's degree in EMS in community colleges. The remaining general education courses can be completed after already becoming certified as a paramedic, which is enticing to many since they receive some type of tuition reimbursement from their employers once they have completed probation (Wilcox, 2006).

Traditional versus Online Delivery

As another of its recommendations, the *Agenda* listed as another of its recommendations to "Explore new techniques and technologies for implementing education" (NHTSA, 2000, p. 35). As with most other types of education delivery, the use of online or web-based education to reach more students is becoming increasingly popular.

A comparison of traditional versus online health education skills acquisition was the subject of a dissertation by Allison (2005). She found that the statistical results of course projection scores representing the health education skills of those students acting as a resource person and evaluating the effectiveness of health education programs were statistically different from those who did not act as resource persons. Students in the online classes scored statistically significantly higher than their traditional counterparts on the course project that related to the health education skill of acting as resource person.

However, traditional students scored statistically significantly higher on the course project related to evaluating the effectiveness of health education programs (Allison, 2005). One of her limitations was that this study only examined two groups of students over six semesters. Also, inter-rater reliability was not statistically correlated, so the author advised using the results with caution. In the end, the author's conclusion was that health education skill acquisition was comparable between students enrolled in traditional and online undergraduate health education courses during the time period it was researched (Allison, 2005).

Allison's work comparing web-based versus traditional teaching delivery methods is important for EMS because of the large number of providers that serve in a rural setting and consequently may not have ready access to educational programs (NAEMSE, 2003). These EMS providers do not always have easy access to academic settings, so alternate delivery approaches are important. Strategies should involve both initial and continuing education. Per the *Agenda*, "EMS education providers and academic

institutions should develop innovative solutions that address cultural variation, rural circumstances, and travel time and constraints. There should be programs that incorporate, for example, distance learning and advancing technology" (NHTSA, 2000, p. 35).

It is important to note, however, that the authors of the *Whitepaper on Internet-Based Distributed Learning (IBDL) in EMS Education* believed that "new students require a high level of interaction with faculty and peers. Skilled IBDL instructors can use IBDL effectively in conjunction with regular classroom meetings, moving some typical classroom activities to an interactive and/or facilitated interactive IBDL format" (NAEMSE, 2003, p. 11). The paper also reflected concerns about the cost of distance learning, competency and confidence of instructors using the technology, and student comfort in using technology. Therefore, although distance learning can be extremely useful for uniformity of delivery of content and the ability to offer quality education to rural and military personnel, it should not be totally substituted for face-to-face time. This is especially true for teaching and testing of psychomotor skills.

Simulation versus Human Subject Skills Training

One of the major differences between the paramedic and EMT-Basic level is the use of advanced airway procedures. An example is the use of an endotracheal tube which is a breathing tube placed through the vocal cords and into the lungs to assist the patient with breathing. This is the same procedure performed by anesthesiologists in the operating room. Of course, a skill as important as this will need to be taught in a classroom and lab environment, with ample opportunities for skills practice before

attempting this procedure on a human being, preferably in the operating room (Hall, Plant, Bands, Kang and Hall, 2004; Cason, 2006).

Hall et al. (2004) presented a study on randomized controlled trials comparing the efficacy of training paramedic students on endotracheal intubation using a patient simulator versus a human subject. They noted that there is still considerable controversy as to where the optimum setting is for learning this procedure. As human patient simulators are becoming more numerous all over the world, the authors wanted to see if there was a difference regarding the success of the paramedic's ability to place the endotracheal tube properly. Their conclusion was that paramedic students who were trained on patient simulators had comparable success and complication rates to those students trained on human subjects.

This study is important because all types of paramedic programs are having difficulty scheduling their students into hospital operating rooms for endotracheal intubation training on live patients. The human patient simulator is one example of an alternative strategy, as identified in the *Agenda* that can be used to help teach this life-saving technique. The downside is the expense of the simulator which runs from $75,000 to $200,000 each, depending on the model and its capabilities.

Another study used standardized patients as well as blended (face-to-face and online) learning for stroke training for paramedics. Standardized patients were defined as actors, in this case paramedic instructors, who portrayed the signs and symptoms of a patient with the condition being taught or assessed (Gordon, Issenberg, Gordon, LaCombe, McGaghie & Petrusa, 2005).

As strokes are a major cause of death and disability in this country, it is imperative that paramedics learn to “rapidly recognize, assess and manage patients with neurological syndromes” in order to enable the patients to receive the treatment they need in the appropriate timeframe” (Gordon et al., 2005, p. 114). The study evaluated 345 paramedics over a ten-month period, using a pre- or post-test method of evaluation. With the use of both the standardized patients and the blended learning format, this one-day course demonstrated significant gain in knowledge ($p<.0001$) as measured by the tests. Limitations of the study included no blinding of the clinical raters regarding whether they were observing a pre or post test. Inter-rater reliability was not calculated, and the paramedics were tested immediately after taking the course. These factors could diminish the validity of the study, since only short-term effects were studied. Reliability could also be an issue, as the numbers may be too small to apply nationwide.

Seropian, Brown, Gavilanes, and Driggers (2004) discussed some of the pitfalls of simulation. The most predominant is the lack of guidance available to the faculty once the product has been purchased. To be successful, integration of simulation technology into health programs involves many steps. These include adequate facilities, faculty buy-in and training, and integration into the curriculum. Scheduling of this resource can also present difficulties if it is shared among various health programs. Seropian et al. (2004) suggested that seeking the advice of other educational institutions who already own the technology and trainers from the manufacturer can smooth the way for programs to add this to their repertoire of tools.

Critical Thinking

As with any health profession, critical thinking is extremely important for paramedics. Critical thinking was defined as

> Disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking. In thinking critically we use our command of the elements of thinking successfully to the logical demands of a type or mode of thinking. (Paul, 1995, p. 526)

Paul also discussed the importance of critical thinking in the workplace. He believes that the quick-fix strategies found in popular business theories must be abandoned. Managers and workers need to learn to think in a new way by learning to discipline their thinking to a new level of clarity, precision relevance, depth and coherence. Finally, basic thinking skills of workers need to be emphasized rather than the more mundane issues common to managers (Paul, 1995).

The importance of critical thinking has been highlighted by accrediting bodies, colleges, universities and faculty; however the practice of actually teaching students to think critically has yet to reach the college classroom on a consistent and comprehensive basis (McMahon, 2005). Although most faculty agree that helping students gain critical thinking skills is an imperative for higher education, very few of those faculty teach courses in a manner that fosters critical thinking. As students learn to think critically, they inevitably do organize and internalize facts, learn terminology, and use scientific procedures (Bok, 2005; Paul, 1995).

Davis (1998) stated “Educators need to consider a new philosophy regarding EMS education that employs creative thinking and problem solving. In the new EMS classroom, students must be intellectually engaged” (p. 43). She differentiated training from education by describing training as rudimentary or rote learning. Training is most appropriate for the EMT-Basic. However, a paramedic requires the ability to think outside the box. According to Davis, clinical competence cannot be established by memorization. “Developing knowledge in paramedic students requires an entirely different approach” (Davis, 1998, p. 43).

Davis concurred with the 1998 National Standard Curriculum revisions when she described what she and other EMS educators believed students should have, that is, good communications skills, basic math skills, problem-solving and critical thinking skills, strong interpersonal skills, and computer skills. There has been much discussion about this revised curriculum in that it appears to strongly favor community college EMS programs. However, the *Agenda* does have a recommendation for EMS programs that states that “increased EMS education program academic affiliation” is a desired outcome for the future.

In her 1997 study, Janing noted that in order for paramedics to respond to the changing paradigm of their practice, EMS practitioners need “problem-solving and reflective thinking skills” (Janing, 1997, p. 215). This is due to paramedics working more from protocol-driven care that is initiated by their assessment and evaluation of the patient’s presenting problem, rather than on-line medical control with physicians directing care via radio communications.

Similarly, Alfaro-LeFevre (2004) stated that critical thinking, defined as "our capacity to focus our thinking to get the results we need" may be the single most important factor that determines whether health care providers succeed or Non-success. Even though curricula and delivery systems are redefined, students Non-success to acquire "thinking skills" needed to function in the challenging health care environment in which they find themselves (Alfaro-LeFevre, 2004, p. xiii).

A good example of critical thinking is the decision of whether or not to resuscitate someone who is without a pulse or breathing and who has a Do Not Resuscitate (DNR) order. In 1991 a group of healthcare providers from Oregon formed the Physician Orders for Life-Sustaining Treatment (POLST) task force. They developed a program to convert the treatment orders of chronically ill patients with advanced directives into written medical orders. The goal of this program was to communicate these patients' preferences for treatment in the form of medical orders as they moved among different healthcare settings, including their home (Schmidt et al., 2004).

Janing (1997) studied the use of a scenario-based approach in facilitating critical thinking skills in paramedic students. She performed a two-year, longitudinal study with 55 students using pre- and post-test scores with final examination scores. She found that the correlation between post-test scores with final examination scores was positive and moderately significant. However, there was no correlation between post-test scores and sub-test scores that measured critical thinking. Finally, comparison of pre-and post-test scores was significant, while the effects for age, experience, and education were found to be not significantly significant.

