



U.S. Department of Transportation  
**National Highway Traffic Safety  
Administration**



DOT HS 810 577

April 2006

## National Reregistration and the Continuing Competence of EMT-Paramedics



1. Report No. DOT HS 810 577	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle  National Reregistration and the Continuing Competence of EMT-Paramedics		5. Report Date  April 2006	
		6. Performing Organization Code	
7. Author(s) Keith Holtermann, Dr.P.H.; Jean Johnson, Ph.D.; Roger White * , M.D.; Bonnie LaFleur, Ph.D.; William Brown, M.S.; Robert Wagner*, M.S.; Gregg Margolis*, M.S.; Mary Beth Michos*, M.S.; Gina Lohr, M.F.S.		8. Performing Organization Report No.	
9. Performing Organization Name and Address The George Washington University School of Medicine and Health Sciences 900 23 <sup>rd</sup> St., NW., 6 <sup>th</sup> Floor , Washington, DC 20037		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTNH22-00-H-05230	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Program Development and Delivery Office of Research and Technology Washington, DC 20590		13. Type of Report and Period Covered Final report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Patti-Ellison Potter, Ph.D., and Paul J. Tremont, Ph.D., were Contracting Officer's Technical Representatives for this project. *These authors are affiliated with the National Registry of Emergency Medical Technicians.			
16. Abstract <b>Objective:</b> To determine if a difference exists in the continued cognitive competence of Nationally Registered Emergency Medical Technician Paramedics (NREMT-P) who voluntarily reregistered with the NREMT (a national non-profit corporation that provides a uniform process to assess the knowledge and skills required for competent practice by EMS professionals), versus those who did not reregister since their original certification. <b>Methods:</b> NREMT-Ps who voluntarily reregistered and those who did not were contacted by mail and requested to complete a multiple-choice online survey. The questionnaire consisted of a standardized exam similar to their initial certification test, an achievement test, and a demographic questionnaire. The responses from cohorts of NREMT-Ps initially certified 2, 4, and 6 years ago were compared. <b>Results:</b> There was a statistically significant difference in the pass rate on the comprehensive cognitive exam between reregistered and nonreregistered groups for years 4 and 6. In both of these years the reregistered groups were approximately two times more likely to pass than the nonreregistered groups. The reregistered groups also averaged one more correct answer on the achievement test compared to the nonreregistered cohorts; this result was statistically significant for all years. The reregistered cohorts were more likely to have more self-reported Continuing Medical Education (CME) than the nonreregistered cohorts. This result was statistically significant in years 2 and 4 for the number of CME's in the last 12 months and in years 2 and 6 for the number of CME's since the last reregistration period. <b>Recommendations for Future Research:</b> While these results suggest differences between reregistered and nonreregistered EMT-Ps, they are to be considered cautiously, given the small sample size and recognizing the fact that passing an exam does not necessarily translate into clinical competence. Future research could address these issues with a most robust sampling plan and by introducing other measures of competence. Also, a comparison of States that mandate continued registry certification in order to practice, with those who do not, would be of interest.			
17. Key Words Paramedic, EMT, EMS, Clinical Competence, Education Measurement, Certification, Recertification, Licensure, Accreditation, Testing, Specialty Boards, Professional Competence, Time		18. Distribution Statement This report is available from the National Technical Information Service, Springfield, VA, phone 703-487-4650, and is available free of charge on the NHTSA Web site at www.nhtsa.dot.gov.	
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages 27 pages	22. Price



## Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	1
Problem .....	1
Method.....	1
Findings .....	1
<b>INTRODUCTION</b> .....	2
General Background.....	2
The Development of Professional Credentials .....	2
The Relationship Between CME and Competence .....	2
Assessment of Competence .....	3
EMT-P Initial and Continued Competence.....	3
Current State Licensure Requirements .....	3
EMT-P Competence and the Role of CME .....	4
<b>RATIONALE FOR THE STUDY</b> .....	4
<b>METHODS</b> .....	4
Sample Design and Subject Selection.....	4
Survey Instrument.....	6
Data Collection .....	6
<b>RESULTS</b> .....	6
Measures of Competence.....	6
Variables Associated With Reregistration.....	8
Variables Associated With Passing the Standardized Exam .....	9
<b>DISCUSSION</b> .....	9
Policy Implications .....	9
Limitations of the Study .....	10
Future Research.....	10
<b>SUMMARY</b> .....	11
<b>REFERENCES</b> .....	12
<b>APPENDICES</b> .....	13
Appendix A – State Certification and Recertification Requirements .....	15
Appendix B – Design of Instrument .....	17
Appendix C – Nonresponder Survey Data.....	20

## List of Figures and Tables

Figure 1. Subject Population Distribution.....	5
Table 1. Standardized Exam Scores.....	7
Table 2. Odds Ratios for Pass Rates for Reregistered and Non Reregistered EMT-Ps..	7
Table 3. Achievement Scores for Reregistered and Nonreregistered EMT-Ps .....	8
Table 4: Variables Related to Reregistered and Nonreregistered EMT-Ps.....	8
Table 5: Description of Responders Who Passed and Who Did Not Pass the Standardized Exam in Percentages .....	9

# EXECUTIVE SUMMARY

## Problem

The National Registry of Emergency Medical Technicians (NREMT) is a national nonprofit corporation that provides a uniform process to assess the knowledge and skills required for competent practice by EMS professionals. The NREMT certifies EMS professionals, but does not license them. The NREMT, together with various State and local Emergency Medical Services (EMS) certification and licensing bodies, is responsible for ensuring the initial and continued clinical competence of Emergency Medical Technician-Paramedics (EMT-Ps). Following initial certification, a difficulty arises in determining whether these EMT-Ps remain competent. This is a complex and costly problem for most licensing and certification agencies.

Among the medical, nursing, health science, and other healing arts professions, continuing education, required practice frequency minimums, and periodic retesting are among the most common methods of ensuring the safe practice of clinicians. However, no standardized procedures have been adopted to ensure that EMT-Ps remain competent, and to date there are no definitive studies that universally support current procedures.

The important health policy question that arises is whether the NREMT reregistration procedures have their intended effect of maintaining competence. Reregistration entails completion of Continuing Medical Education (CME) requirements, completion of nationally standardized EMT-P refresher courses, and verification of skills by the responsible physician--medical director. The principal objective of this research was to determine whether the continued cognitive competence of voluntarily reregistered paramedics differed from those who did not reregister.

