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# What influences safety in paramedicine? Understanding the impact of stress and fatigue on safety outcomes

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## Abstract

**Objective:** The purpose of this study was to build on extant research linking fatigue to safety outcomes in paramedicine by assessing the influence of a multiplicity of workplace stressors, including chronic and critical incident stresses on safety outcomes.

**Methods:** A cross-sectional survey was deployed to 10 paramedic services in Ontario. Validated survey instruments measured operational and organizational chronic stress, critical incident stress, post-traumatic stress symptomatology (PTSS), fatigue, safety outcomes, and demographics. Analysis of covariance assessed associations of workplace stresses with safety outcomes and corroborated findings using hierarchical linear model and generalized estimating equations (GEE) by taking into account paramedic service when assessing the proposed associations. A non-responder survey was conducted to asses for demographic differences in those who did and did not complete the survey.

**Results:** This survey had a response rate of 40.5% (n = 717/1767); 80% of paramedics reported an injury or exposure to pathogen, 95% reported safety compromising behaviors, and 76% reported medical errors. In the GEE analyses, paramedic injury was significantly related to fatigue (0.13, SE = 0.06, $P = 0.020$), critical incident stress (0.03,

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SE = 0.01, $P < 0.01$), and PTSS (0.03, SE = 0.01, $P < 0.01$). Safety compromising behaviors were significantly associated with fatigue (0.37, SE = 0.06, $P < 0.01$), organizational stress (0.06, SE = 0.01, $P < 0.01$), and critical incident stress (0.01. SE = 0.01, $P = 0.017$). Medication errors were significantly related to fatigue (0.12, SE = 0.05, $P < 0.01$). Finally, the bivariate analysis showed increased stress factors and fatigue was associated with increased safety outcomes.

**Conclusion:** These findings illustrate that a host of different stressors may influence safety-related behaviors. For those interested in safety, these findings point to the need for a holistic focus on fatigue and stress in paramedicine.

**KEYWORDS**
emergency medical services, fatigue, paramedicine, safety, stress

## 1 | INTRODUCTION

Within paramedic services, there has been an increasing dialogue about safety culture[1,2] and safety outcomes.[3] This focus on safety in paramedicine is critical, because it works to identify those factors that place both paramedics and patients at risk for psychological and physical injury. When trying to understand safety in paramedicine, the identification of safety outcomes is an important first step. Safety outcomes described in the literature include paramedic injury/exposure to pathogens, medical errors/adverse events (eg, unintended extubation), and safety compromising behaviors (eg, exceeding the speed limit while driving in a non emergency).[4] The next step is to identify what factors might predict safety outcomes. For example, recent research has shown a clear link between fatigue and safety outcomes in paramedics.[4]

Although an empirical link has been established between fatigue and safety outcomes, no currently published research explores how other types of workplace-related stresses and stress reactions, along with fatigue, might contribute to safety outcomes. One of the most widely studied workforce health issues is post-traumatic stress.[5–13] Research has linked post-traumatic pathology to errors in judgment in paramedics.[14] Further, post-traumatic stress, even at subclinical levels has been linked with functional impairment.[15,16] Given the evidence, it is reasonable to hypothesize that post-traumatic stress symptomatology (PTSS) may influence safety outcomes.

Many factors may influence the development of post-traumatic symptomatology. Extant research has linked stress reactions like post-traumatic stress to both chronic and critical incident stresses.[17,18] Chronic stresses are relatively stable and consistent over time.[19] In paramedicine, chronic stresses include operational stress

(the stress of working in the field of paramedicine regardless of the service) and organizational stress (the stress associated with working in a specific paramedic service).[20] Critical incident stress refers to the stress associated with patient care.[21,22] These workplace stresses have been empirically linked to post-traumatic stress and post-traumatic stress may be linked to safety outcomes, therefore the question becomes, what influence might work-related stress have on safety? The objective of this study was to examine the relative influence of chronic operational stress, chronic organizational stress, critical incident stress, post-traumatic stress, and fatigue on safety outcomes.

### 1.1 | The Canadian Emergency Medical Services system

The designation and level of training for emergency medical services (EMS) personnel vary from country to country. In Canada, there are 4 levels of practice, Emergency Medical Responder (EMR), Primary Care Paramedic, Advanced Care Paramedic, and Critical Care Paramedic (CCP). The scope of practice for a Primary Care Paramedic is similar to that of an Emergency Medical Technician (EMT) or Advanced Emergency Medical Technician (AEMT) in the United States. Similarly, Advanced Care Paramedics have a similar scope of practice to Paramedics in the United States. As respondents to this survey came from Advanced Life Support services, respondents were all certified at the Primary Care Paramedic level or higher. The term "paramedicine" is used in this article as it is the preferred term in the Canadian system.

## 2 | METHODS

### 2.1 | Measures

#### 2.1.1 | Work-related stress

Two types of stress which might influence stress reactions for those in paramedicine were included. Chronic stresses were assessed using the Emergency Medical Services Chronic Stress Questionnaire (EMS-CSQ).[20] The EMS-CSQ assesses operational stress, which is the stress associated with working in EMS generally (eg, shift work, being away from family). The EMS-CSQ also assesses organizational stress, which

is the stress associated with the culture in a specific paramedic service (eg, dealing with supervisors, unequal sharing of work responsibilities, or changes in policy). Both operational and organizational stress are assessed on a 7-point Likert scale.

Critical incident stress was assessed using the EMS Critical Incident Stress Inventory.[21] This inventory assesses 37 patient-care-related stresses and is assessed on a 7-point Likert scale. Responses for both the EMS-CSQ and the EMS-CIS are summed to create a continuous measure of stress.

**The Bottom Line**

A survey was performed to evaluate how different workplace stresses, posttraumatic stress, and fatigue influence safety in paramedics. A total of 80% reported an injury or exposure, 95% reported safety compromising behaviors and 76% reported medical errors. Multivariable analyses indicate that a variety of different stressors may influence safety-related behaviors.

### 2.1.2 | Post-traumatic stress

PTSS is a cluster of symptoms that develop after exposure to trauma (eg, intrusive memories or flashbacks, avoidance of reminders of the event, negative alterations in cognition, alterations in arousal, and reactivity).[23] To assess post-traumatic stress, the PTSD checklist–Military (PCL-M) was used.[24] This 17-item scale has been used successfully in multiple previous studies with paramedics.[17,18] In this study, the PCL-M was changed slightly, with participants being asked about a stressful work experience rather than a stressful military experience. The PCL-M can be summed and scored continuously, or a cutoff can be used to establish probable PTSD. Scoring recommendations vary based on the expected level of rates of PTSD; this study used a cutoff of 50 for probable PTSD,[25] which is the most conservative of the recommended cut-off scores that increases the sensitivity of the scale.

