# THE PREDICTIVE RELATIONSHIP BETWEEN PARAMEDIC STUDENT CLINICAL ENCOUNTERS AND PERFORMANCE ON THE PRE4

by

James Frederick Mitchell

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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# ABSTRACT

This study was conducted to assess for the predictive relationship between the number of patient encounters a paramedic student has during their initial education and their scores on a summative exam that has been linked to national exam pass rates. To date, little research has been conducted within the field of Emergency Medical Services (EMS) with a focus on education. Despite the lack of research, the Committee on Accreditation of Educational Programs for the Emergency Medical Services Professions has established recommended patient contact minimums that paramedic students must obtain during their initial education. The sample for this study included paramedic students who attended Blue Community College (a pseudonym) located in the eastern United States during academic years 2015 to 2018 who utilized Field Internship Student Data Acquisition Project's (FISDAP) PRE4 exam and utilized FISDAP's "Skills Tracker" system to record their clinical data. The *N* for this study was 66 students. This study utilized a non-experimental, correlational design, and a bivariate linear regression analysis was untiled to assess for a predictive relationship between the predictor and criterion variables of archival data. There was not a statistically significant correlation found between any of the predictor and criterion variables.

*Keywords*: experiential learning, paramedic, education, clinicals, emergency medical services

**Copyright Page**

## Dedication

This dissertation is dedicated to my wife April and my daughters Eden and Karis. They have always supported and encouraged me during this process and have helped me achieve so much. Words could not express how grateful I am to have them in my life, nor could I ever express the depth of my love for them. Being a husband and father have been the greatest blessings of my life. My life is better because of you girls. I love you!

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**List of Abbreviations**

Advanced Emergency Medical Technician (AEMT)

Commission on Accreditation of Allied Health Education Programs (CAAHEP)

Committee on Accreditation of Educational Programs for the Emergency Medical Services Professions (CoAEMSP)

Emergency Medical Responder (EMR)

Emergency Medical Technician (EMT)

Field Internship Student Data Acquisition Project (FISDAP)

National Highway Traffic Safety Administration (NHTSA)

National Registry of Emergency Medical Technicians (NREMT)

# CHAPTER ONE: INTRODUCTION

## Overview

Chapter One discusses the background of paramedics within the United States, paramedic student education, including clinical experiences, and a brief review of experiential learning theory. Also, the problem and purpose statements of this study are discussed in detail to establish the need for the study. This chapter concludes by reviewing the research questions for the study and by providing pertinent definitions.

## Background

Evidence-based treatments are a common practice for emergency medical services (EMS) providers. However, evidence-based education methods within the field of EMS are lacking. EMS, as an organized profession, is relatively new despite several of the key practices being around for hundreds of years. The practice of transporting an injured individual from the battlefield can be dated as far back as the 1400s but was likely a common practice before then as well. As the result of wars in which the United States was involved, EMS began to change to reflect practices that were proving beneficial on the battlefield (Aehlert et al., 2018). Another significant advancement of EMS within the United States was when the National Academy of Sciences and the National Research Council published *Accidental Death and Disability: The Neglected Disease of Modern Society* in 1965. This document brought to light several needs within the EMS system, including a focus on EMS education (National Academy of Sciences, 1966). Other documents published by the National Highway Traffic Safety Administration (NHTSA) over the next several years also highlighted the need for better EMS education with an emphasis on research-based educational practices (NHTSA, 1996; NHTSA, 2019; NHSTA, 2000).

Nationally, EMS has four certification levels, which are listed here in a basic-to-advanced order, including emergency medical responder (EMR), emergency medical technician (EMT), advanced emergency medical technician (AEMT), and paramedic (NREMT, 2020b). There are many specific differences between the EMS certification levels. However, the key differences are in the areas of understanding anatomy and physiology, pathophysiology, and patient management skills. EMRs have the least amount of required time in the classroom, as well as the lowest required level of understanding of anatomy and physiology, pathophysiology, and patient management skills. On the other end of the spectrum, paramedics spend the most time in the classroom and have the greatest understanding of anatomy and physiology, pathophysiology, and patient management skills as compared to the other levels (Aehlert et al., 2018).

In 2009 the NHTSA released the *National Emergency Medical Services Education Standards*, which are the most current standards and are still utilized today (NHTSA, 2020). These standards list and compare the different levels of EMS providers, educational infrastructures, and course information. An EMR course is a combination of 48-60 class and laboratory hours with no required field or clinical experiences. An EMT course is 150-190 class and laboratory hours combined with required clinical experiences of at least ten, nonspecific patient contacts. An AEMT course is an additional 150-250 hours beyond the EMT course with required clinical experiences (NHTSA, 2020). An AEMT is required to administer medications to at least 15 patients, ventilate a minimum of 20 patients, as well as be exposed to patients suffering from chest pain, respiratory distress, and an altered mental status. The education standards do not speak directly to paramedic course requirements but references the Committee on Accreditation of Educational Programs for the EMS Professionals (CoAEMSP) standards (NHTSA, 2020).

CoAEMSP is responsible for recommending programs for accreditation through the Commission on Accreditation of Allied Health Education Programs (CAAHEP) (CAAHEP, 2015). The CAAHEP (2020) stated that program length is tied more to outcomes than it is a specific time but lists that a paramedic course is 1,000 or more hours of classroom and clinical instruction. Classroom instruction includes advanced depth and breadth of topics including but not limited to pharmacology, cardiology, trauma, pediatrics, and airway (CAAHEP, 2015). According to NHTSA (2020) paramedic students must also demonstrate entry-level competency in several skills including but not limited to intravenous lines, defibrillation, intubation, and newborn delivery. As noted, NHSTA (2020) does not list specific requirements for paramedic students in the clinical setting. However, in 2019 CoAEMSP released new standards for clinical experiences that were included in the Student Minimum Competency Matrix.

The Committee on Accreditation of Educational Programs for the EMS Professionals, under the direction of CAAHEP, has established that each paramedic program must develop a required number of minimum clinical encounters and has provided programs with recommended minimums to follow (CoAEMSP, n.d.; CAAHEP, 2015). These clinical encounters can occur in different venues but are required to provide the following patient exposures: "adult trauma and medical emergencies; airway management to include endotracheal intubation; obstetrics to include obstetric patients with delivery and neonatal assessment and care; pediatric trauma and medical emergencies including assessment and management; and geriatric trauma and medical emergencies" (CAAHEP, 2015, pp. 4-5).

To document and keep track of clinical encounters many programs utilize a tracking system such as Field Internship Student Data Acquisition Project (FISDAP). The FISDAP (2020a) program offers, among other services, a skill tracking software program called *Skills*

*Tracker*, which allows students to document what skills were performed on a patient during a clinical experience as well as information about each patient. These skills are kept in a database that is viewable by the student and instructors to ensure students are meeting their clinical requirements (FISDAP, 2020a), such as with the now required *Student Minimum Competency Matrix* (CoAEMSP, n.d.).

Some of the recommended clinical experiences in *Student Minimum Competency Matrix* are 30 trauma patients, 18 pediatric patients, and 60 medical patients (CoAEMSP, 2020a). However, according to CoAEMSP (n.d.), the minimums were developed based off what programs had done in the past, not evidence of competency. This is in line with what NHTSA (2020) asserted about past EMS education practices that should be avoided in the future: "EMS education is based on perceived needs rather than practice analysis and research" (p. 17). Little research has been conducted to examine the relationship, if any, between clinical experiences and a paramedic student's class outcomes.

Drawing from Kolb's Experiential Learning Theory (ELT) one would assume that a relationship exists between a student's clinical experiences and their knowledge on a summative exam. Kolb (1984) stated that experiential learning is when knowledge is created through an individual's experiences. Furthermore, ELT holds that learning is best explained by the process of relearning, not by starting from scratch. Students approach a situation already knowing some information about the topic (Kolb, 1984). Therefore, especially in a clinical setting, students will learn new things, rooted in experiences, as well as dispel things that they once thought were correct. ELT also holds that a student interacts with the environment and is impacted by the environment (Kolb, 1984). ELT can easily be applied or observed within the clinical requirements of a paramedic course where a student is required to attend hospital and field-based time and competencies (CAAHEP, 2015).

## Problem Statement

According to the Prehospital Care Research Forum (2020), there has been little research conducted within the EMS field. Despite the NHTSA's suggestion in 2001 that future topics of research should include ways to provide effective educational modalities for EMS providers, most EMS-based research is based on patient treatments, not provider education. Therefore, there is a significant gap in literature concerning EMS education. Furthermore, FISDAP and other entities allow for abstract submissions which are rarely submitted for peer-reviewed publication; this gives the illusion of research being conducted, but it is rarely substantiated. The most recent published study concerning a similar topic to this dissertation was conducted in 2008 by Salzman, et al. Their study found that the number of patients a paramedic student encountered during clinical experiences correlated to passing the NREMT cognitive exam. Furthermore, there was also a relationship between passing the NREMT cognitive exam and the number of advanced life support runs a paramedic student went on during clinical time. While this study was significant, there has not been a follow-up study, nor a more recent study conducted since the implementation of adaptive computer-based testing for the NREMT cognitive exam.

The current problem is that CoAEMSP, at the direction of CAAHEP, requires that paramedic programs establish a minimum number of clinical encounters a paramedic student must obtain to be able to graduate. It is up to each program to establish their own required minimums while CoAEMSP offers guidance with recommended minimums (CoAEMSP, n.d.). However, to date, there has been no peer-reviewed research conducted that examines the predictive relationship between the number of patient encounters a paramedic student has and the student's success on a summative exam. Several researchers have found clinical components of student programs to be beneficial for students. However, those same researchers suggest more in-depth studies should be conducted in order to examine the relationship between clinical experiences and summative exams (Kandiah, 2017; Stowell et al., 2015; Wongtongkam & Brewster, 2017). This dissertation looks to address the lack of research between patient encounters and student exam success to provide predictive information for suggested patient encounter program minimums, which are based on empirical research—not past precedents.

## Purpose Statement

The purpose of this correlational study was to address the gap within EMS education research. Specifically, this study sought to determine if there was a relationship between the number of specific types of patient encounters a paramedic student has during their clinical experiences and how well they perform on the subsections of the PRE4. Furthermore, the purpose of this study was to be able to predict the number of specific patient encounters that have a positive relationship with the PRE4, which was previously tested by Salzman, et al. in 2008 and found to have a positive relationship with the NREMT cognitive exam. There were six predictor variables for this study: the number of cardiac, medical, airway, obstetrics and gynecological, pediatric, and trauma patient encounters a paramedic student has during their clinical experience. There were six criterion variables for this study that comprised the paramedic students' test scores on the subsections of the PRE4, which were: cardiac, medical, pediatric, OB/GYN, trauma, and airway. The PRE4 is a summative exam developed and executed by FISDAP and is utilized by many paramedic education institutions as a preparatory test for or a gateway test for the NREMT cognitive exam. The sample for this study included all paramedic students who attended Blue Community College (BCC; a pseudonym) during the academic years of 2015 to 2018; who utilized FISDAP to document patient encounters; and who took the PRE4.

## Significance of the Study

As discovered in the review of literature, this study stands to make a significant impact on paramedic education within the United States concerning the recommended minimum number of patient encounters required during the clinical phase of their education. The clinical setting has been evaluated for paramedic students in relation to their skill performance. Wongtongkam and Brewster (2017) found that preceptors of paramedic students felt that the students' skills improved during the clinical rotations, enabling them to demonstrate competence on the skills. The clinical setting has also been evaluated to determine the effectiveness of affective behaviors for paramedic students. Ross et al. (2018) found that through direct experience in a clinical setting, paramedic students were able to improve their interpersonal communication with geriatric patients.

Despite recent research being conducted on the impact that a clinical setting has on a paramedic student's skills and communication, there has not been any recent, peer-reviewed research conducted on the relationship between clinical encounters and a student's cognitive test scores despite this being an area of interest for other medial professions. Bakoush et al. (2019) found that there was not a correlation between clinical experiences and cognitive scores on a medical examiners test in the United Arab Emirates. Kandiah (2017) found that medical students felt that the most significant factors concerning a clinical site were seeing a variety of patients and being part of a medical team.

This dissertation, by leaning on Kolb's ELT, attempted to address the lack of recent, peer-reviewed research that assessed for the presence of a relationship between a paramedic student's clinical encounters and their cognitive performance on tests. This study stands to support ELT, in general; provide recent research on the topic of paramedic education; and to suggest empirically-based minimums for specific types of patient encounters for paramedic students during their clinical experiences. While the focus of this study is on paramedic students, its findings could be applied to other allied health fields that include a clinical experience as part of their initial education.

## Research Questions

**RQ1**: How well can the number of cardiac patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the cardiac section of the PRE4?

**RQ2**: How well can the number of medical patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the medical section of the PRE4?

**RQ3**: How well can the number of airway patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the airway section of the PRE4?

**RQ4**: How well can the number of obstetrics and gynecological patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the obstetrics and gynecological section of the PRE4?

**RQ5**: How well can the number of pediatric patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the pediatric section of the PRE4?

**RQ6:** How well can the number of trauma patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the trauma section of the PRE4?

## Definitions

1. *Clinical Setting* – The clinical setting for paramedic students includes, but is not limited to hospitals, clinics, and ambulance services that allow paramedic students to perform tasks on patients (Wongtongkam & Brewster, 2017).
2. *Emergency Medical Services (EMS)* – A healthcare system designed to provide sick or injured patients with treatment while on-scene and during transport (Aehlert, 2018).
3. *Field Internship Student Data Acquisition Project (FISDAP)* – Provides services such as skills tracking, testing, and study tools for EMS students (FISDAP, 2020b).
4. *Paramedic* – A prehospital provider who delivers advanced life support to patients and is the highest certification of prehospital provider recognized by the NREMT (CAAHEP, 2015).
5. *Paramedic Readiness Exam 4 (PRE4)* - A comprehensive, summative, paramedic exam with seven subsections including cardiology, airway, trauma, medical, obstetrics and gynecology, pediatrics, and operations.