Service Learning in Allied Health Programs

Besides the inclusion of critical thinking in the curriculum, some allied health programs have included service learning projects. Bender and Randall (2005) described service learning as

> a credit-bearing educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of the course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility. (Bender et al., 2005, p. 1)

The students serve as a potential resource to the client, and this experience allows the students to become exposed to a number of ethical and legal dilemmas regarding social and community health issues.

This idea is in keeping with Cason's (2006) concept of the importance of community outreach. If a program sponsors such activities, students have the opportunity to learn about diverse cultural groups and help enhance the image of EMS in their community (Cason, 2006).

Stratification and Vocational Education

In a 2005 study, Ainsworth & Roscigno found that vocational education, the origins of EMS education, predated more general educational funding by approximately 40 years. Even though the funding appears to be higher, there are problems with the performance of vocational students. The authors found that these students "do not perform as well in basic academic skills such as mathematics, science and reading

compared to those enrolled in more general academic programs" (Ainsworth et al. 2005, p. 262).

The authors also discovered that academic coursework rather than skills-focused vocational training improved the students' ability to not only find a job, but also enhanced occupational mobility. The benefit appeared to increase over time. Ainsworth's study revealed that most employers were more interested in basic academic skills and trainability, and that vocational training significantly reduced the chances of attending a four-year college (Ainsworth et al., 2005). This in turn significantly reduced the opportunities to obtain a professional or managerial position.

In Ko's (2005) article, the data also verified retention that retention rates of vocational education graduates attending colleges and universities are lower than those of general students in both two- and four-year public colleges and universities. The implication by the author was that if colleges are concerned about retention and want to increase their retention rates, administrators should focus on specific groups, such as vocational school graduates.

The State of Florida reviewed students' benefits from workforce education programs in 2004. Their conclusion was that in order to improve the effectiveness of workforce development programs, the Florida Department of Education should partner with local education agencies to increase participant completion rates and strengthen program accountability. Another recommendation was to have the Department of Education develop and implement an "empirically-based strategy" that would identify low-performing programs and require local program managers at community colleges to

justify their continuation (Office of Program Policy Analysis and Government Accountability, 2004, p. 15).

Finally, Vacik, Nadler and Miller (2006) found that with the rise of technological innovation, what were once considered to be traditional vocational programs have now given way to computer programming, nursing and allied health operations, and technology services. They stated that to a great extent, a large number of vocational programs have been remanded to secondary school environments (Vacik et al., 2006).

Proprietary and Public EMS Programs

As stated in the introduction, there are four types of EMS training programs in the United States. These consist of community college/university, vocational/technical school, proprietary/for-profit, and agency-based (hospital/fire department) programs. According to the Florida Department of Education (2006), there are 28 community colleges, three vocational programs, and an unknown number of proprietary programs currently offering EMS programs in the state. There were 30,326 students enrolled in vocational certificates, and 12,651 students who enrolled in college credit certificate programs in 2003-04. In the same time period, 20,470 students graduated with a vocational or college credit certificate and 10,548 students graduated with an associate's degree (FDOE, 2006). These numbers included all majors, so not all of these graduates were in EMS.

There were few articles written on the subject of the relationship between public and proprietary schools. One article stated "If the educational literature makes anything

about proprietary schools clear, it is that they occupy a highly contested and ever-changing place within higher education" (Outcalt, 2003, p. 1).

Leaders of higher education raised many questions. Tony Zeiss, president of Central Piedmont Community College in North Carolina, was quoted in the same article as saying "Yes, there is competition for community colleges, and it's spelled with a capital 'P' for proprietary colleges" (Zeiss, 1998, p. 9). The key questions that were found in the literature included: Are these schools threats to community colleges? Do they take advantage of gullible students and policy makers? Do they do business better than the public schools? And finally, what are the implications of including shareholders within the group of stakeholders to whom proprietary schools are responsible?

Outcalt (2003) cited the rapid growth of proprietary schools. At the time the article was written, there were more than 2,300 proprietary schools offering two- and four- year degrees and certificates in the United States. Until 2001, schools like the University of Phoenix, perhaps the largest of such schools, earned financial revenues of more than $1 billion dollars per year. However, since 2002 investments in proprietary schools have fallen, even though their revenues and enrollment continued to rise (Outcalt, 2003).

The literature did find differences between public and proprietary schools. Community colleges were found to have much broader missions and courses of study. They served a much larger group, while the proprietary schools were more focused, usually offering only a handful of degrees. These degrees were all related to career preparation. Conversely, this focus can cause problems later as some higher education

leaders believe they do not meet the college and university goal of producing good citizens for the community. Another difference cited by Outcalt (2003) was the relative lack of administrative bureaucracy which led to courses designed to be offered by any instructor with little prep time.

On the issue of civic engagement, Persell and Wenglinsky (2004) reported that students who attended both for-profit and not-for-profit institutions demonstrated similar characteristics in the early years of their academic careers. There was a significant difference after four years, however. The authors observed that vocational students attending for-profit proprietary schools

> evince less civic engagement four years later than their public and non-profit community college peers when prior levels of civic-mindedness, social background characteristics, and certain mediating educational experiences are held constant. This relationship was constant for all three measures of civic engagement; student attending for-profit schools were less likely to vote, less likely to participate in political activities other than voting, and less likely to become involved with their communities. (Persell & Wenglinsky, 2004, p. 351)

The Tinto model of influences on higher education outcomes was used by Persell et al. (2004) to test the hypothesis regarding the relationship between attending a proprietary school and civic engagement. Direct effects were defined as those characteristics of the institution that can affect the outcomes in and of themselves, while indirect effects were those characteristics that affect certain student experiences that in turn affect outcomes. The behaviors specifically measured were students' tendency to

vote, participation in political activities other than voting, and involvement in their communities through public service activities (Tinto, 1987).

Persell et al. (2004) found that there was substantial evidence to suggest that major differences exist between community colleges and proprietary schools regarding curricular, extracurricular, and community service programs that fostered civic engagement. A possible connection was suggested between the offering of social science and humanities classes which are typically not offered in the private, for-profit schools.

These authors concluded that the federal policy makers should beware of their presumption that both types of schools are the same. They believed they are not equivalent in terms of civic service and the development of good citizens. The conclusion was that public dollars continue to be spent for private good, leading to a reduction in the "social good of a well-prepared citizenry capable of advancing the interests of the commonwealth" as well as "a reduction in the individual good, with the less advantaged being less able to use the political system to articulate their own concerns. "In either case, the democratic life of the United States suffers" (Persell & Wenglinsky, 2004, p. 353).

Morey agreed with the previous authors by noting that "Society expects public higher education to advance social justice through increased access for underrepresented groups, provide service to communities, enhance economic development through training and applied research, and advance knowledge for the social, economic, cultural and scientific benefit of society" (Morey, 2004, p. 147). Although she admitted the value of competition, the author warned public schools that they must be sensitive to changing

student demographics, which leads to changing student needs while still meeting the obligation they have to the community.

Outcalt (2003) also noted that the proprietary schools offered more certificates while community colleges had more of an emphasis on degrees. Also, few formal articulation agreements were found to exist between the proprietary schools and community colleges. This caused problems for some students who found it difficult to transfer credits from one type of school to the other.

Because community colleges have open access, the authors noted that there are fewer student services available to proprietary school students. However, career placement was just as important for the proprietary schools as for the community colleges, as several states reward community colleges with additional funding for completers (Outcalt, 2003).

As for the suggestion of proprietary schools being a threat to community colleges, Zeiss was quoted in the article as saying, “If we don’t meet the needs and expectations of students, the for-profit colleges and training organizations certainly will; indeed they already have the jump on us” (Zeiss, 1998, p. 9). Because the proprietary schools seem to be better able to adapt to workforce issues, community colleges will have to provide new delivery options or risk losing more of their students.

One noticeable way community colleges were noted as losing to the proprietary schools was in the area of state and federal funding. With the reforms of the Higher Education Act in 1992, both state and federal funding has become more available to the private, for-profit schools. However, even though more proprietary schools are seeking

and receiving some form of state or national funding, there continue to be problems with students graduating from them. Afterward, the graduates discovered the programs were not nationally or regionally-accredited programs, even though students traditionally paid a much higher tuition than those attending community colleges (Outcalt, 2003).

With a slightly different viewpoint, Blumenstyk (2006) defended the federal government's loosening of restrictions on federally subsidized student loans for proprietary schools. She cited the availability of increasing distance education offerings by many of these private institutions. Also noted was the use of the Internet and other forms of advertising to attract potential students. This is in contrast to public higher education institutions that usually have limited funding for such activities.

Chapter Summary

There has been very little research done in the emergency medical services vocation at the present time. Critical thinking was mentioned in several articles as being extremely important for students to master. However, reviewing the literature from other professions did seem to predict variables that contributed to student success both in post-secondary education and on the certification or credentialing examinations. Further study appears to be warranted.

CHAPTER III

RESEARCH METHODOLOGY

The following section discusses the method and procedures that were used in answering the research question. This section begins with a discussion of the design, population and sample, data collection procedures, research question and hypotheses, variables of the study, instrumentation, and reliability and validity of the instrument. The final section provides an overview of the method of analysis.