## Method

The sample consisted of two groups: (1) EMT-Ps who voluntarily reregistered, and (2) those who did not voluntarily reregister after the two-year registration cycle and chose to remain only credentialed by the State. Subjects were sent a letter requesting them to complete a multiple-choice online survey that included a standardized exam similar to their initial certification test, an achievement test, and a demographic and professional practice questionnaire. The responses from cohorts of NREMT-Ps initially certified 2, 4, and 6 years earlier were compared.

## Findings

NREMT-Ps who reregistered 4 and 6 years after initial registration were twice as likely to pass the exam as their State-certified cohort counterparts who did not reregister with the NREMT. Also, the reregistered cohorts averaged one more correct answer on the achievement portion of the exam compared with the nonreregistered cohorts in all years. The registered group compared to the nonregistered group overall had more self-reported Continuing Medical Education. Taken together, the findings suggest that EMT-Ps who reregister with the NREMT are more knowledgeable than those who do not reregister.

# Emergency Medical Technician-Paramedic Competence and Reregistration with the National Registry of Emergency Medical Technicians

## INTRODUCTION

### General Background

#### *The Development of Professional Credentials*

Society has always demanded accountability from its health care professionals, although prior to the 1900s, the public and government often allowed professions sole responsibility for monitoring their own performance. By the turn of the century many people had grown skeptical of the ability and willingness of professionals to monitor their own ranks and to adequately protect the public from incompetent practitioners. The emergence of accreditation and credentialing was the initial mechanism by which the public was assured that health care professionals were competent prior to being awarded the legal right to practice (Flexner, 1910).

National board examinations evolved as the principal means of entering health care professions. These examinations were focused primarily on knowledge assessment, and were not focused on the relationship between knowledge and competent practice. Despite the fact that national board examinations continue to move away from the recall of facts and toward the synthesis of complex information and its application to clinical decision-making (Kalkwarf, 2000), they still primarily assess competence at the point of entry. While this initially seemed adequate, it did not give adequate consideration to the issue of *maintaining* competence. Public skepticism, malpractice allegations and litigation, in addition to the exponential increase in the rate of change in professional knowledge and practice, forced many professionals and State regulators to adopt a life-long credential model. This model, currently in use, incorporates CME requirements as a primary mechanism of maintaining competence (Gunn, 1999).

#### *The Relationship between CME and Competence*

The continued assurance of clinical competence is the goal of CME. It is commonly believed that mandatory continuing education automatically means continued competence (Hoffman, 1980), but there is little evidence supporting this assertion.

According to Finocchio et al. (1995), CME requirements generally ask only that the individual attend approved continuing education courses. There is little evidence of a demonstrated relationship between participation in CME and job performance or clinical outcome (Gross, 1994). Courses may not necessarily address the needs of the health professionals. Moreover, there is no assessment of the students' understanding of the course material. Another issue is that most CME courses are subject to only cursory regulatory review. As a result, there is growing concern over whether mandatory CME courses adequately address the need for continued competence (Swankin, 1997).

In 1995, the Pew Health Professions Commission recommended that boards abandon arbitrary CME requirements and "develop, implement and evaluate continuing competency requirements to assure the continuing competence of regulated health care professionals" (Finocchio et al., 1995). This has remained a major issue. In October 1998, the Taskforce on Health Care Workforce Regulation of the Pew Health Professions Commission published a report titled "Strengthening Consumer Protection: Priorities for Health Care Workforce Regulation." This report emphasized the critical role that health care workforce regulation plays in consumer



protection, not only by regulating initial entry to the profession, but also by maintaining oversight throughout the health care professionals' careers (Finocchio et al., 1995).

### *Assessment of Competence*

Other than looking solely at the accumulation of knowledge as an indicator of continued competence, some researchers (e.g., Gunn, 1999) now recommend that a multifaceted approach be used to assess those professional attributes deemed essential for achieving quality patient outcomes. However, assessing the full breadth of professional competence is a complex problem. Illustrative of this is the experience of Washington State's Dental Quality Assurance Commission. It made a serious effort at reforming the assessment of competence, only to discover it could not achieve this goal because it could not determine an acceptable means of evaluating competence (Kinney and Anderson, 1997).

Other recommendations for assessing competence were derived from focus groups conducted by Tilson and Gebbie (2001). These recommendations included changes to the certification process, use of mentoring programs, development of innovative educational material and programs (including the use of distance-based learning), use of professional associations as facilitators, use of professional publications, and increased governmental/agency support. Some researchers (e.g., Karnath, Thornton, and Frye, 2002) have also advocated the use of manikin simulators. Carlson and Kalkwarf (1997) suggest a combination of simulations, continuing education with measurable outcomes, case presentation, and practice audits. However, to date no consensus has been reached on the best way to ensure continued competence.

## EMT-P Initial and Continued Competence

### *Current State Licensure Requirements*

In order to be initially certified as a Nationally Registered Emergency Medical Technician-Paramedic, a candidate must graduate from a State or nationally accredited program that meets or exceeds the National Highway Traffic Safety Administration (NHTSA) standardized curriculum. Periodic reregistration in most States is the primary method of ensuring the continued competence of EMT-Ps. The lengths of State licensure for EMT-Ps and required CME vary significantly from State to State.

Appendix A lists the current lengths of State licensure and the required amounts of continuing education to be completed on an average yearly basis (EMS, 2002). The average length of a State license for EMT-P is currently 29.2 months (range 12 months to permanent licensure) with 33 States issuing an EMT-P credential valid for 24 months. The average number of hours of CME required per year is 31.6 with a wide variation (range 0 to 94.5 hours). For example, a rural State with a small number of services currently requires the greatest amount of continuing education (94.5 hours/year). In contrast, a very small urban State whose entire population is serviced by a 9-1-1 response system currently does not require its paramedics to complete any continuing education to renew the State-issued EMT-Paramedic license.

The National Registry of EMTs issues a National Registry EMT-P (NREMT-P) certification that is valid for 24 months and requires a total of 72 hours of refresher training and CME be completed. Some States require that EMT-Ps maintain their NREMT-P status, and other States require the NREMT-P exam for entry to the profession and then adherence to State requirements for renewal, while other States use their own exam for both entry and renewal.

### *EMT-P Competence and the Role of CME*

Various factors may influence the continued clinical competence of EMT-Ps including: CME, practice frequency, average length of transport, quality assurance measures, medical control, initial education, employer policies, consumer expectations, and peer professionalism. Renewal of NREMT registration or State certification incorporates some of these factors including the reporting of CME, professional activity, and sponsorship by a medical director.

An important question to be answered (although not directly addressed by this study) is how to ensure the continued competence of EMT-Ps. This is a difficult and costly problem for most licensing and certification agencies. Among the medical, nursing, health science, and other healing arts professions, CME, required practice frequency minimums, and periodic retesting, appear to be among the most common forms of ensuring the practices of clinicians are safe. Of the foregoing, CME is the most commonly used method of ensuring competence.