### 2.1.3 | Fatigue

Fatigue, or the sense of "tiredness" that individuals experience,[26] was assessed using the Chalder Fatigue Scale.[27] This scale has been successfully used with paramedic populations in the past[28] and assesses fatigue using an 11-item scale scored on a 4-point Likert scale. Responses are summed; a total over 4 is considered fatigued.

### 2.1.4 | Safety outcomes

To assess safety outcomes, the EMS Safety Inventory was used (EMS-SI).[1] The EMS Safety Inventory assesses injuries and exposures, safety compromising behaviors, and medical errors/adverse events. The EMS-SI was adapted in several ways for this study. The initial iteration of the EMS-SI had 2 questions on injury and exposure; in this study, more specific queries were generated about different types of injuries and/or exposures to offer a greater specificity and detail in that domain; a total of 17 questions were asked about injury and exposure. A second change that was made to the EMS-SI was adapting it for the Canadian population. Items were reviewed by community collaborators who are active paramedics to make sure they were contextually appropriate for the Canadian population. A few changes were required. For example, respondents were asked about driving over the speed limit in kilometers per hour rather than miles per hour. Another change was made in coding responses. In the past, if respondents endorsed "probably yes/definitely yes," or "forgot to perform/ran out of time/did not think it was necessary," they were coded as a negative safety outcome and treated as dichotomous (yes/no). In this study, responses were summed to create a continuous variable that reflected how many negative safety outcomes each respondent endorsed. Although previous research has dichotomized the safety outcome variables, the decision was made to create a continuous variable to see if there was a linear relationship between level of stress and the frequency of reports of safety outcomes. As multiple changes were made to the EMS-SI, the revised version of the scale has been included as Appendix A.

### 2.1.5 | Demographics

Respondents were asked about age, the number of years they had been in the paramedic profession, gender, marital status, level of certification, hours worked weekly, number of paramedic jobs held, ethnicity, and income.

### 2.1.6 | Study protocol

This study used a cross-sectional online survey methodology. Recruitment occurred through a listserv of chiefs of paramedic services in Ontario. Each participating service agreed to share the email addresses of their staff so that participants could be contacted directly. Before contact from the researchers, all paramedics received an email contact from their administration, communicating to paramedics that participation was voluntary, confidential, and they could respond to the survey while at work. The survey instrument included 167 questions. Once data collection started, respondents received an introductory email describing the purpose of the survey. Participants received 2 invitations and 2 reminders about the survey at 5-day intervals. Respondents could opt out through a hyperlink in their emails or by declining to participate on the first page of the survey. At the end of the study, a non-responder survey was sent out to assess for demographic differences in those who chose not to complete the study. To be included in the study, respondents had to have completed at least 80% of the

survey questions.[29] Response was incentivized by the opportunity to be entered into a drawing for 1 of 10 Android tablets. The study was reviewed and cleared by the University of Windsor Research Ethics Board (REB 15-057).

#### 2.1.7 | Analysis of data

In primary analysis, respondent-level data was used for descriptive analyses and bivariate analyses. Analysis of covariance (ANCOVA) was used to assess for significant relationships between the independent variables and safety outcomes. Categorical variables were dichotomized as gender (male/female), marital status (partnered/not partnered), level of certification (Advanced Care Paramedic/Primary Care Paramedic), and ethnicity (white/visible minority). Paramedic service (the service the paramedic was employed by) was used as a covariate. Demographic characteristics that were significantly correlated with safety outcomes were also used as covariates in addition to paramedic service.

As paramedics were nested within paramedic services, hierarchical linear modeling was used to measure if the y-intercepts (level at which prediction line begins when predictor = 0) differ across services for each outcome, if the slopes (association of predictor with outcome) differ across services for each outcome, and if there is an interaction of intercepts and slopes for each outcome. A significant interaction would indicate that services that start low on a specific outcome may have steeper slopes, meaning they are particularly sensitive to certain stressors. The estimates of beta parameter were obtained using generalized estimating equations (GEE) and nested within paramedic services as in hierarchical linear modeling model.

Both analyses are presented to allow for a comparative assessment of the impact of service-level variables on safety outcomes. Model 1 represents analyses including only demographic factors, Model 2 represents analyses the inclusion of workplace stresses, Model 3 includes all factors, including fatigue and post-traumatic stress. Model 4 is the hierarchical linear modeling analysis. Model 5 is the GEE analysis. For all analyses, SPSS (versions 24–26) were used.[30,31]

## 3 | RESULTS

Of the 54 services, 10 agreed to participate. Out of the total of 1767 paramedics in the participating regions, 825 responded to the survey; however, after removing those with <80% completion, the overall usable response rate for the survey was 40.5% (n = 717). Responses were received from paramedics at all 10 services that opted to participate in the study. Within services, response rates varied, ranging from 24%–54%. A total of 69 individuals completed the non-responder survey.

To assess if the standardized scales had performed reliably, Cronbach $\alpha$ scores were calculated. In this sample, the scales performed reliably; operational stress scale ($\alpha = 0.882$), organizations stress ($\alpha = 0.878$), and the PTSS scale was ($\alpha = 0.943$).

### 3.1 | Sample demographics

Most respondents were male (66%), white (93%), and certified at the Primary Care Paramedic level (78%). The average age of respondents was 38 (SD = 10.1) and the average number of years in paramedicine was 13.6 (SD = 9.9). Respondents reported most frequently working between 41 and 60 hours (71%) and working 12-hour shifts (99%). A simple majority of respondents reported being married (57.5%), the vast majority reported working 1 job (76.5%) and 82% reported making over $70,000 per year. This sample was overwhelmingly white (92.7%). To assess for the relative representativeness of this sample to the overall paramedic population, a review of studies of paramedics was conducted to compare demographic characteristics of this sample. The results are presented in Table 1.[17,29,30,32,33]

### 3.2 | Stress and safety

In this sample, 54.9% of respondents reported they were fatigued at work (M = 5.4, SD = 2.7). The percentage of participants who reported post-traumatic symptomatology which might indicate post-traumatic stress disorder (PTSD) was 14.5% (M = 34.1, SD = 14.6). As the EMS-SI was adapted for this population and items were added, individual items and the frequency with which they were endorsed is included as Appendix A.

Safety-compromising situations were reported by most respondents; 80.2% reported some sort of injury or exposure, 95.3% reported at least 1 safety compromising behavior, and 76.4% of respondents reported an adverse event or medication error. Before multivariable analyses, the demographic variables were assessed for significance with the safety variables. The results were as follows in Table 2.

