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ORIGINAL RESEARCH

Emergency Medical Services

# Paramedic educational program attrition accounts for significant loss of potential EMS workforce

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## Abstract

**Objective:** Recent concerns for the strength and stability of the emergency medical services (EMS) workforce have fueled interest in enhancing the entry of EMS clinicians into the workforce. However, the educational challenges associated with workforce entry remain unclear. Our objective was to evaluate the educational pathway of entry into the EMS workforce and to identify factors that lead to the loss of potential EMS clinicians.

**Methods:** This is a cross-sectional evaluation of all US paramedic educational programs, with enrolled students, in the 2019 Committee on Accreditation of Educational Programs for the EMS Professions annual report survey. This data set includes detailed program characteristics and metrics including program attrition rate (leaving before completion), and certifying exam pass rates. Descriptive statistics were calculated, and multivariable logistic regression analysis was conducted to evaluate the association between high program attrition rates (>30%) and program specific characteristics.

**Results:** In 2019, 640 accredited programs met inclusion with 17,457 students enrolled in paramedic educational programs. Of these, 13,884 students successfully graduated (lost to attrition, 3,573/17,457 [21%]) and 12,002 passed the certifying exam on the third attempt (lost to unable to certify, 1,882/17,457 [11%]). High program attrition rates were associated with longer programs (>12 months), small class sizes (<12 students), and regional locations.

**Conclusions:** Nearly 1 in 3 paramedic students were lost from the potentially available workforce either owing to attrition during the educational program or failure to certify after course completion. Attrition represented the largest loss, providing an avenue for future targeted research and interventions to improve EMS workforce stability.

KEYWORDS
attrition, certification, emergency medical services, paramedic education, workforce

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# 1 | INTRODUCTION

## 1.1 | Background

Emergency medical services (EMS) clinicians are an integral part of the public health and safety system in the United States.[1] Consequently, the maintenance of an adequate workforce of EMS clinicians is crucial to the continued delivery of effective, safe, and equitable prehospital care. Recently, there has been heightened concern regarding the stability of the EMS workforce with significant data describing the impact of EMS turnover on the available workforce.[2–5] However, the challenges associated with the entry of EMS clinicians into the workforce remain unclear.

## 1.2 | Importance

Two key aspects are necessary for an EMS clinician to enter the workforce: successful completion of an educational program followed by successful completion of the certification examination.[6] Unfortunately, some candidates who enroll in paramedic educational programs have difficulty completing their education and leave before completion (defined as student attrition). Additionally, some students also have difficulty demonstrating minimal competence to practice as exhibited by unsuccessful completion of the certification examination. These students are therefore unable to enter the workforce and obtain licensure. Previous research has characterized the educational profiles of paramedic programs in the United States and has described performance characteristics of paramedic educational programs focusing on the successful graduation and certification of candidates.[7,8] To date, the impact and independent contributions of student attrition and certification failure that decrease the availability of the potential workforce have not been evaluated.

## 1.3 | Goals of this investigation

Increasing the number of students fully completing the paramedic educational process is a crucial component of optimizing the EMS clinician labor force. Our objective was to evaluate the impact of attrition and certification on entry into the workforce. More important, we compared attrition rates to program characteristics (eg, program infrastructure and available instructional resources) to identify factors associated with successful entry into the workforce.

**The Bottom Line**

Paramedic shortages remain a major concern. In this study of more than 17,000 paramedic students, nearly 1 in 3 were lost to attrition before graduation or failure to certify after course completion. These results highlight areas to target to reduce barriers for those intending to enter the paramedic workforce.

# 2 | METHODS

## 2.1 | Study design, setting, and participants

We performed a retrospective cross-sectional analysis of the 2019 Committee on Accreditation of Educational Programs for the EMS Professions (CoAEMSP) annual report survey, completed by all accredited paramedic educational programs between January and May of 2021. Included in this study were all Commission on Accreditation of Allied Health Education Programs (CAAHEP; Clearwater, FL, USA)-accredited and CoAEMSP-Letter of Review paramedic educational programs with enrolled students in 2019. This study was determined to be exempt by the American Institutes of Research Institutional Review Board (Arlington, VA, USA).