Purpose of Research

The purpose of this quantitative study was to determine the multiple correlation between the five predictors (high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and national EMS program accreditation) and success on the National Registry paramedic certification cognitive examination. Through a voluntary computer-based survey (Appendix A) administered via email approximately one week after the examination, the data gathered was compared to the first-attempt success rates.

Research Design

The study utilized correlational research methodology. Correlational research is used to investigate the relationship among two or more variables without any attempt to influence them. There was no manipulation of the variables in this study. Correlational research is also used to predict likely outcomes (Fraenkel & Wallen, 2006).

As an explanatory study, a major purpose of correlational research is to clarify understanding of important phenomena by identifying relationships among variables. If a

relationship of sufficient magnitude exists between two variables, it becomes possible to predict a score on one variable if a score on the other variable is known. The variable that is used to make the predication is called the predictor variable; the variable about which the prediction is made is called the criterion variable (Fraenkel & Wallen, 2006).

The population consisted of those paramedic candidates taking the National Registry paramedic certification cognitive examination for the first time. This certification examination was offered at multiple Pearson-VUE testing sites throughout the country and was computer-based. The convenience sample was comprised of participants who voluntarily completed the anonymous survey with all requested information after they completed the certification examination. A potential limitation of this technique is the inability to generalize the findings. When a new group of subjects is used, the ability to generalize previous findings is determined by the similarity of the initial group to the subsequent group (Fraenkel & Wallen, 2006).

Population and Sample

The population consisted of those paramedic candidates taking the National Registry paramedic certification cognitive examination for the first time. This certification examination was offered at multiple Pearson-VUE testing sites throughout the country and was computer-based. The convenience sample was comprised of participants who voluntarily completed the anonymous survey with all requested information after they completed the certification examination. January of 2007 was the first time the examination was offered on the computer. The questionnaire was

distributed by the researcher from the email addresses provided by the National Registry to the subjects approximately one week after the examination.

The anonymity of the subjects was maintained because the information provided to the researcher came from the National Registry and not the participants. The responses to the survey were returned directly to the National Registry. The National Registry then provided the responses from the survey to the researcher along with the examination results. However, no names or other identifying information were provided to the researcher.

Data Collection Procedures

The instrument administered was the National Registry of EMTs' paramedic certification cognitive examination. Per the psychometrician at the NREMT, the examination has been validated using the following items of analysis:

- Test Score Distribution - minimum = -.53, max = 3.52, SD =.56, mean = 1.47, median = 1.46
- Standard Error of Measurement - mean = .18 logit
- Reliability Estimate – equals standard error of measurement squared/standard deviation squared; result = .89
- Item Difficulty Distribution .295-2.98 logit, with mean item difficulty =.06, mean point biserial correlation = .21
- Correlation between subscores and overall test score: airway correlation = .83, cardiology correlation = .75, trauma correlation = .83, medical correlation = .62, OB/Peds correlation = .78, EMS Ops correlation = .78;

these findings were significant at the .01 level with 2-tailed test (P. Dickison, personal communication, October 9, 2006).

Periodic item analysis of all examinations offered by the National Registry of EMTs is conducted (NREMT, 2006). The test banks have been authored by multi-disciplinary committees consisting of physicians, state EMS regulators, and educators recruited nationally from urban and rural areas. The items are referenced to the tasks and blueprint of the practice analysis based upon the National Standard Curricula developed by the National Highway Traffic Safety Administration. All the items have one correct or best answer that was agreed upon by the Item Writing Committee. All items are multiple choice and have been reviewed for appropriate reading level.

The Item Writing Committee is advised by the Standard Setting Committee, which is directed by a psychometric consultant who holds a Ph.D. in Educational Measurement (NREMT, 2006). The NREMT received accreditation of all five levels of their examinations from the National Commission for Certifying Agencies, a certification accrediting agency sponsored by the National Organization for Competency Assurance in 2003.

The subjects were invited to participate voluntarily by a recruitment email and attachment including the six-question survey (Appendix A). The purpose of the study was explained and the subject was allowed to decline if he/she did not want to participate. The survey was generated from information received from the NREMT Research Office and was emailed to candidates who had taken the paramedic certification cognitive examination approximately one week earlier. After the questionnaire was completed, the

results were attached to the candidate's success/Non-success information on the paramedic certification cognitive examination and sent to the researcher. The data provided by the NREMT were completely anonymous and no names or other identifying information were collected on any of the instruments.

Research Question and Hypotheses

The following research question and hypotheses were addressed in this study:

Research Question. What is the multiple correlation between high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination?

Research Hypothesis. There is a multiple correlation between high school GPA, paramedic program GPA, type of program attended, years of EMS experience, attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

Null Hypothesis. There is no multiple correlation between the high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

Variables of the Study

The dependent or criterion variable was the successful certification as measured by the National Registry paramedic certification cognitive examination. Only the first

attempt at the cognitive examination was assessed for this study, as that is how CoAEMSP-accredited programs report their success rates.

The independent or predictor variables were GPA upon high school graduation, type of paramedic program attended, final GPA upon completion of the paramedic program, number of years of experience as an EMT-B or EMT-I, and attendance at a paramedic program that was nationally accredited. Rationale for attending the type of program the paramedic graduate attended was also asked via a multiple choice questionnaire (Appendix A).

Data Collection Measures

In addition to the score on the National Registry paramedic cognitive certification examination, answers to the questionnaire (Appendix A) were listed in either a fill-in-the-blank or multiple choice format, depending on the question. Once received by the researcher, the fill-in-the-blank answers were categorized into groups.

Method of Analysis

The data from the survey and the National Registry paramedic cognitive certification examination scores were analyzed using the Statistical Package for the Social Sciences (SPSS for Windows 15.0). The statistical procedure of multiple regression was used to analyze the multiple influences of the independent variables of high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and national EMS program accreditation as predictors of success for the National Registry paramedic certification cognitive examination. A correlation is defined

as a statistical test to determine the tendency or pattern for two or more variables or two sets of data to vary consistently (Fraenkel & Wallen, 2006; Kerlinger & Lee, 2000).

The data file, backup copies of the data file, and all the data will be stored for safekeeping. Data received by the researcher from the NREMT will be kept in the researcher's office for five years under lock and key, and after this time period, all data will be shredded.

Chapter Summary

This study was of a predictive nature, using multiple regression to determine whether or not there was a relationship between the dependent variable and the independent variables. It does not determine cause and effect. The use of multiple regression, as with any correlation study, limits the generalizability of this study compared to the general population of paramedics.

The population consisted of those paramedic candidates taking the National Registry paramedic cognitive certification examination for the first time during an established time period. The convenience sample was comprised of participants who voluntarily completed the anonymous survey delivered via email with all requested information after they completed the certification examination. January of 2007 was the first time the examination was offered on the computer.

The research question addressed whether there was a multiple correlation between high school GPA, paramedic program GPA, type of paramedic program attended, years of EMS experience, attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination.

CHAPTER IV

ANALYSIS OF THE DATA

This study examined the predictive values of high school GPA, paramedic program final GPA, years of EMS experience, EMS program type, and attendance at a CoAEMSP accredited paramedic program compared to success on the National Registry paramedic cognitive certification examination. The results of the data analysis and the research findings are presented in this chapter. This chapter also includes the research question, descriptive data for demographic information and research findings.

Research Question

In order to determine the multiple correlation between the five predictors (high school GPA, paramedic program final GPA, years of EMS experience, EMS program type, and attendance at a CoAEMSP accredited paramedic program) and success on the National Registry paramedic cognitive certification examination, an answer was sought to the following research question:

> What is the multiple correlation between high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program and success on the National Registry paramedic certification cognitive examination?

Descriptive Data for Demographic Information

The data analyzed were based on surveys completed by 89 paramedic candidates who took the National Registry paramedic cognitive certification examination between March 13 and April 20, 2007. A total of 967 questionnaires was distributed by

convenience sample via an online survey using email addresses supplied by the NREMT. The questionnaires were sent to paramedic candidates who had completed the paramedic cognitive certification examination during the prior week. Eighty-nine, or 9% usable surveys were returned to the researcher by the NREMT. The demographic data collected included gender and reason the candidate selected their type of EMS program.

Table 4

Demographic Characteristics: Frequencies and Percentages of Pass/Fail

Frequencies of Pass/Fail by Gender				
	Male	Female	Total	Percent
Pass	31 (44%)	9 (47%)	40	45%
Fail	39 (56%)	10 (53%)	49	55%
Total	70 (78%)	19 (22%)	89	100%

Of the study sample, 78% (70 of 89) of the paramedic candidates were male and 22% (19 of 89) were female. Table 4 shows that 45% of the subjects were successful on the NREMT examination versus 55% who were not successful on the NREMT examination. Of these, 44% of males and 47% of females were successful on the NREMT examination while 56% of males and 53% of females were not successful on the NREMT examination in this study (Appendix C, Figure C1). These results are lower than those reported by the NREMT in their 2006 annual report where a 56% success rate was described.

