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Abstract

Purpose: This study was a non-experimental evaluative study designed to identify the effects of instructor-to-student ratios, academic preparation, and selective admissions processes on retention rates among CAAHEP accredited paramedic training programs in the United States. **Methods:** Self-reported data from accredited program directors was analyzed to identify what relationships, if any, existed among the variables. **Results:** Results showed no effect of instructor-to-student ratios or academic preparation on retention rates. However, those programs that utilized selective admissions processes reported a statistically significantly higher student retention rate when compared to those that did not. **Conclusions:** Paramedic programs seeking to improve retention rates should consider utilizing a selective admissions process.

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ABSTRACT

Purpose: This study was a non-experimental evaluative study designed to identify the effects of instructor-to-student ratios, academic preparation, and selective admissions processes on retention rates among CAAHEP accredited paramedic training programs in the United States. **Methods:** Self-reported data from accredited program directors was analyzed to identify what relationships, if any, existed among the variables. **Results:** Results showed no effect of instructor-to-student ratios or academic preparation on retention rates. However, those programs that utilized selective admissions processes reported a statistically significantly higher student retention rate when compared to those that did not. **Conclusions:** Paramedic programs seeking to improve retention rates should consider utilizing a selective admissions process.

Keywords: retention, instructor-to-student ratios, selective admissions, academic preparation, paramedic

INTRODUCTION

Student retention is seen as a measure of program quality by institutional administrators, external accreditors, and prospective students. Students who enter into an educational program, particularly those leading to third-party credentials, often do so in an effort to increase their employability skills, change career fields, or gain the knowledge and certification necessary to secure advancement opportunities in their current field. There are multiple variables that students take into consideration when looking for training programs including retention and attrition rates of the institution, particularly in medical profession programs.^{1,2} While not the only indicator of a program's quality, prospective students and employers view retention rates as suggestive of future individual student likelihood of program completion. No one wants to enroll into a program which they do not have a reasonable expectation of completing.

Paramedic programs in the United States are accredited through the Commission on Accreditation of Allied Health Education Programs (CAAHEP). The Committee on Accreditation of Educational Programs for the Emergency Medical Services Professions (CoAEMSP) is the committee charged with making accreditation recommendations to CAAHEP regarding paramedic training programs. The committee evaluates programmatic outcomes annually and conducts site visits every five years to determine program compliance with CAAHEP standards. Programmatic retention is one measure which the committee reviews to determine program quality. Each year, accredited programs must report retention rates, among other outcomes, to the committee for review. The current threshold for retention is 70%. Accredited paramedic training programs must meet this threshold in order to maintain accreditation. Those programs falling below the threshold for a three-year period risk being placed on probationary accreditation while they work to improve those rates. There are several recommendations for ways to improve retention rates among these programs.³ However, a review of the literature regarding retention rates in allied health programs was conducted through Ebsco Host Education FullText, Science Direct, Research Gate, the Journal of Allied Health Education, the Internet Journal of Allied Health Sciences and Practice, and the ProQuest Education Database, using the key terms "retention rates" and "paramedic programs" revealed that no research exists, specific to paramedic programs, that identifies what, if any, variables have an impact on retention in these particular allied health programs. Identifying relationships between these variables can prove beneficial, particularly in training programs within the health professions.⁴ This study was designed to begin developing foundational research from which accredited paramedic program directors, and those pursuing accreditation, can make informed decisions about their efforts to enhance student retention rates.

REVIEW OF THE LITERATURE

There are several variables that have been shown to affect student retention in programs of study. Of particular interest to this present study are the variables instructor-to-student ratio, required academic preparation, and selective admissions processes because, unlike variables such as socio-economic status, these are variables that can be appropriately controlled by the educational institution.

Instructor-to-Student Ratio

Class size has been shown to have a significant effect on retention.^{4,5} Smaller classes result in smaller instructor-to-student ratios which increase interaction among students the faculty members. These increased opportunities for interactions are integral to the development of a sense of connection within the group.⁶⁻¹⁰ That sense of connection with the institution, faculty, and other students is a significant predictor of student satisfaction and retention.¹¹⁻¹⁷ These interactions also allow students to build a social network within the course which has been shown to have positive effects on student retention.¹⁸ In a 2015 study, Verdinelli and Kutner found that a student's development of community and interaction with that community was a significant variable in their desire to stay in the course.¹⁹ Conversely, the less opportunity a student has to develop a sense of connection within the class, the more likely they are to become frustrated with the course and withdraw.²⁰ While this variable has been explored at length in higher education, there are very few studies exploring the effect this variable has on retention in allied health training programs and no studies related to its effect on retention in paramedic training programs.^{4,5}

