Effect of Paramedic Student Internship on Performance on the National Registry Written Exam

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Abstract

Background. Paramedic students are exposed to numerous patient contacts during their required internship experience. There is no current research examining paramedic student internship experience in relation to performance on the written portion of the National Registry Exam (NRE-W). **Methods.** A retrospective review from 2001 to 2006 of student records from FISDAP™ was completed. Three hundred ninety-six students met the inclusion criteria: 1) graduate of a paramedic program, 2) consent to access data, 3) internship data previously verified, and 4) NRE-W results available. Pearson correlation coefficients were used to determine if the number of advanced life support (ALS) runs (run with an IV and ECG, or one medication administered), hospital patient contacts (PCs), field PCs, total PCs (hospital PCs + field PCs), student team lead runs (TLs), in-hospital clinical hours, field internship hours, or total hours (in-hospital clinical hours + field internship hours) were associated with passing the NRE-W. Logistic regression was used to determine predictors of success on the NRE-W. **Results.** The number of ALS runs and total PCs were the only variables associated with passing the NRE-W ($p = 0.003$, 95% CI 0.05–0.24; $p = 0.047$, 95% CI = 0.00–0.20, respectively). These variables were also predictors for passing the NRE-W (OR = 1.015, 95% CI 1.005–1.025; OR = 1.003, 95% CI 1.000–1.006, respectively). **Conclusions.** In this sample, the number of ALS runs students completed was the strongest clinical and field internship predictor of passing the NRE-W. The number of ALS runs and total PCs paramedic students complete need to be evaluated by paramedic programs.

Key words: paramedic; internship; education; National Registry Exam

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Introduction

In most states, paramedic students must pass the National Registry Exam (NRE), administered by the National Registry of Emergency Medical Technicians (NREMT), to become licensed to practice as an entry-level provider. The exam has recently switched to a computer-based testing format for the written portion (formerly a pencil-and-paper multiple-choice section). The second portion of the exam, a scenario-based practical skills (psychomotor) section, continues to be administered in conjunction with the written portion of the exam. Paramedic programs across the country prepare students for this exam in similar educational formats. In addition to the didactic portion of their education, paramedic students are required to complete a clinical internship. The National Standard Curriculum for Paramedics (NSC-P), developed by the National Highway Traffic Safety Administration (NHTSA), includes clinical skill recommendations for students to complete prior to graduation.[1] The specific tasks and recommended goals for each category can be found in Table 1. These recommendations are intended to guide paramedic programs to properly prepare students for entry-level employment, and to assist students in passing both portions of the National Registry Exam, as the NCS-P is used as a guide for the development of test questions on the NRE.[2]

Identifying ways to increase a student's likelihood of passing the NRE, both written and practical, is of great interest to paramedic instructors. It is intuitive to believe clinical internship experiences directly impact a student's performance on the practical portion of the NRE, as the scenario-based format of the NRE-P that is intended to mimic real-world patient care. Of equal interest to paramedic instructors is the relationship between the completion of clinical internship variables and student performance on the written portion of the NRE. The NSC-P recommendations provide a structure around which many paramedic programs design the clinical internship requirements.[3] There are no data linking the completion of any of these requirements to increased success on the written portion of the NRE. We examined eight clinical internship experience variables to identify which, if any, appeared to impact performance on the written portion of the NRE-W.

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An abstract of this paper was presented at the 2006 National Association of Emergency Medical Services Educators Conference in Pittsburgh, Pennsylvania (September 7–9, 2006).

DP was an original developer of the FISDAP database and continues to serve as a paid consultant for content development.