Research Findings

Various statistical methods were completed to compare the relationship between success on the NREMT paramedic cognitive certification examination and program type and whether or not the program was accredited. In addition, a multiple regression

analysis was conducted to evaluate the predictive values of the high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. All analyses were conducted at the .05 significance level. Looking at the R square, Table 5 shows that only 11.1% of the variance in the dependent variable can be explained by the variance in the independent variables. Using the prediction equation, 68% of the data will fall within one standard error of the estimate of the predicted value. Just over 95% will fall within two standard errors of the estimates.

Referring to Table 5, only 11.1% of the variation in success on the NREMT paramedic cognitive certification examination can be explained by high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. Obviously, this is a very low percentage, and therefore not statistically significant.

Table 5

Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.332[a]	.111	.038	.49151

[a]Predictors: (Constant), Program Type, HS GPA, Years-B ,Years-I, Accreditation Status, Program GPA

The multiple regression analysis was not shown to be significant. R equals .332, and R Square (the coefficient of determination) equals .111, which indicates that only 11.1% of the variance in the dependent variable could be explained by the predictors in

the independent variables. Multiple linear regression assumes that all variables are interval or ratio-scaled (Cronk, 2006).

A multiple linear regression was calculated to predict success on the National Registry paramedic cognitive certification examination based on the independent variables. In Table 6, the ANOVA summary table shows a significance result of .179, which is not statistically significant as it is greater than .05. The multiple regression was not statistically significant overall.

Table 6

ANOVA Summary Table

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.222	6	.370	1.533	.179(a)
	Residual	17.877	74	.242		
	Total	20.099	80			

a Predictors: (Constant), Accredited?, Program GPA, Program Type, Years-I, HS GPA, Years-B

The coefficients table (Table 7) indicated, however, that one independent variable was statistically significant. That independent variable is paramedic program GPA (.010, $p < .05$).

Table 7

Coefficients Table

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	B	Sig.
1	(Constant)	2.545	.587		4.336	.000
	Program GPA	-.405	.153	-.305	-2.647	.010*
	HS GPA	.110	.124	.102	.888	.377
	Years-B	.008	.013	.086	.668	.506
	Years-I	.017	.020	.106	.867	.389
	Program Type	-.056	.058	-.109	-.958	.341
	Accredited?	.028	.060	.053	.458	.648

*$p < .05$

Based on Table 7, a predicted score of the NREMT paramedic cognitive certification examination equals 2.545 -.405 (program GPA) + .110 (HS GPA) + .008 (years experience as an EMT-B) + .017 (years experience as an EMT-I) -.056 (program type) + .028 (accreditation status). Due to the fact that only one independent variable (program GPA) was shown to be statistically significant, and because the National Registry provided information on the number of students who passed or failed the certification examination, chi-square analyses were performed on each independent variable except for program GPA. The chi-square determines whether the frequencies of pass/fail on the National Registry paramedic cognitive certification examination match the theoretical values (Cronk, 2006).

Table 8 shows the observed and expected frequencies for the pass/fail occurrences on the National Registry paramedic cognitive certification examination.

Table 8

Observed and Expected Frequencies for Pass/Fail on NREMT Exam

	Observed N	Expected N	Residual
Pass	40	44.5	-4.5
Fail	49	44.5	4.5
Total	89		

A chi-square goodness of fit test (Table 9) was calculated comparing the frequency of the occurrence of pass/fail on the National Registry paramedic cognitive certification examination. There was no significant difference based on the chi-square analysis.

Table 9

Test Statistics on Frequency of Pass/Fail for NREMT Examination

	Pass/Fail
Chi-Square[a]	.910
df	1
Asymp. Sig.	.340

[a]0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 44.5.

Table 10 shows the observed and expected frequencies based on years of experience as an EMT-B between those who passed/failed the National Registry paramedic cognitive certification examination. Data were broken down into four categories--experience less than five years, experience five to 10 years, experience 11 to 15 years, and experience greater than 15 years for certification type (Appendix C, Figure C2).

Table 10

Frequencies of Pass/Fail the NREMT Exam versus Years of Experience as an EMT-B

			Years Experience as EMT-B				Total
			Less than 5 years	5-10 years	11-15 years	Greater than 15 years	
	Pass	Count	24	9	0	2	35
		Expected Count	21.3	10.7	.4	2.6	35.0
	Fail	Count	26	16	1	4	47
		Expected Count	28.7	14.3	.6	3.4	47.0
Total		Count	50	25	1	6	82
		Expected Count	50.0	25.0	1.0	6.0	82.0

Table 11

Chi-Square Tests for Pass/Fail the NREMT Exam versus Years of Experience as EMT-B

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	1.993[a]	3	.574
N of Valid Cases	82		

[a] 4 cells (50.0%) have expected count less than 5. The minimum expected count is .43.

The chi-square test of independence shown in Table 11 demonstrates that no significant relationship exists between success/non-success on the National Registry paramedic cognitive certification examination and years of experience as an EMT-B as the chi-square = 1.993, $p > .05$. Success on the National Registry paramedic cognitive certification examination and years of experience as an EMT-B appear to be independent events. A similar analysis was done for the EMT-I as displayed in Tables 12 and 13. Figure C3 in Appendix C shows the breakdown of paramedic candidates who were

successful versus those who were not successful compared to years of experience as an EMT-I.

Table 12

Frequencies of Pass/Fail for the NREMT Exam versus Years of Experience as an EMT-I

			Years Experience as EMT-I			Total
			Less than 5 years	5-10 years	Greater than 15 years	
	Pass	Count	9	3	1	13
		Expected Count	7.6	5.0	.4	13.0
	Fail	Count	11	10	0	21
		Expected Count	12.4	8.0	.6	21.0
Total		Count	20	13	1	34
		Expected Count	20.0	13.0	1.0	34.0

Table 12 shows the actual and expected frequencies of years of experience as an EMT-I, by category, compared to pass/fail on the National Registry paramedic cognitive certification examination.

Table 13

Chi-Square Tests for Pass/Fail for the NREMT Exam versus Years of Experience as EMT-I

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	3.268[a]	2	.195
N of Valid Cases	34		

a 3 cells (50.0%) have expected count less than 5. The minimum expected count is .38.

The chi-square test of independence showed that no significant relationship exists between pass/fail on the National Registry paramedic cognitive certification examination and years of experience as an EMT-I, as the chi-square = 3.268, $p > .05$. Success on the

National Registry examination and years of experience as an EMT-I appear to be independent events.

Table 14 shows a chi-square test of independence and was calculated using the Committee on Accreditation of EMS Programs (CoAEMSP) accreditation status as reported by the subjects. Data were broken down into three categories; 1 = accredited, 2 = not accredited, and 3 = unsure (Appendix C, Figure 4).

Table 14

Frequencies of Pass/Fail for the NREMT Exam versus Accreditation Status

			Accredited?			Total
			Accredited	Not accredited	Unsure	
	Pass	Count	15	1	24	40
		Expected Count	13.9	.4	25.6	40.0
	Fail	Count	16	0	33	49
		Expected Count	17.1	.6	31.4	49.0
Total		Count	31	1	57	89
		Expected Count	31.0	1.0	57.0	89.0

Table 14 reveals the actual and expected frequencies of accreditation status by category compared to pass/fail on the National Registry paramedic cognitive certification examination.

Table 15

Chi-Square Tests for Pass/Fail for the NREMT Exam versus Accreditation Status

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	1.559[a]	2	.459
N of Valid Cases	89		

[a]2 cells (33.3%) have expected count less than 5. The minimum expected count is .45.

Table 15 reveals that the chi-square test of independence shows no significant relationship existing between pass/fail on the National Registry paramedic cognitive certification examination and accreditation by the Committee on Accreditation of EMS Programs (CoAEMSP) as the chi-square = 1.559, $p > .05$. Success on the National Registry paramedic cognitive certification examination and CoAEMSP accreditation status appear to be independent events. Figure C2 in Appendix C shows the breakdown of paramedic candidates by those who passed versus failed compared to accreditation status.

A chi-square test of independence was calculated using the self-reported reason the subject chose the EMS program he or she attended. Data were broken down into five categories; 1 = cost, 2 = location, 3 = reputation, 4 = length of program, and 5 = other.

Table 16

Frequencies of Pass/Fail for the NREMT Exam versus Reason Attended EMS Program

			Reason Attended					Total
			Cost	Location	Reputation	Length of Program	Other	
	Pass	Count	1	11	14	4	10	40
		Expected Count	2.2	11.2	12.1	3.1	11.2	40.0
	Fail	Count	4	14	13	3	15	49
		Expected Count	2.8	13.8	14.9	3.9	13.8	49.0
Total		Count	5	25	27	7	25	89
		Expected Count	5.0	25.0	27.0	7.0	25.0	89.0

Table 16 shows the actual and expected frequencies of the self-reported reason the subjects attended their EMS program by category compared to pass/fail on the National Registry paramedic cognitive certification examination.

Table 17

Chi-Square Tests for Pass/Fail for the NREMT Exam versus Reason Attended EMS Program

	Value	df
Chi-Square	2.455[(a)]	4
N of Valid Cases	89	

[a]4 cells (40.0%) have expected count less than 5. The minimum expected count is 2.25.