## **RATIONALE FOR THE STUDY**

NHTSA, in its role as lead agency responsible for research and development for Emergency Medical Services, was interested in assessing the continued competence of EMT-Ps after initial certification by NREMT. The NREMT, a national non-profit corporation that provides a uniform process to assess the knowledge and skills required for competent practice by EMS professionals, was also interested to learn if its reregistration policy was effective in maintaining competence. To date there are no studies that specifically assess the value of reregistration as a mechanism for maintaining EMT-P competence. This study is the first step to determine the value of NREMT reregistration by EMT-Ps.

## **METHODS**

### Sample Design and Subject Selection

The study population consisted of two groups: (1) EMT-Ps who were initially credentialed by NREMT and *voluntarily* chose to reregister with the NREMT, and (2) those who did not reregister their NREMT-Paramedic credential after the initial two-year registration cycle and chose to remain only credentialed by the State. The pool of subjects who reregistered was restricted to those who voluntarily did so because they were thought to be similar to the non-registered cohort. EMT-Ps required to reregister for State certification would likely have different characteristics than those in voluntary and nonreregistered cohorts and were not included in the study population.

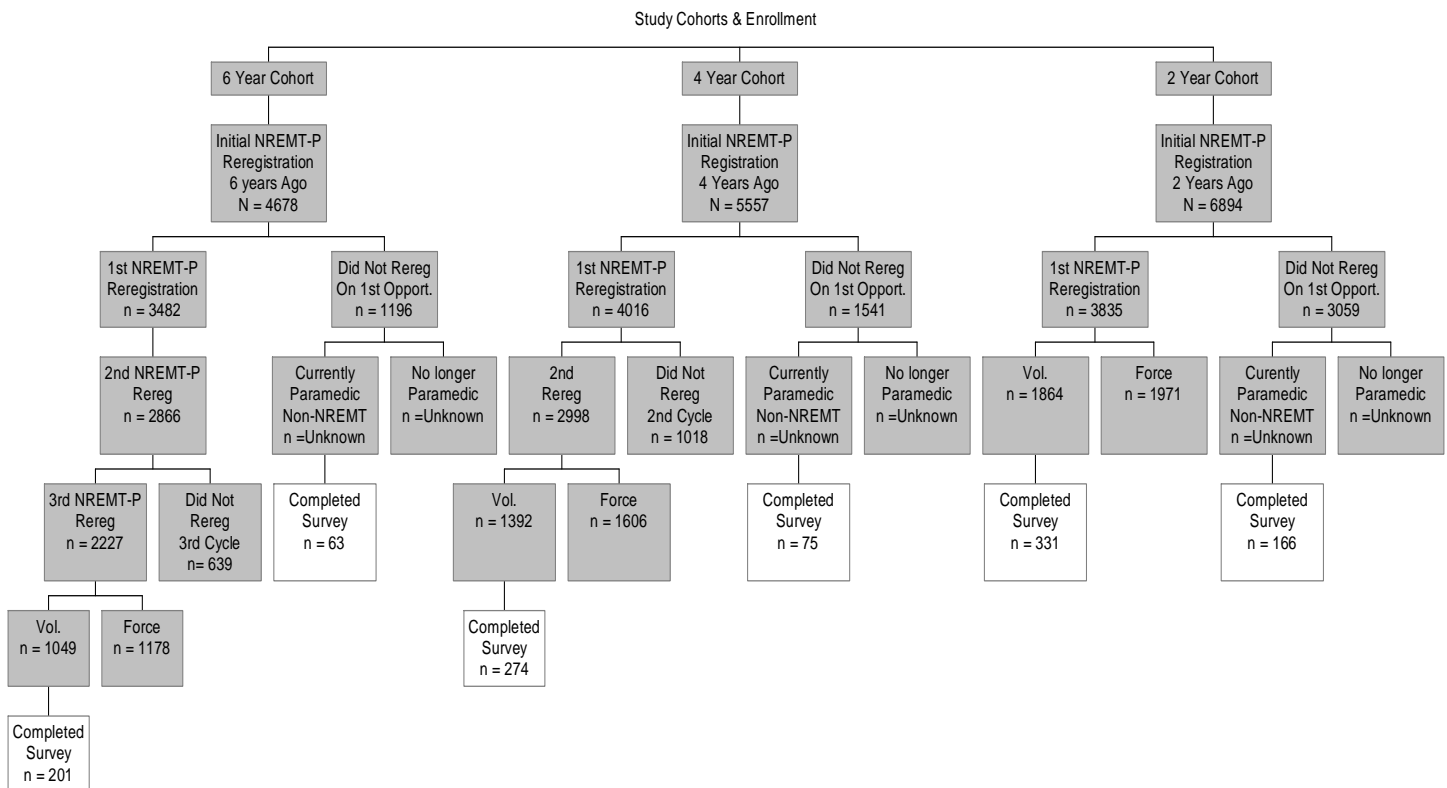
To control for the varying amounts of continuing education, and to help ensure consistency, three cohorts of subjects, initially certified 2, 4, and 6 years earlier, comprised of those who voluntarily reregistered and those who did not reregister, were selected. Cohorts beyond 6 years were not used due to industry turnover and the resources required to locate them.

The sampling plan was implemented by asking all NREMT-Ps during the March 2001 reregistration cycle (a biennial requirement) why they renewed their NREMT certification. Those who stated "It is a requirement to work in my State" or "My employer requires NREMT certification" were eliminated. This assisted in ensuring that the voluntary inclusion factor was upheld. Also included in the study population were all of the cohort NREMT-Ps who did not reregister after their first opportunity to do so. No EMT-Ps who reregistered after their first opportunity were included in the study (disallowing enrollment to those not reregistering during their second or third cycle). Names and addresses of NREMT-Ps were obtained from the

National Registry of Emergency Medical Technicians in Columbus, Ohio. NREMT-P cohorts who voluntarily reregistered and those who did not reregister were sent a letter by mail to their last known addresses, requesting that they complete a multiple-choice questionnaire on-line. Members of the nonregistrant cohort were required to be State-certified EMT-Ps. Competence was determined by administering an exam, details of which are explained in Appendix B. A \$25 incentive payment was sent to those subjects who completed a three-part survey instrument consisting of decommissioned NREMT registration items, an achievement exam, and a demographic questionnaire. Following the main survey, a followup survey of nonresponders was performed to determine if there was a difference between those who responded to the request to enroll in the study and those who did not. No appreciable descriptive differences were found (see Appendix C).