Academic Preparation

The quality of an applicant's performance in prerequisite coursework has often been associated with academic success in subsequent related coursework.²¹⁻²⁴ In addition to their association with success in subsequent course work, prerequisite courses have been shown to negatively affect withdrawal rates by helping applicants feel more prepared for subsequent coursework.^{25,26} The quality of performance in prerequisite coursework is also considered as a predictor of retention. A review of the literature related to prerequisite coursework in allied health programs suggests that those applicants who have shown an academic aptitude in particular subject matter (usually the sciences) will perform well and are more likely to successfully complete medical profession training programs.^{27,28} Currently there is no standard practice among paramedic programs to require prerequisite coursework for students, beyond mere completion of college-level English and math and a basic anatomy & physiology course. With regard to paramedic programs, prescribing prerequisite coursework (beyond the standard English, math, and A&P described earlier) as a

gateway to entry has been identified as one of many strategies utilized by programs that are considered to be “high-performing.”²⁹ However, there is also evidence to suggest that there is no difference in the attrition rates of allied health programs that do and those that do not prescribe prerequisite coursework.³⁰

Selective Admission

For the purposes of this study, the term “selective admission” refers to processes in which applicants are evaluated then scored or ranked. These scores or rankings are then used to selectively admit applicants to the educational program. These selective admission processes have been shown to be significant predictors of retention in other allied health programs.⁵ The scoring metrics for these processes vary by program. However, those programs that do employ selective admission processes have historically evaluated at least one, if not more of the following variables: an applicant’s prior academic performance, scores on standardized tests, and performance during oral interviews.^{31,32} Some health care programs also consider an applicant’s years of experience in the field as part of their admission process.²⁸

Previous Academic Performance

Previous academic performance in high school or in related coursework is often viewed as a predictor of applicant success in health-related education programs. Several studies have shown that GPA rankings from high school or previous college work (particularly in the sciences) are often seen as reliable predictors of success in the health professions such as nursing, physician assistant, and medical school.³³⁻³⁶ However, another recent study found no significant relationships between an applicant’s prior high school or science coursework and their success on health care licensure exams.³⁷ With regard to emergency medical services, academic performance in high school has been correlated to higher first-time pass rates on the National Registry of EMTs written exam.³⁸

Standardized Tests

The use of standardized tests as a predictor of success in health professions is common. Perhaps the most well-known health-related pre-admission test is the Medical College Admission Test (MCAT), which has often been seen as a valuable predictor of success in medical school.³⁴ One particular study found the use of standardized testing a significant predictor of overall success in baccalaureate level nursing programs.³⁹ In addition, standardized tests as a requirement for preadmission have also been shown to be associated with improved performance in allied health programs.⁴⁰

Interviews

The use of admissions interviews has been shown to be moderately predictive of applicant success in allied health education programs.⁴¹ Other studies have found that attrition rates are only slightly decreased in those programs that utilize admissions interviews, but that these interviews should be individual and, even then, do not have a large impact on drop-out rates.⁴² In sum, due to the need of interviewer training and reliable evaluation metrics, the effectiveness of interviews is questionable with regard to identifying successful applicants for health profession programs.^{31,35}

Years of Experience

There is some research to suggest that previous experience, particularly in the clinical setting, can be predictive of success in health education programs.³³ However, there is little research available regarding the effect of years of experience on performance in paramedic training programs. A 2009 qualitative study interviewed program directors from twelve paramedic programs deemed to be “high-performing” and found that there was disagreement as to whether previous experience in the field was indicative of success in Paramedic training.²⁹

METHODOLOGY

This study was a non-experimental evaluative study designed to answer several questions:

1. Is there a relationship between instructor-to-student ratio and retention rates in accredited Paramedic programs?
2. Is there a statistically significant difference in retention rates between programs that do and programs that do not require prerequisite coursework prior to matriculation into a cohort?
3. Is there a statistically significant difference in retention rates between programs that do and programs that do not utilize a selective admissions process for cohort applicants?

Participants for this study were drawn from program directors of CAAHEP accredited paramedic programs in the United States. As of June 2020, there were 642 accredited paramedic training programs in the United States. These programs must submit an annual report each year on various outcomes metrics. A formal request was made to the CoAEMSP for email addresses for directors of accredited programs. Program directors were sent a ten-question survey via Survey Monkey. The survey was divided

into three subsections. The first subsection recorded instructor-to-student ratios for cohorts. The second subsection asked participants to note if pre-requisite coursework was required for applicants to cohorts. If pre-requisite coursework was required, participants were then asked to identify what pre-requisite coursework was required of applicants. The third subsection asked if the program utilized a selective admissions process for applicants to cohorts. If a selective admissions process was utilized, participants were then asked to identify the criteria used in the admissions process and rank the criteria based on weight in the admissions process.