The chi-square test of independence demonstrated in Table 17 shows no significant relationship exists between pass/fail on the National Registry paramedic cognitive certification examination and the reason the subject chose his or her particular EMS program as the chi-square = 2.455, $p > .05$. Success on the National Registry cognitive certification examination and reason the subject chose his or her EMS program appear to be independent events. Figure C5 in Appendix C shows a breakdown of paramedic candidates who passed versus failed on the examination and the reason they chose their EMS program.

In Table 18, a chi-square test of independence was calculated using the type of EMS program the paramedic candidate attended. Data were broken down into four categories: 1 = community college/university, 2 = technical/vocational school, 3 = hospital/agency based and 4 = proprietary/for-profit institutions.

Table 18

Frequencies of Pass/Fail for the NREMT Exam versus Type of EMS Program Attended

			Program Type				Total
			Community College/ University	Technical/ Vocational School	Hospital/ Agency Based	Proprietary/ For-Profit	
	Pass	Count	20	9	6	5	40
		Expected Count	18.9	12.1	5.4	3.6	40.0
	Fail	Count	22	18	6	3	49
		Expected Count	23.1	14.9	6.6	4.4	49.0
Total		Count	42	27	12	8	89
		Expected Count	42.0	27.0	12.0	8.0	89.0

Table 18 shows the actual and expected frequencies of the EMS program attended by category compared to pass/fail on the National Registry paramedic cognitive certification examination.

Table 19

Chi-Square Tests for Pass/Fail for the NREMT Exam versus Type of EMS Program Attended

	Value	df	Asymp. Sig. (2-sided)
Chi-Square	2.713[a]	3	.438
N of Valid Cases	89		

[a]2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.60.

Finally, Table 19 reveals that the chi-square test of independence shows no statistically significant relationship existing between pass/fail on the National Registry paramedic cognitive certification examination and the type of EMS program the

candidate attended as the chi-square = 2.713, $p > .05$. Success on the National Registry paramedic cognitive certification examination and type of EMS program attended appear to be independent events. Figure C6 in Appendix C shows the breakdown of paramedic candidates who were successful versus those who were not successful compared to the type of program they attended.

Summary of Results

In summary, the null hypothesis that predicted no multiple correlation between the five independent variables (high school GPA, paramedic program GPA, type of program attended, years of EMS experience, and attendance at a nationally accredited paramedic program) and success on the National Registry paramedic cognitive certification examination was not rejected. Multiple regression and nonparametric chi-square analyses indicated that none of the independent variables, except program GPA, were significantly associated with paramedic candidates' scores on the National Registry paramedic cognitive certification examination.

Chapter Summary

The total number of participants was 967, with emails sent to each subject approximately one week after completion of the National Registry examination. A total of 89 subjects provided all the information requested as well as answering the survey. Using multiple regression, the only independent variable found to be statistically significant in predicting success on the National Registry paramedic cognitive certification examination was paramedic program GPA (.010, $p < .05$).

CHAPTER V

CONCLUSIONS, DISCUSSION, LIMITATIONS, IMPLICATIONS AND RECOMMENDATIONS

Very few studies have been conducted that explored the predictors of success on certification examinations for EMS as well as other health professions. This study has attempted to contribute to the body of knowledge regarding which factors predict paramedic student success regarding the certification examination. Multiple regression and nonparametric statistical analyses were conducted to determine whether relationships exist between success on the NREMT paramedic cognitive certification examination and high school GPA, paramedic program GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. The information gathered from 89 paramedic candidates sought to determine whether relationships existed between the dependent and independent variables among those who participated in the study. Data procured by surveying NREMT paramedic candidates attempted to provide answers to the following research question:

> What is the multiple correlation between a set of five predictors (high school GPA, paramedic program final GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program) and success on the NREMT paramedic cognitive certification examination?

Data for this study was obtained by a survey sent via email to 967 NREMT paramedic candidates the week after they completed the certification examination. The survey (Appendix A) served as the instrument in this study to assess the extent to which

paramedic candidates were able to be successful on the NREMT cognitive certification examination on the first attempt as predicted by five constructs: high school GPA, paramedic program final GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. Demographic information was also collected that included the reason the candidates selected the program they attended and their gender. Although these data were not studied as predictors of success, the researcher considered some of the information to be of interest when determining the generalizability of the findings. According to the literature reviewed, high school GPA was found to be a very strong predictor of success for certification examinations. Some studies also indicated years of relevant experience and age were strong predictors of success.

Conclusions

Overall, this study does not provide support to previous research about predictors of success for paramedics taking the NREMT cognitive certification examination. It is important to note, however, the low number of respondents to the survey as compared to the total number of surveys sent out over a five-week time period. Another study including either a larger sample size or sampling over a longer duration may lead to a more predictive study.

Benner's theory of Novice to Expert was not supported in the results of this study as evidenced by no statistically significant result in predicting success on the National Registry examination with experience as either an EMT-B or EMT-I. However, a study

with a larger population that is more representative of the EMS community may change this outcome.

Discussion

Even though little research was found on predictors of success for certification examinations, especially for EMS students, it was interesting to note that a slightly higher percentage of females (47.3%) were successful on the NREMT paramedic cognitive certification examination than males (44.2%), even though females accounted for only 22% of the total number of paramedic candidates in this study. It was also surprising to note the large number of students (65.2% total) who did not know whether or not their EMS program was accredited by the Committee on Accreditation of EMS Programs, the only national certification agency for paramedic programs. Of those who were successful on the examination, only 32.6% knew whether or not their EMS program was nationally accredited.

Another interesting comparison was found in the reasons paramedic students selected their program type. Of those who were successful on the examination, the strongest reason for selecting their EMS program was reputation (35%), followed by location (27.5%), other (25%), length of program (10%), and cost (2.5%). Of those who were not successful on the examination, the most common reason given was other (31%), followed by location (28.5%), reputation (26.5%), cost (8%), and length of program (6%). Some of the reasons listed in the "other" category were previous attendance, choice determined by their employer, faculty, and that particular EMS program being the only school available in their respective areas.

When investigating EMS program type, the community college/university was the most prevalent choice for both those who were successful (50%) versus those who were not successful (45%) the NREMT examination. This was followed by attendance at vocational/technical schools (22.5%), hospital/agency based (15%) and proprietary/for profit (12.5%) for those paramedic candidates who were successful on the NREMT examination. The program type results were similar for those who were not successful the NREMT examination with the following percentages--vocational/technical (37%), hospital/agency based (12%) and proprietary/for profit (6%).

The results of this study revealed that no multiple correlation exists between the dependent variable, success on the NREMT paramedic cognitive certification examination, and any of the independent variables that included high school GPA, paramedic program final GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. The multiple regression performed in this study indicated only 11.1% of the variance of those who were successful on the examination was accounted for by the variance among the independent variables. Relationships among high school GPA, paramedic program final GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program were also scarce in the literature (Dickison et al., 2006; Margolis & Wagoner, 2004; Veronesi, 1999).

Limitations

This study has several limitations, some of which relate to all research on success regarding certification examinations.

1. The information obtained from this study was dependent on the participants' self-reported responses. This limitation may have influenced the responses if the paramedic candidates were concerned about providing personal information such as GPA to the NREMT.

2. Because no variables were manipulated, making this study a non-experimental design, there is no conclusive evidence of causality. Surveys are only a snapshot of a particular group at a particular time and are subject to contamination by mood, attitude, or other intervening variables. This limitation could lead to decreased generalizability of the study to anyone outside this particular group of participants (Fraenkel & Wallen, 2006).

3. This study included larger numbers of males than females, which may not be typical in emergency medical services overall.

4. Because of the convenience sampling used in this study, it was assumed that the population was typical and may therefore have selection bias. Voluntary participation could also contribute to selection bias.

Implications

There are regional shortages of paramedics across the United States. These shortages are creating a crisis in the affected regions' prehospital care system. Many experienced paramedics are leaving the field due to retirement, and younger people are not selecting EMS as a potential career due to the availability of more lucrative professions that require the same or lesser amounts of education (Veronesi, 1999). Therefore, EMS providers, educators and employers must promote and develop new

methods for building organizational commitment among EMTs and paramedics before the shortage worsens. The changing role of EMS, particularly the increasing complexity of the scope of practice for paramedics as well as the proposed *EMS Education Agenda for the Future* and a lack of appropriate increases in compensation is causing problems in recruiting prospective prehospital providers and qualified instructors to teach them (Veronesi, 1999, Wilcox, 2006).

Recommendations

This study explored several aspects of EMS education. It can be assumed that this sample may not be representative of the larger population of paramedics nationwide. More research is needed to investigate the relationships among a larger and more widespread and diverse population.

Summary

In closing, there is much to be learned about EMS education. Although five variables were examined in this study, a great amount of variance remains unaccounted for in predicting success both on the certification examination and in practice. Possible reasons include the lack of EMS research, the relative newness of the vocation, and the multitude of issues facing EMS as identified in the Institute of Medicine report. Thus, it is hoped that this study will stimulate further research in EMS education as well as promote greater attention to strengthening the academic requirements of this allied health profession.