Age and years in paramedicine were significantly associated with safety-compromising behaviors and errors/adverse events ($P < 0.01$), with younger paramedics and those with fewer years in paramedicine report reporting higher levels on both outcomes. Level of certification was significantly related to injuries/exposures ($P < 0.01$), safety-compromising behaviors ($P < 0.001$), and errors/adverse events ($P < 0.001$). Respondents certified at the Advanced Care Paramedic level reported higher levels of all safety outcomes than respondents at the Primary Care Paramedic level. Hours worked weekly were significantly related to injuries, ($P < 0.01$) and safety compromising events ($P < 0.01$), with those who worked more hours reporting higher rates. The more jobs individuals reported working, the more errors and adverse events were reported ($P < 0.05$). Given bivariate significance, these demographic variables were included in subsequent analyses as covariates. The descriptive statistics between demographics characteristics and safety outcome is included as Appendix B.

In further bivariate analysis, all the stress factors and fatigue were significantly associated with injuries/exposures, safety compromising behaviors, and errors/adverse events ($P < 0.01$), with a higher level of stress and fatigue reporting higher levels on the safety outcomes (Table 3).

**TABLE 1** Comparative demographic characteristics of Canadian paramedics

| | Current study (n = 717) | Bigham et al.[32] (n = 1676) | Fischer and MacPhee[33] (n = 2557) | Donnelly et al.[18] (n = 162) |
|---|---|---|---|---|
| Response rate | 40% | 89% | N/A | 60% |
| Male | 66% | 70% | 64% | 71% |
| Age in years (mean) | 38 | 34 | N/A | 38 |
| Years of experience | 13.5 | 10.2 | N/A | 13.75 |
| Full time hours worked weekly (35+ h) | 80% | 91.5% | 78% | N/A |
| Level of certification (Primary Care Paramedic) | 78% | N/A | 61% | 80.7 |
| Married | 57.5% | N/A | 73% | 67% |

N/A, not available.

**TABLE 2** Bivariate relationship between safety outcomes and demographic characteristics

| | Injuries/exposures | Safety-compromising behaviors | Errors/adverse events |
|---|---|---|---|
| Age | N/S | $r(665) = -0.17, P < 0.01$ | $r(652) = -0.12, P < 0.01$ |
| Years in paramedicine | N/S | $r(646) = -0.13, P < 0.01$ | $r(637) = -0.11, P < 0.01$ |
| Gender | N/S | N/S | N/S |
| Marital status | N/S | N/S | N/S |
| Level of certification | $t(672) = 2.67, P < 0.01$ | $t(669) = 4.21, P < 0.001$ | $t(659) = 4.00, P < 0.001$ |
| Hours worked weekly | $r(672) = 0.13, P < 0.01$ | $r(669) = 0.12, P < 0.01$ | N/S |
| Ethnicity | N/S | N/S | N/S |
| Gross personal income | N/S | N/S | N/S |
| Number of jobs | N/S | N/S | $r(657) = 0.09, P < 0.05$ |

N/S, non-significant.

### 3.2.1 | Multivariable analyses

*Injuries and exposures*

To test the multivariable relationships predicting injuries and exposures, ANCOVA analyses were run. Respondents certified at the Advanced Care Paramedic reported higher level (M = 4.58, SD = 3.37) of injury than respondents at the Primary Care Paramedic level (M = 3.78, SD = 3.19). When all the covariates were added (Model 3), the predictors that had a significant relationship to injuries and exposures were paramedic service ($P = 0.006$), organizational stress ($P = 0.050$), critical incident stress ($P < 0.001$), post-traumatic stress ($P = 0.003$), and fatigue ($P = 0.017$). A final $R^2$ for the model was 0.226, signifying that these predictors accounted for 22.6% of the variance in injuries and exposures (Table 4).

To further explore the effect of paramedic service and account for non-independence of observations, 3 hierarchical linear modeling and GEE models were run to assess whether measuring the variability in intercepts and slopes across services improved the fit of the model to the data. Model fit was measured by the log-likelihood (−2LL) for hierarchical linear modeling and quasi log-likelihood (QIC) for GEE.

**TABLE 3** Bivariate relationship between safety outcomes and stress/fatigue

| | Injuries/exposures (n) | Safety-compromising behaviors (n) | Errors/adverse events (n) |
|---|---|---|---|
| Organizational stress | 0.27[a] (652) | 0.36[a] (650) | 0.13[a] (641) |
| Operational stress | 0.26[a] (648) | 0.30[a] (646) | 0.13[a] (634) |
| Critical incident stress | 0.40[a] (678) | 0.30[a] (676) | 0.11[a] (665) |
| Post-traumatic stress | 0.36[a] (659) | 0.34[a] (659) | 0.13[a] (645) |
| Fatigue | 0.29[a] (663) | 0.39[a] (663) | 0.18[a] (653) |

[a]Correlation is significant at the 0.01 level (2-tailed).

**TABLE 4** ANCOVA and hierarchical linear modeling analyses on injuries and exposures

| | Model 1 | | Model 2 | | Model 3 | | Model 4 (hierarchical linear modeling) | | Model 5 (GEE) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | F | P | F | P | F | P | F | P | β (SE) | P |
| Intercept | 7.271 | 0.007 | 0.893 | 0.345 | 0.010 | 0.919 | 0.006 | 0.936 | −0.40 (0.80) | 0.617 |
| Level of certification | 5.619 | 0.018 | 3.915 | 0.048 | 0.832 | 0.362 | 1.241 | 0.266 | 0.34 (0.28) | 0.230 |
| Hours worked weekly | 10.86 | 0.001 | 1.813 | 0.179 | 2.147 | 0.143 | 2.137 | 0.144 | 0.25 (0.18) | 0.158 |
| Paramedic service | 2.974 | 0.002 | 2.448 | 0.010 | 2.590 | 0.006 | [a] | [a] | [a] | [a] |
| Organizational stress | | | 6.986 | 0.008 | 3.857 | 0.050 | 3.250 | 0.072 | 0.02 (0.01) | 0.080 |
| Operational stress | | | 4.528 | 0.034 | 0.000 | 0.992 | 0.011 | 0.915 | 0.001 (0.01) | 0.966 |
| Critical incident stress | | | 55.156 | 0.000 | 37.427 | 0.000 | 38.081 | 0.000 | 0.03 (0.01) | 0.000 |
| Post-traumatic stress | | | | | 8.768 | 0.003 | 8.719 | 0.003 | 0.03 (0.01) | 0.006 |
| Fatigue | | | | | 5.707 | 0.017 | 6.009 | 0.015 | 0.13 (0.06) | 0.021 |
| Adjusted $R^2$ | | 0.046 | | 0.200 | | 0.226 | [b] | [b] | [b] | [b] |

Model 4 allowed intercepts to vary across paramedic services, which accounted for significant variance (2.37%) in injuries and exposures and significant improvement in model fit, $\chi^2_{change}$ (1) = 5.683, $P < 0.05$. Tabled intercept value represents a fixed effect across all individuals.