ANALYSIS AND RESULTS

The data collected from the program director surveys was analyzed using SPSS to test for relationships between instructor-to-student ratios and retention rate. The author then analyzed responses from the program director survey subsets with regard to prerequisite coursework and selective admissions to compared them with respondent self-reported retention rates to identify any significant relationships in the data.

Demographics and Screening

The program director survey was sent to 642 program directors via email. Of those contacted, 288 agreed to participate in the study. Incomplete responses were removed from the data. This left 268 responses in the dataset. The survey asked program directors to self-report their cohort size and their program retention rate. The median self-reported cohort size among the participants was 18 (IQR = 8.641), with a minimum of 3 and a maximum of 30. The mode of the self-reported cohort size sample was 12. The media self-reported retention rate was 84% (IQR = .149), with a minimum of 8% and a maximum of 100%.

Instructor-to-student Ratio

The author used self-reported instructor-to-student ratio data and self-reported retention rates from Program Directors to evaluate if these ratios were related to retention rate. Table 1 shows the frequency of instructor-to-student ratio responses.

Table 1. Frequency of Instructor-to-Student Ratios.

Instructor-to-Student Ratio	<i>N</i>	%
1:1	9	3.2%
1:2	23	8.6%
1:3	28	10.5%
1:4	90	33.7%
1:5	12	4.5%
1:6	29	10.9%
1:7	5	1.9%
1:8	38	14.2%
1:9	1	0.4%
1:10	17	6.4%
1:11	0	0.0%
1:12	4	1.5%
1:13	0	0.0%
1:14	0	0.0%
1:15	5	1.9%
1:16	1	0.4%
1:17	0	0.0%
1:18	0	0.0%
1:19	0	0.0%
1:20	3	1.1%
1:21	0	0.0%
1:22	0	0.0%
1:23	0	0.0%
1:24	1	0.4%
1:25	1	0.4%

The author converted each instructor-to-student ratio into a numerical score based on the number of students in the selected ratio (i.e., 1:10 = 10). A scatter plot was then analyzed with instructor-to-student ratio as the independent variable and retention rate as the dependent variable. Inspection of the scatterplot revealed no linear relationship between the variables; however, the data points were monotonic. Therefore, a Spearman's rank-order correlation was run to assess the relationship between instructor-to-student ratio and retention rate. Table 2 shows the results of the Spearman's rank-order correlation. There was no statistically significant correlation between instructor-to-student ratio and retention rate, $r_s(265) = -.024$, $p = .693$.

Table 2. Spearman's Rank-order Correlation between Instructor-to-Student Ratio and Retention Rate.

Variable	Correlation	Instructor-to-Student Ratio	Retention Rate
Instructor-to-Student Ratio	Correlation Coefficient	1.00	-0.24
	Sig. (2-tailed)		.693
	N	267	267
Retention Rate	Correlation Coefficient (2-tailed)	-0.24	1.00
		.693	
	N	267	267

Prerequisite Coursework

The author assigned each program to a group based on the program director's response to whether they did or did not require prerequisite course work for applicants. There were 170 programs that indicated they require pre-requisite coursework and 98 that indicated they did not require pre-requisite course work. Using SPSS, the author ran a Non-parametric K Independent Samples median test to analyze differences in median retention rates among the two groups. The median retention rate for the group that did require prerequisite coursework was 83% (IQR = 15%) while the median retention rate for the group that did not require prerequisite coursework was 85% (IQR = 15%). Median retention rates were not statistically significantly different between the two groups, $p = .603$.

Selective Admission

The authors assigned each program to a group based on the program director's response to whether they did or did not utilize a selective admission process for applicant selection. There were 185 programs that indicated they use a selective admissions process and 83 that indicated they did not. The Non-parametric K Independent Samples median test was used to analyze differences in median retention rates among the two groups. The median retention rate for the group that did utilize a selective admissions process was 85% (IQR = 14%) while the median retention rate for the group that did not require prerequisite coursework was 80% (IQR = 20%). A statistically significant difference existed with regard to median retention rates between the two groups, $p = .023$, with the selective admissions group reporting a higher median retention rate than the group that did not use selective admissions.