The CoAEMSP annual report satisfies CAAHEP Standard V.A.4 that states all programs "must maintain, and make available to the public, current and consistent summary information about student/graduate achievement that includes the results of one or more of the outcomes assessments required in the CAAHEP Standards," establishing a de facto requirement of a 100% response rate for all paramedic educational programs (CAAHEP accredited and CoAEMSP-Letter of Review) in the United States.[9]

Data for the annual review are self-reported from each program. CoAEMSP, as part of their mission, provides training for the completion of the annual review including webinars, frequently asked questions, virtual office hours, and email contacts to facilitate accurate reporting of data points.[10] Additionally, annual report completion is enforced by CoAEMSP with possible penalties including fees or administrative probation for failure to complete in a timely manner. The annual report is collected 2 years after the completion of the educational year to ensure that all candidates have the requisite 2-year certification testing period.[6] The 2021 CoAEMSP annual review collected data for the paramedic educational program class of 2019; therefore, data evaluated in this study focus on the data collected for the 2-year period from those completing their paramedic cohort in 2019.

## 2.2 | Measurements

Data on paramedic educational program characteristics were collected including program cohort and class sizes, program education details, and infrastructure. The number of classes or cohorts that graduated from the program during the survey period were reported as continuous variables categorized into meaningful cut points (0, 1, 2, 3, and >4). The National Association of State EMS Officials (NASEMSO) region was a categorical variable to the West, Western Plains, South, Great Lakes, or East regions.[11]

We also evaluated program educational details including total duration (in months) to program completion and total hours of instruction, captured as continuous variables. Total hours of instruction were defined as all phases of paramedic educational program hours including didactic, laboratory, clinical, field experience, and capstone field internship. Hours of instruction were evaluated in more specific detail by time (hours) dedicated to clinical (eg, in-hospital, clinics), field experience (excluding capstone), and capstone field internship events. Program certification examination pass rates, first-attempt pass rates, and cumulative third-attempt pass rates were continuous variables. Program attrition data were also collected. Educational program attrition was defined as the number of students leaving a program without completion of educational curriculum. Attrition rates were defined as the total number of students leaving the educational program before completion by the total number of students enrolled in the program.

Program infrastructure and instructional resource details were also evaluated. The total full-time faculty number was a continuous variable whereas the degree or credential awarded was categorical (certificate, associate's degree, bachelor's degree). Additionally, a resource assessment matrix (RAM) was calculated to measure the availability of necessary program-level resources.[12] This measure synthesizes the results of 2 separate surveys conducted by programs that assess resources available to both students and program representatives. This measure is scored across 10 different parameters, with a corrective plan necessary for any scores below the established 80% or better satisfactory benchmark. The RAM requirement was dichotomized as meeting the benchmark or not.

## 2.3 | Analysis

Inclusion criteria for this evaluation were all programs that enrolled at least 1 student in a program cohort during 2019. Descriptive statistics were calculated presenting the median (interquartile range) and frequency expressed as a percentage, as appropriate. Program attrition was calculated as the number of students leaving a program without completion of the educational curriculum. In this evaluation, we defined any program with attrition greater than 30% as having a high level of program attrition. This was set to remain in line with the benchmark retention threshold set by CoAEMSP at 70%.[10] Univariable and multivariable logistic regression analysis was conducted to evaluate the association between the percent of attrition above 30% to program specific characteristics (eg, months to completion, total hours of instruction). Statistical analysis was performed with the Stata 17 version statistical package (Stata, College Station, TX, USA).

## 3 | RESULTS

A total of 690 programs submitted data in 2019 (100% response rate) with 640 programs included in the analysis. Fifty programs were excluded because they had no enrolled students in 2019. The median number of students enrolled per program was 18 students (Table 1) with a total of 17,457 candidates graduated in 2019. The majority of programs graduated 1 cohort in 2019. Geographic distribution of programs in the United States demonstrated the greatest number (254, 40%) of paramedic educational programs in the South NASEMSO region.