# CHAPTER TWO: LITERATURE REVIEW

## Overview

This chapter focuses on the theoretical framework and a review of the literature relevant to this study. Elements of Experiential Learning Theory (ELT) have been around since 350 B.C.E. and individuals, including John Dewey, Kurt Lewin, and Jean Piaget continued to build upon those elements until formally identified as ELT by Kolb in 1984 (Hill, 2017). ELT is essentially the process of learning based on an individual's experiences (Kolb, 1984). Key elements of the related literature are the history of emergency medical services (EMS), EMS providers, the history of paramedic education, paramedics as learners, clinicals, and data tracking via the *Student Minimum Competency Matrix*. These areas help establish the need for this study as well as provide an overview of the context in which the study took place.

## Theoretical Framework

The theoretical framework for this study was based on experiential learning theory (ELT). This theory was first introduced by Kolb in 1984 and was based on the previous work of John Dewey, Kurt Lewin, and Jean Piaget (Kolb, 1984; Hill, 2017; Kolb & Kolb, 2017). Specifically, Kolb's theory was spring boarded into action based on John Dewey's call for a student's experience to be at the forefront of educational innovation (Kolb & Kolb, 2017; Roberts, 2012). Despite a more-recent beginning, the concept of experiential learning can be traced back to 350 B.C.E. when Aristotle wrote about learning by doing. Other earlier, historical individuals, such as Benjamin Franklin, spoke to the importance of being involved with the learning process as well (Hill, 2017).

Henry (1989) asserts that the term "experiential learning" is not easily defined, even by those that utilize it. Experiential learning, as defined by Kolb (1984) is "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (p. 41). Kolb's experiential learning is based on continuity and interaction (Fry et al., 2015). Continuity is when learners take information from their past and carry it into the future. Interaction is when past experiences interact with the present experience and combine to make a new experience (DeCaporale-Ryan et al., 2016).

Experiential learning theory holds to a learning cycle, or process, of four phases which are concrete experience, reflective observation, abstract conceptualization, and active experimentation (DeCaporale-Ryan et al., 2016; Hill, 2017; Kolb & Kolb, 2017). A concrete experience is the ability to have new experiences. A reflective observation is the ability of the individual to view experiences from different perspectives. Abstract conceptualization is being able to create concepts into theories. Active experimentation involves utilizing the theory to solve problems (Kolb, 1974).

According to Kolb and Kolb (2017) and Kolb (1984) the most important thing to remember about the learning cycle is that it is circular—not linear—meaning that it is a recursive process. The material to be learned is at the center for both the learner and the instructor, as opposed to traditional education whereby the material is above the instructor and the instructor above the learner (Kolb & Kolb, 2017). Dewey (1938) addressed this same notion in that textbooks are where knowledge is held, teachers are the ones who express the knowledge located within the texts, and the students are expected to receive the knowledge.

Experiential learning allows for students and instructors to observe the students' knowledge in application. Kolb (1974) asserts that the use of the term "experiential" in his learning theory is to give the basis of its origin in social psychology and to emphasize how this theory differs from other learning theories. Experiential learning can be fun and is often interactive (Hill, 2017). Experiential learning is conducted through experiences of the learner (Kolb, 1984). Kolb and Kolb (2017) state that the space in which learning occurs can either be a hindrance to learning or help facilitate it. The use of the word "space," as used by Kolb and Kolb (2017), is not limited to a physical location but includes physical, cultural, institutional, social, and psychological dimensions.

Within ELT, not all experiences are considered equal. Just because a student has an experience does not mean that the experience is educational (Dewey, 1938; Roberts, 2012). "Everything depends on the quality of the experience which is had" (Dewey, 1938, p. 27). Therefore, emphasis needs to be placed on the quality of educational experiences a student has in order to ensure effective learning takes place (Kolb, 1974). Experiential Learning Theory can be described and defined as learning by experiencing (Fry et al., 2015; Kolb, 1984).

**Piaget**

As stated previously, Kolb's ELT was based on the earlier work of three key individuals, one of whom was Jean Piaget. Piaget's research and theories focused on the role that learners' environments have on their learning (Dongo-Montoya, 2018). Piaget's work asserts two basic tendencies that humans have: organization and adaptation (Bormanaki & Khoshhal, 2017). Organization is how humans organize their thinking from simple structures into more complex structures. Piaget refers to this as *schema* (Bormanaki & Khoshhal, 2017). Adaptation is a combined process of assimilation and accommodation. Assimilation is where new information is obtained, and accommodation is where old schema are altered based on new information (Bormanaki & Khoshhal, 2017).

Piaget also focused on cognitive development and how individuals come to an answer instead of if they got the answer right or wrong. He noticed that younger children are not necessarily less intelligent than older children but that they think about things in a different way, leading to Piaget's theory of intelligence being shaped by an individual's experience (Kolb, 1984). "Intelligence is not an innate internal characteristic of the individual but arises as a product of the interaction between the person and his or her environment" (Kolb, 1984, p. 12). Piaget's work led way to the utilization of experience-based curricula which, at the time, had a significant positive impact on education and created excitement in the classroom as individual students were able to experience learning and make their own conclusions. This impacted the content of curriculum and how students were taught (Kolb, 1984).

**Lewin**

Kurt Lewin also played a role in the development of Kolb's experiential learning theory (Kolb, 1984). Lewin's focus was on reflective learning and social learning. The ability to reflect, following a learning experience, ensures that the learners take away the right information from the experience. Lewin's work focused on many different areas, but of the most importance to experiential learning is his work with groups and action research (Kolb, 1984). His work on action groups is a significant part of organizational development efforts of the $20^{th}$ century. This led to what is commonly referred to as debriefing where individuals are able to stimulate each other's learning (Kolb, 1984). Lewin also was a proponent and forerunner of laboratory groups, which focus on a student's subjective learning experience (Kolb, 1984).

**Dewey**

Lastly, and most recently, John Dewey was another key individual in the development of Kolb's ELT. During Dewey's time, education was viewed to have come from above the student, e.g., knowledge that is in the textbooks, and also coming from outside the student. Dewey (1938) argued that education is an experience that comes from the inside of learners as they are impacted by their environments, which relates more with other social interactions that individuals experience, such as within a family unit (Dewey, 1938). Dewey felt that students need to stick with a problem and work through it in order to draw meaning from the experience and use it with future experiences (Kolb & Kolb, 2017).

Dewey's influence on higher education can be seen in current "apprenticeships, internships, work-study programs, cooperative education, studio arts, laboratory studies, and field projects" (Kolb, 1984, p. 5). In these settings the learner can touch what is being learned, as opposed to thinking about it or attempting to visualize it. Dewey (1938) stated, "There is an intimate and necessary relation between the processes of actual experience and education" (p. 20). Also important to Dewey's view of experiential education is time spent reflecting on the learning experience (Parkay et al., 2014).

**Experiential Learning in Other Fields**

Nursing, much like paramedicine, is a field that is hands-on and, therefore, much of the learning is very practical (NMC, 2015). According to Hill (2017), by its very nature, ELT is imbedded into nursing education. This is especially true in situations where theory must be put into application while working with a patient. Experiential learning is also common among other allied health professions and can be observed during interprofessional learning experiences (Cant et al., 2015; Hill, 2017; Sweigart et al., 2016; West et al., 2015).  According to Hill (2017), experiential learning is a successful teaching tool for nursing students. Ti et al. (2009) also finds experiential learning to be an effective tool for teaching medical students the skill of intubation. Students that are part of experiential learning groups are less likely to have an error while performing the skills three months and 12 months after the teaching of the skill took place (Ti et al., 2009). Physical therapy assistant students also utilize experiential learning. Physical therapy assistant students that are enrolled in full-time clinical experiences are more likely to graduate and more likely to obtain licensing (Gresham et al., 2015).

Allied health students are not the only ones that utilize ELT in their education. Aviation students also utilize experiential learning (Macchiarella & Mirot, 2018; Prather, 2018; Whitehurst et al., 2019). Prather (2018) states that one form of experiential learning is used in aviation is internships. Nearly 80% of collegiate aviation programs offer internships for their students in which they can further learn by doing. Whitehurst et al. (2019) notes that experiential learning is beneficial within the field of aviation education. They suggest that experiential learning via simulation is an effective way to train for less-common weather-related flight concerns.

Experiential Learning Theory is also incorporated into teacher education programs by way of student teaching (Brown et al., 2015; Salmona et al., 2015; Smalley et al., 2015) and continuing education (Blair, 2016; Bohon et al., 2017). Some student teachers take part in study-abroad programs (Salmona et al., 2015). By immersing themselves in new and different cultures they are able to take part in ELT's application to cultural differences. Instead of reading about cultural differences, like most student teachers do, these students experience cultural differences. While it is not feasible for all student teachers to travel abroad, there is evidence suggesting that aspiring teachers should conduct student teaching in areas outside their regular cultural realm (Salmona et al., 2015).

Cultural diversity is not the only area ELT can be applied to during student teaching; rather, the entire student teaching experience is an example of ELT. Brown et al. (2015) reports that student teachers have an increase in content knowledge after their student teaching experiences. Other areas of improvement for student teachers following their student teaching experience include their ability to plan for instruction, classroom management, and areas of professionalism. Students believe that hands-on teaching, direct observation of teaching, and relationships with experienced teachers help their self-reported scores improve (Brown et al., 2015). Student teachers generally feel that their student teaching experiences are beneficial to their overall education (Smalley et al., 2015).

Current teachers also utilize ELT in their continuing education. Bohon et al. (2017) writes that ELT is a beneficial way to improve instruction for teachers of English language learners. In fact, the participants in the Bohon et al. study suggest that both the experience itself and the reflection on the experience, which are foundations of ELT, are critical to their learning. Another way ELT has been utilized in continuing education for teachers is by those individuals visiting historical sites and learning about them in person.

**Experiential Learning Theory and Paramedic Education**

Experiential learning theory has been applied to and utilized by several different disciplines (Kolb & Kolb, 2017; Poore et al., 2014), and Hill (2017) purports that experiential learning is an effective way to teach allied health professionals. When reflecting on ELT, one can easily see its involvement and integration into paramedic education within the laboratory and during clinical rotations (Kolb, 1984). The ELT learning cycle can easily be adapted for utilization within a paramedic education program. The concrete experience of a paramedic student's ELT experience is a patient encounter during a clinical rotation. The reflective observation is when the paramedic student sees the patient and can observe the patient's and others' experiences. The abstract conceptualization is when the students can see what they have learned in the classroom being put into action. Active experimentation is when the student encounters a different patient and can draw from past experiences in clinical rotations as well as the information obtained in the classroom and apply it to another patient (Kolb, 1984).

Hobgood et al. (2013) suggests that paramedics are able to learn about death notifications by using experiential learning, establishing that ELT can be successful in EMS education. Page et al. (2013) notes that paramedic students who experience more emergency patient contacts perform better on summative exams than paramedic students who experience patient transfers, suggesting ELT's application to EMS education. Tavares et al. (2013) offers that students who participate in simulation-based learning are likely to score well on real clinical experience assessments. Salzman et al. (2008) observes that the number of advanced life support runs that a paramedic student runs during clinical experiences and the total number of patient experiences are associated with passing the NREMT cognitive exam. Lastly, Rishipathak et al. (2019) indicates that EMS students are highly satisfied with experiential learning when high fidelity simulation manikins are utilized to learn about hemorrhagic shock. Based on this research, it appears that ELT is applicable and appealing to EMS providers. However, to date, there has not been research conducted where ELT has been correlated to the Paramedic Readiness Exam 4 (PRE4).

## Related Literature

### History of EMS

Emergency medical services has had a slow forward progression (Shah, 2006). EMS, as it is known today, is a young profession and concept. However, a key component of EMS practice, transporting injured individuals, can be traced back to battlefields of the 1400s. It was not until the later 1800s that the United States began to utilize EMS services in larger cities such as New

York and Cincinnati (Aehlert et al., 2018). EMS was propelled into the public sector because of the wars that the United States was involved in during the 1900s. A significant turning point for EMS in the United States was in 1965 when the National Academy of Sciences and the National Research Council published the document *Accidental Death and Disability: The Neglected Disease of Modern Society,* also known as *The White Paper*. This document highlighted several deficiencies of EMS including the need for faster medical intervention for patients, the need for community ambulance services, and the need to provide standards for EMS training (The National Academy of Sciences and the National Research Council, 1966).

Based on the findings and recommendations of the National Academy of Sciences and the National Research Council, the National Highway Safety Act of 1966 was established, which allowed for the creation of the United States Department of Transportation (DOT). The DOT was tasked with the development of training programs for EMS providers (Aehlert et al., 2018) and continues to maintain oversight of those programs today (NHTSA, 1996; U.S. Department of Transportation, 2020). In 1969, a recommendation from the Committee on Highway Traffic Safety to President Lyndon Johnson was to have a national certification agency which would include education standards (NREMT, 2020c). This led to the development of the National Registry, which is now known as the National Registry of Emergency Medical Technicians (NREMT, 2020c).

