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SLEEP DYSFUNCTION, ACCIDENTS, AND INTENT TO LEAVE AMONG EMERGENCY MEDICAL SERVICES PROVIDERS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Emergency medical services (EMS) providers operate under occupational conditions that carry substantial risk for sleep disruption and fatigue-related impairment. Extended shifts, overnight assignments, rotating schedules, and secondary employment are structural features of many EMS systems that consistently interfere with adequate sleep. The relationships among sleep quality, daytime sleepiness, sleep disturbance, occupational fatigue, fatigue-related safety outcomes, and workforce retention were examined among a cross-sectional sample of 254 EMS providers. Sleep quality was assessed using self-report measures, daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS), and sleep disturbance was assessed using a sleep disturbance index derived from the Pittsburgh Sleep Quality Index (PSQI). Results indicated that poor sleep quality and fatigue were widespread: 63.7% of participants rated their sleep quality as bad or fairly bad, and 47.6% reported considerable or intense sleepiness while at work. Providers who reported fatigue-related driving accidents or near-miss incidents demonstrated significantly higher ESS scores than those who did not ($M = 9.33$ vs. 7.28 , $p = .001$, $d = 0.49$). Regression analyses revealed that sleep variables explained limited variance in intent to leave, though work-related sleepiness approached significance as a predictor of turnover intentions in both models. Shift length emerged as a significant independent predictor of intent to leave EMS ($p = .033$), with providers working longer shifts reporting lower turnover intentions. Findings suggest that fatigue within EMS extends beyond wellness concerns to carry meaningful implications for operational safety and, to a lesser extent, workforce sustainability.

INTRODUCTION

Fatigue and sleep disruption are part of the operational culture of emergency medical services. Overnight tours, 24-hour shifts, mandatory overtime, and providers working for multiple agencies simultaneously make inadequate sleep not merely common but, in many systems, inevitable (Patterson et al., 2010; Patterson et al., 2012a). There is increasing awareness and recognition that this pattern carries consequences that extend well beyond individual discomfort, including consequences for clinical judg-

ment, emergency vehicle operation, patient safety, and the long-term sustainability of an already strained workforce (Patterson et al., 2018a).

The EMS occupational context is distinct in ways that complicate simple comparisons to other healthcare or shift-work populations. Paramedics and EMTs are expected to transition rapidly from rest to high-acuity clinical response, often within seconds, during overnight hours when circadian physiology is least supportive of alertness (Boivin & Boudreau, 2014). Unlike hospital-based providers working within structured clinical environments, EMS personnel operate in uncontrolled field settings where scene safety, emergency driving, and real-time treatment decisions occur simultaneously and under pressure. The physiological consequences of fragmented sleep and circadian disruption, including impaired reaction time, reduced sustained attention, degraded working memory, and compromised executive function, directly impacting skills that are foundational to safe prehospital care (Alhola & Polo-Kantola, 2007; Lowe et al., 2017).

Despite this, fatigue within EMS has historically been treated as an occupational norm rather than an occupational hazard. Survey research conducted across EMS populations has consistently documented elevated rates of poor sleep quality, excessive daytime sleepiness, and clinically significant fatigue (O'Brien et al., 2025; Patterson et al., 2010; Patterson et al., 2012a). What is less well understood is how these conditions translate to operational outcomes, particularly fatigue-related driving incidents, and whether sleep disruption contributes independently to workforce instability beyond the better-studied contributors of burnout, compensation dissatisfaction, and organizational stress (Crowe et al., 2018; Crowe et al., 2020).

This study sought to address this gap by examining a range of sleep-related and occupational variables among a sample of EMS providers. Specific attention was directed toward the relationship between daytime sleepiness and fatigue-related motor vehicle accidents or near-miss driving events, the differential effects of shift length and nontraditional scheduling on sleep outcomes, and the degree to which sleep variables predict intent to leave one's current employer or the EMS profession entirely.

Shift Work, Circadian Disruption, and the EMS Operational Environment

Shift work is widely recognized as a major contributor to sleep disruption, particularly in EMS, where long hours, overnight shifts, and unpredictable schedules are common (Barth et al., 2022; Boivin & Boudreau, 2014). Overnight and rotating schedules interrupt circadian rhythmicity in ways that are not fully remediated by daytime sleep, which tends to be shorter, lighter, and more fragmented than nocturnal sleep (Boivin & Boudreau, 2014). For providers working consecutive extended shifts or holding secondary EMS employment, the opportunity for physiologic recovery between work periods may be genuinely inadequate (Patterson et al., 2015; Rivard et al., 2020).