**TABLE 1** Size, structure, and distribution reported to the Committee on Accreditation of Educational Programs for the EMS Professions for programs graduating cohorts in 2019.

| Characteristic | 2019 cohort |
|---|---|
| Programs with graduating cohorts, n | 640 |
| Total students across programs, n | 17,457 |
| Students enrolled per program (median, IQR) | 18 (12, 30) |
| Graduated cohorts by programs (frequency, %) | |
| 1 cohort | 384 (60%) |
| 2 cohorts | 153 (24%) |
| 3 cohorts | 52 (8%) |
| ≥ 4 cohorts | 51 (8%) |
| Graduating programs by NASEMSO regions (frequency, %) | |
| East | 107 (17%) |
| South | 254 (40%) |
| Great Lakes | 134 (21%) |
| Western Plains | 72 (11%) |
| West | 72 (11%) |
| *N/A* | 1 |

Abbreviations: EMS, emergency medical services; IQR, interquartile range; NASEMSO, National Association of EMS Officials; N/A, not applicable.

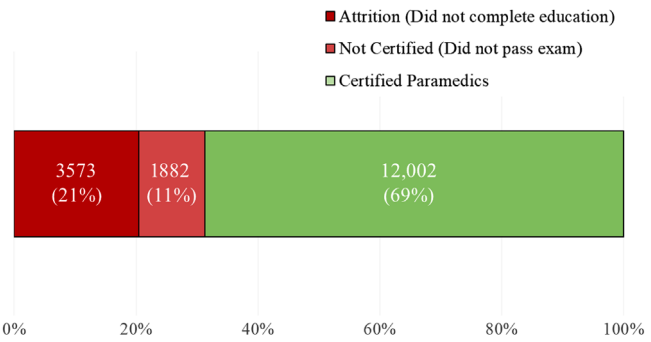


**FIGURE 1** Impact of program attrition and certification completion on available certified paramedics. Attrition accounts for 21% of loss of potentially available certified paramedics.

The median program duration was 12 months with median hours of instruction of 1,175 hours (Table 2). A majority of programs reported having more than 1 full-time faculty member (65%) and meeting or exceeding the 80% RAM threshold (76%). Program first-attempt and cumulative third-attempt median pass rates were 74% and 89%, respectively. A total of 410 programs (64%) reported having greater than 90% of graduates placed with an EMS agency at graduation.

Attrition rates and overall certification success were tracked for all programs in 2019 (Figure 1). Of the total students enrolled in programs

**TABLE 2** Program educational details and associated testing outcomes reported to the Committee on Accreditation of Educational Programs for the EMS Professions for educational programs graduating cohorts in 2019.

| Characteristic | 2019 cohort |
|---|---|
| Total months to completion (median, IQR) | 12 (12–16) |
| Total hours of instruction (median, IQR) | 1175 (1069–1305) |
| Total hours of clinical experience | 219 (168–272) |
| Total hours of field experience | 160 (90–240) |
| Total hours of capstone field internship | 180 (100–250) |
| Total number of full-time Faculty (frequency, %) | |
| One or less | 221 (35%) |
| Two | 195 (30%) |
| Three | 97 (15%) |
| Four or more | 127 (20%) |
| Meets 80% RAM minimum (frequency, %) | |
| Yes | 487 (76%) |
| No | 153 (24%) |
| Exam pass rates (%) | |
| First attempt (median, IQR) | 75% (64–90) |
| Cumulative third attempt (median, IQR) | 93% (82–100) |
| Positive placement in EMS agency upon graduation | |
| (>90%), (frequency, %) | 440 (64%) |

Abbreviations: EMS, emergency medical services; IQR, interquartile range; RAM, resource assessment matrix.