[a]Slopes and intercepts allowed for vary across paramedic services, thus negating overall effect for paramedic service. Model 5 allows for subjects to be nested across services and provides parameter estimates and SE.

[b]Both hierarchical linear modeling and GEE do not provide $R^2$ statistic.

After taking the variability in intercepts into account in the GEE model, critical incident stress (0.03, SE = 0.01, $P < 0.001$), post-traumatic stress (0.03, SE = 0.01, $P = 0.006$), and fatigue (0.13, SE = 0.06, $P = 0.021$) still predicted injuries and exposures; the effect of organizational stress was reduced to marginal significance (0.02, SE = 0.01, $P = 0.080$). In the hierarchical linear modeling model, we have found the same predictors predicting injuries and exposures as in the GEE model.

*Safety compromising behaviors*

Respondents certified at the Advanced Care Paramedic reported a higher level (M = 8.06, SD = 4.25) of safety-compromising behaviors than respondents at the Primary Care Paramedic level (M = 6.61, SD = 3.80). In ANCOVA analyses, safety-compromising behaviors were significantly related to level of certification ($P = 0.003$), organizational stress ($P < 0.001$), critical incident stress ($P = 0.003$), post-traumatic stress ($P = 0.017$), and fatigue ($P < 0.001$). The final model had an $R^2$ for the model was 0.291, signifying that these predictors accounted for 29.1% of the variance in safety-compromising behaviors (Table 5).

In GEE analyses, organizational stress (0.06, SE = 0.01, $P < 0.001$), critical incident stress (0.01, SE = 0.01, $P = 0.017$), post-traumatic stress (0.03, SE = 0.01, $P = 0.018$), and fatigue (0.37, SE = 0.06, $P < 0.001$) still predicted safety-compromising behaviors, but operational stress ($P = 0.164$) did not predict safety-compromising behaviors, possibly due to the strong variability in this association across services. Greater age (−0.07, SE = 0.03, $P = 0.015$) and level of certification (−1.07, SE = 0.36, $P = 0.003$) predicted fewer safety-compromising behaviors in the GEE model. In the hierarchical linear modeling analyses, we found a similar conclusion with the GEE model, but post-traumatic stress no longer predicts safety-compromising behaviors.

*Medication errors/adverse events*

Like the earlier outcomes, respondents certified at the Advanced Care Paramedic reported a higher level (M = 2.76, SD = 2.96) of adverse events in comparison to Primary Care Paramedic level certification (M = 1.85, SD = 2.18). ANCOVA analyses indicated that level of certification ($P = 0.017$), number of jobs ($P = 0.032$), organizational stress ($P = 0.035$) and fatigue ($P = 0.014$) were significantly related to medication errors and adverse events. A final $R^2$ of 0.088 indicated that predictors accounted for 8.8% of the variance in medication errors and adverse events (Table 6).

In GEE analyses, fatigue still predicted medication errors/adverse events (0.12, SE = 0.05, $P = 0.005$), but organizational stress was reduced to marginal significance (0.02, SE = 0.01, $P = 0.065$). A greater level of certification, however, still predicted fewer errors (0.78, SE = 0.28, $P = 0.005$), and a greater number of jobs marginally predicted more errors (0.41, SE = 0.22, $P = 0.062$). In the hierarchical linear modeling analyses, a similar conclusion was found in the GEE model, but we gained the number of jobs ($P = 0.024$) as a predictor of medication errors and adverse events.

### 3.2.2 | Non-responder survey

To assess for differences among responders and non-responders (paramedics who did not respond to the survey and did not opt out of participation), a follow-up survey was undertaken. The purpose of this non-responder survey was not to query respondents about stress or safety, but to assess for demographic differences between those who responded to the survey and those who did not. A total of 69 responses were received from 9 paramedic services. No significant differences

**TABLE 5** ANCOVA, hierarchical linear modeling, and GEE analyses on safety-compromising behaviors

| | Model 1 | | Model 2 | | Model 3 | | Model 4 (hierarchical linear modeling) | | Model 5 (GEE) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | F | P | F | P | F | P | F | P | β (SE) | P |
| Intercept | 50.999 | 0.000 | 16.329 | 0.000 | 11.96 | 0.001 | 12.105 | 0.001 | 3.15 (1.26) | 0.013 |
| Age | 6.341 | 0.012 | 2.097 | 0.148 | 3.416 | 0.065 | 4.277 | 0.039 | −0.07 (0.03) | 0.015 |
| Years in EMS | 0.008 | 0.931 | 2.558 | 0.110 | 2.784 | 0.096 | 2.453 | 0.118 | −0.04 (0.03) | 0.158 |
| Level of certification | 19.402 | 0.000 | 15.261 | 0.000 | 8.771 | 0.003 | 10.601 | 0.001 | −1.07 (0.36) | 0.003 |
| Hours worked weekly | 6.966 | 0.009 | 1.69 | 0.194 | 2.362 | 0.125 | 3.044 | 0.082 | 0.37 (0.22) | 0.090 |
| Paramedic service | 2.250 | 0.018 | 2.057 | 0.032 | 1.82 | 0.062 | [a] | [a] | [a] | [a] |
| Organizational stress | | | 32.533 | 0.000 | 21.46 | 0.000 | 21.95 | 0.000 | 0.06 (0.01) | 0.000 |
| Operational stress | | | 3.977 | 0.047 | 0.824 | 0.364 | 0.791 | 0.374 | −0.01 (0.01) | 0.364 |
| Critical incident stress | | | 18.448 | 0.000 | 8.906 | 0.003 | 7.952 | 0.005 | 0.01 (0.01) | 0.017 |
| Post-traumatic stress | | | | | 5.782 | 0.017 | 2.188 | 0.164 | 0.03 (0.01) | 0.018 |
| Fatigue | | | | | 34.5 | 0.000 | 37.127 | 0.000 | 0.37 (0.06) | 0.000 |
| Adjusted $R^2$ | | 0.079 | | 0.232 | | 0.291 | [b] | [b] | [b] | [b] |

Model 4 allowed intercepts and slopes to vary across services, which produced best-fitting model. Allowing only intercepts to vary across services resulted in non-significant improvement in the fit of the model, $\chi^2_{change}$ (1) = 0.826, $P > 0.10$. Tabled intercept value represents a fixed effect across all individuals.