Extended shift structures, 12- and 24-hour tours in particular, introduce additional concerns specific to within-shift fatigue accumulation (Patterson et al., 2018b; Patterson et al., 2012b). Even when agencies permit or designate rest periods during extended tours, the quality of sleep available in a station environment is frequently poor (Martin-Gill et al., 2018; Thielmann & Böckelmann, 2024). Dispatch tones, equipment checks, crew activity, and the anticipatory arousal associated with waiting for calls all compromise sleep continuity. Research has shown that interrupted and fragmented sleep can still lead to

significant fatigue and impairment, even when total sleep duration appears relatively adequate (Van Dongen et al., 2003).

These effects are not limited to overnight workers. EMS providers working rotating schedules often have little time to fully adjust between shift changes, leading to ongoing disruption of normal sleep patterns (Barth et al., 2022; Courtney et al., 2013). Day-shift workers who hold secondary employment during evening or overnight hours accumulate equivalent sleep debt through a different mechanism (Rivard et al., 2020). In high-volume urban systems, providers across all schedule types may complete a shift having obtained only fragmented, light sleep interspersed with repeated clinical activations throughout the night (Patterson et al., 2010).

DAYTIME SLEEPINESS, FATIGUE, AND OPERATIONAL SAFETY

In EMS, excessive daytime sleepiness is particularly concerning because it has direct implications for patient care, provider performance, and public safety (Patterson et al., 2012a; Patterson et al., 2018a). Sustained attention, reaction time, situational awareness, and divided attention processing, all central to both clinical care and emergency vehicle operation, are among the cognitive functions sensitive to sleep loss (Alhola & Polo-Kantola, 2007; Lowe et al., 2017). Research consistently shows that as sleep restriction increases, performance progressively worsens (Lim & Dinges, 2010; Van Dongen et al., 2003). Importantly, individuals experiencing chronic sleep restriction often underestimate the degree of their own impairment, reporting levels of alertness that do not match objective declines in performance (Van Dongen et al., 2003).

Emergency vehicle operation under fatigue is a particularly underexamined area within the EMS literature. Drivers of emergency vehicles must process rapidly changing roadway environments, respond to other drivers' unpredictable behavior, navigate intersections against traffic signals, and make split-second decisions. During overnight hours when fatigue-related impairment is greatest this can be more problematic (Boivin & Bourdreau, 2014; Dinges, 1995). Research involving commercial transportation workers and overnight shift employees has documented substantially elevated crash risk associated with sleep deprivation and excessive daytime sleepiness, yet equivalent data for EMS providers remain sparse (Lee et al., 2016). This gap is notable given that EMS-involved vehicle accidents carry consequences not only for crews but for patients in transport and the general public.

The Epworth Sleepiness Scale (ESS) has been widely used across occupational and clinical populations to assess propensity for daytime dozing across a range of sedentary situations (Johns, 1991). Higher ESS scores have been associated with impaired driving performance, increased accident risk, and occupationally significant lapses in vigilance (Dinges, 1995; Lee et al., 2016). ESS scores served as the primary measure of daytime sleepiness in this study and were examined in relation to both work-related functioning and self-reported fatigue-related driving incidents.

SLEEP DISRUPTION AND WORKFORCE RETENTION

EMS systems across the United States are confronting workforce instability of considerable scope. Recruitment pipelines have not kept pace with attrition, and the providers who do enter the field frequently leave within the first several years (Cash et al., 2024;

Powell et al., 2025). Understanding what drives these decisions and what distinguishes providers who remain from those who leave has become a practical priority for agency administrators and policymakers (Rivard et al., 2021).

Research examining EMS workforce retention has identified burnout, emotional exhaustion, leadership quality, compensation dissatisfaction, and scheduling demands as among the most consistent predictors of turnover intent (Crowe et al., 2018; Crowe et al., 2020; Powell et al., 2025). Sleep disruption has received comparatively less attention as an independent contributor to retention outcomes, despite its likely role in exacerbating the occupational strain that underlies each of these factors. A provider experiencing chronic fatigue may be less capable of emotional recovery between shifts, more susceptible to the cumulative effects of stress exposure, and more likely to perceive their working conditions as unsustainable (Patterson et al., 2015; Van Dongen et al., 2003).

Financial considerations, promotional opportunities, geographic factors, family demands, and organizational culture also contribute independently to retention decisions (Cash et al., 2024; Crowe et al., 2018), and the present study examined sleep-related variables as one contributor among many.