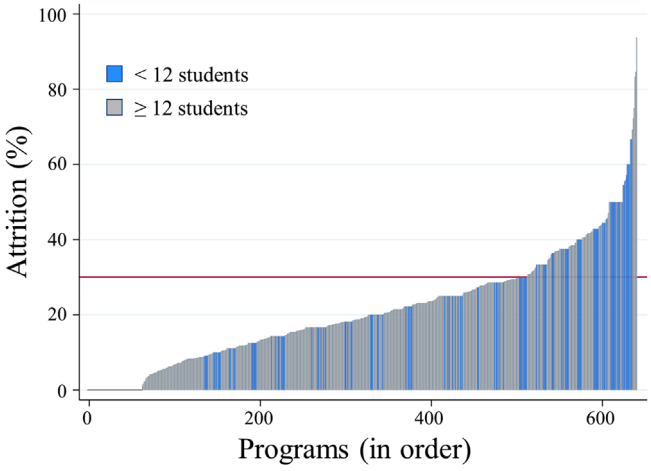


**FIGURE 2** Histogram of program attrition rate (%) for all paramedic educational programs in the United States. Programs are shown in ascending order of attrition rate and programs with <12 total students enrolled are noted in blue. Reference line (red) is the 30% attrition rate benchmark to be in line with the retention threshold set by Committee on Accreditation of Educational Programs for the EMS Professions.

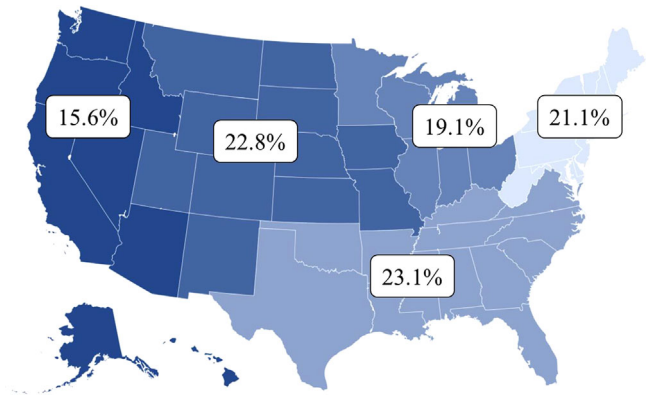


**FIGURE 3** Regional variability in program median attrition rate (%) for all paramedic educational programs in the United States ($P < 0.01$). Programs were divided into National Association of State EMS Officials (NASEMSO) regions.

in 2019, 21% were removed from the potential workforce through program attrition (ie, not completing the educational program). Additionally, another 11% were lost from the potential workforce by not passing the certification examination over the 2-year eligibility period.

Overall attrition rates per program were also evaluated (Figure 2). Median program attrition was 19.1% (interquartile range 10.9, 28.6) with a large amount of variability in attrition rates. A total of 138 programs (22%) had program attrition rates above the 30% attrition benchmark for high level of program attrition. Causes for attrition were also noted with 52% of students not completing the educational program due to academics (Appendix 1). There were also differences in program attrition rates per region (Figure 3). Programs with attrition rates exceeding 30% were significantly associated with total months to course completion, total students enrolled, and the NASEMSO region of the program (Table 3). After controlling for these factors (Table 4), the adjusted odds of program attrition above 30% were increased if the total months to program completion was >12 months (odds ratio [OR] = 1.91, 95% CI [confidence interval]: 1.21–3.00, referent: 12 months) and if total students enrolled were 1–11 (OR = 2.53, 95% CI: 1.45–4.41, referent: 12–17 total students enrolled). Regarding NASEMSO regions, with referent as the West region, the East (2.68 [95% CI: 1.07–6.70]) and South (3.24 [95% CI: 1.38–7.61]) had increased odds of program attrition >30%.