[a]Slopes and intercepts allowed for vary across paramedic services, thus negating overall effect for paramedic service. Allowing interaction of slopes and intercepts resulted in significant improvement in fit, $\chi^2_{change}$ (1) = 5.950, $P < 0.05$. Model 5 allows for subjects to be nested across services and provides parameter estimates and SE.

[b]Both hierarchical linear modeling and GEE do not provide $R^2$ statistic.

**TABLE 6** ANCOVA and hierarchical linear modeling analyses on medication errors and adverse events

| | Model 1 | | Model 2 | | Model 3 | | Model 4 (hierarchical linear modeling) | | Model 5 (GEE) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | F | P | F | P | F | P | F | P | β (SE) | P |
| Intercept | 28.423 | 0.000 | 9.341 | 0.002 | 6.723 | 0.01 | 15.325 | 0.000 | 1.38 (0.72) | 0.026 |
| Age | 2.303 | 0.130 | 1.041 | 0.308 | 1.623 | 0.203 | 1.732 | 0.189 | −0.03 (0.02) | 0.124 |
| Years in EMS | 0.000 | 0.984 | 0.754 | 0.386 | 0.575 | 0.449 | 1.003 | 0.317 | −0.02 (0.02) | 0.225 |
| Level of certification | 12.105 | 0.001 | 8.611 | 0.003 | 5.694 | 0.017 | 11.883 | 0.001 | 0.78 (0.28) | 0.005 |
| Number of jobs | 3.057 | 0.081 | 3.499 | 0.062 | 4.609 | 0.032 | 5.092 | 0.024 | 0.41 (0.22) | 0.062 |
| Paramedic service | 1.407 | 0.181 | 1.627 | 0.104 | 1.372 | 0.197 | [a] | [a] | [a] | [a] |
| Organizational stress | | | 6.765 | 0.010 | 4.444 | 0.035 | 2.932 | 0.087 | 0.02 (0.01) | 0.065 |
| Operational stress | | | 0.053 | 0.818 | 1.474 | 0.225 | 1.133 | 0.288 | −0.01 (0.01) | 0.352 |
| Critical incident stress | | | 3.489 | 0.062 | 1.144 | 0.285 | 0.734 | 0.392 | 0.003 (0.004) | 0.450 |
| Post-traumatic stress | | | | | 1.127 | 0.289 | 0.044 | 0.834 | 0.01 (0.01) | 0.383 |
| Fatigue | | | | | 6.057 | 0.014 | 7.024 | 0.008 | 0.12 (0.05) | 0.005 |
| Adjusted $R^2$ | | 0.049 | | 0.077 | | 0.088 | [b] | [b] | [b] | [b] |

Model 4 allowed intercepts and slopes to vary across services, which produced best-fitting model. Model 4 allowing only intercepts to vary across services resulted in non-significant improvement in the fit of the model, $\chi^2_{change}$ (1) = 0.458, $P > 0.10$. Tabled intercept value represents a fixed effect across all individuals.

[a]Slopes and intercepts allowed for vary across paramedic services thus negating overall effect for paramedic service. Measuring variability in slopes across services, together with the interaction of slopes and intercepts, resulted in significant improvement in fit, $\chi^2_{change}$ (2) = 6.070, $P < 0.05$. Model 5 allows for subjects to be nested across services and provides parameter estimates and SE.

[b]Both hierarchical linear modeling and GEE do not provide $R^2$ statistic.

were found in age t(769) = 0.498, $P = 0.62$, years in EMS, t(753) = 1.02, $P = 0.31$, in gender $\chi\check{s} = 0.74$ (3) $P = 0.86$, marital status $\chi\check{s} = 1.25$ (5) $P = 0.94$, level of certification ($\chi\check{s} = 0.12$(1), $P = 0.72$, hours worked weekly t(778) = −1.49, $P = 0.136$, ethnicity $\chi\check{s}$ (12) = 5.87, $P = 0.923$, income $\chi\check{s}$ (8) = 4.23, $P = 0.84$. One significant difference was identified; non-responders reported that they held fewer paramedic jobs than responders $\chi\check{s}$ (5) = 77.43, $P < 0.001$.

## 4 | DISCUSSION

This study examined how different types of stress might influence safety outcomes in paramedicine. Results provide preliminary evidence that the factors which influence safety outcomes paramedicine are multifaceted and complex and warrant further investigation. In the Canadian context, fatigue is the most powerful influence on all types of safety outcomes. Although this relationship has already been documented in American paramedics,[4] the Canadian system has significant structural differences,[34] so earlier results cannot be easily generalized. Over half of paramedics reported being fatigued, which is consistent with American paramedics, where 55% of respondents reported being fatigued.[4] Interestingly, in the American sample, respondents commonly worked 24-hour shifts and in this sample, 12-hour shifts were most frequently reported.

Respondents reported high levels of post-traumatic stress; 14.5% of paramedics reported post-traumatic symptomatology that exceeded the recommended cut-off for PTSD. This elevated level of symptomatology was found even when a conservative cutoff was used, so results may be underestimating prevalence in this sample. Although not as high as recent Canadian national study of paramedics that found a prevalence rate of 24.5%,[13] it is significantly higher than in samples of the general population, where the prevalence of PTSD is between 6.8% and 7.8%.[35,36]

The first safety outcomes examined was risk for injury or exposure. In addition to fatigue, critical incident stress and PTSS were significant predictors for injury or exposure. Although work-related stress, including critical incident stress, has been tied to PTSS in previous research on paramedics, this is the first evidence that critical incident stress influences the physical safety of paramedics in addition to influencing their psychological health.

The second safety outcome, safety-compromising behaviors, was significantly influenced by critical incident stress and fatigue. Organizational stress also become influential, indicating that organizational culture has an ability to impact the safety behaviors of paramedics. These findings serve as an extension of research that has linked perceived safety culture and safety behaviors.[1,2] Interestingly, level of certification and age remained significant predictors in the final model. Although individuals at the Advanced Care Paramedic level had greater levels of safety compromising behaviors than Primary Care Paramedics, younger paramedics reported more safety compromising behaviors than older paramedics. The finding related to age may indicate younger paramedics are willing to acknowledge safety compromising behaviors or may reflect a desire to adhere to the socio-cultural dynamic within a service. This finding may also be the result of an age-related difference in cultural norms or behaviors related to work or it may be reflective of an attrition of paramedics with high levels of safety-compromising behaviors from the workforce over time. The finding of higher levels of safety-compromising behaviors is novel and unexpected. This finding may indicate a structural difference in how work demands are experienced by Advanced Care Paramedics, possibly the demands of their higher scope of practice or another factor that was not captured in this survey.