Those respondents that did utilize a selective admission process were asked to describe the various components that are part of the selective admissions process. Table 3 shows the frequency of responses for each criterion. Oral Interviews, Standardized Test Scores, and Years of Experience were the most frequently utilized criteria in selective admissions processes.

Table 3. Frequency of Selective Admissions Criteria.

Criteria	N
Oral Interviews	115
Standardized Test Scores	111
Years of Experience	101
Science GPA	66
High School GPA	51
Entrance Exams	31
Letters of Reference	14
Overall College GPA	11
Application Essay	5

DISCUSSION

The median cohort size from the self-reported survey data was 18 students per cohort. The most frequent instructor-to-student ratio was 1:4 (33%) followed by 1:8 (14%). There were no statistically significant correlations between instructor-to-student ratios and retention rate.

No statistically significant difference in retention rate was noted between programs that prescribed prerequisite coursework and those that did not. This finding is different from those of other studies.^{25, 26} While this finding may lead one to think that prescribing prerequisite coursework may not be important, some of the same prerequisite criteria were included in the reported selective admissions processes such as performance in science and general education courses. While the findings with regard to prerequisite coursework do not show independent correlation to retention rates, prerequisite coursework may be contributory to the relationship between selective admissions and retention rates. In other words, prescribing a set of prerequisite courses or coursework for applicants may contribute to selecting applicant who may be more likely to persist in the course of study. A statistically significant difference was noted in median retention rates between those programs that did use selective admissions and those that did not, which corroborated previous research.⁵

The most frequent criteria utilized in selective admissions processes were oral interviews, scores on standardized tests (i.e., ACT WorkKeys, college placement tests, SAT, etc.), and years of experience in the field. The large frequency of these criteria in selective admissions processes among paramedic programs corresponds to best practices identified by other studies in the medical and allied health education professions.^{33,35,39,40} The programs that utilized these selective admissions processes did show a higher retention rate. It could be that these criteria correlate to students who are prepared for the rigors of an allied health education profession, and therefore, are more likely to persist in their course of study.

Limitations

This study focused primarily on pre-enrollment variables and subsequent effects on retention rates in paramedic training programs. It did not evaluate the effect of various teaching methodologies that can also impact retention rates such as learning modalities, tutoring services, or lecture modalities. Research into this effect would certainly be an area of interest for further study, as there is currently a lack of published information with regard to effects of these variables on retention in paramedic education programs.

This study was dependent upon self-reported data. A key assumption was that program directors were truthful in their reporting. Anonymity was maintained with regard to responses in an effort to limit the effects of this limitation. However, self-reported data inherently carries the risk of human error. Something as simple as inadvertent key strokes or translation of numbers can result in errors in the data.

As an initial study of the variables, this study did not analyze the data with regard to attrition nor did it explore variables related to attrition. Attrition is integrally linked with retention and is worthy of exploration in future studies to see how these variables relate to academic attrition from programs. This study did not disaggregate the data between certain demographic features of paramedic programs such as degree vs. certificate programs or hybrid vs. face-to-face delivery. Degree programs tend to be longer and more sequential for students, creating other unique considerations for student retention. Certificate programs are typically shorter in length and may offer the paramedic education content in larger portions in fewer classes, which may have effect on retention rates. Delivery modality (hybrid vs. face-to-face) also brings unique considerations with regard to retention. Similar to the degree vs. certificate demographic, hybrid programs tend to allow for more flexibility with student's schedules which could affect retention rates. An interesting area for further study would to replicate this study and disaggregate the data in order to compare findings between degree and certificate programs as well as by program modality.

CONCLUSIONS

This study was the first of its kind with regard to paramedic education programs in the United States. This was a non-experimental study designed to answer several questions:

1. Is there a relationship between cohort size and retention rates in accredited Paramedic programs?
2. Is there a statistically significant difference in retention rates between programs that do and programs that do not require prerequisite coursework prior to matriculation into a cohort?
3. Is there a statistically significant difference in retention rates between programs that do and programs that do not utilize a selective admissions process for cohort applicants?

The results of this study found no statistically significant relationships between instructor-to-student ratios and retention rates among the sample. No statistically significant differences were found in retention rates between programs that did and those that

did not require pre-requisite coursework for admissions. However, a statistically significant difference was found between the retention rate of programs that did utilize selective admissions and those that did not, with the group that used selective admissions reporting a higher median retention rate. The tests used for this analysis only identify the presence of non-predictive relationships and correlations. Correlation does not equal causation and there may be other unidentified variables affecting Paramedic student retention. However, this study does begin to move the research forward by beginning the exploration of certain variables, which will hopefully lead future researchers to identify additional variables and begin exploring predictive relationships.

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