Figure 1 shows the obtained distribution of the cohort populations. The deeply shaded boxes show the sampling plan and the lightly shaded boxes show the numbers of actual subjects enrolled in the study. The figure demonstrates the prospective estimate of the minimum number of subjects needed to enroll in the study in order to detect at least a 10 percent difference in exam scores among the cohorts with a 95 percent level of certainty. Ultimately 1,110 EMT-Ps were successfully recruited and completed the exam over a 6-month period. The subjects were self-selected from a maximum population pool of 17,129.

Figure 1. Subject Population Distribution



## Survey Instrument

The three-component survey instrument consisted of: (1) a 60-question exam comprised of decommissioned NREMT-P certification items, (2) a 30-question achievement examination designed by a panel of experts, and (3) the 12-question demographic questionnaire used in the NREMT LEADS study (Brown et al., 2002).

## Data Collection

A Web-based survey was used to collect all data from the subjects. Subjects logged in using a unique identifier, consented to participate in the study, and verified inclusion criteria. Instructions were provided to the participants, and once they began the survey they were required to complete it in its entirety. Ten questions were displayed at a time, and participants were not permitted to move to the next frame without completing all questions in that frame. Participants could change responses at any time within the 10-question frame they were in, but were not permitted to go to previous frames. E-mail address, street address, and phone contact information were provided should the participants want to reach the principal investigator, the institutional review board, or the study administrator. Participants who lost their Internet connections while completing the survey questionnaire were advised to contact the study administrator, who assigned them a new unique identifier. The investigators were not permitted access to the personal information of the subjects. Only a study administrator had access to this information so that incentive payments could be made. The researchers released randomly selected cohorts of names until predetermined enrollment targets from the different cohorts had been reached. Once targets were reached, subjects received a notice when they attempted to log onto the Web site. The requirement to complete the survey in order to collect the participatory honorarium resulted in all surveys being completed; that is, there was no missing data.

## **RESULTS**

### Measures of Competence

Clinical competence is comprised of multiple components including skills, attitudes, and knowledge of the cognitive domain. This study focused exclusively on the cognitive aspect of clinical competence. The two measures of cognitive competence used in this study are depicted in Table 1 below. The first of these was norm-referenced data extracted from a standardized exam based on decommissioned NREMT exam items. The second measure of cognitive competence was the achievement exam constructed to measure advanced knowledge. For each of the three cohorts (that is the 2-, 4-, and 6-year cohorts since original registration) Table 1 shows the number of subjects scoring at least 70 percent (70% is required for passing) on the NREMT-based exam. In the year 2 cohort there was no difference in the percent passing the NREMT-based exam; however, there was on the achievement exam. The reregistered cohorts in the 4- and 6-year cohorts performed significantly better than the nonreregistered cohorts on both the NREMT-based and achievement exams.

Table 1. Standardized Exam Scores

Group	N	% Passing NREMT Based Exam	Average Achievement Score
Year 2 not Rereg	166	68%	13.14
Year 2 Rereg	331	66%	14.09
Year 4 not Rereg	75	59%	12.99
Year 4 Rereg	274	73%	14.40
Year 6 not Rereg	63	60%	13.33
Year 6 Rereg	201	75%	14.54

Because of the categorical nature of the pass/not pass measure, logistic regression was used to test the differences between the reregistered and nonreregistered cohorts for this dependent variable, while analysis of variance was used to test for differences on the achievement test. Table 2 below shows odds ratios for passing the standardized exam between the different cohorts for the achievement test. An odds ratio greater than 1.0 means that the reregistered cohort is more likely than the nonreregistered cohort to have a passing score on the comprehensive portion of the exam.

The data shows that the reregistered cohort did better than the nonreregistered cohorts in years 4 and 6. The years 4 and 6 reregistered cohorts were about twice as likely to pass the NREMT exam than those who did not reregister from the same cohort. The three reregistered cohort groups (on average) were nearly one-and-a-half times as likely to pass the NREMT exam as their nonreregistered counterparts, (although the year 2 non-reregistered group showed no difference in the odds ratio for pass rates and actually did slightly better in mean number of correct scores than the reregistered group).

Table 2. Odds Ratios for Pass Rates for Reregistered and Non Reregistered EMT-Ps

Group	Odds Ratio reregistered vs. nonreregistered (95% Confidence Intervals)	p-value
Year 2	0.90 (0.61, 1.35)	0.6221 (NS)
Year 4	1.94 (1.14, 3.30)	0.0146
Year 6	1.99 (1.09, 3.61)	0.0243
Average over all years	1.46 (1.11, 1.90)	0.0061

Table 3 below shows the difference in achievement scores for the reregistered and nonreregistered cohorts. In all cohorts and overall, the reregistered cohorts scored higher than the nonreregistered cohorts. While the score difference was only one question, this was still significant.

**Table 3. Achievement Score Differences for Reregistered and Non-reregistered EMT-Ps**

Group	Difference reregistered vs. nonreregistered <sup>‡</sup> (95% Confidence Intervals)	p-value
Year 2	0.95 (0.35, 1.55)	0.0020
Year 4	1.41 (0.59, 2.23)	0.0008
Year 6	1.21 (0.30, 2.12)	0.0094
Average over all years	1.07 (0.66, 1.48)	<0.0001

<sup>‡</sup>This is a difference in mean number of correct scores between reregistered and nonreregistered cohorts.

### Variables Associated with Reregistration

A question of interest is whether other variables associated with reregistration may account for some of the differences observed. Data from the demographic questionnaire was considered the most likely source of possible associations with reregistration status. The variables examined for possible associations are shown in Table 4. The  $\chi^2$  statistic was used to evaluate the statistical difference between the total number of reregistered and non-reregistered participants. Significant differences were found for several variables. More reregistered EMT-Ps had higher numbers of CMEs since the last State certification and over the 12 months prior to recertification. In addition, reregistered EMT-Ps were more likely to be in States with certification extending 2 years or less and to have a bachelor's degree or higher. Another difference was the reregistered EMT-Ps had more years of experience.