Finally, in assessing predictors of adverse events and medication errors, fatigue remains significant, as does level of certification and the number of jobs. In this sample, Advanced Care Paramedics reported higher levels of medication errors and adverse events than Primary Care Paramedics. This may be a function of the fact that those at the Advanced Care Paramedic level have a greater scope of practice and access to more invasive and complicated interventions. Additionally, respondents with more jobs reported higher levels of medication errors/adverse events. Although this may be a finding that reflects greater levels of fatigue, the fact that it retained significance in a model that controlled for fatigue is interesting and warrants further investigation. Overall, paramedics endorsed medication errors and adverse events at a much lower rate than injuries and safety-compromising behaviors, which may reflect the fact that medication errors do not happen frequently. However, unlike the other 2 safety outcomes, medication errors and adverse events may result in administrative review and possible sanction, which may influence a paramedic's career. Given the higher personal career risk, paramedics may have been less likely to acknowledge a negative event in this domain.

In the interest of improving safety for paramedics and their patients, creating change should take the form of collaborative and iterative efforts that include employer, employee, unions, and human resources. Findings offer suggestions as to where interventions could potentially be targeted. As fatigue remains the most influential predictor of safety outcomes in this sample, implementing a fatigue management strategy may be a good first step. Guidelines are available for the management of fatigue and fatigue reduction[37] and these guidelines could be used to assist leaders to lessen the impact that fatigue plays on safety. Additionally, the fact that paramedic service was a significant predictor of safety outcomes indicates that it is an important influence on safety. Given this finding, it may be possible to learn from "high performing" services to improve safety across all paramedic services.

Further, opportunities should be explored to focus on improving mental health fitness at both the employee and employer level. Given the influence of workplace stresses on safety, attention should be paid to mitigating these stresses. This may take the form of organized work events, anonymous feedback for system improvements, educational workshops offering practical tools to incorporate into a high stress occupation, and confidential access to mental health services. It may be impossible to fully remove all stress factors in the occupation; more work can be done to improve organizational culture and removing stress by mitigating operational conflict and scheduling issues, supporting a culture of both physical health, and mental health to better respond to stressful events, and limit injury and error.

## 5 | LIMITATIONS

This study has several limitations. Paramedic services self-selected into the study, so the sample is not generalizable to the broader population. The response rate being <50% also limits the generalizability of the findings; however, it is comparable with response rates for other surveys that used online methodologies.[38] Additionally, the non-responder survey found few significant differences between the non-responders and the responders, and the response rate is higher than other large-scale internet-based surveys for paramedics.[39-41]

The reliance on participant self-report creates the possibility of introducing biases including social desirability bias,[42] wherein respondents report how they would prefer to be seen rather than how they are really behaving. Further, respondents were queried about events in the past 3 months; however, there is no way to independently assess if responses are being accurately recalled,[43] introducing the possibility of recall bias. Respondents may be underreporting events because of fear of reprisal or variability in safety culture.[44,45] This study was not able to differentiate fatigue related to work versus fatigue related to out-of-work commitments and did not control for service specific events (eg, if service was in negotiations with a union or managing with an investigation).

A final limitation which perhaps might be addressed in future research is the failure to capture if stress and fatigue management services were made available and if paramedics accessed those services. Paramedic Service retained a significant relationship to all 3 safety outcomes, which indicates there is an uncaptured difference in paramedic services which significantly influences safety. Future research may be able to improve on this research by capturing not only structural supports (eg, Employee Assistance Plans or Peer Support programs), but assessing the broader culture of safety.

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### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

### AUTHOR CONTRIBUTIONS

EAD takes responsibility for the paper as a whole.

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## APPENDIX A: Valid percentages endorsing items in the adapted EMS safety inventory

| In the past 3 months | Definitely not | Probably not | I am not sure | Probably yes | Definitely yes | Do not wish to answer | Not applicable to me |
|---|---|---|---|---|---|---|---|
| Injuries and exposures | | | | | | | |
| I was injured during a shift | 42.4 | 6.4 | 4.2 | 14.9 | 18.0 | 0.4 | 13.7 |
| I injured my head or neck | 63.6 | 7.6 | 1.8 | 4.1 | 3.4 | 0.3 | 19.3 |
| I injured my back | 45.6 | 5.5 | 5.2 | 15.2 | 14.1 | 0.7 | 13.7 |
| I injured a joint (shoulder, knee, ankle, or wrist) | 48.1 | 5.4 | 3.3 | 13.4 | 15.6 | 0.6 | 13.5 |
| I injured my hands or feet | 59.6 | 8.0 | 1.7 | 5.9 | 7.0 | 0.4 | 17.3 |
| I received a laceration or other traumatic injury | 66.7 | 4.2 | 1.3 | 2.9 | 5.9 | 0.6 | 18.5 |
| I received another type of injury | 58.8 | 6.5 | 3.6 | 6.5 | 7.6 | 0.6 | 16.5 |
| I received a needle stick injury | 77.4 | 1.0 | .4 | .3 | 2.1 | 0.3 | 18.5 |
| I was exposed to a pathogen in the field | 35.6 | 5.4 | 9.5 | 20.4 | 17.5 | 0.1 | 11.5 |
| I was exposed to MRSA/VRE | 21.8 | 4.2 | 7.4 | 27.2 | 31.7 | 0.1 | 7.6 |
| I was exposed to tuberculosis (TB) | 39.4 | 20.0 | 18.6 | 5.7 | 2.5 | 0 | 13.7 |
| I was exposed to meningitis | 41.8 | 18.5 | 18.5 | 4.8 | 3.2 | 0 | 13 |
| I was exposed to a blood-borne pathogen | 32.4 | 11.8 | 16.5 | 15.8 | 13.5 | 0.1 | 9.8 |
| I was exposed to bedbugs, fleas, or other insects | 25 | 8.0 | 14.3 | 22.1 | 22.4 | 0.3 | 7.9 |
| I was exposed to measles, chickenpox, or the flu | 25.4 | 7.0 | 11.5 | 20.8 | 26.5 | 0.4 | 8.4 |
| I was exposed to a pathogen not listed above | 26.9 | 9.7 | 22.9 | 21.4 | 8 | 0.3 | 10.8 |
| I was injured in an ambulance crash | 81 | 0.1 | 0.3 | 0.3 | 0.1 | 0 | 18.2 |
| Safety-compromising behaviors | | | | | | | |
| I have "fudged" information on a patient care report (ie, vitals, chronology of events). | 53.1 | 13.5 | 5.5 | 15.4 | 6.4 | 2.7 | 3.4 |
| I didn't discuss the consequences of not going to the hospital with a "no service patient" | 77.7 | 11.2 | 2.6 | 2.9 | 1.3 | 0.4 | 3.9 |
| I convinced someone not to go to the hospital | 76.8 | 8.4 | 1.8 | 5.5 | 3.2 | 0.6 | 3.8 |
| I spent more than 20 minutes on scene because I was "staying and playing" | 37.2 | 14.1 | 12.4 | 19.5 | 12 | 1.0 | 3.8 |
| I reported for my shift without getting adequate rest beforehand | 12.0 | 6.0 | 3.8 | 31.4 | 43.4 | 0.6 | 2.9 |
| I reported for my shift after drinking alcohol within the previous 8 hours | 74.4 | 5.9 | 1.4 | 6.1 | 4.7 | 1.4 | 6.0 |
| I was overly stressed during a shift | 17.1 | 15.1 | 7.3 | 29.4 | 28.3 | 0.3 | 2.5 |
| I found myself at an unsafe scene | 23.3 | 13.2 | 6.6 | 26.8 | 25.9 | 0.3 | 3.9 |
| I may have been contaminated with copious amounts of patient bodily fluids | 49.9 | 14.5 | 5.9 | 11.0 | 11.5 | 0.1 | 7.0 |
| I felt vulnerable to harm due to lack of appropriate PPE (ie, BSI, turnout gear, etc.) | 55.7 | 19.4 | 5.6 | 8.1 | 4.2 | 0.6 | 6.4 |
| My "chute time" (time from call received to rolling) was >2 minutes | 34.0 | 20.7 | 10.2 | 17.9 | 12.3 | 0.4 | 4.3 |
| I felt that a patient's safety was jeopardized because my agency did not provide me with updated equipment | 57.4 | 19.5 | 6.3 | 6.2 | 5.2 | 0.1 | 5.3 |
| I felt that my safety was jeopardized because my agency did not provide me with updated equipment | 56.0 | 15.9 | 6.0 | 8.0 | 8.9 | 0.1 | 5.1 |