PURPOSE OF THE PRESENT STUDY AND HYPOTHESES

The primary aim was to examine relationships among sleep quality, sleep disturbance, daytime sleepiness, occupational fatigue, and fatigue-related safety outcomes among EMS providers. A secondary aim was to assess the degree to which sleep-related and scheduling variables were associated with workforce retention outcomes, including intent to leave one's current employer and intent to leave EMS entirely.

Five hypotheses guided the analyses. First, poorer overall sleep quality and lower sleep sufficiency were expected to be associated with greater daytime sleepiness, greater sleep disturbance, and increased work-related sleepiness (H1). Second, higher ESS scores and greater sleep disturbance index scores were expected to predict greater work-related sleepiness (H2). Third, providers reporting fatigue-related motor vehicle accidents or near-miss driving incidents were expected to demonstrate significantly higher ESS scores than those without such events (H3). Fourth, nontraditional scheduling and longer shift lengths were expected to be associated with poorer sleep and greater work-related sleepiness (H4). Fifth, sleep-related and scheduling variables were expected to be associated with intent-to-leave outcomes. (H5).

METHOD

PARTICIPANTS AND PROCEDURE

Participants were current EMS providers recruited using convenience sampling method. Recruitment occurred through professional EMS organizations, social media groups, and EMS agency distribution lists over a 4-month period in 2025. The final analytic sample consisted of 254 providers who completed an anonymous online survey distributed via SurveyMonkey. Participation was entirely voluntary. Electronic informed consent was obtained prior to survey participation, and all items were completed electronically in a single session.

MEASURES

DEMOGRAPHIC AND OCCUPATIONAL CHARACTERISTICS

Participants provided demographic information including age, race and ethnicity, relationship status, educational attainment, household income, and student status. Occupational variables included certification level, type of EMS service, typical weekly EMS work hours, shift length, work schedule type, estimated annual call volume, whether respondents worked nontraditional schedules, and whether they held additional EMS or non-EMS employment.

SLEEP QUALITY AND SLEEP BEHAVIORS

Overall sleep quality during the previous month was assessed via a single self-report item. Participants additionally reported average nightly sleep duration, typical sleep latency, frequency of nighttime awakenings, and perceived overall sleep sufficiency. Additional items examined work-related sleepiness, sleep medication use, diagnosed sleep disorders, and use of positive airway pressure devices (CPAP). Participants were also asked to indicate whether they had ever experienced a motor vehicle accident or near-miss accident attributable to falling asleep while driving.

DAYTIME SLEEPINESS

Daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS; Johns, 1991), in which participants rated their likelihood of dozing across eight common sedentary situations, including sitting and reading, watching television, and riding as a passenger in a vehicle. Higher total scores indicated greater daytime sleepiness. Internal consistency within the current sample was acceptable ($\alpha = .80$).

SLEEP DISTURBANCE

Sleep disturbance was assessed using a Sleep Disturbance Index derived from selected items adapted from the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). The index included items assessing difficulty initiating sleep, nocturnal awakenings, nocturia, respiratory discomfort, coughing or snoring, temperature-related sleep disruption, nightmares, and pain-related sleep disturbances. Participants rated the frequency of each disturbance during the previous month, with higher scores indicating greater sleep disturbance. Because the complete seven-component PSQI scoring procedure was not used, this index should not be interpreted as the validated global PSQI score. Internal consistency of the Sleep Disturbance Index in the present sample was acceptable ($\alpha = .72$).

INTENT TO LEAVE

Workforce retention was assessed using two items examining participants' self-reported likelihood of leaving their current EMS employer within the next 12 months and leaving EMS entirely within the next 12 months. Response options ranged from very unlikely to very likely, with higher scores reflecting greater turnover intent.

STATISTICAL ANALYSIS

All analyses were conducted using IBM SPSS Statistics. Descriptive statistics were computed for demographic, occupational, sleep, and retention variables. Internal consistency

for the ESS and Sleep Disturbance Index (PSQI-derived sleep disturbance scale) was evaluated using Cronbach's alpha. Pearson correlations examined relationships among primary study variables. Independent-samples t-tests compared sleep outcomes between providers reporting and not reporting fatigue-related driving incidents, and between those using and not using sleep medications. One-way analyses of variance explored differences across scheduling and certification groups. Multiple linear regression examined whether sleep and scheduling variables predicted intent-to-leave outcomes after accounting for demographic and occupational covariates. Statistical significance was set at $\alpha = .05$ for all analyses.

Analyses were conducted using pairwise deletion. Consequently, sample sizes vary slightly across analyses because participants with missing data were excluded only from analyses involving those variables.

An a priori power analysis was not conducted. However, the final sample of 254 participants provided adequate statistical power to detect small-to-moderate effects for the primary analyses.