**Table 4: Variables Related to Reregistered and Nonreregistered EMT-Ps**

	Total number of respondents		p-values
	Rereg (N= 806)	Nonrereg (N=304)	
Rural area or small town <2500	29.8%	29.6%	0.8449
CME since last State certification more than 60	70.7%	59.2%	0.001
CME over the past 12 months are more than 12	78.5%	69.4%	0.0009
Length of State certification is 2 years or less	56.8%	50.7%	0.0022
20 or more calls in a typical week	45.1%	45.3%	0.1444
Most or all calls are emergency	81.9%	79.6%	0.5411
Highest education bachelor's or graduate degree	27.2%	22.0%	0.0018
Number of years in EMS			
0-4 years	6.5%	13.3%	<0.0001
5-10 years	54.6%	52.3%	
11+ years	39.0%	34.2%	

## Variables Associated with Passing the Standardized Exam

In addition to being tested for their associations with reregistration, the variables identified above were also tested for their association with passing and not passing the NREMT competency exam. These results are shown in Table 5 below. EMT-Ps living in small towns or rural areas were less likely to pass the exam than those living in larger towns. Also, EMT-Ps who passed the exam have more CMEs since last certification as well as over the past 12 months and they have a greater number of calls that are emergency calls. In addition, a greater percentage of those who pass have a bachelor's or higher degree.

**Table 5: Description of Responders Who Passed and Who Did Not Pass the Standardized Exam in Percentages**

	Total number of respondents		P-values
	Pass (N=765)	Not Pass (N=345)	
Rural area or small town <2500	26.8%	36.2%	0.0402
CME since last State certification more than 60	70.1%	62.0%	0.0019
CME over the past 12 months are more than 12	79.3%	68.7%	0.0013
Length of State certification is 2 years or less	56.5%	52.2%	0.3207
20 or more calls in a typical week 20 or more	46.4%	39.4%	0.4103
Most or all calls are emergency	83.8%	70.4%	0.0077
Highest education bachelor's or graduate degree	29.2%	17.7%	0.0023
Number of years in EMS			0.7935
0-4 years	11.0%	17.1%	
5-10 years	52.2%	52.2%	
11+ years	36.0%	30.7%	

## **DISCUSSION**

### Policy Implications

The results of this study can be used to contribute to the development of policies that are related to maintaining competence of EMT-Ps including CME requirements, practice frequency, reregistration periods, reexamination, etc. The data supports the position that continued education and ongoing clinical experiences are important to maintaining competence. The fact that EMT-Ps were more likely to pass the exam if reregistration was 2 years or less suggests that 2 years could be a reasonable time frame for requiring recertification.

Several variables were significant for both reregistering and passing the NREMT competency exam. These variables included having more CME, having a bachelor's degree or higher, and having more years of experience as an EMT-P. Those who passed the exam also had more clinical experience related to emergency calls. An important finding was that it appears that some common traits may help to explain the differences found. However, the study was designed to answer the principal question only, and these suggestive findings can now be explored more vigorously and with greater precision given that the principal hypothesis appears to be true.

## Limitations of the Study

A limitation of this study is that the sample size (determined by cost factors) was not large enough to examine the interactions among all the variables related to reregistering as well as passing the exam.

Another limitation is that passing an exam does not necessarily translate into complete clinical competence. The study was designed to detect the difference between reregistered and non-reregistered EMT-Ps at given intervals and it is not known how predictive this is of clinical competence.

Also, CME is a challenging variable to measure. It is difficult for paramedics to recall an exact amount and type of CME they had in preceding years. Once they have reached their recertification thresholds, many paramedics do not continue to formally record further credits. CME is also difficult to categorize, since it may be formal or informal in nature. Employers may have regular, mandatory, continuous quality-improvement or quality-assurance sessions that may not be perceived as formal CME. In addition, regular reading of professional journals or being involved in a good quality assurance process are examples of processes that may provide the same benefit as formal CME.

Only EMT-Ps who had access to a computer could enroll in the study. This may have biased the sample selection since those people with computer access may have been more associated with those subjects who are more affluent and thus more likely to pay for reregistration when it was not required for employment.

Selection of all subjects from States where EMT-Ps are only required to take the NREMT-P exam to enter the profession, but not required to maintain State certification, and comparing them with EMT-Ps from States where maintenance of NREMT-P certification is mandated may have allowed for more forceful policy implications. Such a sample would have better reflected the general population of EMT-Ps. Indeed, a completely different sampling plan that lessened self-selection, and forced a more representative sample of the target population would have strengthened the study. Designing future studies to be better able to detect differences in the major demographic and professional differences within the cohorts by increasing the sample size would also be desirable.

## Future Research

An observation needing further study is that a smaller percentage of EMT-Ps living in rural areas or small towns passed the exam than those living in urban areas or larger towns. There are many possible explanations for this finding. EMT-Ps living in rural areas could have a lower level of education, limited access to strong training programs, or less clinical experience because of the density of the population served. In addition, people living in rural areas could have less access to continuing education. Moreover, many of the Nation's rural services are provided by volunteers who have competing issues for their time. These are all areas that could be explored further.

Another area of future research is exploring this same question but at the EMT Basic or EMT-Intermediate levels of certification. Given the much larger numbers of EMT Basics compared with those at the paramedic level, the implications of the finding that more CME is related to better test scores might have an even greater impact. Also, it would be useful to compare States that mandate continued registry certification in order to practice with those who do not.



## SUMMARY

EMT-Ps who were originally certified and voluntarily reregistered with the National Registry of Emergency Medical Technicians were more likely to pass an exam similar to their initial certification test when compared with those who did not reregister. They also scored higher on an achievement test related to EMT-P practice. The higher pass rates were observed at both 4 and 6 years following initial registration. The reregistered cohorts were also more likely to have a greater number of self-reported CME. The number of years between certification cycles was significantly higher in the nonreregistered participants. EMT-Ps with more CME, more years in EMS, and higher education were more likely to pass the exam regardless of their reregistration status. While these findings suggest differences between reregistered and nonreregistered EMT-Ps, they are to be considered cautiously in view of the limitations of the study described above. Future work in this area could include a more sophisticated prospective study that would assess the reasons for higher test scores and would perform more detailed analyses of the differences between EMT-Ps who reregister with the National Registry and those who do not.