## 4 | LIMITATIONS

Estimates of attrition are based on self-reported data from programs and on raw student level data collection. We believe this to be a valid estimate because there are no national databases available and no national structured reporting of students enrolled per program. Some states do require reporting of students who are enrolled in programs; however, this is inconsistent across states and does not allow

**TABLE 3** Univariable associations between percent attrition >30% and program characteristics (*, $P < 0.05$).

| Characteristic | Odds ratio (95% CI) |
|---|---|
| Total months to completion | |
| <12 months | 0.44 (0.23–0.86)* |
| 12 months | Referent |
| >12 months | 1.81 (1.17–2.79)* |
| Total hours of instruction | |
| Less than 1070 hours | 0.82 (0.48–1.37) |
| 1070–1174 hours | 0.68 (0.40–1.15) |
| 1175–1298 hours | Referent |
| More than 1298 hours | 0.80 (0.47–1.34) |
| Total students enrolled | |
| 1–11 | 2.81 (1.63–4.82)* |
| 12–17 | Referent |
| 18–29 | 1.07 (0.60–1.92) |
| 30 or more | 0.96 (0.53–1.73) |
| Total number of full-time faculty | |
| One or less | Referent |
| Two | 1.09 (0.69–1.71) |
| Three | 0.73 (0.39–1.34) |
| Four or more | 0.80 (0.46–1.37) |
| Meets 80% RAM minimum | 0.75 (0.49–1.14) |
| Program first-attempt certification exam pass rate above median | 0.96 (0.66–1.40) |
| Positive placement in EMS agency upon graduation (>90%) | 0.96 (0.64–1.44) |
| NASEMSO regions | |
| East | 3.13 (1.28–7.66)* |
| South | 3.33 (1.45–7.62)* |
| Great Lakes | 1.73 (0.70–4.28) |
| Western Plains | 2.65 (1.02–6.91)* |
| West | Referent |

Abbreviations: CI, confidence interval; EMS, emergency medical services; NASEMSO, National Association of EMS Officials; RAM, resource allocation matrix.

for more than general regional estimates. For this reporting period, programs determined at what point in the student's educational progression a student was included as attrition. Therefore, there was no standardized metric applied to all students reported as attrition. The certification rate is also self-reported from programs and based on raw numbers of students who attained certification by the 2-year eligibility window. Because this is calculated with this window in mind, the number of students certified is an underestimation of the true number of individuals certified. This is because after remedial education, students can still complete the certification process to eventual licensure. Because of this window, the potential for recall bias is also present, though mitigated by the annual report survey being a required survey all participants are encouraged to prepare for.

**TABLE 4** Adjusted multivariable associations between percent attrition >30% and months to course completion, total students enrolled, and geographic regions (*, $P < 0.05$).

| Characteristic | Odds ratio (95% CI) |
|---|---|
| Total months to completion | |
| <12 months | 0.57 (0.29–1.13) |
| 12 months | Referent |
| >12 months | 1.91 (1.21–3.00)* |
| Total students enrolled | |
| 1–11 | 2.53 (1.45–4.41)* |
| 12–17 | Referent |
| 18–29 | 1.12 (0.61–2.04) |
| 30 or more | 1.08 (0.59–1.99) |
| NASEMSO Regions | |
| East | 2.68 (1.07–6.70)* |
| South | 3.24 (1.38–7.61)* |
| Great Lakes | 1.63 (0.64–4.14) |
| Western Plains | 2.47 (0.92–6.66) |
| West | Referent |

Abbreviations: CI, confidence interval; NASEMSO, National Association of EMS Officials.

## 5 | DISCUSSION

Owing to the EMS workforce shortage in the United States, retention of eligible individuals during education is critically important. In this evaluation, we demonstrate that program attrition accounts for a large loss of candidates to the potential workforce (21%), almost double the amount due to the certification process (11%). Program attrition was significantly associated with course length, student enrollment, and regional program location. Future studies will need to focus on identifying additional program characteristics associated with attrition.