| In the past 3 months | Definitely not | Probably not | I am not sure | Probably yes | Definitely yes | Do not wish to answer | Not applicable to me |
|---|---|---|---|---|---|---|---|
| I felt that a patient's safety was jeopardized because my agency did not provide me with updated protocols/policies/procedures | 58.5 | 16.5 | 8.3 | 5.5 | 5.9 | 0.6 | 4.9 |
| I felt that my safety was jeopardized because my agency did not provide me with updated protocols/policies/procedures | 57.5 | 17.8 | 8.1 | 5.9 | 5.7 | .4 | 4.6 |
| I have exceeded the speed limit while routinely driving the unit in a non-emergency mode | 10.9 | 12.6 | 6.3 | 36.0 | 30.9 | 1.5 | 1.8 |
| I have greatly exceeded the speed limit while responding lights and sirens (ie, >20 kilometers over the posted speed limit) | 12.7 | 12.7 | 6.7 | 25.3 | 38.5 | 1.3 | 2.8 |
| I felt my safety was endangered while driving due to fatigue levels | 30.3 | 25.1 | 7.9 | 19.4 | 14.2 | .7 | 2.4 |
| I was involved in a collision involving one of my agency's vehicles | 87.4 | 0.4 | 0.1 | 0.4 | 2.8 | 0.3 | 8.5 |
| Medication errors/adverse events | | | | | | | |
| I accidentally started an IO in a location outside of protocol | 66.1 | 0.6 | 0.1 | 0.3 | 0 | 0.3 | 32.7 |
| I made a patient with chest pain or shortness of breath ambulate instead of using a stretcher | 59.2 | 18.0 | 3.2 | 10.1 | 4.2 | 1.0 | 4.3 |
| I placed an IV into an artery instead of into a vein | 82 | 1.0 | 0.1 | 0.7 | 0.4 | 0.3 | 15.5 |
| I accidentally dislodged an ET tube | 74.7 | 1.3 | 0.8 | 0.6 | 0.1 | 0.1 | 22.4 |
| I accidentally dropped a patient while on a transportation device (ie, stretcher, stair chair) | 92.2 | 0.8 | 0.1 | 0.6 | 0.4 | 0.1 | 5.7 |
| I accidentally caused physical injury to a patient moving the patient | 82.1 | 6.2 | 2.7 | 1.8 | 1.7 | 0.1 | 5.5 |
| In the past 3 months: | Ran out of time | Forgot to perform | Not part of protocol | Did not think it was necessary | Contrainc | Do not wish to answer | Not applicable to me |
| Safety-compromising behaviors | | | | | | | |
| I did not complete a pre-shift check of equipment and medications because… | 43.8 | 2.7 | 0.3 | 3.8 | 0.1 | 1.0 | 48.3 |
| I did not restock the ambulance before a call or shift because… | 48.7 | 7.7 | 0.1 | 1.8 | 0.1 | 0.7 | 40.7 |
| I didn't contact medical direction from a base hospital in a situation where it may have been considered appropriate or beneficial… | 3.8 | 1.5 | 0.8 | 6.2 | 0.6 | 1.3 | 85.9 |
| I didn't follow medical direction from a base hospital physician because… | 0.3 | 0 | 0.1 | 0.4 | 0.6 | 1.0 | 97.6 |
| My patient assessment and patient history were abbreviated or neglected for a "frequent flier" patient | 1.4 | 0.6 | 0.1 | 14.4 | 0.4 | 1.0 | 82.0 |
| Medication errors/adverse events | | | | | | | |
| I did not establish an advanced airway after two attempts because… | 2.8 | 0.1 | 5.4 | 4.5 | 8.5 | 0.8 | 77.8 |
| I did not use a secondary treatment device when the preferred failed (eg, IO instead of IV access, OPA to King airway or King airway instead of ET tube) because… | 2.1 | 0.7 | 2.7 | 4.3 | 2.5 | 1.0 | 86.7 |
| I did not check a glucose level in a patient with altered mental status because… | 2.2 | 4.6 | 1.8 | 8.87 | 0.6 | 1.4 | 80.6 |
| I did not check a glucose level in a diabetic patient with nausea and vomiting because… | 1.0 | 1.0 | 7.3 | 8.4 | 1.8 | 1.3 | 79.3 |