## REFERENCES

- Brown, W.E., Jr., Dickison, P.D., Misselbeck, W.J., and Levine, R. Longitudinal emergency medical technician attribute and demographic study (LEADS): an interim report. *Prehospital Emergency Care*. 2002 Oct-Dec; 6(4): 433-439.
- Carlson, E.C., and Kalkwarf, K.L. Continued competency – a responsibility of the profession. *Journal of the American College of Dentistry*. 1997 Winter; 64(4): 22-25.
- Emergency Medical Services 25th annual State & province survey. *Emergency Medical Services*. 2002; 31(12): 218-254.
- Finocchio, L.J., Dower, C.M., McMahon, T., and Granola, S.M., Taskforce on Health Center Workforce Regulation. *Reforming Health Care Workforce Regulation: Policy Considerations for the 21<sup>st</sup> Century*. San Francisco, CA: Pew Health Professions Commission; December 1995.
- Flexner, A. Medical education in the United States and Canada. From the Carnegie Foundation for the Advancement of Teaching, bulletin number four, 1910. *Bulletin of the World Health Organization*. 2002; 80(7): 594-602.
- Gross, L.J. Setting cutoff scores on credentialing examinations: A refinement of the Nedelsky procedure. *Evaluation and the Health Professions*. 1985 Dec; 8(4): 469-493.
- Gross, L.J. (1989, January 25). Implementation of a new procedure for setting criterion-referenced pass-fail standards. Paper presented to the National Registry of EMTs. January 25, 1989.
- Gross, L.J. *Of Foxes and hen houses: licensing and the health professions*. Quorum Books; 1994: 84-85.
- Gunn, I.P. Regulation of health care professionals, Part 2: Validation of continued competence. *CRNA*. 1999 Aug; 10(3): 135-141.
- Hoffman, A.M. Avoiding professional obsolescence: the mandatory continuing education debate. *American Journal of Medical Technology*. 1980 Apr; 46(4): 266-269.
- Kalkwarf, K.L. How the licensure process will evolve. Comment in *Journal of the American Dental Association*. 2000 Mar; 131(3): 290.
- Karnath, B., Thornton, W., and Frye, A.W. Teaching and testing physical examination skills without the use of patients. *Academic Medicine*. 2002 Jul; 77(7): 753.
- Kinney, B.P., and Anderson, L. Continued competency assessment: reflections from the State board viewpoint. *Journal of the American College of Dentistry*. 1997 Winter; 64(4): 33-34.
- Practice Analysis: NREMT-Basic, NREMT-Intermediate and NREMT-Paramedic*. National Registry of Emergency Medical Technicians, Inc.; 2000.
- Swankin, D.A. Assuring the continuing competence of health care professionals in the public interest. *Journal of the American College of Dentistry*. 1997 Winter; 64(4): 35-38.
- Tilson, H.H., and Gebbie, K.M. Public health physicians: an endangered species. *American Journal of Preventative Medicine*. 2001 Oct; 21(3): 233-240.

## APPENDICES



**Appendix A**  
**State Certification and Recertification Requirements**

<b>STATE</b>	<b>LENGTH OF EMT –P LICENSE</b>	<b># HOURS OF CE TO RECERTIFY</b>	<b>CE hours (avg hrs/yr)</b>
AK	2 YEARS	60 HOURS/YEAR	60
AL	2 YEARS	CREDENTIALING	CREDENTIALING
AR	2 YEARS	72 HOURS	36
AZ	2 YEARS	60 HOURS	30
CA	2 YEARS	48 HOURS	24
CO	3 YEARS	45 HOURS/3 YEARS	15
CT	1 YEAR	0 HOURS	0
DC	2 YEARS	72 HOURS	36
DE	2 YEARS	72 HOURS	36
FL	2 YEARS	40 HOURS	20
GA	2 YEARS	40 HOURS	20
HI	2 YEARS	72 HOURS	36
IA	2 YEARS	60 HOURS	30
ID	2 YEARS	72 HOURS	36
IL	4 YEARS	120 HOURS/4 YEARS	30
IN	2 YEARS	72 HOURS	36
KS	2 YEARS	60 HOURS	30
KY	30 MONTHS	40 HOURS/YEAR	40
LA	2 YEARS	72 HOURS	36
MA	2 YEARS	73 HOURS	36.5
MD	2 YEARS	72 HOURS	36
ME	3 YEARS	58 HOURS	19.3
MI	3 YEARS	45 HOURS	15
MN	2 YEARS	56 HOURS	28
MO	5 YEARS	144 HOURS	28.8
MS	2 YEARS	72 HOURS	36
MT	2 YEARS	72 HOURS	36
NC	4 YEARS	48 HOURS	12
ND	2 YEARS	72 HOURS	36
NE	3 YEARS	60 HOURS	20
NH	2 YEARS	72 HOURS	36
NJ	2 YEARS	72 HOURS	36
NM	2 YEARS	88 HOURS	44
NV	2 YEARS	48 HOURS	48 HOURS
NY	3 YEARS	PASS EXAM	PASS EXAM
OH	3 YEARS	EXAM; 88 HOURS;72 HOURS; 88 HOURS	24
OK	2 YEARS	72 HOURS	36
OR	4 YEARS	24 HOURS/YEAR + RE-EXAM EVERY 4 <sup>TH</sup> YEAR	24
PA	PERMANENT	18 HOURS/YEAR	18
RI	2 YEARS	72 HOURS	36
SC	3 YEARS	56 HOURS	18.7
SD	2 YEARS	60 HOURS	30
TN	2 YEARS	30 HOURS	15
TX	4 YEARS	192 HOURS OR EXAM	48
UT	4 YEARS	108 HOURS + EXAM	27

<b>STATE</b>	<b>LENGTH OF EMT LICENSE</b>	<b># HOURS OF CE TO RECERTIFY</b>	<b>CE hours (avg hrs/yr)</b>
VA	3 YEARS	72 HOURS	24
VT	2 YEARS	72 HOURS	36
WA	3 YEARS	150 HOURS/3 YEARS	50
WI	2 YEARS	56 HOURS	28
WV	2 YEARS	72 HOURS	36
WY	2 YEARS	189 HOURS + SKILLS REVIEW	94.5
			31.57917

## Appendix B Design of Instrument

Participants who successfully logged into the Web site completed three major tasks: a 60-item standardized competency examination, a 30-item achievement examination, and 11 demographic questions similar to the NREMT LEADS study.

### Standardized Competence Examination

The 60-item standardized competence examination consisted of 60 questions previously used on NREMT-Paramedic certification examinations and decommissioned from NREMT item banks for the purpose of this study. Item performance from 18,859 candidates for NREMT-Paramedic certification who were previously exposed to the identical 60 items was reviewed prospectively. The 60 items were selected based on the current NREMT Test Plan for the NREMT-Paramedic written examination derived from the NREMT Practice Analysis conducted in 1999 (Brown, Dickison, Misselbeck, and Levine, 2002).

In the NREMT Practice Analysis, 744 randomly selected NREMT-Paramedics rated 199 tasks and patient interventions based upon frequency, difficulty, and potential of harm. The data was analyzed by the NREMT Practice Analysis Committee and a test plan for NREMT examinations was developed. This process helps NREMT provide a valid certification process that assures safe and effective practice at entry-level competency based on responses to items that accurately reflect the current practice of the EMS profession by those who are actually providing patient care in the field. The 60 items chosen for the standardized competency examination were selected to proportionately reflect the NREMT Test Plan (4% variance by section permitted) used for NREMT certification as follows.