In 1996, the *EMS Agenda for the Future* was published. This document identified the need for EMS education to meet the demands of the evolving EMS profession (NHTSA, 1996). In 1996, the NHTSA (1996) asserted that there were many different types of EMT programs, based on how they were delivered and their focus, as well as different organizations offering those courses, including private institutions, hospitals, fire departments, and educational institutions. Until 1996, there was not a universal evaluation of EMS personnel for whom EMS education was responsible (NHTSA, 1996). The *EMS Agenda for the Future* asserted that future EMS education programs should be based on “sound educational principles” that are “based on research,” that “meet expectations for personnel of their stature,” are “based on national core contents,” and are “affiliated with academic institutions” (p. 34). To achieve these outcomes—and more—it was asserted that curriculum must be assessed for adequacy by those trained to do so and should provide information concerning the best method for educating EMS students (NHTSA, 1996).

In 1998, the NHTSA established the Blueprint Modeling Group, which later became known as the EMS Education Task Force, who developed the *EMS Education Agenda for the Future: A Systems Approach.* This document was written in response to the 1996 *EMS Agenda for the Future* with a special focus on EMS education. Of specific importance was the call for national EMS education standards to be developed, which was followed by the replacement of the National Standard Curricula (NHTSA, n.d.). Another significant finding from this document was that EMS education was based on assumptions rather than research (NHTSA, n.d.). To address that limitation, the NHTSA proposed a “regular feedback loop” (p. 17) between research and common EMS education practices to ensure empirical reasoning for education practices.

The NHTSA released *The National Emergency Medical Services Education Standards* in 2009, which are the standards currently utilized by EMS educators (NHTSA, 2020). These standards list, define, and compare the different educational levels of EMS providers. In 2019, the NHTSA released the *EMS Agenda 2050* with a focus on the direction of EMS as a profession for the next 30 years. The *Agenda* pushed for EMS education across all levels to take place in an educational setting. Specifically, there should be a focus on clinical problem-solving and decision-making with dedicated time in a clinical setting (NHTSA, 2019). Within the clinical setting, clinical educators are important, and students should "spend time with those providers in both the clinical and educational environments" (NHTSA, 2019, p. 22).

## Levels of EMS Providers

Each state may adopt its own different EMS certification levels; however, there are four national certification levels: EMR, EMT, AEMT, and Paramedic (Aehlert et al., 2018; NREMT, 2020b). The levels of EMS providers begin with basic knowledge and skills and progress to the most advanced knowledge and skills in the order they are presented above; EMR is the most basic level provider, and the paramedic is the most advanced level provider. As the EMS providers advance, their knowledge, skill set, and scope of practice all increase (Aehlert et al., 2018).

### *EMR*

The term Emergency Medical Responder (EMR) is often interchangeable with the title of "first responder" as these individuals are trained for immediate life threats with little knowledge of pathophysiology. These providers are trained to perform cardio-pulmonary resuscitation and first aid (Aehlert et al., 2018; NHTSA 2020; NREMT, 2020d). An EMR course does not require clinical experiences for initial education and lasts between 48-60 combined class and lab hours. (NHTSA, 2020).

### *EMT*

An Emergency Medical Technician (EMT) is the most common type of EMS provider (UCLA, n.d.; Aehlert et al., 2018). An EMT is expected to have a deeper and broader knowledge base concerning common emergencies and interventions as compared to the EMR (Aehlert et al., 2018). An EMT course is typically between 120-190 combined class and lab hours (NHTSA, 2020; UCLA, n.d.). As part of EMT training, clinical experience is mandatory. EMT students are required to have at least 10 non-specific, patient contacts. Furthermore, no specific skills are required to be performed by EMT students (NHTSA, 2020).

### *AEMT*

An Advanced Emergency Medical Technician (AEMT) is the next level of training and is a combination of an EMT and a Paramedic. AEMT's are expected to build on the knowledge they acquired as an EMT in order to develop a better understanding of common emergencies (NHTSA, 2020). The AEMT performs more skills than an EMT, including starting an intravenous (IV) line and administering some medications (Aehlert et al., 2018). To become an AEMT, one must first hold certification as an EMT. An AEMT course is an additional 150-200 hours of classroom, lab, and clinical work (NHTSA, 2020).  During clinical experiences, AEMT students must administer medications at least 15 times, ventilate 20 or more patients, and be exposed to patients suffering from different emergencies, specifically those suffering from chest pain, respiratory distress, and an altered mental status (NHTSA, 2020).

### *Paramedic*

The highest level of prehospital provider recognized by the NREMT is the paramedic (NREMT, 2020b). The paramedic is expected to have a good understanding of pathophysiology, emergencies, and patient interventions (Aehlert et al., 2018; NHTSA, 2020; UCLA, n.d.). NHTSA (2020) does not address the length of a paramedic program, but references standards set by CoAEMSP. CoAEMSP does not list a specific number of hours required for a paramedic program. However, CAAHEP (2015) states that a paramedic course is typically over 1,000 hours, and according to UCLA (n.d.) a program can be as many as 1,800 hours. The difference of hours can be the result of didactic information delivery and/or clinical experiences.

**History of Paramedic Education**

The first call for a national EMS education standard resulted from The National Academy of Sciences (1966) which, under the direction of President Lyndon Johnson, published *The White Paper* in 1966. This document shed light on the high rate of accidental deaths and injuries and their associated costs. Included in this document was the recommendation for “preparation of nationally acceptable texts, training aids, and courses of instruction for rescue squad personnel, policemen, firemen, and ambulance attendants” (National Academy of Sciences, 1966, p. 13). As a result of those findings, the National Registry of Emergency Medical Technicians (NREMT) was established in 1970 to ensure a national certification for emergency medical care (NREMT, 2020h).

The NREMT’s mission is to “provide a valid, uniform process to assess the knowledge and skills required for competent practice by EMS professionals throughout their careers, and to maintain a registry of certification status” (NREMT, 2020c, para. 2). The NREMT provides initial and ongoing certification for the following levels of EMS providers: EMR, EMT, AEMT, and paramedic. Currently, 46 states require NREMT certification for initial state licensure at the paramedic level (Fernandez et al., 2008; NREMT, 2020c), but all states recognize the certification (NREMT, 2020c). To obtain certification with the NREMT a student must meet minimum competency, which is determined by a psychomotor, or skills test, as well as a cognitive test. Thousands of hours are spent developing the tests and ensuring they are valid methods for determining a student’s competency. The cognitive exam given for paramedics is a computerized adaptive test where students, based on their performance, may be subject to a different number of questions to determine competency (NREMT, 2020e).

The first paramedic program was established in Miami in 1969 and was taught by Dr. Eugene Nagel. In 1971, the first EMT textbook was published by the American Academy of Orthopedic Surgeons (AAOS). That same year, AAOS also began to hold training workshops nationwide (Aehlert et al., 2018). The *Emergency Medical Services Systems Act* of 1973 provided guidance for training programs based on pilot programs in larger cities, like Miami. The mid 1970s revealed several deficiencies of the EMS system, including provider training. These deficiencies, along with other factors, led to the development of the *National Standard Curriculum* for paramedics, which was sponsored by the United States DOT. Emergency management services education slowly progressed through the 1980s and 1990s with most program oversight the responsibility of individual states (Aehlert et al., 2018).

In 2007, the NREMT voted to require that paramedic students attend a nationally accredited program in order to be eligible to take its certification exam. This was necessary to meet the requirements from the 1996 *EMS Agenda for the Future* which indicated the need for EMS education to be associated with a formal education system. On January 1, 2013, the NREMT approved a policy whereby any student wishing to take the NREMT paramedic certification examination (required of all licensed paramedics anywhere in the United States) must have attended an accredited program (Aehlert et al., 2018).

### ***Paramedic Learning Domains***

As with other allied health fields, paramedic education focuses on multiple domains of student learning that are based on Bloom's taxonomy. Those domains are the affective, cognitive, and psychomotor domains (Alexander, 2006; COAEMPS, 2015a; NAEMSE, 2013). The affective domain represents the student's attitude and conduct according to Alexander (2006). The component of an individual's values was added later by NAEMSE (NAEMSE, 2013). The affective domain is listed as “essential” for EMS students and can be evaluated by the way a student participates in class, treats classmates, and receives constructive feedback (Alexander, 2006; NAEMSE, 2013).

Alexander (2006) asserts that the cognitive domain is a focus on knowledge and a student’s intellectual abilities. This is similar to the NAEMSE (2013) understanding, which includes knowledge and facts. Oftentimes, oral or written exams are utilized to assess the cognitive domain (NAEMSE, 2013). The psychomotor domain is one associated with learning to perform skills or the physical actions of a paramedic’s job (Alexander, 2006) and is assessed by skills competency in a controlled environment (NAEMSE, 2013). Alexander (2006) states that it is imperative for EMS educators to have a full understanding of each domain, its role in EMS education, and how it can be evaluated. Experiential learning theory can be applied to all three domains of learning, but is most easily associated with the psychomotor domain.

### ***Paramedic Education Standards***

As previously mentioned, the current EMS education standards, from which all EMS curriculum is derived from, were released by the NHTSA in 2009 (NHTSA, 2020). The EMS education standards speak to specific areas of EMS education; they are not complete concerning the education of paramedic students. The NHTSA standards reference the CoAEMSP standards regarding many areas of the paramedic’s education (NHTSA, 2020). The EMS education standards are the minimum objectives that students should achieve during their initial education and serve as a guide (NHTSA, 2009). The standards were created to meet the *1996 EMS Agenda for the Future*’s goal of common education standards resulting in better public protection from ill-prepared EMS providers, as well as to ensure training within the providers’ scope of practice. The EMS education standards have four specific components: “competency, knowledge required for achieved competency, clinical behaviors and judgments, and educational infrastructure" (NHTSA, 2009, p. 7). As the provider level increases from EMR to Paramedic, the students' understanding of materials and the depth of those materials increases from simple to complex understanding (NHTSA, 2009). In the educational infrastructure for paramedic students, the EMS education standards reference the CoAEMSP standards (NHTSA, 2009).

***COAEMPS/CAAHEP***

As it stands today, CoAEMSP is the review body for paramedic education programs for accreditation through CAAHEP. Despite this process being in place since the late 1970s, these bodies have changed their names and procedures several times (CoAEMSP, 2020c). In 1978, the Joint Review Committee on Education Programs for the EMT-Paramedic (JRC-EMT-P) was the initial review board for what was then the Committee on Allied Health Education and Accreditation (CAHEA). At that point, CAHEA was the accrediting body for paramedic programs until 1994 when CAHEA was dissolved and CAAHEP became the accrediting body. In 2000, JRC-EMT-P renamed to CoAEMSP, as it is currently known, and is responsible for reviewing paramedic education programs for initial and current accreditation (CoAEMSP, 2020c). According to the CoAEMSP October 2020 newsletter there, are 642 accredited paramedic education programs, and 73 have a letter of review (CoAEMSP, 2020d).

A paramedic course is based more on competencies rather than a specific number of hours (CAAHEP, 2020). Recently, under direction from CAAHEP, CoAEMSP now requires each paramedic program to establish a minimum number of patient contacts for paramedic students during clinicals. They also require paramedic programs to establish a minimum number of clinical procedures that a paramedic student must complete during clinical rotations (CAAHEP, 2015; CoAEMSP, n.d.). Paramedic courses include a minimum of 1,000 hours of classroom and clinical experiences. During classroom instruction students are exposed to topics such as cardiology, pediatrics, airway, and more (CAAHEP, 2015). Paramedic students are also expected, in a lab setting, to demonstrate entry-level competency of skills such as defibrillation, medication administration, and intubation (NHTSA, 2020). CoAEMSP (2019) released recommended minimums of clinical encounters and skills that each paramedic student should obtain during their clinical rotations in the *Student Minimum Competency Matrix*. These recommended minimums must be approved or altered by each paramedic program's advisory council based on the program's expectations for its students (CAAHEP, 2015; CoAEMSP, n.d.). The clinical encounters and skills can be obtained in multiple venues, such as hospitals, clinics, and while riding on an ambulance (CAAHEP, 2015). According to CoAEMSP (2019), the minimum requirements developed for paramedic students were based on national past precedents of program experiences. However, to date, the data for the national averages of paramedic students' clinical experiences has not been published.

### ***Paramedic Student Success***

The definition of student success is one that is not easily nor regularly agreed upon. Ireland (2015) asserts that competition and job placement are measure of success that many administrators utilize. Picton et al. (2018) notes that grades are good indicators of success but acknowledges there are others. O'Shea and Delahunty (2018) find that the definition of success depends on who is asked as to how they would define their success, but it typically includes things ranging from graduation outcomes to a student's obtained knowledge.

While many of the same instances may be true for paramedic students, there is one specific indicator of success, the NREMT exams. In 47 states, a paramedic student must pass the NREMT cognitive and psychomotor exams to become a paramedic (NREMT, 2020h). However, this is not an easy task. The NREMT publishes cognitive and psychomotor exam pass rates on its website, and information is regularly updated. According to the NREMT (2018), there were 11,404 newly certified paramedics in the United States in 2018. That same report showed a cumulative pass rate on the cognitive exam of 80% and 94% pass rate on the psychomotor exam (NREMT, 2018). The cumulative pass rates were the same for 2017 (NREMT, 2017) and slightly higher in 2016.

In 2016, the cognitive exam cumulative pass rate was 85% and the psychomotor exam pass rate was 90% (NREMT, 2016). The first attempt pass rates for the same years, 2016, 2017, and 2018 are significantly lower than the cumulative pass rates; 71%, 73%, and 72% respectively (NREMT, 2020h). These rates are significantly lower than other allied health programs. Nursing students that took the National Council Licensure Examination for registered nurses (NCLEX-RN) exam had first-time pass rates of 88% in 2018, 88% in 2017, and 85% in 2016 (National Council of State Boards of Nursing, 2020).