| In the past 3 months | Definitely not | Probably not | I am not sure | Probably yes | Definitely yes | Do not wish to answer | Not applicable to me |
|---|---|---|---|---|---|---|---|
| I did not use CPAP on a patient with congestive heart failure while enroute to the hospital because… | 1.5 | 0.4 | 1.3 | 5.0 | 7.4 | 1.4 | 82.9 |
| I did not place a patient on the monitor because… | 0.8 | 1.0 | 2.4 | 39.5 | 0.6 | 1.1 | 54.6 |
| I did not perform upload the 12-lead EKG on a patient with STEMI because… | 0.7 | 1.3 | 0.8 | 1.4 | 0.1 | 1.4 | 94.3 |
| I confirmed a STEMI but did not administer aspirin when warranted because… | 0.1 | 0 | 0.3 | 0 | 7.7 | 1.1 | 90.8 |
| I administered the wrong medication by not checking the label because… | 0.1 | 0.4 | 0.1 | 0 | 0.3 | 1.1 | 97.9 |
| I administered the wrong dose of medication by not confirming the dose because… | 0.3 | 1.1 | 0.3 | 0.4 | 0.1 | 1.1 | 96.6 |
| I transferred a patient at the emergency department (ED) with an unrecognized esophageal intubation (ET tube placed in esophagus rather than trachea) because… | 0.1 | 0 | 0.7 | 0 | 0.1 | 0.8 | 98.2 |
| I did not secure an embedded object in a wound instead of securing the object with bandages and accidently removed it because… | 0.1 | 0.1 | 0.3 | 0.1 | 0.3 | 0.8 | 98.2 |
| I did properly interpret an EKG because… | 2.0 | 1.4 | 1.7 | 1.4 | 0.3 | 2.3 | 91 |
| I did not properly size a piece of equipment and then used it on a patient (eg, ET tube, C-collar, airway adjunct, IV catheter) because… | 1.1 | 1.5 | 0.3 | 2.8 | 0.3 | 1.7 | 92.3 |
| I did not transport a specialty care patient to a specialty care facility (ie, trauma, stroke, pediatric) because… | 0.4 | 0.4 | 3.4 | 2.1 | 12.2 | 0.7 | 80.8 |
| I did not deliver high flow oxygen to a patient with chest pain because… | 0 | 0.7 | 1.1 | 17.1 | 3.5 | 1.8 | 75.7 |
| I deviated from the chest pain protocol because… | 0.1 | 0.1 | 0.8 | 3.5 | 7.3 | 1.7 | 86.4 |
| I didn't administer pain control to a patient because… | 0.8 | 0.7 | 4.2 | 12.1 | 15.6 | 1.7 | 64.9 |
| I did not establish an IV after two attempts because… | 11 | 0 | 4.8 | 3.5 | 8.0 | 1.5 | 71.1 |
| I did not follow proper c-spine immobilization in a patient with a suspected spinal injury | 0.1 | 0.4 | 0.4 | 3.2 | 0.8 | 1.3 | 93.7 |
| A patient signed a refusal form but I did not gather all the information to complete it | 4.6 | 7.0 | 0.4 | 3.4 | 0.3 | 1.0 | 83.3 |
| I did not perform a 12-lead EKG on a patient with chest pain because… | 1.5 | 0.1 | 0.3 | 3.2 | 0.4 | 0.7 | 93.7 |

## APPENDIX B: Descriptive statistics of safety outcomes

| | Injury/exposures | Safety-compromising behaviors | Medical errors/ adverse events |
|---|---|---|---|
| Ethnicity | | | |
| Visible minority | 3.4 (2.79, 47) | 6.55 (3.43, 49) | 2.09 (2.43, 47) |
| White | 3.98 (3.26, 626) | 6.89 (3.99, 621) | 2.01 (2.38, 614) |
| Gender | | | |
| Female | 3.91 (3.08, 226) | 7.04 (4.04, 224) | 1.86 (2.14, 221) |
| Male | 3.98 (3.33, 445) | 6.78 (3.9, 444) | 2.1 (2.5, 437) |
| Marital Status | | | |
| Married first time | 4.03 (3.38, 344) | 6.9 (4.05, 346) | 1.99 (2.39, 338) |
| Married with previous marriage | 4.96 (3.65, 45) | 7.2 (3.99, 44) | 2.38 (2.82, 47) |
| Widowed | 2 (3.46, 3) | 3.67 (2.08, 3) | 0 (0, 2) |
| Divorced or separated | 3.43 (3.49, 51) | 6.55 (3.91, 56) | 1.56 (2.28, 52) |
| Never married | 3.54 (2.8, 121) | 6.64 (3.85, 116) | 1.96 (1.82, 115) |
| Common-law relationship | 4.08 (2.92, 109) | 7.21 (3.75, 105) | 2.3 (2.73, 106) |
| Certification | | | |
| Primary Care Paramedic | 3.78 (3.19, 523) | 6.53 (3.8, 519) | 1.82 (2.16, 513) |
| Advanced Care Paramedic | 4.58 (3.37, 151) | 8.05 (4.23, 152) | 2.7 (2.93, 148) |
| Shifts | | | |
| 8–10 hours | 3.08 (3.61, 26) | 5.08 (4.13, 24) | 1.48 (3.14, 25) |
| 12+ hours | 3.99 (3.23, 650) | 6.94 (3.93, 649) | 2.04 (2.35, 638) |
| Weekly shift | | | |
| Under 40 hours | 3.12 (3, 123) | 5.48 (3.77, 128) | 1.69 (2.04, 120) |
| Over 40 hours | 4.15 (3.27, 551) | 7.2 (3.92, 543) | 2.1 (2.45, 540) |
| Income | | | |
| <$50,000 | 3.05 (2.71, 21) | 5.41 (2.97, 22) | 1.64 (1.53, 22) |
| $50,000–$59,999 | 2.86 (3.03, 22) | 5.39 (3.69, 23) | 1.52 (1.41, 23) |
| $60,000–$69,999 | 3.47 (3.38, 30) | 6.07 (4.1, 29) | 1.85 (2.01, 27) |
| $70,000–$79,999 | 4.04 (3.23, 114) | 7.31 (4.17, 111) | 1.83 (2.04, 106) |
| $80,000–$89,999 | 4.03 (3.17, 193) | 7.08 (3.85, 190) | 2.28 (2.41, 189) |
| $90,000–$99,999 | 4.54 (3.49, 122) | 7.37 (4.36, 121) | 2.21 (2.77, 126) |
| $100,000+ | 3.91 (3.22, 129) | 6.81 (3.71, 129) | 1.91 (2.5, 127) |
| Number of jobs | | | |
| 1 | 3.88 (3.33, 510) | 6.82 (3.99, 510) | 1.93 (2.32, 502) |
| 2 | 4.1 (2.98, 144) | 6.94 (3.7, 143) | 2.3 (2.48, 139) |
| 3 | 4.91 (2.88, 11) | 8.27 (5.12, 11) | 2.36 (3.56, 11) |
| 4+ | 4.25 (3.69, 4) | 10 (4.69, 4) | 3.75 (3.86, 4) |

Reported are mean (SD, N).