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TABLE 1. National Curriculum Standards—Paramedic Recommended Tasks for Field Internship

Psychomotor Skills	Complaints
• Medication administration to live patients 15 times	• Perform a comprehensive patient assessment, formulate, and implement a treatment plan on 20 adult patients with dyspnea
• Successful endotracheal intubations on live patients 5 times	• Perform a comprehensive patient assessment, formulate, and implement a treatment plan on 8 pediatric patients with dyspnea
• Successful intravenous access 25 times in live patients	• Perform a comprehensive patient assessment, formulate, and implement a treatment plan on 10 patients with syncope
• Ventilate 20 unintubated live patients in various age groups	• Perform a comprehensive patient assessment, formulate, and implement a treatment plan on 20 patients with abdominal complaints
Ages	• Perform a comprehensive patient assessment, formulate, and implement a treatment plan on 20 patients with altered mental status
• Perform a comprehensive patient assessment on 30 pediatric patients	
• Perform a comprehensive patient assessment on 50 adult patients	
• Perform a comprehensive patient assessment on 30 geriatric patients	
Pathologies	Team Leader Skills
• Perform a comprehensive patient assessment on 10 obstetric patients	• Serve as the team leader for at least 50 prehospital emergency responses
• Perform a comprehensive patient assessment on 40 trauma patients	
• Perform a comprehensive patient assessment on 20 psychiatric patients	

METHODS

This study was designed as a retrospective review of prospectively collected clinical internship data from the Field Internship Student Data Acquisition Project (FISDAP™) database. FISDAP™, developed in 1999, is a national database used by paramedic programs to track paramedic student clinical internship experience. The methods for data collection have been previously described.[4,5] Briefly, paramedic students create a user account within the database and are given the opportunity to provide consent for their deidentified data to be used for research purposes. Students and instructors can schedule and track clinical internship experiences using the administrative component of the software. Students also have the ability to enter individual clinical experiences that coincide with the five categories of the NSC recommendations. The data entered by students are verified for accuracy by paramedic preceptors and program instructors prior to research use.

This project was reviewed and approved by the institutional review board at Inver Hills Community College, the entity that oversees the prospective collection of data into FISDAP™. Three hundred ninety-six student records from 24 programs between 2001 and 2006 met the following inclusion criteria and were abstracted from the database: 1) graduate of a paramedic program, 2) consent to access data, 3) internship data previously verified by student preceptors and clinical instructors, and 4) NRE-W results available. All of the students included in this sample completed the paper-and-pencil test. Descriptive statistics, reported by NRE-W performance as well as the overall statistic, were complied for the following variables: number of advanced life support (ALS) runs (defined as a run with an IV and ECG, or one medication administered other than oxygen), hospital patient contacts (PCs), field PCs, total PCs (hospital PCs + field PCs), runs where the student served as team lead (TLs), in-hospital clinical hours, field internship hours, and total hours (in-hospital clinical hours + field internship hours) (Table 2). Pearson correlation coefficients were used to determine if an association existed between the above-mentioned variables and student performance on the NRE-W. Following the identification of variables that were associated with passing the NRE-W, logistic regression models were used to determine if these variables were predictors of success on the NRE-W.

RESULTS

Results from the descriptive analysis for each variable are seen in Table 2. Of the eight clinical internship variables examined, only the number of ALS runs and total PCs students completed were associated with passing the NRE-W (95% CI 0.05–0.24, $p = 0.003$; 95% CI = 0.00–0.20, $p = 0.047$, respectively), with the number of ALS runs indicating the strongest association. Using logistic regression models, these two variables were also identified as predictors for passing the NRE-W ($p = 0.004$ and

TABLE 2. Descriptive Statistics of Internship Variables by NRE-W Performance

Variable	NRE-W Outcome	N	Mean ± SD
Advanced life support runs	Fail	59	35.9 ± 24.5
	Pass	337	49.1 ± 32.8
	Total	396	47.1 ± 32.0
Field patient contacts	Fail	59	105 ± 75.5
	Pass	337	125 ± 87.3
	Total	396	122.1 ± 85.8
In-hospital patient contacts	Fail	55	131.9 ± 50.2
	Pass	311	139.5 ± 65.8
	Total	366	138.4 ± 63.7
Total patient contacts	Fail	55	230.7 ± 85.4
	Pass	311	261.2 ± 107.9
	Total	366	256.6 ± 105.2
Team leads	Fail	59	75 ± 61.6
	Pass	334	91.5 ± 74.5
	Total	393	89.0 ± 72.9
Field hours	Fail	59	370.4 ± 233.2
	Pass	330	446.4 ± 328.4
	Total	389	434.8 ± 316.8
In-hospital hours	Fail	56	215.0 ± 81.2
	Pass	307	221.6 ± 99.7
	Total	363	220.6 ± 97.0
Total hours	Fail	55	554.3 ± 197.2
	Pass	292	584.4 ± 208.1
	Total	347	579.6 ± 206.4

0.048, respectively). Students who completed 47 ALS runs, the average number completed by our sample, had approximately an 86% chance of passing the NRE-W (Fig. 1). Similarly, students who completed the average number of 257 total PCs had an 85% chance of passing the NRE-W (Fig. 2). None of the hour-based variables (field hours, in-hospital hours, or total hours) were associated or predictive of passing the NRE-W.