Program performance and overall success are difficult to define, assess, and track. Early work focused on the innate challenges associated with paramedic program education.[13–17] Margolis et al identified high performing paramedic educational programs and described subjective characteristics of paramedic programs, such as maintaining high-level entry requirements and fostering a culture that values continuous review and improvement.[18] Most recently, studies have evaluated paramedic program success as defined by first and cumulative third certification pass rates.[7,19,20] This outcome variable allows for the evaluation of program performance and assessment of national variability in performance at the end of the educational process before entry into the workforce. However, the use of certification pass rates as benchmarks misses one of the larger challenges in paramedic educational program performance–the successful completion of the educational program. Previous work has characterized attrition in

some states; however, neither a nationwide profile nor a description of attrition from educational programs has been published.[21] A more detailed picture of attrition rate and what factors contribute to it is important to understanding the workforce crisis the field is facing. This is the first study that has evaluated, on a national level, the cumulative impact of program attrition and certification on the number of enrolled students who can enter the workforce as licensed. Using program attrition as an outcome variable highlights the important role EMS programs play in helping maintain the constantly changing EMS workforce.

Student attrition is not a new phenomenon in higher education, in fact, it is an expected aspect of the educational process. As students are exposed to the field of study, some leave the education program because of a lack of interest, funding, time, support, or inability to meet the set requirements (academic disqualification). Interestingly, fields that are similar to EMS report similar average attrition rates: respiratory therapy at ~18% in 2020; nursing at ~20% in 2019.[22–25] As part of the overall programmatic accreditation process for these programs, retention thresholds are also set, similar to those for EMS, at 70% for respiratory therapy and 70% for nursing.[10,26,27] Thus, taken together, when considering EMS workforce dynamics, specifically the balance of EMS clinicians entering the workforce, an important consideration must be the inherent rate of attrition and certification that is part of the educational process.

It is uncertain what characteristics drive program attrition. Attrition was associated with total months of the educational program, total students enrolled, and regional locations of programs. Interestingly, there was no association with hours of instruction, faculty number, resources (RAM), certification pass rates, or agency placement rates. Prior large-scale evaluations of higher education have provided guidance concerning influential constructs important to retain students, including academic advising, social connectedness, student involvement, faculty and staff approachability, business procedures, learning experiences, and student support services.[28] These were not evaluated in this study. Interestingly, there were 61 programs that were noted to have an attrition rate of 0% (Figure 2) suggesting that specific strategies to minimize attrition from educational programs do exist and are successful. Some of these could be prerequisites, screening or testing before enrollment, interviews to facilitate informed student choices for admission, providing strategies for success in the program, and enhanced faculty engagement through the educational process.[29] Future evaluations will need to identify factors that drive EMS program attrition to begin developing interventions to enhance program success.

One important finding in this study that has been noted in previous evaluations is the significant variability in program success regionally. This was noted in a previous evaluation of program specific certification pass rates in 2015 where first and cumulative third pass rates were higher in the West and Northeast NASEMSO regions.[7] In this evaluation, we also demonstrate regional variability in program attrition. The reason behind this regional variability is unclear and necessitates further study.

In summary, 1 in 5 paramedic students did not complete their educational program and more than 1 in 10 program graduates were unable to complete the certification process. Additionally, programs with high attrition rates were found to be associated with longer program length, smaller class sizes, and specific regional locations in the East and South. Future evaluations need to examine the drivers of high program attrition, including regional differences, to create more effective strategies for reducing potential workforce losses.

## AUTHOR CONTRIBUTIONS

Matthew Ball, Jonathan R. Powell, Michael G. Miller, Lisa Collard, and Ashish R. Panchal conceived and designed the study. Lisa Collard, Michael G. Miller, Matthew Ball, and Ashish R. Panchal collected the data. All authors analyzed and interpreted the data and drafted the manuscript. All authors contributed substantially to the revision of the manuscript. Ashish R. Panchal takes responsibility for the paper as a whole.

## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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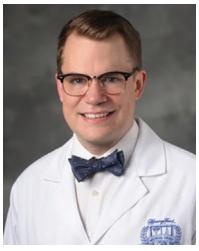
## AUTHOR BIOGRAPHY



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