### *Predictors for Student Success in Education Programs*

There are several education programs that utilize student success predictors for graduation, licensure, or certification. For nursing students, two of those predictive tools are the Exit Exam (E2) and the RN Comprehensive Predictor (RNCP). According to Brodersen and Mills (2014), the E2 and the RNCP are both considered significant predictors for the NCLEX-RN. Physical therapy assistant programs are also interested in predictors for their students' success. Gresham et al. (2015) explain that graduation rates and successful licensure are both associated with the amount time spent in a clinical setting. The company Field Internship Student Data Acquisition Project (FISDAP) has several predictive tools that are utilized by EMS educators to predict EMS students' success on the NREMT cognitive exams (FISDAP, 2020b).

The PRE4 is one particular exam that has a 97.5% positive predictive value associated with the NREMT cognitive paramedic exam (FISDAP, 2014).

### ***Expectations of Graduate Paramedic Students***

Not only is it important for paramedic students to be able to pass a cognitive and psychomotor exam, but they must also be able to meet the expectations of working in the field of EMS. This process is one that can cause significant stress for EMS students (Kennedy et al., 2015). According to Thompson et al. (2015), paramedic students in Australia must demonstrate they are able to work as EMS professionals before they can graduate. EMS educators had observed EMS students that were not prepared for the streets, and this was one of the reasons a capstone was developed. Many paramedic students in Australia and the United Kingdom asserted that it would be unlikely that recently graduated paramedic students could function well as independent providers (Reid et al., 2019).

Sometimes, newly graduated EMS students' partners report they are not prepared for the field either (Kennedy et al., 2015). This often leads to a difficult transition from student to practitioner, as well as some persecution. This, according to Kennedy et al. (2015), is the result of an, at times, significant gap between what students have learned in theory that must be made applicable in the field. This, for many EMS students, takes time to develop, and there may be an unrealistic expectation for newly-graduated students. This often results in isolation for newly graduated EMS students (Kennedy et al., 2015). Unfortunately, more clinical time does not seem to help recently graduated paramedic students to practice independently (Reid et al., 2019).

### ***Paramedic Program Accreditation***

Accreditation for paramedic programs is only provided by the Commission on Accreditation for Allied Health Education Program (CAAHEP), which is assessed and administered by the Committee on Accreditation for the EMS Professions (CoAEMSP) (Aehlert et al., 2018; CoAEMSP, 2019). Students that attend accredited programs are more likely to pass the NREMT cognitive exam as compared to students that attend non-accredited programs (Fernandez et al., 2008; Margolis et al., 2009; Rodriguez et al., 2018). According to Rodriguez et al. (2018) in 2012 a total of 8,404 paramedic students took the NREMT paramedic cognitive exam. Thirteen percent of those students were graduates of non-accredited paramedic programs. When the students' first attempts were analyzed students that attended an accredited program passed at a higher rate when compared to students from non-accredited programs, 75.6% and 67.3% ($p < 0.001$) respectively.

Students from accredited programs were are more likely to pass when their cumulative third attempts are compared to non-accredited program students, 88.9% and 81.9% ($p < 0.001$) respectively (Rodriguez et al., 2018). With this data, Rodriguez et al. asserts that students who attend an accredited paramedic program are 51% more likely to pass the NREMT paramedic cognitive exam on their first attempt as compared to students that attend non-accredited programs. These findings are not necessarily new and support with the findings of Dickison et al. (2006), who also expressed that association with an accredited program produced higher pass rates on the NREMT cognitive exam.

**Paramedics as Learners**

According to the Kolb Learning Style Inventory (KLSI) (Kolb & Kolb, 2005), there are four types of learning styles: diverging, assimilating, converging, and accommodating. Individuals with the diverging style of learning prefer concrete experiences and reflective observations. These individuals prefer group work and receiving personal feedback. Individuals with the assimilating style prefer abstract conceptualization and reflective observation. These individuals favor readings, lectures, and thinking about things. Individuals with the converging style prefer abstract conceptualization and active experimentation. These individuals desire simulations, laboratory assignments, and practical situations. Lastly, individuals with the accommodating style prefer concrete experiences and active experimentation. These individuals wish for group and testing ways to complete a project (Kolb & Kolb, 2005).

Staple et al. (2018) utilized these four learning style types when assessing paramedics' preferred learning styles. They found an about equal distribution of paramedics within each group. Of the paramedics assessed, 35% identify as assimilators, 20% as accommodators, 20% as divergers, and 24% as convergers. As identified by this study, paramedics do not have a preferred leaning style. This concept was replicated when participants were evaluated based on what elective learning stations they chose; no style stood out from the rest. However, the assimilator type of electives was chosen most frequently. This is, as reported within the study, due to the participants' belief that such classes would be more convenient and that they would get more enjoyment out of those types of learning (Staple et al., 2018).

**Clinicals**

Clinicals, which typically take place in the area a student is studying or in another applicable area, are opportunities for students to experience hands-on training (Alrazeeni, 2018; Boyle et al., 2008; O'Meara et al., 2015). According to Sweitzer and King (2004), clinicals are one of the most exciting components of a student's education, focusing on skills development and even personal growth. Clinical experiences are common among allied health programs (McCall et al., 2009; Miller & Berry, 2002; Rodger, 2008), and paramedic students are often in competition with other allied health students for clinical time (Boyle et al., 2008). Clinicals are beneficial to students, as it allows them to take theory and put it into practice while developing skills (Alrazeeni, 2018; Awuah-Peasah et al., 2013; Hakim et al., 2014; McCall et al., 2009; O'Meara et al., 2015; Rodger, 2008; Ross et al., 2018; Ralph et al., 2009).

Allied health programs require their students to complete clinical experiences based on either the number of hours spent in a clinical setting or specific skills to be completed. Allied health programs that utilize clinicals include audiology, occupational therapy, physiotherapy, and speech pathology (Rodger, 2008); medical students (Ash et al., 2012; Kandiah, 2017; Stowell et al., 2015); physical therapists (Hakim et al., 2004); nurses (Awuah-Peasah et al., 2013); and paramedics (CAAHEP, 2015; COAEMSP, 2015). These clinicals are an essential part of the students' training (Hakim et al., 2014). For most allied health professions, clinical experiences take up a significant portion of the time spent on their training (Awuah-Peasah et al., 2013; Rodger, 2008; Stowell et al., 2015). For example, athletic training students must complete a minimum of 800 clinical hours as part of their initial education (Miller & Berry, 2002).

Clinical experiences, or other experiential learning opportunities, are not unique to allied health fields. Clinical experiences are the very essence of experiential learning (Hakim et al., 2014; NAEMSE, 2013; Ralph et al., 2009) and play an important role in a student's education (Wallin et al., 2013). Clinicals are an essential component to physical therapy education (Hakim et al., 2014). Clinicals promote engagement and participation in real-life situations that positively impact learning (Ash et al., 2012; Kandiah, 2017; Ralph et al., 2009). The purpose of clinicals is for students to develop confidence and efficiency in their practice as well as to gain exposure to the work environment (Alexander, 2006). Clinicals also allow students to focus on the comprehension of skills and knowledge while in clinical settings (Miller & Berry, 2002) and to develop communication skills further (Ross et al., 2018).

Medical students report that clinicals are successful because of the ability to be a part of a team, being exposed to different types of patients, and having good supervision (Kandiah, 2017). Effective clinicals also train students how to recognize and subsequently solve problems (Alexander, 2006). Clinical experience has the biggest impact on nursing students' knowledge and skills (Henderson, et al., 2007). The number of clinical experiences a student has is positively related to a student's clinical performance (Kim & Myung, 2014). Students prefer to interact with live patients as opposed to text-based clinical cases (Braeckman et al., 2014). Clinical preceptors have a significant impact on the student's clinical experience (Kandiah, 2017; Ralph, et al., 2009; Wallin et al., 2013). Many students enjoy their clinical experiences (Kandiah, 2017).

Clinicals also allow for interdisciplinary education. Jutte et al. (2016) states that allied health students who participate in interdisciplinary education through clinical experiences develop better understandings of the roles of other professionals. Other results of interdisciplinary education, through clinical-based experiences, are improved communication among professions (Cant et al., 2015; Miller et al., 2014; Sweigart et al., 2016; West et al., 2015) and an improved perception of students in different fields (Cant et al., 2015; Friend et al., 2016; King et al., 2014; Miller et al., 2014). Poore et al. (2014) asserts that interdisciplinary education is crucial for nursing students.

Unfortunately, the clinical portion of a program is often the least-developed portion of an EMS education program (Alexander, 2006). Many EMS students feel that they are unsupported in their non-ambulance clinical rotations (Credland et al., 2020). This is despite clinicals being viewed by many as one of the most important components of an allied health student's education (Ralph et al., 2009). Many paramedic students do report excellent learning opportunities in a non-ambulance based clinical setting but acknowledge that they often needed to be proactive about those learning opportunities (Credland et al., 2020).

Nursing students report a medium level of satisfaction with their clinical experiences (Mokadem & Ibraheem, 2017). Much of the time that nursing and paramedic students spend in clinical settings is not spent interacting with patients or otherwise actively learning (Awuah-Peasah et al., 2013; Boyle et al., 2008; Kennedy et al., 2015; Miller & Berry, 2002). As an example, Boyle et al. (2008) says that nearly 30% of paramedic students have been excluded from assisting with patients, despite this being the primary purpose the students were at that clinical location. Another example from Awuah-Peasah et al. (2013) is that nursing students were using their mobile devices instead of engaging in patient care activities. Lastly, according to Miller and Berry (2002), athletic training students spend more time having side conversations or doing activities that are not related to their field than they spend on things applicable to athletic training. This suggests that educational programs participating in clinical rotations need to ensure students are on task during the rotations. This is especially true if a predictive link exists between the number of clinical encounters students have and their performance on summative exams.

**Paramedic Clinicals**

For a paramedic program within the United States to obtain and maintain accreditation, clinical affiliations and clinical experiences are required. Furthermore, those clinical affiliations must allow for students to have access to different ages and types of patients (CAAHEP, 2015; COAEMSP, 2015). According to CAAHEP (2015), examples of the types of patient encounters a student must be exposed to include “adult trauma and medical emergencies; airway management to include endotracheal intubation; obstetrics to include obstetric patients with delivery and neonatal assessment and care; pediatric trauma and medical emergencies including assessment and management; and geriatric trauma and medical emergencies" (Standard III.A.2).

According to the CAHHEP (2015) standards, paramedic programs must require a minimum number of patient contacts for specific patient categories. The minimum number of patient contacts must be approved by the program's medical director and the advisory committee. COAEMSP (2015) states that programs must document that the minimums are met and that regular evaluation is conducted to ensure the minimums are enough to make certain that the student has reached competency. COAEMSP's only stated requirement for patient contacts is that a program's minimum must be at least two encounters and that students must have contact with live patients (COAEMSP, 2015). The most recent, peer-reviewed publication about paramedic patient contacts in the United States showed that paramedic students have an average of 81 patient contacts and 335 clinical experience hours (Page et al., 2004).

This is similar to the direction given by the Paramedic Association of Canada (2011) for initial paramedic education, which states that adequate field placements must be provided in which student can perform competencies. Paramedic students in Australia are not required to obtain a minimum number of clinical education hours (Hickson et al., 2014; Reid et al., 2019). There are no specific requirements for clinicals in New Zealand (Hickson et al., 2015; O'Meara et al., 2015). The British Association of Ambulance Chief Executives asserts that half of the paramedic program is field placements but does not provide a specific number of hours (O'Meara et al., 2015). International paramedic students at Creighton University had their clinical experience time while in the United States documented for three years. In 2015, paramedic students of an international cooperative program completed an average of 354.6 clinical hours. Different years of students from the same program completed an average of 202 hours in 2016, and 476.12 hours in 2017. Those same students had an average of 80 clinical contacts and 42 field contacts in 2015, 41 clinical and 25 field in 2016, and 27 clinical and 66 field in 2017 (Alrazeeni, 2018).

Paramedic students have many different patient encounters during clinicals (Salzman et al., 2008) and clinicals take place in different locations (Boyle et al., 2008; O'Meara et al., 2015; NAEMSE, 2013; Reid et al., 2019). Clinical sites can include ambulance time, emergency and non-emergency; hospitals, health centers, and some specialty areas of the hospital (Alrazeeni, 2018; Boyle et al., 2008; NAEMSE, 2013; O'Meara et al., 2015). Clinicals are an important portion of a paramedic student's education because the field of paramedicine is a practice-based profession (Alexander, 2006; Hickson et al., 2014). In fact, many suggest that clinicals are vital to a paramedic student's education (Alrazeeni, 2018; Boyle et al., 2008; Hickson et al., 2014, 2015; Lazarsfeld-Jensen et al., 2014; ; NAEMSE, 2013; O'Meara et al., 2015; Williams et al., 2012; Wongtongkam & Brewster, 2017). Clinical education can be defined as the "part of the education process in a health profession that takes place in the service setting and has the purpose of allowing students to practice, under competent supervision, the knowledge, skills, and attitudes learned in the classroom and lab" (Seibert, 1979, p. 368).

For some programs, administrators are challenged to provide adequate clinical experiences for paramedic students (Lazarsfeld-Jensen et al., 2014). According to Boyle et al. (2008), this is not a new problem for paramedic programs. The clinical environment for Blue Community College (a pseudonym) paramedic students is very competitive as per the program's Education Director, Paramedic Director 1 (a pseudonym). There are several other professions, such as respiratory therapy, nursing, radiology, and medical students, that are competing for the same spots at times. This becomes especially difficult with specialty rotations, such as surgery, pediatrics, and obstetrics (Paramedic Director 1, personal communication, September 21, 2020). According to Paramedic Director 1, for paramedic students to obtain beneficial clinical rotations, programs must have a good working relationship with the hospitals, and students must be willing to become a part of a comprehensive team while in clinical rotations. Red Community and Technical College's (a pseudonym) paramedic students experience similar difficulties, especially in specialty areas such as obstetrics and pediatrics (Paramedic Director 2 [a pseudonym], personal communication, October 24, 2020).