In addition, items whose performance closely matched the rating of item difficulty as judged by a panel of experts using the Gross Modification to the Nedelsky technique of criterion-referenced standard setting were selected (Gross, 1985; Gross 1989). This process of standard setting was adopted by the NREMT in 1988 under the guidance of Leon Gross, Ph.D., and has been a successful method of establishing the criterion of entry-level competency for NREMT-Paramedics. Items of varying levels of difficulty were selected in each of the six content areas of the competence examination as identified in Appendix B, Table 1. Due to the small sample size, the content domain, and the use of scenario-type questions, no difficult items were selected in the “Airway and Breathing” and “Ob/Gyn and Pediatrics” sections of the examination merely by coincidence. The minimum required criterion or passing score based on the Gross Modification to the Nedelsky technique for these 60 items was 70 percent, the same minimum overall score which is required for NREMT-Paramedic certification for entry level providers.

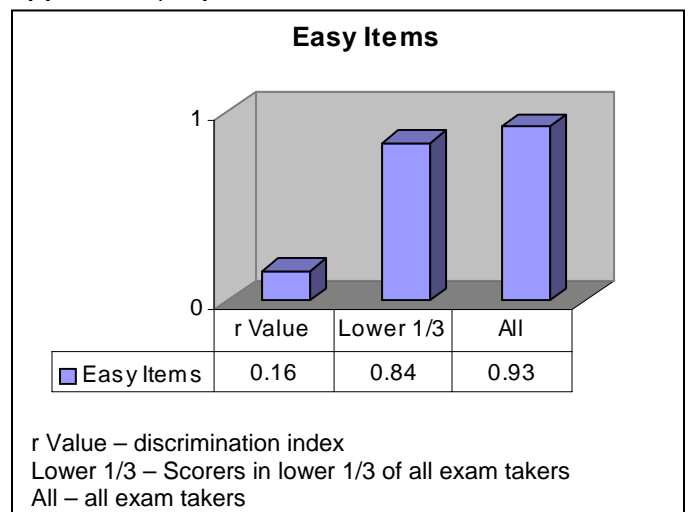
Appendix B, Table 1

<b>CONTENT</b>	<b># of ITEMS</b>	<b>EASY ITEMS</b>	<b>MODERATELY DIFFICULT ITEMS</b>	<b>DIFFICULT ITEMS</b>
<b>Airway &amp; Breathing</b>	11	4	7	0
<b>Cardiology</b>	15	5	9	1
<b>Trauma</b>	6	4	1	1
<b>Medical</b>	14	4	9	1
<b>Ob/Gyn and Pediatrics</b>	8	2	6	0
<b>EMS Operations</b>	6	3	2	1
<b>TOTAL</b>	60	22	34	4

The most important performance indices to compare with the predicted item difficulty criterion based on the Gross Modification to the Nedelsky technique are the difficulty index and discrimination index. The difficulty index, known as the p-value, represents the percentage of the candidates correctly answering an item. One should expect to see decreasing percentages of candidates answering items correctly as the item becomes more difficult so long as the criterion is established in an appropriate manner. Additionally, the discrimination index, known as the r-value, should increase as the items become more difficult. As the item is judged more difficult, the low achievers should miss the item more often than the higher achievers on the examination. Lower achievers are those who are defined as scoring in the lower one-third of the entire population of exam takers. Items that demonstrate a positive discrimination index of 0.20 or higher are very desirable and contribute to the effective measurement of the examination. The average discrimination index of the 60 items used in this portion of the survey was +0.33 (range +0.03 to +0.74).

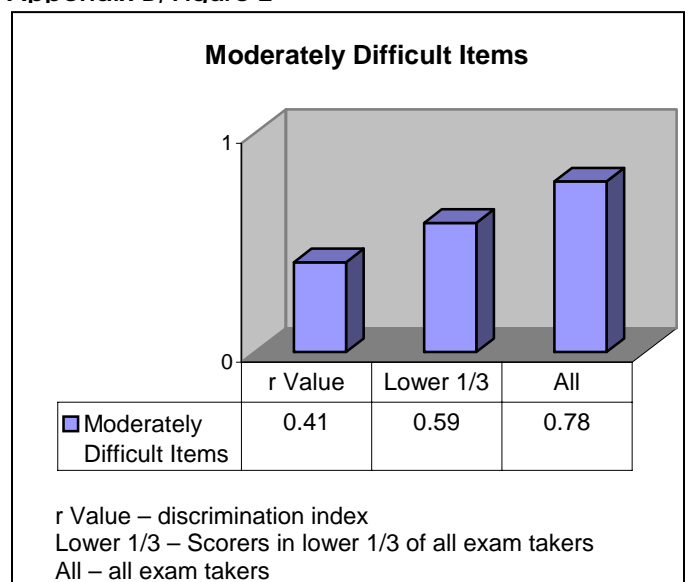
Ninety percent of the easy items in the examination are expected to be answered correctly using the criterion based on the Gross Modification to the Nedelsky technique. The actual performance on the easy items by these 18,859 candidates is shown here:

Appendix B, Figure 1



Sixty percent of the moderately difficult items in the examination are expected to be answered correctly using the criterion based on the Gross Modification to the Nedelsky technique. The actual performance on the easy items by these 18,859 candidates is shown here:

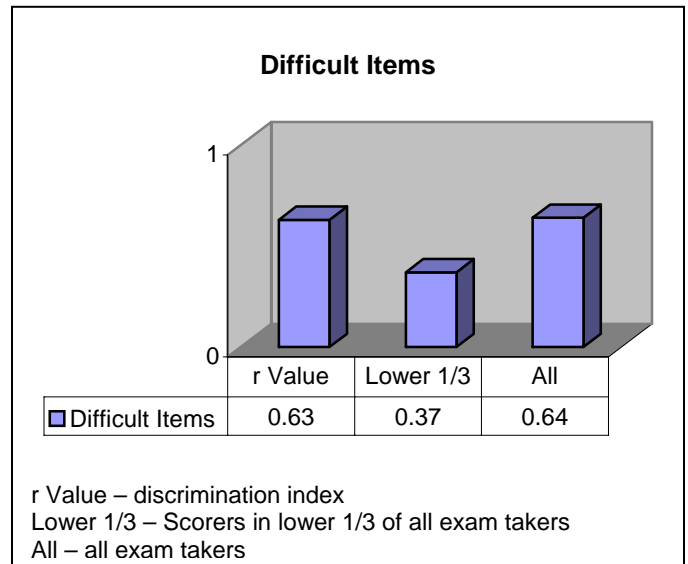
Appendix B, Figure 2





Appendix B, Figure 3

Forty-five percent of the difficult items in the examination are expected to be answered correctly using the same criterion. The actual performance on the easy items by these 18,859 candidates is shown here:



There is very high correlation with the predicted criterion and mean performance on easy, moderately difficult, and difficult items of the 60-item standardized competency examination:

Appendix B, Table 2

	Average Performance	Correlation of Criterion with Actual Performance (n = 18,859 candidates)
Easy Items	$\rho = 0.93$	Correlation = 0.98
Moderately Difficult Items	$\rho = 0.78$	
Difficult Items	$\rho = 0.64$	

### Achievement Exam

Thirty achievement items were then presented to the respondent. These items were drafted by a select group of experienced EMT-Paramedic educators and providers with the sole purpose of writing very difficult items in order to spread the scores of the group. The achievement items had never been developed for use on NREMT-Paramedic certification examinations. No pilot data or previous performance by candidates for certification were available for the 30 achievement items. Five achievement items in each of the six examination content areas (see Appendix B, Table 2) were developed for use in the survey to balance content and keep the survey instrument to a reasonable length.

### Demographic Questions

The final portion of the survey consisted of 11 demographic questions. These questions were designed to determine the respondent's educational background, length of time performing as an EMT-Paramedic, call volume, and continuing education. Where possible, identical questions from the NREMT's LEADS (Longitudinal Emergency Medical Technician Attributes and Demographics Study) project were asked to provide linkage to the EMT-Paramedic population at large (NREMT, 2000). The NREMT is currently in the fifth year of a 10-year longitudinal study of attributes and demographics of EMT.

## Appendix C

### Comparison of Nonresponder and Responder Survey Data

Question	Nonresponders N=219		Responders N=1,110	
1. Which of the following best describes the community in which you do most of your work as a paramedic?				
Rural area (less than 2,500 people)	5	2.3%	64	5.8%
Small town (2,500 - 24,999 people)	51	23.3%	266	24.0%
Medium town (25,000 - 74,999 people)	52	23.7%	259	23.3%
Large town (75,000 – 149,000 people)	27	12.3%	119	10.7%
Mid-sized city (less than 500,000 people)	34	15.5%	164	14.8%
Suburb/fringe of a mid-sized city	6	2.7%	40	3.6%
Large city (500,000 or more people)	28	12.8%	130	11.7%
Suburb/fringe of a large city	14	6.4%	68	6.1%
Did Not Answer	1	0.5%	0	0.0%
2. During your last State recertification period, how many CMEs did you complete? Continuing education can be obtained in a number of ways, including classroom instruction, conferences, run reviews (or case reviews), journal articles, grand rounds, videos, and computers.				
0-20	3	1.4%	38	3.4%
21-40	20	9.1%	123	11.1%
41-60	33	15.1%	199	17.9%
61-80	40	18.3%	239	21.5%
81-100	49	22.4%	212	19.1%
100 or more	72	32.9%	299	26.9%
Did Not Answer	1	0.5%	0	0.0%
3. In the past 12 months, how many CMEs did you complete? Continuing education can be obtained in a number of ways, including classroom instruction, conferences, run reviews (or case reviews), journal articles, grand rounds, videos, and computers.				
0	1	0.5%	20	1.8%
1-3	1	0.5%	20	1.8%
4-6	7	3.2%	47	4.2%
7-9	1	0.5%	51	4.6%
10-12	12	5.5%	128	11.5%
13-15	13	5.9%	86	7.7%
16-18	9	4.1%	109	9.8%
19-21	25	11.4%	89	8.0%
22 or more	149	68.0%	560	50.5%
Did Not Answer	1	0.5%	0	0.0%
4. What is the length of time of your State certification/licensure?				
1 year	4	1.8%	33	3.0%
2 years	105	47.9%	579	52.2%
3 years	49	22.4%	333	30.0%
4 years	29	13.2%	93	8.4%
5 years or more	32	14.6%	72	6.5%
Did Not Answer	0	0.0%	0	0.0%

Question	Nonresponders N=219		Responders N=1,110	
5. About how many calls do you respond to during a typical week?				
0	7	3.2%	43	3.9%
1	1	0.5%	15	1.4%
2-4	8	3.7%	73	6.6%
5-9	25	11.4%	164	14.8%
10-19	68	31.1%	313	28.2%
20-29	63	28.8%	241	21.7%
30-39	20	9.1%	153	13.8%
40-49	6	2.7%	60	5.4%
50 or more	19	8.7%	48	4.3%
Did Not Answer	2	0.9%	0	0.0%
6. When you work as a paramedic, what proportion of your calls are emergency calls and what proportion of your calls are scheduled transports?				
All of my calls are emergency calls.	121	55.3%	549	49.5%
Most of my calls are emergency calls.	60	27.4%	353	31.8%
I respond to an equal number of emergency calls and scheduled transports.	28	12.8%	142	12.8%
Most of my calls are scheduled transports.	8	3.7%	59	5.3%
All of my calls are scheduled transports.	0	0.0%	7	0.6%
Did Not Answer	2	0.9%	0	0.0%
7. What is the highest level of education you have completed?				
Didn't complete high school	0	0.0%	1	0.1%
High school graduate/GED	89	40.6%	452	40.7%
Associate's degree (A.A., A.S.)	83	37.9%	371	33.4%
Bachelor's degree (B.A., B.S.)	38	17.4%	242	21.8%
Graduate degree (M.A., M.S., Ph.D., etc.)	9	4.1%	44	4.0%
Did Not Answer	0	0.0%	0	0.0%
8. How many years have you worked in EMS?				
Less than one year	0	0.0%	5	0.5%
1 – 2 years	1	0.5%	9	0.8%
3 – 4 years	8	3.7%	79	7.1%
5 – 7 years	25	11.4%	292	26.3%
8 – 10 years	55	25.1%	307	27.7%
11 – 15 years	79	36.1%	272	24.5%
16 – 20 years	27	12.3%	100	9.0%
21 or more years	24	11.0%	46	4.1%
Did Not Answer	0	0.0%	0	0.0%
9. I chose not to participate in this study when originally asked because I: (Please check all that apply)				
Did not have ready access to the Internet.	54	24.7%	0	0.0%
Did not have the necessary time.	50	22.8%	0	0.0%
Felt that the \$25 stipend was not enough.	3	1.4%	0	0.0%
Was disinterested in participating in this kind of event.	13	5.9%	0	0.0%
Cannot remember.	98	44.7%	0	0.0%
Did Not Answer	1	0.5%	0	0.0%

DOT HS 810 577  
April 2006



U.S. Department of Transportation  
**National Highway Traffic Safety  
Administration**

[www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)  
**nhtsa** ★  
people saving people