Overall, the findings of this study did not support the proposed hypothesis. The results showed no significant relationship between success on the NREMT paramedic

cognitive certification examination and high school GPA, paramedic program final GPA, type of paramedic program attended, years of EMS experience, and attendance at a nationally accredited paramedic program. Therefore, the null hypothesis was not rejected.

In conclusion, although there has been some research related to predictors of success on various certification examinations, most studies of health care providers tend to focus on nurses and other medical personnel in acute health care settings. This has resulted in a major gap in the literature on issues regarding success in both certification examinations and practice in the prehospital setting.

The final conclusion is that more research will contribute to clarifying predictors of success and, perhaps, some of the processes involved in paramedic candidates being successful on the cognitive certification examination on the first attempt. More importantly, additional research will contribute to the delivery of quality patient care.

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APPENDICES

Predictors of Success for the National Registry Paramedic Certification Cognitive Examination

Thank you for your willingness to participate in my research project. The title of the study is “Predictors of Success for the National Registry Paramedic Certification Cognitive Examination”. The research is being conducted by Nerina J. Stepanovsky, a student in the Education department at Barry University, and is seeking information that will be useful in the field of Emergency Medical Services education. The aims of the research are to assess the impact of high school GPA, paramedic program GPA, type of school attended, years of EMS experience, and program accreditation on success on the NREMT paramedic certification cognitive examination on the first attempt. In accordance with these aims, the following procedures will be used: paramedic candidates will be asked to voluntarily participate in a brief survey, and to allow the NREMT to anonymously release the survey results coupled with the individual’s score on the examination to the researcher. We anticipate the number of participants to be 100.

Predictors of Success for the National Registry Paramedic Certification Cognitive Examination

If you decide to participate in this research, you will be asked to complete a brief survey and allow the survey results paired with your score on the paramedic certification cognitive examination to be anonymously released to the researcher.

Your consent to be a research participant is strictly voluntary and should you decline to participate or should you choose to drop out at any time during the study, there will be no adverse effects on your standing as an NREMT-Paramedic.

There are no known risks to you for involvement in this study. Although there are no direct benefits to you, your participation in this study may help our understanding of predictors of success for the NREMT paramedic certification cognitive examination and EMS education overall.

As a research participant, information you provide will be kept anonymous, that is, no names or other identifiers will be collected on any of the instruments used. Data will be kept in a locked file in the researcher's office. By completing this survey you have shown your agreement to participate in the study.

If you have any questions or concerns regarding the study or your participation in the study, you may contact me, Nerina J. Stepanovsky, at (727) 341 3680, my supervisor, Dr. Edward Bernstein, at (305) 899 3861, or the Institutional Review Board point of contact, Ms. Nildy Polanco, at (305) 899-3020.

Thank you for your participation.

Sincerely,

Nerina J. Stepanovsky

Predictors of Success for the National Registry Paramedic Certification Cognitive Examination

1

What was your final paramedic program GPA? (Please list as a number, such as 3.5, 2.0, etc).

2

What was your high school grade point average (GPA)? (Please list as a number, such as 3.5, 2.0, etc).

3

How many years of experience do you have working as an EMT-Basic?

4

How many years of experience do you have working as an EMT-Intermediate?

5

What type of paramedic program did you attend?

- Community College/University
- Technical/Vocational School
- Hospital/Agency Based
- Proprietary/For-profit

6

What was the primary reason you chose for attending this program?

- Cost
- Location
- Reputation
- Length of program
- Other, please specify

7

Is the paramedic program you graduated from accredited by the Committee on Accreditation of Emergency Medical Services Programs (CoAEMSP)?

- Yes
- No
- Unsure

APPENDIX B: Relationships Between Candidate Demographics and Successful Completion of the National Registry Exam (Dickison et al, 2006)

Factor	**Passed** (*n* = 7,072)	**Failed** (*n* = 5,701)	**Odds ratio (**95% CI)
Type of program			
Non-accredited	5,272 (74.5%)	4,725 (82, 9%)	(Referent Level)
Accredited	1,801 (25.4%)	976 (17.1%)	1.65 (1.51-1.81)
Gender			
Female	1,610 (22.8%)	1,629 (28.6%)	(Referent Level)
Male	5,462 (77.2%)	4,072 (71.4%)	1.36 (1.25-1.47)
(missing)	1 (0.01%)	0 (0.0%)	
Age (years)--mean $\pm$ SD	29.8 $\pm$ 7.4	30.5 $\pm$ 8.1	P < 0.0001 (t-test)
Affiliation			
Fire Department	3,427 (48.5%)	2,488 (43.6%)	(Referent Level)
Private/3rd Service	1,999 (28.3%)	1,730 (30.4%)	0.83 (0.77-0.91)
Hospital	582 (8.2%)	525 (9.2%)	0.80 (0.71-0.92)
Volunteer	273 (3.9%)	228 (4.0%)	0.86 (0.72-1.04)
Government/Military	324 (4.6%)	190 (3.3%)	1.23 (1.03-1.49)
Other	312 (4.4%)	266 (4.7%)	0.85 (0.72-1.01)
(missing)	63 (0.9%)	232 (4.1%)	N/A
Education			
< 12 years	3 (0.04%)	36 (0.6%)	0.08 (0.02-0.25)
12-13	4,196 (59.3%)	3,870 (67.9%)	(Referent Level)
14-15	1,560 (22.1%)	1,147 (20.1%)	1.25 (1.15-1.37)
16-17	1,118 (15.8%)	365 (6.4%)	2.83 (2.49-3.21)
> 17	113 (1.9%)	51 (0.9%)	2.41 (1.74-3.33)
(missing)	63 (0.9%)	232 (4.1%)	N/A
Examination attempt			
1	4,983 (70.5%)	2,804 (49.2%)	(Referent Level)
2	1,200 (17.0%)	1,413 (24.8%)	0.48 (0.44-0.52)
3	497 (7.0%)	756 (13.3%)	0.37 (0.33-0.42)
4	217 (3.1%)	372 (6.5%)	0.33 (0.28-0.39)
5	102 (1.4%)	206 (3.6%)	0.28 (0.22-0.36)
$\geq$ 6	73 (1.0%)	150 (2.6%)	0.27 (0.21-0.36)
(missing)	1 (0.01%)	0 (0.00%)	N/A