However, clinical experiences are beneficial to paramedic students. Thompson et al. (2015) asserts that forms of experiential learning are highly effective. Boyle et al. (2008) expounds that 93% of paramedic students have a positive experience at ambulance clinicals. Some of the benefits for students of clinical experiences include developing a better understanding of what their own profession and other professions do (Feltham et al., 2015), performing better than students without clinical experience (Li et al., 2013), gaining practical experience (Boyle et al., 2008), improving skills (O'Meara et al., 2015; Wongtongkam & Brewster, 2017), and bridging the gap between theory and practice (Kennedy et al., 2015). During clinical experiences, there are several different learning opportunities offered (Boyle et al., 2008; Williams, 2012).

Most paramedic students understand that clinicals are a necessary component of their education (Lazarsfeld-Jensen et al., 2014). In fact, most paramedic students are satisfied with their clinicals (Feltham, 2015; Reid et al., 2019; Williams et al., 2012; Wongtongkam & Brewster, 2017) and even look forward to them (Williams et al., 2012). However, it is important to remember that just because a student has an experience does not mean that the experience is educational (Dewey, 1938). This idea has been fortified by the National Association of EMS

Educators (2013), which states that "experience alone, however, does not necessarily inspire learning" (p. 268). This is in line with Dewey's (1938) view on experiences. He noted that "everything depends on the quality of the experience which is had" (Dewey, 1938, p. 27). Dewey posited that simply seeing something was not enough for learning to occur. People must understand what it is they have observed and how it is important so that learning can take place.

Where a student is placed for clinicals plays a significant role in the student's overall experience (McCall et al., 2009). Also, clinical experiences should occur where an experienced provider can supervise the student (NAEMSE, 2013). A preceptor is an individual that holds the certification (or one higher than a student is seeking) that facilitates learning in the clinical environment (Alexander, 2006; McCall et al., 2009; O'Meara et al., 2015; Wongtongkam & Brewster, 2017). A preceptor also guides experiential learning (NAEMSE, 2013). Paramedic preceptors feel it is their role to show students how things work in practice (O'Meara et al., 2015).

Clinicals are a time of experiential learning for paramedic students (Boyle et al., 2008). During clinicals, theory can transition into practice which allows for professional skills to be developed (Alrazeeni, 2018; McCall et al., 2009; O'Meara et al., 2015; NAEMSE, 2013; Ross et al., 2018) as paramedic students experience real patient contacts during clinicals (O'Meara et al., 2015). Clinical experiences have been tied to first-time pass rates on the NREMT cognitive exam (NAEMSE, 2013; Salzman et al., 2008) and a relationship between a paramedic's cognitive ability and that person's performance in field-related tasks (Studnek et al., 2011). Therefore, students should be exposed to as many critical patient clinical experiences as possible (Margolis et al., 2009). It is also important for clinical experiences to be tracked (NAEMSE, 2013). One common method of tracking clinical experience is to utilize a system like FISDAP.

**Data Tracking and the Student Minimum Competency Matrix**

Current EMS education standards state that EMS students should be able to report and document (NHTSA, 2009). Thus, an important component of an EMS student's education and an EMS professional's job is documentation. One way this component can be emphasized is through proper documentation with clinical and lab data. Paramedic programs are required to ensure that students keep track of their clinical experiences (CAAHEP, 2015; COAEMSP, 2015). While there is no specific direction as to how this should or could be done, the are some specific data fields that are required for accreditation (COAEMSP, 2020a). The specific experiences that paramedic programs are required to report for each student can be found in CoAEMSP's *Student Minimum Competency Matrix*.

COAESMP (2020) lists data items that are required to be recorded in the lab and clinical settings. Concerning a paramedic student's clinical experiences, the *Student Minimum Competency Matrix* recommends a minimum of 18 pediatric patient, 60 medical patient, and 30 trauma patient encounters. The *Student Minimum Competency Matrix* also lists minimum recommendations concerning skills including, but not limited to, intravenous medication administration, intramuscular or subcutaneous injections, intubations, and continuous positive airway pressure application (COAEMSP, 2020a). According to COAEMSP (n.d.) the recommended minimums in the *Student Minimum Competency Matrix* were developed based on past precedents of paramedic programs within the United States and it was stated that data would be published concerning those minimums. To date, that information has not been published, and programs are allowed to develop and approve their own minimums concerning patient contacts as long as they are above two encounters for each group.

One of the ways students and instructors can track student data is by utilizing one of the available electronic tracking systems. FISDAP’s *Skills Tracker* system is an example of one of these systems. *Skills Tracker* allows for documentation of students’ clinical and laboratory shifts and formative and summative skills completion. The benefit of a system like *Skills Tracker* is that students and instructors can view progress and print reports in all areas of the clinical setting *Skills Tracker* also allows for programs to set customized goals and required minimums within all areas of their clinical and lab experience (FISDAP, 2020a).

## Summary

A known problem in the industry is that there is little research focused on EMS education. To date, there has not been any research conducted regarding the specific types of patient encounters that students have in order to assess for a predictive relationship with a summative exam. Clinicals are a crucial aspect of education for students from different areas of study, especially those in healthcare. Clinical data must be tracked by students or their programs and often is reported to accrediting bodies for compliance. Clinicals allow for students to take part, when done correctly, in experiential learning. In other fields, experiential learning has shown to be beneficial to students.

# CHAPTER THREE: METHODS

## Overview

This chapter discusses the chosen methodology for this study. The research design, including design rationale, are discussed first within the chapter. Following the design, the research questions and hypotheses are restated. Next, the participants and setting of the study are discussed with specific focus on the study's sampling procedures. The instrument of the study, the PRE4, is examined, followed by the procedures this researcher utilized. The chapter concludes with a discussion on how the data was analyzed.

## Design

This study utilized a quantitative, correlational design. Since an objective reality is present, which can be measured numerically, quantitative methodology was most appropriate (Joyner et al., 2018). According to Creswell and Creswell (2018), if a researcher wishes to utilize numbers, as opposed to words, one should utilize a quantitative methodology, which is the most objective way to obtain data. Furthermore, this researcher acknowledged that his personal experience as a paramedic and paramedic instructor was likely to influence his opinion concerning the research questions, so the most objective way to obtain data would be to utilize numbers (Creswell & Creswell, 2018). Lastly, Joyner et al. (2018) states that a researcher should focus on their strengths when choosing a methodology, which was also part of the reasoning for choosing a quantitative methodology.

Correlational designs are utilized when one wants to determine the presence of a relationship between two or more variables (Gall et al., 2007). This study utilized a predictive correlational design. This specific design allowed for the researcher to determine if a predictive relationship existed between the predictor and criterion variables. The criterion variables for this study were cardiac, medical, airway, trauma, obstetrics and gynecology, and pediatrics sub scores on the PRE4. These sub scores, along with an operations section, make up the entire PRE4. The predictor variables for this study were the number of patient encounters a student had, where the patient was experiencing a cardiac, medical, airway, trauma, obstetrics and gynecology, or pediatric emergency during clinicals. These patient encounters are required to be tracked at the program and individual level (CoAEMSP, n.d.). The data for all variables of this research were quantitative in nature and were obtained from archival sources. This research design was appropriate because the researcher was able to predict an outcome (Creswell, 2014) as well as the degree of relationship between the predictor and criterion variables (Gall et al., 2007).

## Research Questions

**RQ1**: How well can the number of cardiac patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the cardiac section of the PRE4?

**RQ2**: How well can the number of medical patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the medical section of the PRE4?

**RQ3**: How well can the number of airway patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the airway section of the PRE4?

**RQ4**: How well can the number of obstetrics and gynecological patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the obstetrics and gynecological section of the PRE4?

**RQ5**: How well can the number of pediatric patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the pediatric section of the PRE4?

**RQ6**: How well can the number of trauma patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the trauma section of the PRE4?

## Hypotheses

The null hypotheses for this study were:

**$H_0$1:** There is no statistically significant predictive relationship between the criterion variable, the number of cardiac patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the cardiac section of the PRE4.

**$H_0$2:** There is no statistically significant predictive relationship between the criterion variable, the number of medical patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the medical section of the PRE4.

**$H_0$3:** There is no statistically significant predictive relationship between the criterion variable, the number of airway patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the airway section of the PRE4.

**$H_0$4:** There is no statistically significant predictive relationship between the criterion variable, the number of obstetrics and gynecological patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the obstetrics and gynecological section of the PRE4.

**$H_0$5:** There is no statistically significant predictive relationship between the criterion variable, the number of pediatric patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the pediatric section of the PRE4.

**$H_0$6:** There is no statistically significant predictive relationship between the criterion variable, the number of trauma patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the trauma section of the PRE4.

## Participants and Setting

According to Gall et al. (2007), the target population represents all the potential individuals that would meet the criteria identified in the research questions. The accessible population for this study was the paramedic students who took the PRE4 between academic years 2015-2018 and utilized FISDAP's skills tracker program while attending Blue Community College (BCC). This date range was chosen to include the largest number of students from BCC while avoiding students whose clinical experiences were impacted by the COVID-19 pandemic. The recent coronavirus resulted in several changes or limitations to many paramedic programs in academic years 2019 and 2020 (CoAEMSP, 2020b; NREMT, 2020g). Gall et al. (2007) recommends that the largest sample size possible be utilized for quantitative research and Creswell and Creswell (2018) state that the larger the sample size, the more accurate the inferences from the study. Therefore, this researcher did not set a limit to the number of participants who could be included in the study.

Participants for this archival study were drawn from a convenience sample of paramedic students who attended BCC, utilized FISDAP for clinical data entry, and took the PRE4 during academic years 2015 to 2018. This population was chosen because data was available for both the predictor and criterion variables in one location which allowed for more simple data retrieval and fit the purpose of this study (Gall et al., 2007). The researcher obtained approval for this study from the Liberty University Institutional Review Board. This approval can be viewed in Appendix A. The researcher then gained access to the data for this study by a written agreement with BCC. This approval can be viewed in Appendix B.

The sample for this study was obtained from FISDAP data and based off specific inclusion criteria which included the students' first attempt PRE4 test date within the specific time frame and paramedic student status within *Skills Tracker*. For academic years 2015 to 2018, there were a total of 72 paramedic students at BCC who utilized FISDAP's software for either clinical skills tracking or for practice testing. Of those, six users had incomplete clinical data, leaving a total of 66 paramedic students who utilized both *Skills Tracker* and practice testing combined.

This sample size of 66 met the required minimum of 66 participants to obtain a medium effect size with a statistical power of .7 and an alpha level of .05 (Gall et al., 2007). The sample was made up of 20 women (30.3%) and 46 men (69.7%). Of the 66 students, 28 (42.4%) were considered to have attended the on-campus program and 38 (57.6%) an off-campus program, both of which are accredited under BCC. All data from BCC was deidentified by this researcher. Since this study was conducted by utilizing archival data a specific setting for this study was not applicable.

## Instrumentation

The criterion variables (cardiac, medical, airway, obstetrics and gynecology, pediatrics, and trauma sub scores) for this study were evaluated by the PRE4. The PRE4 was utilized as it was a valid and reliable instrument designed specifically for paramedic students. Furthermore, the NREMT cognitive exam would not have been a viable option to utilize for this study as the

NREMT cognitive exam assesses for minimal competency and does not provide a specific score on subcategories of the exam (NREMT, 2020a).

FISDAP exams, such as the PRE4, have been utilized in several research projects (Barr et al., 2017; Edwards et al., 2019; Hamel, et al., 2019; Leggio et al., 2017). The PRE4 was developed by FISDAP in 2014 and is made up of 200 multiple choice questions (Bowen, 2014) in seven different categories (FISDAP, 2014). The PRE4 is a comprehensive summative exam that must be proctored by a program representative. The test provides a timer to prepare students for the NREMT cognitive exam but the PRE4 is not officially timed. Once students have completed the exam, they are able to see their cumulative scores, as well as scores in the subcategories of cardiac, medical, airway, trauma, obstetrics and gynecology, pediatrics, and operations. The majority of the PRE4 focuses on adult patients (85%), and the remaining 15% focuses on pediatric patients (FISDAP, 2014).

According to FISDAP (2014), the PRE4 is a valid exam that has been reviewed by multiple subject matter experts and was developed with the assistance of EMS educators, physicians, and measurement specialists. The exam, before release to the public, was pilot tested with over 1,400 students; the PRE4 was able to differentiate proficient from less proficient learners. During piloting of the PRE4, questions that had a point-biserial of less than .15 were omitted from further use unless the question was deemed to be based on essential content. Bias review was conducted during item writing, during item review, and during the review of the pilot data. Data was reviewed for differential facet functioning and differential item functioning. Based on this information 22 questions on the PRE4 were revised (FISDAP, 2014).

The finalized version of the PRE4 was tested for content and construct validity. As previously stated, content validity was ensured by several subject matter experts (FISDAP, 2014). Construct validity was ensured by point-biserial correlations along with infit and outfit values. All assessed infit and outfit ranges fell with 0.5 to 1.5, which are considered productive. All point-biserial measures were between .44 to .46, which demonstrated strong validity. Test reliability was assessed by measuring internal consistency using coefficient alphas for the PRE4 among different subgroups, which ranged from .81 to .86 (FISDAP, 2014). The PRE4 also has a 97.5% positive predictive value with the NREMT cognitive exam first-attempt pass rate when students either met or exceeded the cumulative score of 73%, which according to FIDAP is referred to as the cut score for the PRE4 (FISDAP, 2014).