DISCUSSION

A paramedic instructor's job is to prepare students to function as employable, entry-level paramedics. In most states, the largest hurdle to achieving that goal for students is passing the NRE. The design of a paramedic program, both the clinical and didactic portions, plays an important role in a student's success on this exam.[6] The clinical internship phase may be the most difficult component to design and evaluate for its impact on a paramedic student. The inability to predict the types of skills a student will perform during a ride-along or hospital rotation, what to do when a student does not complete a certain skill during their internship, and how to determine when a student has achieved the necessary skills in the clinical internship to end this part of their program are a few of the challenges faced by program directors and instructors.

Our results show the importance of actual interactions with patients, particularly patients who were treated at the ALS level, as it relates to success on the National Registry Exam. As intuitive as this finding may seem, this is the first study to empirically show the importance of patient interaction as it relates to performance on the NRE. It is also the first study to suggest the number of hours a student spends in their clinical internship may not be associated with or predictive of success on the NRE-W. Program directors and instructors can translate this information into practice by finding ways to increase student-patient interactions, particularly ALS interactions, and spend less time concentrating on setting an hour requirement for students to complete prior to graduation. Due to the short amount of time allotted in a paramedic program for the clinical internship component, maximizing patient interactions can decrease the actual hours spent in that clinical internship phase. This information may also be useful as a way to examine a student's progress within their clinical internship phase and modify rotations if they appear to have a high number of hours, but a low number of patient interactions. We recognize the difficulty programs face in finding opportunities for students to complete their clinical internship rotations.

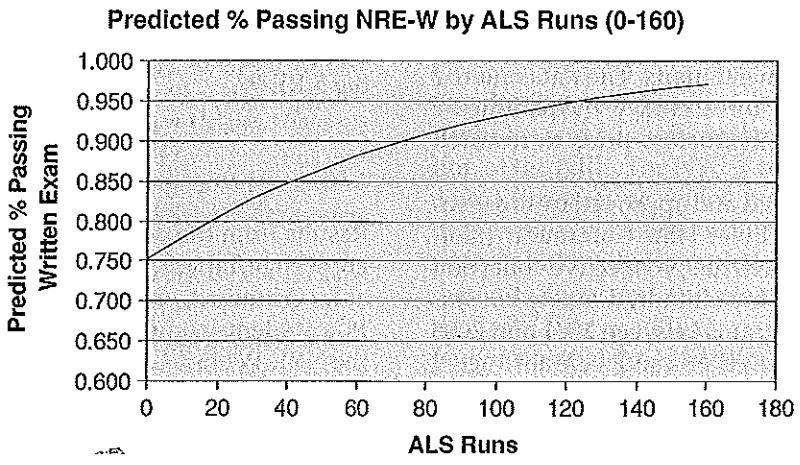

FIGURE 1. Model for predicting passing the National Registry Exam (NRE-W) according to advanced life support (ALS) runs.