APPENDIX C: Charts

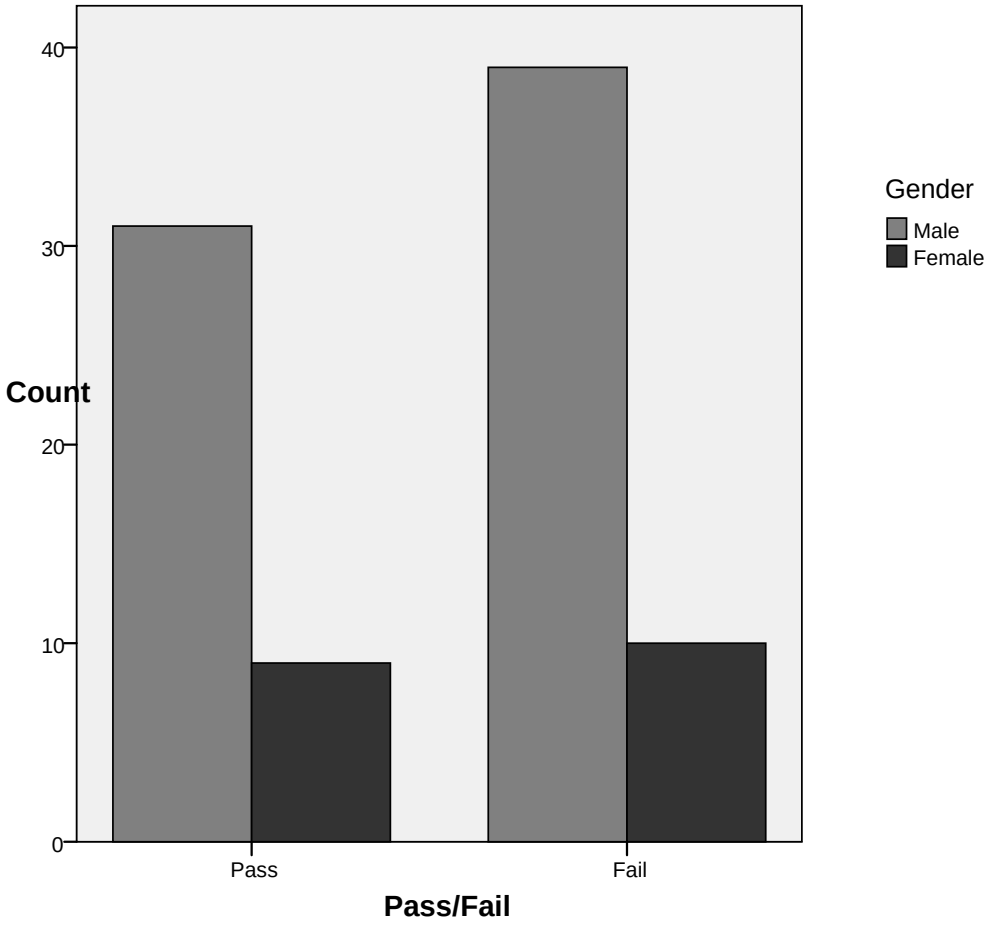

Figure C1. Pass/Fail Compared to Gender

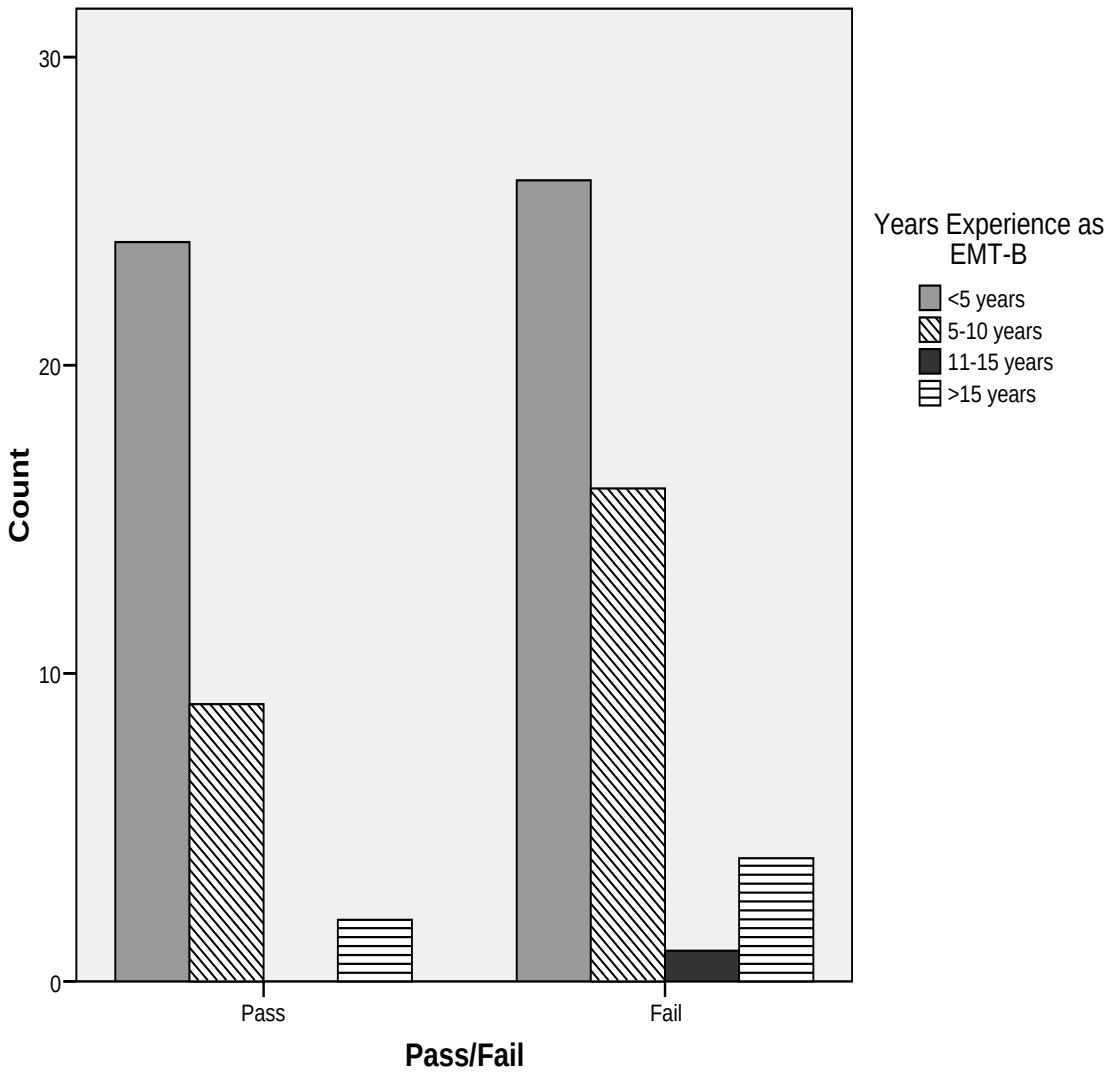

Figure C2. Pass/Fail Compared to Years of Experience as an EMT-Basic

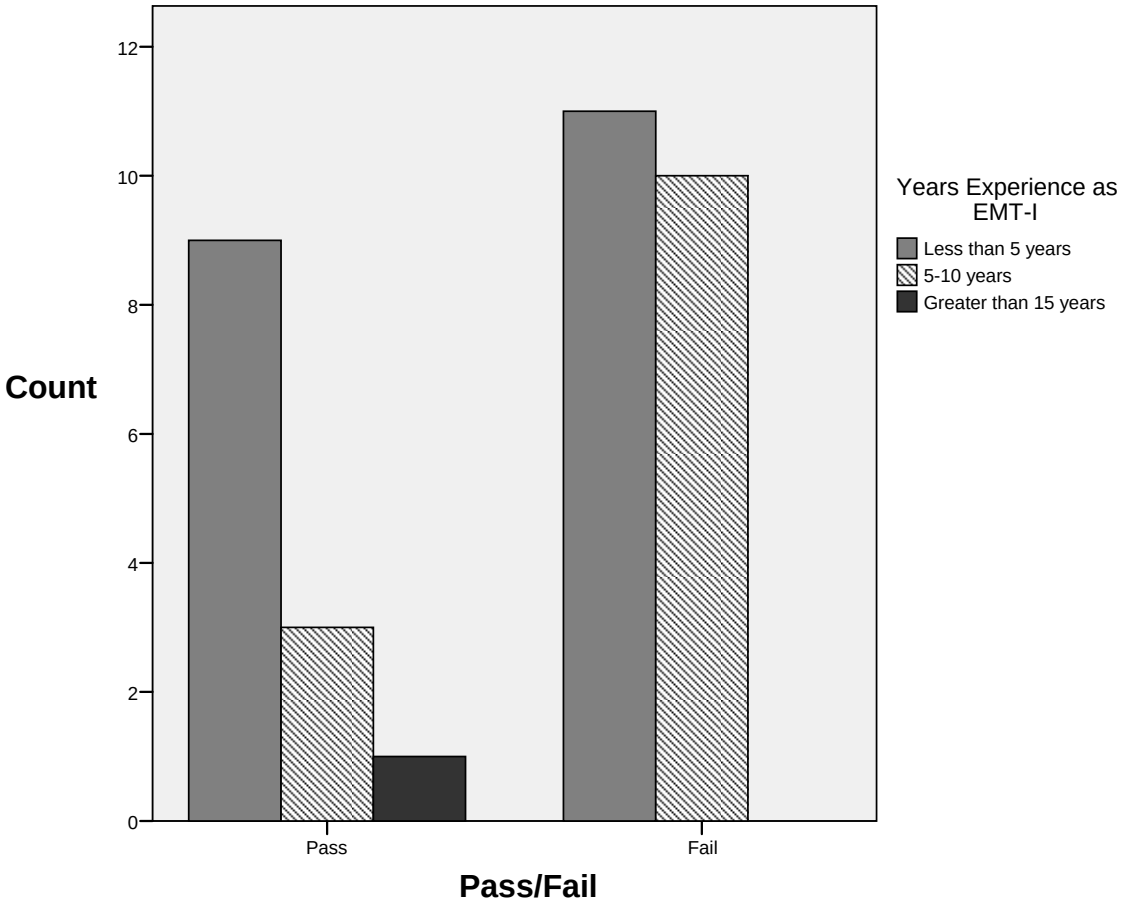

Figure C3. Pass/Fail Compared to Years of Experience as an EMT-Intermediate