## Procedures

Institutional Review Board (IRB) approval was obtained from Liberty University by this researcher prior to obtaining data from BCC (See Appendix A). A copy of IRB approval was provided to the BCC prior to data being released by the institution Blue Community College approved the data to be utilized for this research (See Appendix B). The data obtained included the predictor variable information (the number of patient encounters where the patient was experiencing a cardiac, medical, airway, trauma, obstetrics and gynecology, or pediatric emergency) and the criterion variable information (cardiac, medical, airway, trauma, obstetrics and gynecology, and pediatric sub scores on the PRE4). The target population for this study was all paramedic students of academic years 2015 to 2018. However, convenience sampling was utilized since reliable information for both variables was available from FSIDAP.

## Data Analysis

Data was reviewed for accuracy and entered into the Statistical Package for the Social Sciences (SPSS) for data analysis. Once all the data was coded and entered into SPSS, bivariate linear regressions were ran. Six separate bivariate linear regressions were utilized for data analysis to demonstrate the possibility of a relationship, specifically a predictive relationship, between the predictor variables (the number of patient encounters a student had where the patient was experiencing a cardiac, medical, airway, trauma, obstetrics and gynecology, or pediatric emergency) and the criterion variables (cardiac, medical, airway, trauma, obstetrics and gynecology, and pediatric sub scores on the PRE4) (Gall et al., 2007; Warner, 2013). This type of analysis supported the research questions that attempted to assess the presence of a predictive relationship. Warner (2013) states that this type of analysis allows for raw scores to be predicted for the criterion variable based on the predictor variable.

Data for all hypotheses was screened to check for missing data points and inaccuracies; missing data points were removed. Assumption testing for a bivariate linear regression, according to Warner (2013), is the same as assumption testing for a Pearson correlation, which includes the assumptions of normality and linearity (Warner, 2013). The assumptions of normality were assessed by scatter plots, as Warner (2013) states that visual examination is typically sufficient to test for this assumption. The assumptions of linearity were also assessed by scatter plots (Warner, 2013). Lastly, the assumption of bivariate outliers was similarly examined via scatter plots (Gall et al., 2007).

# CHAPTER FOUR: FINDINGS

## Overview

This chapter discusses the findings of the data analyses that were conducted for this study. Findings included in this chapter are descriptive statistics, assumption tests, and results from the six bivariate linear regression analyses that were conducted to test the null hypotheses. A review of the research questions and hypotheses is also provided.

## Research Questions

**RQ1**: How well can the number of cardiac patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the cardiac section of the PRE4?

**RQ2**: How well can the number of medical patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the medical section of the PRE4?

**RQ3**: How well can the number of airway patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the airway section of the PRE4?

**RQ4**: How well can the number of obstetrics and gynecological patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the obstetrics and gynecological section of the PRE4?

**RQ5**: How well can the number of pediatric patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the pediatric section of the PRE4?

**RQ6**: How well can the number of trauma patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the trauma section of the PRE4?

**Null Hypotheses**

The null hypotheses for this study are:

**$H_0$1:** There is no statistically significant predictive relationship between the criterion variable, the number of cardiac patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the cardiac section of the PRE4.

**$H_0$2:** There is no statistically significant predictive relationship between the criterion variable, the number of medical patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the medical section of the PRE4.

**$H_0$3:** There is no statistically significant predictive relationship between the criterion variable, the number of airway patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the airway section of the PRE4.

**$H_0$4:** There is no statistically significant predictive relationship between the criterion variable, the number of obstetrics and gynecological patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the obstetrics and gynecological section of the PRE4.

**$H_0$5:** There is no statistically significant predictive relationship between the criterion variable, the number of pediatric patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the pediatric section of the PRE4.

**$H_0$6:** There is no statistically significant predictive relationship between the criterion variable, the number of trauma patients a paramedic student encounters within a clinical setting during their initial training and the predictor variable, the trauma section of the PRE4.

**Descriptive Statistics**

Descriptive statistics were calculated for the study variables including the mean and standard deviation and are displayed in Table 1. There were six predictor variables (the number of patient encounters a student had where the patient was experiencing a cardiac, medical, airway, trauma, obstetrics and gynecology, or pediatric emergency) and six criterion variables (cardiac, medical, airway, trauma, obstetrics and gynecology, and pediatric sub scores on the PRE4). The predictor variables had a range from five patient contacts to 161 patient contacts experiencing specific complaints. The criterion variables had scores ranging from 33% to 96%.

Table 1

*Descriptive Statistics of Variables*

| Variables | *N* | Minimum | Maximum | Mean | Std. Dev. |
|---|---|---|---|---|---|
| PRE4 Airway Score | 66 | 30 | 93 | 63.21 | 12.061 |
| PRE4 Cardio Score | 66 | 37 | 93 | 68.29 | 11.959 |
| PRE4 OB/Gyn Score | 66 | 48 | 96 | 79.21 | 8.736 |
| PRE4 Medical Score | 66 | 41 | 89 | 66.70 | 11.149 |
| PRE4 Pedi Score | 66 | 33 | 90 | 67.03 | 9.698 |
| PRE4 Trauma Score | 66 | 48 | 93 | 70.56 | 9.110 |
| PRE4 Ops Score | 66 | 60 | 94 | 75.52 | 7.735 |
| # of Cardiac Patients | 66 | 5 | 66 | 33.61 | 10.300 |
| # of Medical Patients | 66 | 19 | 161 | 74.80 | 27.438 |
| # of Trauma Patients | 66 | 11 | 91 | 40.59 | 12.226 |
| # of Pediatric Patients | 66 | 5 | 66 | 36.65 | 12.356 |
| # of Breathing Problem Patients | 66 | 3 | 86 | 41.32 | 15.930 |
| # of OB Patients | 66 | 0 | 19 | 10.14 | 4.026 |
| Valid *N* (listwise) | 66 | | | | |

A convenience sample of 72 paramedic students from academic years 2015 to 2018 was utilized for this study. Of those participants, six were missing data or were otherwise withheld from the calculations resulting in a sample population of 66 paramedic students. Participants in this study included 46 (69.7%) male and 20 (30.3%) female students as displayed in Table 2. Of the sample population 28 (42.4%) students attended an on-campus program and 38 (57.6%) of students that attended an off-campus program as displayed in Table 3.

Table 2

*Participants' Gender (*N= *66)*

| Gender | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 46 | 69.7 | 69.7 | 69.7 |
| Female | 20 | 30.3 | 30.3 | 100.0 |
| Total | 66 | 100.0 | 100.0 | |

Table 3

*Program Location Attended (*N *= 66)*

| On vs. Off-Campus | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| On-Campus | 28 | 42.4 | 42.4 | 42.4 |
| Off-Campus | 38 | 57.6 | 57.6 | 100.0 |
| Total | 66 | 100.0 | 100.0 | |

# Results

## Data Screening

Data screening was performed on all predictor and criterion variables assessing for the presence of data omission or other errors. Of the 72 student records obtained six were found to be incomplete. Two of the student records had no patient contacts and the other four recorded less than 65 which was substantially below the mean of 192.32 of the remaining 66 students. Data screening was assessed and applied for all six null hypotheses.

**Assumption Testing**

According to Gall et al. (2007), there are three assumption tests that must be met when a bivariate linear regression is utilized for analysis. The three assumptions tests are bivariate outliers, linearity, and bivariate normal distribution. The assumptions were tested by utilizing six scatterplots, one for each pair of variables (see Figures 1-6). The assumptions of bivariate outlier and linearity were tenable. However, the assumption of bivariate normal distribution was not tenable between the number of trauma patients encountered and the PRE4 trauma score as well as between the number of medical patients encountered and the PRE4 medical score. According to Green and Salkind (2017), this finding suggests that there may be a non-linear relationship between the predictor and criterion variable. The relationship between these variables is not linear, resulting in a cluster, not a curve (see Figures 2 & 6).