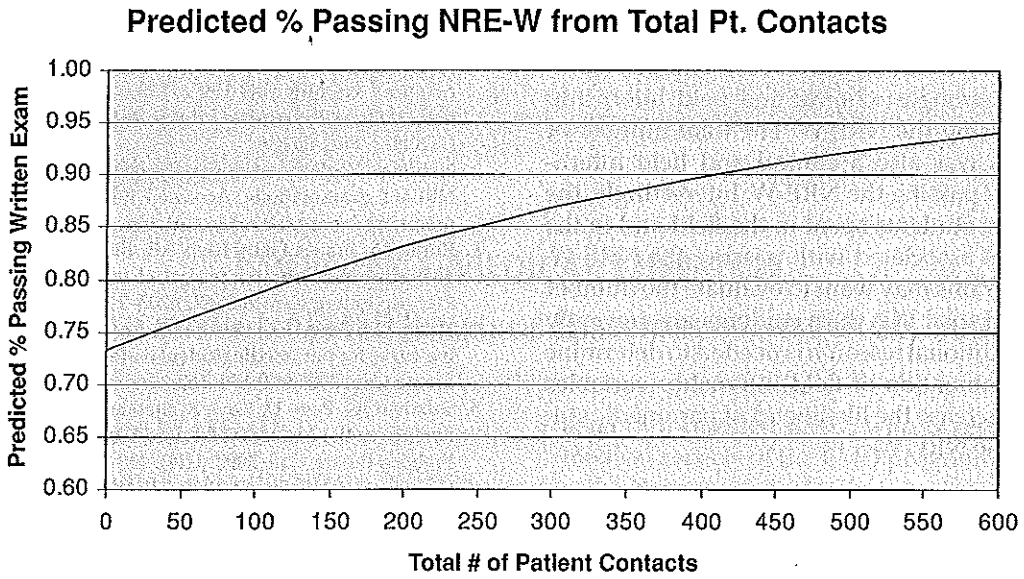

FIGURE 2. Predictive model of passing the National Registry Exam (NRE-W) according to total number of patient contacts.

We also recognize the fact that emergency medical services (EMS) is not a predicable world, and there will be times when a clinical rotation results in hours without many patient interactions. The creativity of program directors can shift attention to less traditional venues for clinical internships, including urgent care facilities or EMS systems outside of a program's geographic location.

The results from this study may also be used to assist in establishing general endpoints for a student's clinical internship. It is important to caution against using this model as the sole predictor of success, as there are other factors that have an impact on NRE-W success (i.e., program accreditation, etc.). However, in combination with other quality-improvement efforts, programs may choose to utilize regression models to establish numeric values for the number of ALS runs or PCs they would like students to complete based on an acceptable probability of passing the NRE-W. These models are individual and will vary by program. Once validated internally, they may serve to give students a more concrete number to work toward and programs would have a way to evaluate student progress within their clinical internship.

There were limitations to our study, primarily the use of an administrative database and the definition of ALS runs we used. We believe the possibility for errors in the administrative database has been decreased by the verification requirement built into the system, where the paramedic preceptors and program instructors double-check entered data for accuracy against the student's run report and the preceptor's recollection of the run. Only after this has been completed are records flagged as good data and used for research purposes. We also believe our definition of an ALS run as a run with an IV and ECG, or one medication administered other than oxygen, is reasonable and allows for quantification of an qualitative concept. One may also question why we did not compare the pass rate of the practical section of the NRE to the NSC-P recommendations. The percentage of students who take and pass the practical portion of the NRE is very high. In addition to adequate preparation by the student to pass the exam on the first attempt, the ability to retake failed sections of the practical exam the same day is likely a significant factor impacting the high pass rate. Only the second attempt result (pass/fail) is reported to the NREMT as the score on the practical portion of the exam. It is misleading to interpret the reported practical pass rate as a first-time pass. Due to the very small sample size of students reporting a fail on the practical portion, the results of this analysis would not be meaningful to paramedic programs or instructors.

Future areas for research in paramedic education are plentiful. In relation to this project, validation of our results prior to extensive use in paramedic programs is important. Developing a regression model that combines several clinical internship variables and results in an "odds calculator" for passing the NRE-W would also be valuable. This would enable programs to enter their standards for clinical internship variables that significantly impact passing the NRE-W and obtain a percentage of students that should pass the NRE-W. The value lies in the program's ability to modify their program design to maximize the number of students passing the NRE-W.

CONCLUSIONS

In this sample, the number of ALS runs students completed was the strongest clinical and field internship predictor of passing the NRE-W. The total number of patient contacts was also a clinical and field internship predictor of passing the NRE-W. Interestingly, the number of hours students spent in the field and in the hospital was not associated with passing the NRE-W. Paramedic programs may want to evaluate the number of ALS runs and total PCs their students are currently completing. Additional research is needed to determine if a specific combination of field internship variables exists that can increase the likelihood of paramedic students passing the NRE-W.

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