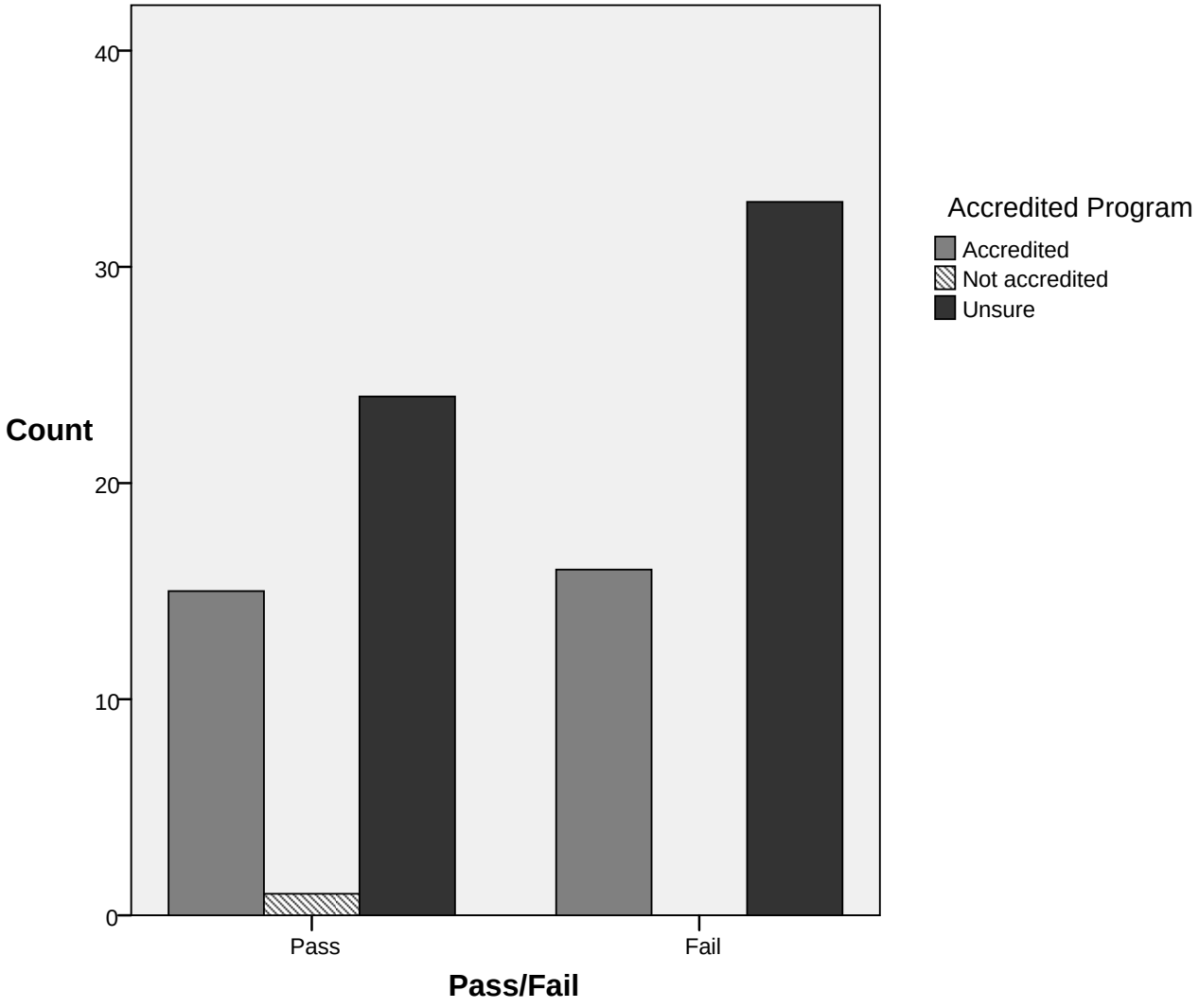

Figure C4. Pass/Fail Compared to Program Accreditation Status

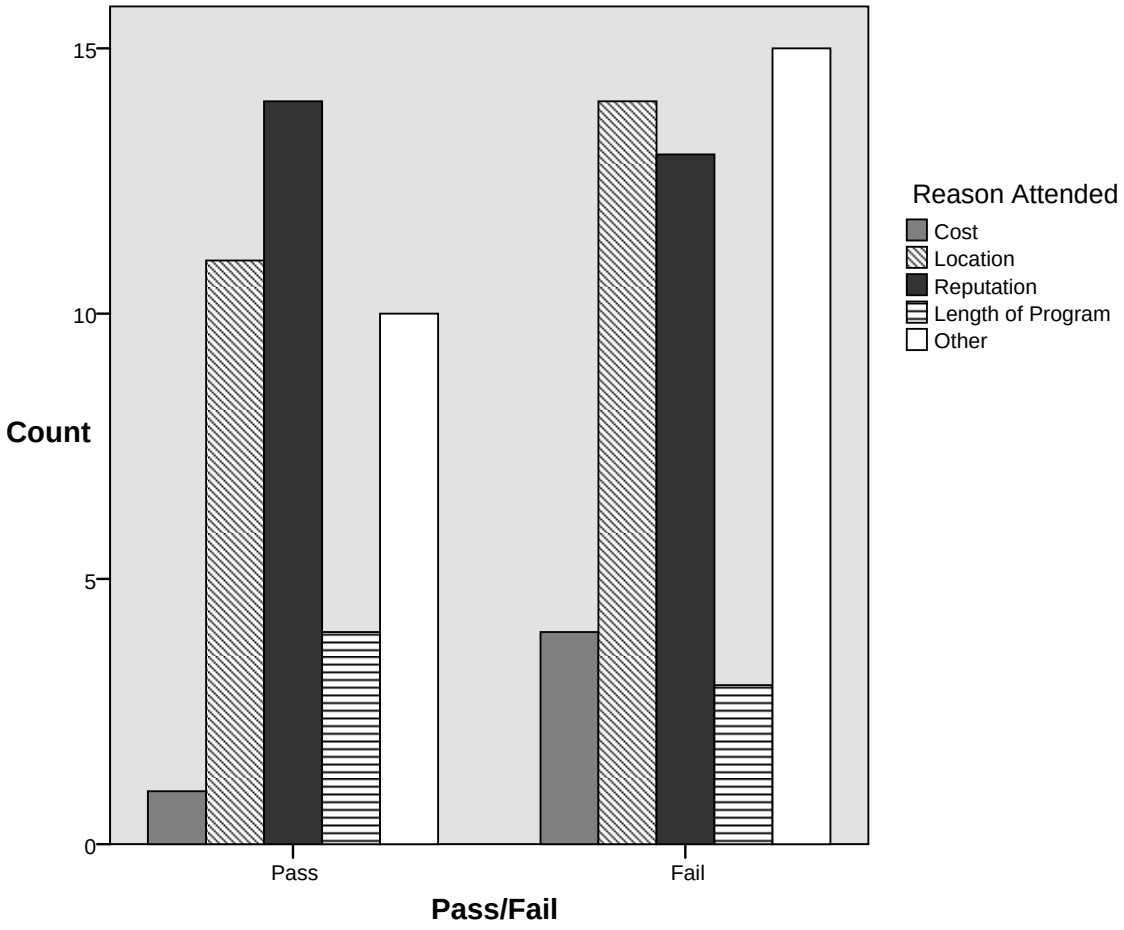

Figure C5. Pass/Fail Compared to Reason Attended EMS Program

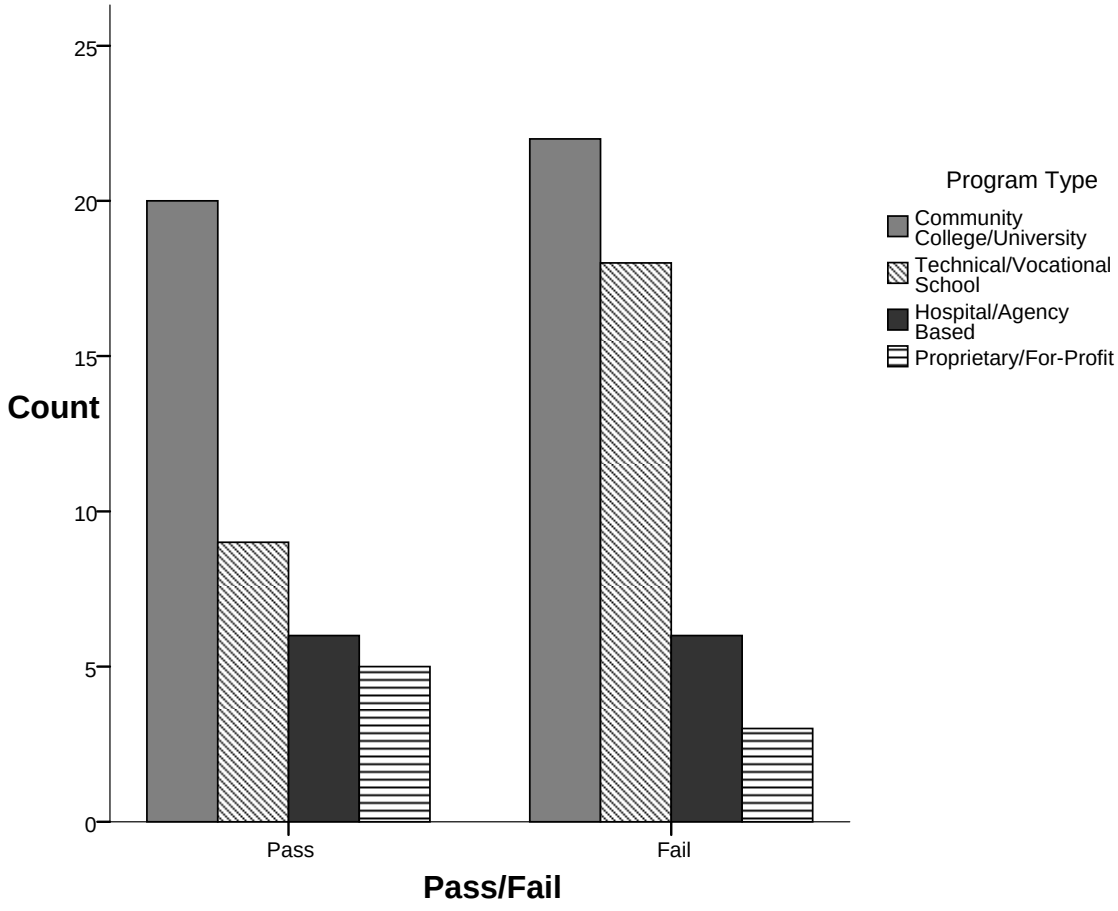

Figure C6. Pass/Fail on NREMT Exam Compared to Program Type