Figure 1

*Number of Cardiac Patients vs. PRE4 Cardiac Score*

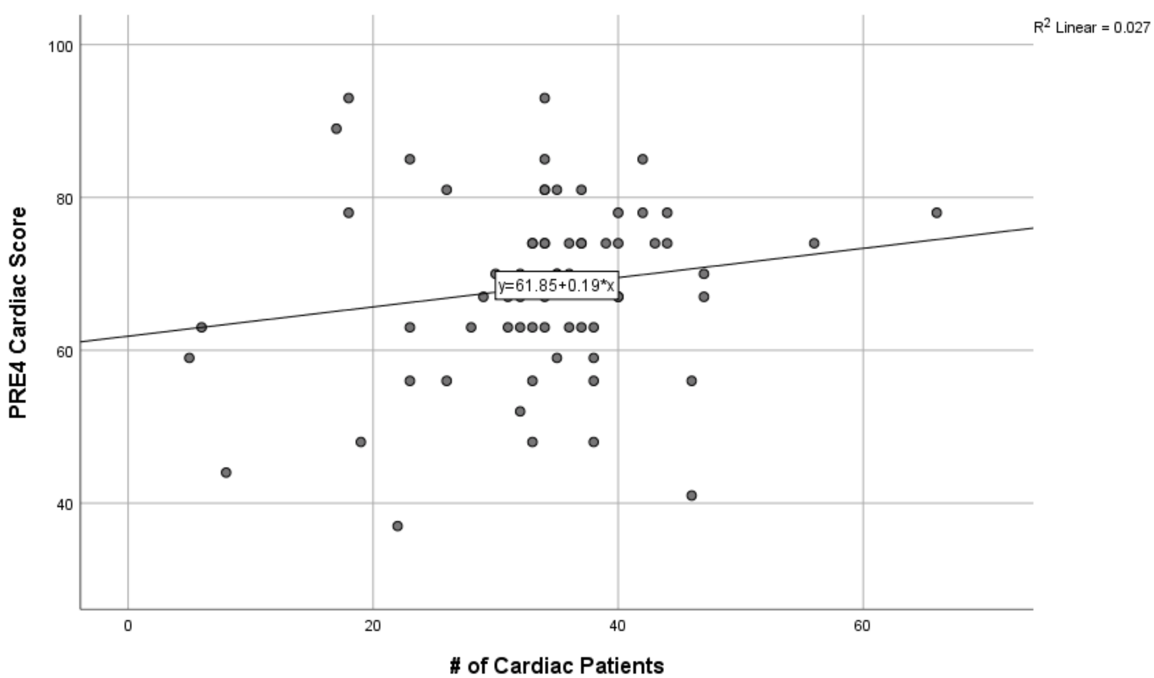


Figure 2

*Number of Medical Patients vs. PRE4 Medical Score*

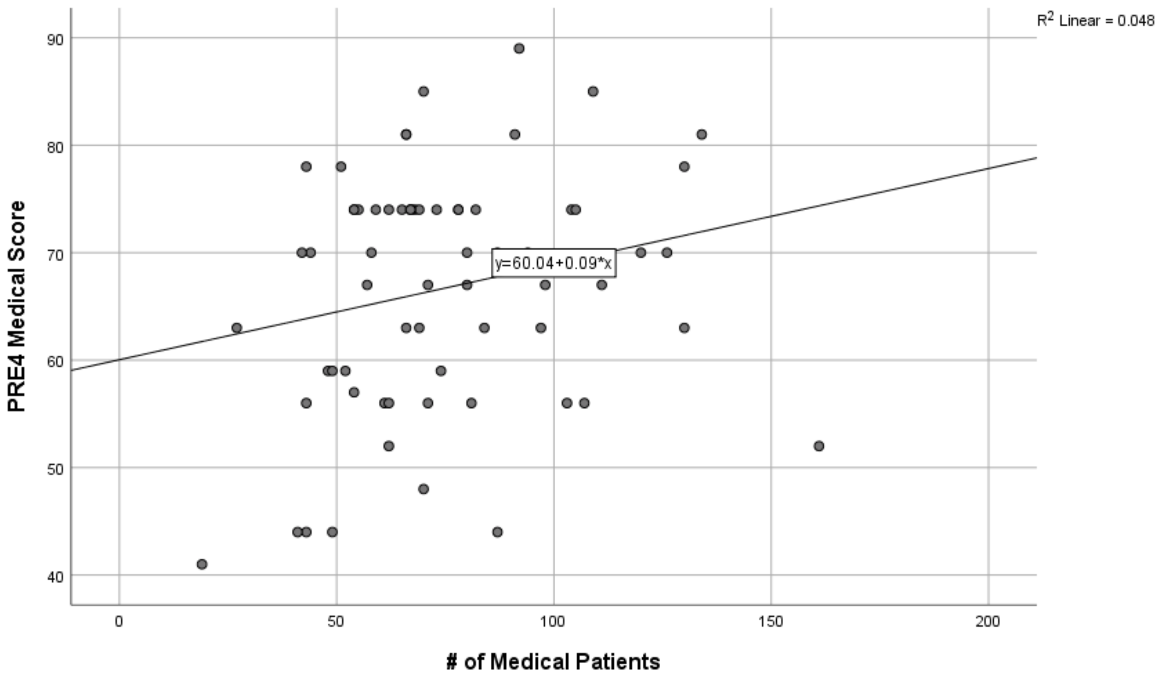



Figure 3

*Number of Breathing Problem Patients vs. PRE4 Airway Score*

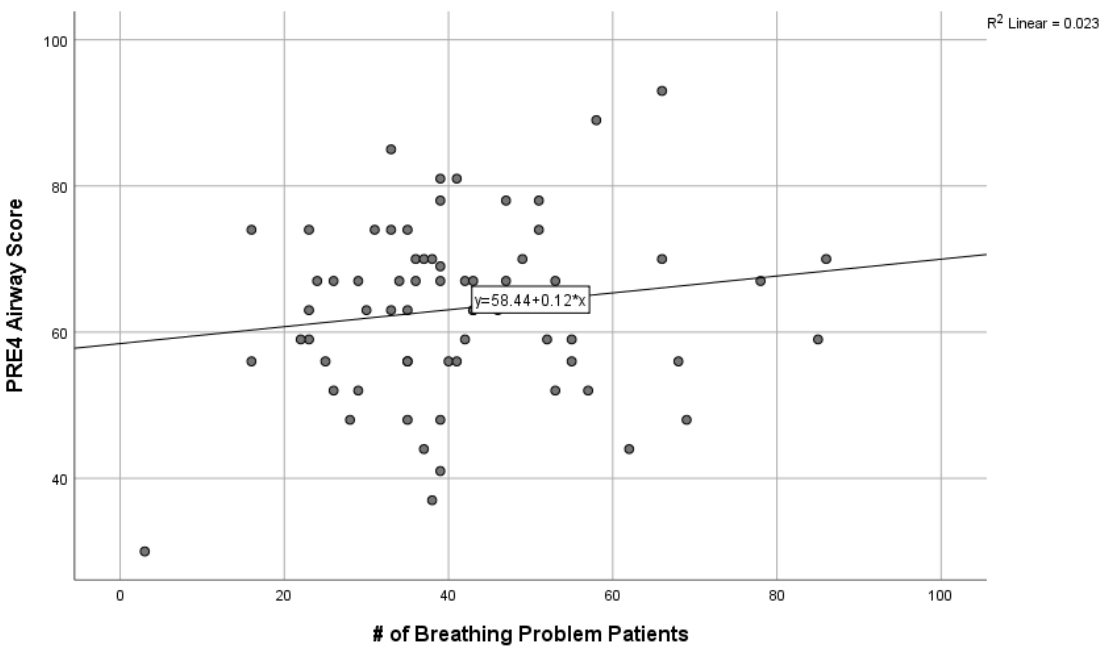


Figure 4

*Number of OB Patients vs. PRE4 OB/GYN Score*

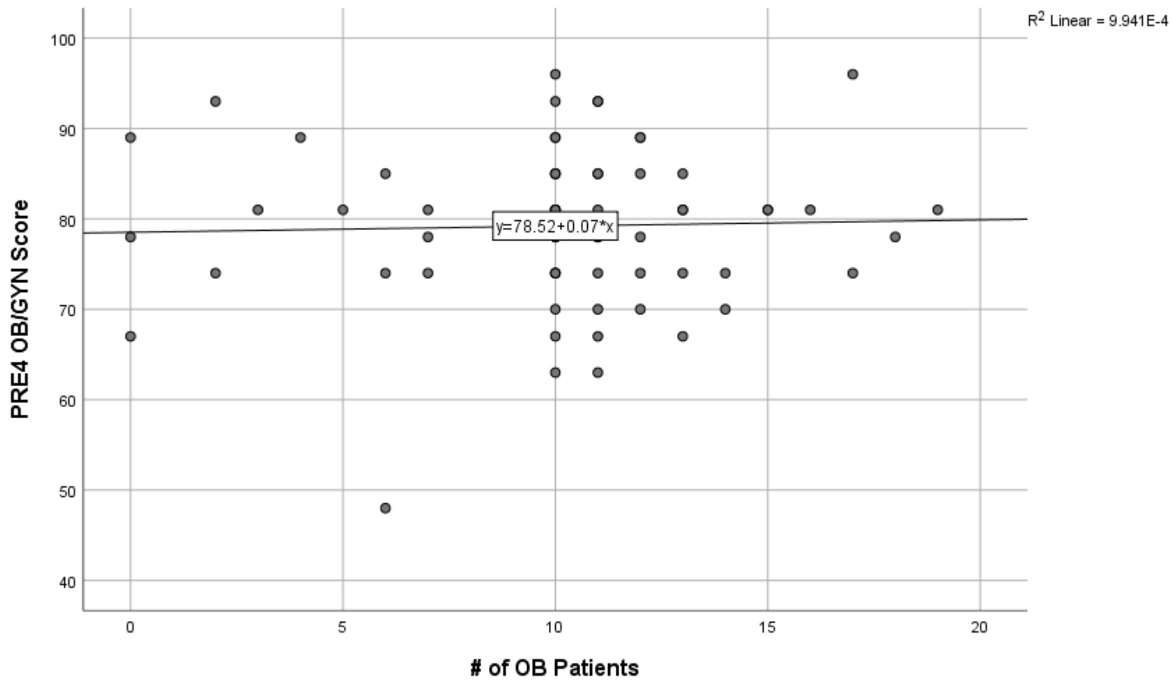



Figure 5

*Number of Pediatric Patients vs. PRE4 Pediatric Score*

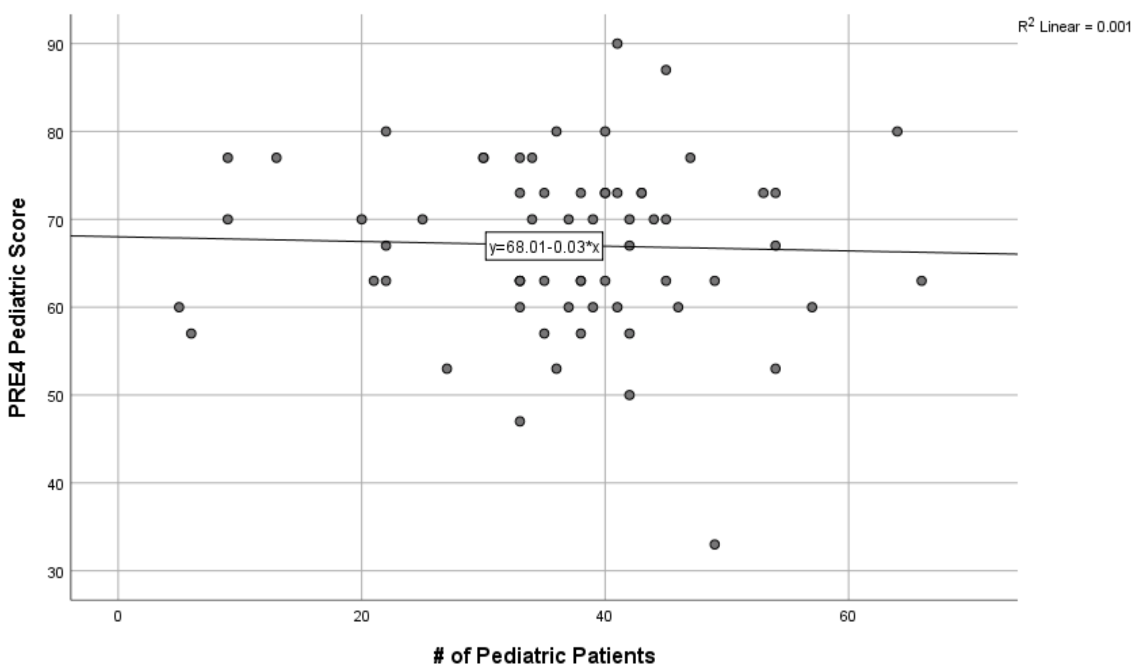
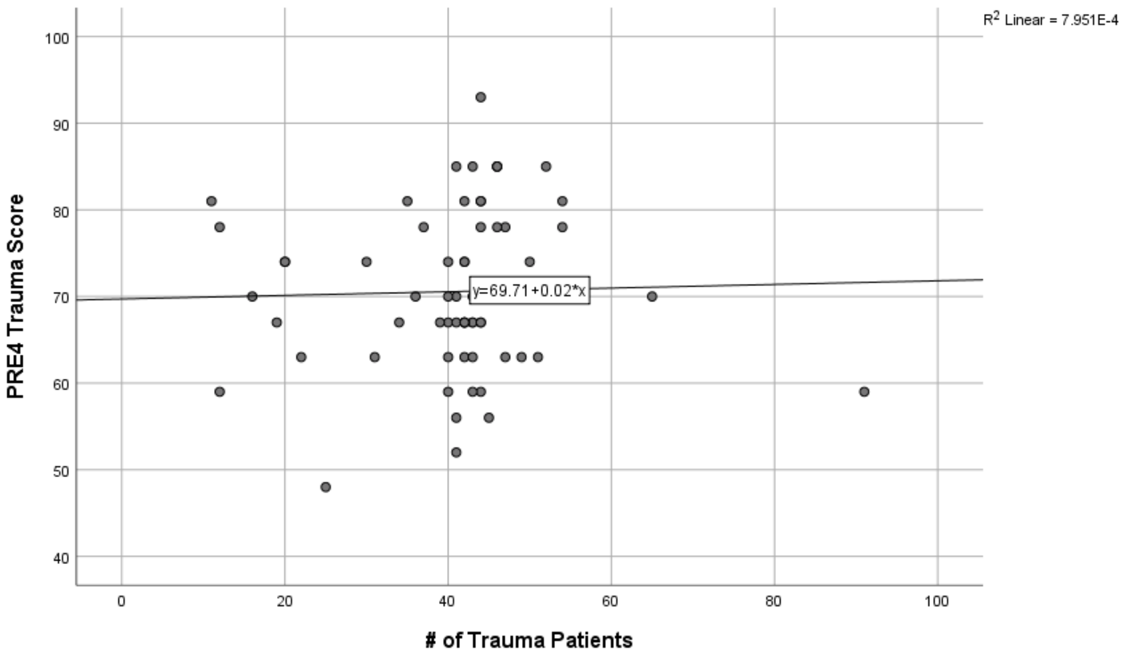


Figure 6

*Number of Trauma Patients vs. PRE4 Trauma Score*




**Results for $H_0 1$**

A bivariate linear regression was utilized to test Null Hypothesis One, which stated there is not a statistically significant predictive relationship between the number of cardiac patients a paramedic student encounters and the score on the cardiac section of the PRE4. A correlation between the two variables was not presently determined by $r = 0.156$ as observed in Table 4. The model produced $F$ (1, 65) = 1.79, $p = .186$; therefore, the model was not significant in predicting the student's PRE4 cardiac score as (Table 5). The number of patients a paramedic encountered during a clinical rotation that had cardiac complaints did not predict the score on the cardiac section of the PRE4 ($B = .191$, $p = .186$). As a result, there was not enough evidence to reject null hypothesis one.

Table 4

*Correlations, Cardio Score*

| | | PRE4 Cardio Score | # of Cardiac Patients |
|---|---|---|---|
| Pearson Correlation | PRE4 Cardio Score | 1.000 | .165 |
| | # of Cardiac Patients | .165 | 1.000 |
| Sig. (2-tailed) | PRE4 Cardio Score | . | .186 |
| | # of Cardiac Patients | .186 | . |
| *N* | PRE4 Cardio Score | 66 | 66 |
| | # of Cardiac Patients | 66 | 66 |

Table 5

*Coefficients[a], Cardio Score*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 61.853 | 5.028 | | 12.302 | .000 | 51.808 | 71.897 |
| | # of Cardiac Patients | .191 | .143 | .165 | 1.338 | .186 | -.094 | .477 |

*a.* Dependent Variable: PRE4 Cardio Score

**Results for $H_0$2**

A bivariate linear regression was utilized to test Null hypothesis Two, which stated there was not a statistically significant predictive relationship between the number of medical patients a paramedic student encounters and their score on the medical section of the PRE4. A correlation between the two variables was not present determined by $r = 0.219$ as observed in Table 6. The model produced $F(1, 65) = 3.22$, $p = .077$ and, therefore, the model was not significant in predicting the student's PRE4 medical score as observed in Table 7. The number of patients a paramedic encountered during a clinical rotation who had a medical complaint did not predict their score on the medical section of the PRE4 ($B = .089$, $p = .077$). As a result, there was not enough evidence to reject this null hypothesis.

Table 6

*Correlations, Medical Score*

| | | PRE4 Medical Score | # of Medical Patients |
|---|---|---|---|
| Pearson correlation | PRE4 Medical Score | 1.000 | .219 |
| | # of Medical Patients | .219 | 1.000 |
| Sig. (2-tailed) | PRE4 Medical Score | . | .075 |
| | # of Medical Patients | .075 | . |
| *N* | PRE4 Medical Score | 66 | 66 |
| | # of Medical Patients | 66 | 66 |

Table 7

*Coefficients[a], Medical Score*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 60.043 | 3.945 | | 15.219 | .000 | 52.161 | 67.924 |
| | # of Medical Patients | .089 | .050 | .219 | 1.795 | .077 | -.010 | .188 |

*a*. Dependent Variable: PRE4 Medical Score

**Results for $H_0 3$**

A bivariate linear regression was utilized to test Null Hypothesis Three which stated there was not a statistically significant predictive relationship between the number of airway patients a paramedic student encounters and their score on the airway section of the PRE4. A correlation between the two variables was not present as determined by $r = 0.153$ as observed in Table 8. The model produced $F(1, 65) = 1.52$, $p = .222$ and, therefore, the model was not significant in predicting the student's PRE4 airway score as disclosed in Table 9. The number of patients a paramedic encountered during a clinical rotation who had an airway complaint did not predict their score on the airway section of the PRE4 ($B = .153$, $p = .222$). As a result, there was not enough evidence to reject the null hypothesis.

Table 8

*Correlations, Airway Score*

| | | PRE4 Airway Score | # of Airway Patients |
|---|---|---|---|
| Pearson correlation | PRE4 Airway Score | 1.000 | .153 |
| | # of Airway Patients | .153 | 1.000 |
| Sig. (2-tailed) | PRE4 Airway Score | . | .222 |
| | # of Airway Patients | .222 | . |
| *N* | PRE4 Airway Score | 66 | 66 |
| | # of Airway Patients | 66 | 66 |

Table 9

*Coefficients[a], Airway Score*

| | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| Model | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 58.441 | 4.138 | | 14.124 | .000 | 50.175 | 66.707 |
| | # of Airway Patients | .115 | .094 | .153 | 1.235 | .222 | -.071 | .302 |

*a*. Dependent Variable: PRE4 Airway Score

**Results for $H_0$4**

A bivariate linear regression was utilized to test Null Hypothesis Four which stated there was not a statistically significant predictive relationship between the number of obstetrics and gynecological patients a paramedic student encounters and their score on the obstetrics and gynecological section of the PRE4. A correlation between the two variables was not present as determined by $r = 0.032$ as shown in Table 10. The model produced $F(1, 65) = .064$, $p = .802$ and, therefore, the model was not significant in predicting the student's PRE4 obstetrics and gynecological score (Table 11). The number of patients a paramedic encountered during a clinical rotation that had an obstetrics and gynecological complaint did not predict the score on the obstetrics and gynecological section of the PRE4 (*B* = .068, *p* = .802). As a result, there was not enough evidence to reject this null hypothesis.

Table 10

*Correlations, OB/GYN Score*

| | | PRE4 OB/Gyn Score | # of OB Patients |
|---|---|---|---|
| Pearson correlation | PRE4 OB/Gyn Score | 1.000 | .032 |
| | # of OB Patients | .032 | 1.000 |
| Sig. (2-tailed) | PRE4 OB/Gyn Score | . | .802 |
| | # of OB Patients | .802 | . |
| *N* | PRE4 OB/Gyn Score | 66 | 66 |
| | # of OB Patients | 66 | 66 |

Table 11

*Coefficients*[a], *OB/GYN* Score

| | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| Model | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 78.519 | 2.954 | | 26.584 | .000 | 72.618 | 84.419 |
| | # of OB Patients | .068 | .271 | .032 | .252 | .802 | -.473 | .610 |

*a.* Dependent Variable: PRE4 OB/Gyn Score

**Results for $H_0$5**

A bivariate linear regression was utilized to test Null Hypothesis Five which stated there was not a statistically significant predictive relationship between the number of pediatric patients a paramedic student encounters and their score on the pediatric section of the PRE4. A correlation between the two variables was not present as measured by *r* = -0.034 as shown in Table 12. The model produced *F*(1, 65) = .074, *p* = .786 and, therefore, the model was not significant in predicting the student's PRE4 airway score as listed in Table 13. The number of patients a paramedic encountered during a clinical rotation that had an airway complaint did not predict their score on the airway section of the PRE4 (*B* = -.027, *p* = .786). As a result, there was not enough evidence to reject this null hypothesis.

Table 12

*Correlations, Pediatric Score*

| | | PRE4 Pedi Score | # of Pediatric Patients |
|---|---|---|---|
| Pearson correlation | PRE4 Pedi Score | 1.000 | -.034 |
| | # of Pediatric Patients | -.034 | 1.000 |
| Sig. (2-tailed) | PRE4 Pedi Score | . | .786 |
| | # of Pediatric Patients | .786 | . |
| *N* | PRE4 Pedi Score | 66 | 66 |
| | # of Pediatric Patients | 66 | 66 |

Table 13

*Coefficients[a], Pediatric Score*

| | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| Model | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 68.010 | 3.790 | | 17.945 | .000 | 60.439 | 75.581 |
| | # of Pediatric Patients | -.027 | .098 | -.034 | -.273 | .786 | -.223 | .169 |

*a*. Dependent Variable: PRE4 Pedi Score

**Results for $H_06$**

A bivariate linear regression was utilized to test Null Hypothesis Six which stated there was not a statistically significant predictive relationship between the number of trauma patients a paramedic student encounters and their score on the trauma section of the PRE4. A correlation between the two variables was not present as determined by $r = 0.028$ as observed in Table 14. The model produced $F(1, 65) = .051$, $p = .822$ and, therefore, the model was not significant in predicting the student's PRE4 trauma score as demonstrated in Table 15. The number of patients a paramedic encountered during a clinical rotation that had a trauma complaint did not predict their score on the trauma section of the PRE4 ($B = -.021$, $p = .822$). As a result, there was not enough evidence to reject the final null hypothesis.

Table 14

*Correlations, Trauma Score*

| | | PRE4 Trauma Score | # of Trauma Patients |
|---|---|---|---|
| Pearson correlation | PRE4 Trauma Score | 1.000 | .028 |
| | # of Trauma Patients | .028 | 1.000 |
| Sig. (2-tailed) | PRE4 Trauma Score | . | .822 |
| | # of Trauma Patients | .822 | . |
| *N* | PRE4 Trauma Score | 66 | 66 |
| | # of Trauma Patients | 66 | 66 |

Table 15

*Coefficients[a], Trauma Score*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | 95.0% Confidence Interval for *B* | |
|---|---|---|---|---|---|---|---|---|
| | | *B* | Std. Error | Beta | *t* | Sig. | Lower Bound | Upper Bound |
| 1 | (Constant) | 69.708 | 3.944 | | 17.673 | .000 | 61.828 | 77.587 |
| | # of Trauma Patients | .021 | .093 | .028 | .226 | .822 | -.165 | .207 |

*a*. Dependent Variable: PRE4 Trauma Score

# CHAPTER FIVE: CONCLUSIONS

## Overview

This chapter discusses the findings of the data analyses that were performed on each of the variables and how they interact with other research findings. This chapter also examines the implications of the research conducted. The chapter concludes by reviewing the limitations of this research as well as providing recommendations for future research around the topic.

## Discussion

The purpose of this study was to determine if a relationship existed between the number of specific types of patient encounters a paramedic student has during their clinical experiences and how well they perform on the subsections of the Paramedic Readiness Exam 4 (PRE4). The criterion variables for this study were cardiac, medical, airway, trauma, obstetrics and gynecology, and pediatrics sub scores on the PRE4. The predictor variables for this study were the number of patients the student encountered during their clinicals who were experiencing either a cardiac, medical, airway, trauma, obstetrics and gynecology, or pediatric emergency.

This study's relevance is based on The Committee on Accreditation of Educational Programs for the EMS Professionals' requirement that paramedic programs throughout the United States must create minimum numbers of required patient contacts for their students during clinical rotations (CAAHEP, 2015; CoAEMSP, n.d.). The patient contacts paramedic students have during their clinical rotations must be documented in the *Student Minimum Competency Matrix* (CoAEMSP, n.d.).

Based on work by David Kolb and others concerning experiential learning theory (ELT), a relationship between clinical encounters and student exam performance might be assumed. However, this study produced findings contrary to that assumption. Furthermore, several researchers have suggested that further examination take place to consider the impact of students' clinical experiences and their performance on an exam (Kandiah, 2017; Stowell et al., 2015; Wongtongkam & Brewster, 2017). Despite the correlation found in previous studies, the present study failed to confirm those findings.

The population for this study included paramedic students who attended Blue Community College (a pseudonym) during the academic years 2015 to 2018 who utilized Field Internship Student Data Acquisition Project's (FISDAP) clinical tracker product as well as the PRE4. The sample size of 72 paramedic students was reduced to 66 because of missing or incomplete data. The study had a total of six research questions.

**Research Question One Findings**

The first research question of this study was, how well can the number of cardiac patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the cardiac section of the PRE4? A bivariate linear regression was utilized to test the null hypothesis; $r = 0.156$ and the model produced $F(1, 65) = 1.79$, $p = .186$. Therefore, the model was not significant in predicting the student's PRE4 cardiac score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

**Research Question Two Findings**

The second research question of this study was, how well can the number of medical patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the medical section of the PRE4? A bivariate linear regression was utilized to test the null hypothesis; $r = 0.219$ and the model produced $F(1, 65) = 3.22$, p = .077. Therefore, the model was not significant in predicting the student's PRE4 medical score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

**Research Question Three Findings**

The third research question of this study was, how well can the number of airway patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the airway section of the PRE4? A bivariate linear regression was utilized to test the null hypothesis; $r = 0.153$ and the model produced $F(1, 65) = 1.52$, $p = .222$. Therefore, the model was not significant in predicting the student's PRE4 airway score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

**Research Question Four Findings**

The fourth research question of this study was, how well can the number of obstetrics and gynecological patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the obstetrics and gynecological section of the PRE4? A bivariate linear regression was utilized to test the null hypothesis; $r = 0.032$ and the model produced $F(1, 65) = .064$, $p = .802$. Therefore, the model was not significant in predicting the student's PRE4 obstetrics and gynecological score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

**Research Question Five Findings**

The fifth research question of this study was, how well can the number of pediatric patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the pediatric section of the PRE4? A bivariate liner regression was utilized to test the null hypothesis; $r = -0.034$ and the model produced $F(1, 65) = .074$, $p = .786$. Therefore, the model was not significant in predicting the student's PRE4 airway score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

**Research Question Six Findings**

The sixth research question of this study was, how well can the number of trauma patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the trauma section of the PRE4. A bivariate linear regression was utilized to test the null hypothesis; $r = 0.028$ and the model produced $F(1, 65) = .051$, $p = .822$. Therefore, the model was not significant in predicting the student's PRE4 trauma score. Based on the findings for this research question there was not enough evidence to reject the null hypothesis.

## Implications

The implications of this study are significant as it contradicts previous works or assertions concerning the positive relationship between ELT and clinical rotations. This study's findings contradict Salzman et al.'s 2008 study, which demonstrated a correlation between student clinical experiences and passing the National Registry of Emergency Medical Technician (NREMT) cognitive exam as well as assertions made by emergency medical service educators (NAEMSE, 2013). It is important to note that despite no statistically significant correlations being found within this study, $H_0 2$ did result in a weak correlation where $r = 0.219$ and p = .077. However, the findings of this study should not limit clinical opportunities for paramedic students as there is more research that should be conducted.

Perhaps these findings suggest that quality (which was not measured in this study) is more important than quantity when it comes to clinical experiences. Kolb (1984) asserted that there is more to a student's involvement than simply experiencing something. Kolb and Kolb (2017) discuss the significance the instructor plays in making ELT a success. Others have emphasized quality over quantity (Dewey, 1938; Kolb 1974; Roberts, 2012).

## Limitations

A significant limitation of this study was the small sample size. While the sample size met the minimum requirement for a bivariate linear regression to be conducted, a larger sample size would have been preferable (Gall et al., 2007). Another limitation of this study was that the validity of the data was dependent on the accuracy of student reporting concerning their clinical encounters. Students could have inadvertently or purposefully skewed the number of patient encounters they had, and this might not have been noticed during program or student data audits. The sample for this study was across the span of academic years 2015 to 2018. While there were not any significant program changes or national changes that occurred during that timeframe there could have been confounding variables that were not controlled which could have impacted the data.

The PRE4 is not the only summative examination that could have been utilized as a criterion variable. Therefore, the results of this study are limited to the PRE4 and not other possible summative exams, specifically the NREMT's cognitive paramedic exam. Another limitation of this study is that the data was collected from one initial education paramedic program. It is possible that other programs, located in other geographic regions, with different clinical opportunities for students to experience, could yield different results.

## Recommendations for Future Research

Based on the research and findings of this study there are several recommendations for future research concerning ELT and emergency medical services (EMS) education. Some of the recommendations for future research are discussed below. The first would be to conduct a similar study utilizing a larger and broader student population. The second recommendation for future research is for this study to be replicated at the local level for other programs that utilize FISDAP and the PRE4 to determine if a predictive relationship is present. If one is found, then the results should be utilized to produce the program minimums for student contacts under the *Student Competency Matrix*. The third recommendation for future research is to develop and execute studies concerning the quality versus quantity of clinical experiences for students in allied health fields. The last recommendation for future research is that a study should be conducted to determine if there is a statistical difference between students that attend an on-campus cohort as compared to students who attend an off-campus cohort.

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# APPENDIX A

## Liberty University IRB Approval

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

March 18, 2021

James Mitchell
Shanna Akers, Scott Watson

Re: IRB Exemption - IRB-FY20-21-453 The Predictive Relationship Between Paramedic Student Clinical Encounters and Performance on the PRE4

Dear James Mitchell, Shanna Akers, Scott Watson:

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

Category 4. Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:

(i) The identifiable private information or identifiable biospecimens are publicly available;

(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;

(iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or

(iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

**G. Michele Baker, MA, CIP**
*Administrative Chair of Institutional Research*
**Research Ethics Office**

## APPENDIX B

### Data Use Agreement with BCC

[redacted]

June 28, 2021

Dear James Mitchell,

I grant you permission to gather and use the data following the guidelines you stated below and all requirements in the Liberty University School of Education to maintain the privacy of former and current [redacted] students.

> As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctor of Philosophy degree. The title of my research project is The Predictive Relationship Between Paramedic Student Clinical Encounters and Performance on the PRE4 and the purpose of my research is to assess for the presence of a predictive relationship between paramedic student patient encounters and their scores on the subsections of the PRE4.
>
> I am writing to request your permission to access and utilize data obtained from [redacted] paramedic program which is documented in the Field Internship Data Acquisition Project (FISDAP). All student identifier would be removed from the data and the institution's name would not be published.
>
> The data will be used to answer the following research questions.
>
> **RQ1**: How well can the number of cardiac patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the cardiac section of the PRE4?
> **RQ2**: How well can the number of medical patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the medical section of the PRE4?
> **RQ3**: How well can the number of airway patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the airway section of the PRE4?
> **RQ4**: How well can the number of obstetrics and gynecological patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the obstetrics and gynecological section of the PRE4?
> **RQ5**: How well can the number of pediatric patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the pediatric section of the PRE4?
> **RQ6**: How well can the number of trauma patients a paramedic student encounters in a clinical setting during their initial training predict their performance on the trauma section of the PRE4?

Sincerely,

[redacted]

Vice President and Chief Academic Officer

[redacted]

[redacted]