ETHICS APPROVAL

This study was reviewed and approved by the City University of New York (CUNY) University Integrated Institutional Review Board (UI-IRB) (Protocol No. 2019-0564), titled EMS Sleep Study: Examining Self-Reported Sleep Behaviors in EMS Providers. Participation was voluntary and anonymous. Electronic informed consent was obtained from all participants prior to completing the online survey.

RESULTS

SAMPLE CHARACTERISTICS

The sample comprised 254 currently certified EMS providers (Table 1), including 140 EMTs (55.1%) and 114 paramedics (44.9%). Service types represented included hospital-based EMS (31.5%), private ambulance (29.9%), municipal agencies (21.1%), fire-based agencies (12.4%), and volunteer services (5.2%). The majority of respondents reported working 12-hour shifts (51.8%), with smaller proportions working 8-hour (17.0%) or other extended configurations. Schedule types included overnight (28.9%), rotating (23.7%), day (22.9%), evening (8.7%), split (7.5%), and irregular or on-call arrangements (8.3%).

Occupational demands were substantial. Most respondents worked between 40 and 72 hours per week, and nearly half (49.4%) held more than one EMS-related position. Approximately 24.9% reported additional non-EMS employment. Urban or large-city settings accounted for approximately 50.6% of primary work locations. Call volume was high among many respondents: 30.7% reported responding to 20 to 29 calls weekly, 13.4% to 30 to 39 calls, and 10.6% to 50 or more calls per week.

The sample was predominantly White or Caucasian (81.9%), with Hispanic (12.4%), Asian (3.2%), and Black or African American (2.4%) participants also represented. Approximately 45.2% of respondents were married, and 24.4% held a bachelor's degree.

Regarding workforce retention, approximately 31.8% of participants reported being at least somewhat likely to leave their current employer within the next 12 months. A

smaller proportion, 15.4%, reported being likely or very likely to leave EMS entirely within the same period.

SLEEP QUALITY AND FATIGUE PREVALENCE

Sleep-related difficulties were pervasive. Nearly two-thirds of participants (63.7%) rated their overall sleep quality as bad or fairly bad, while only 3.9% reported very good sleep quality. Perceived sleep insufficiency was similarly common: 58.1% described their overall sleep amount during the previous month as very insufficient or somewhat insufficient. Most participants reported averaging five to six hours of sleep per night at home. Nearly half reported routine sleep latencies exceeding 30 minutes, and the majority reported multiple nocturnal awakenings.

Work-related sleepiness was widespread, with 47.6% of respondents reporting either considerable or intense sleepiness during work hours in the prior month. Mean ESS scores were elevated at 7.89 (SD = 4.27), with approximately 24.0% of the sample meeting criteria for at least mild excessive daytime sleepiness. Fatigue-related driving concerns were common: 29.1% of participants reported having experienced a motor vehicle accident or near-miss incident attributable to falling asleep while driving. Additionally, 25.8% of respondents reported using medications to assist with sleep, and 21.7% reported a prior diagnosis of a sleep disorder.

RELIABILITY

The ESS demonstrated acceptable internal consistency ($\alpha = .80$), with corrected item-to-total correlations ranging from .38 to .60. No item substantially altered overall reliability upon deletion, supporting retention of the full eight-item scale (Johns, 1991). The Sleep Disturbance Index likewise demonstrated acceptable consistency ($\alpha = .72$), with corrected item-total correlations ranging from .31 to .53 (Buysse et al., 1989). The mean sleep disturbance score was 10.39 (SD = 5.35), indicating moderate overall disturbance and considerable variability across the sample.

CORRELATIONAL ANALYSES

Pearson correlations supported the primary study hypotheses (Table 2). Overall sleep quality was significantly correlated with perceived sleep sufficiency ($r = .65, p < .001$), sleep latency ($r = -.32, p < .001$), nocturnal awakenings ($r = -.24, p < .001$), work-related sleepiness ($r = -.43, p < .001$), and sleep disturbance scores ($r = -.37, p < .001$). The direction of these correlations reflects the coding of the study variables. Similarly, reduced sleep

Category	Characteristic	n	%
Certification Level	EMT	140	55.1
	Paramedic	114	44.9
Primary EMS Service	Hospital-based	79	31.5
	Fire-based	31	12.4
	Municipal	53	21.1
	Private	75	29.9
	Volunteer	13	5.2
Work Schedule	Day	58	22.9
	Evening	22	8.7
	Overnight	73	28.9
	Rotating	60	23.7
	Split shift	19	7.5
	Irregular/on-call	21	8.3
Relationship Status	Married	114	45.2
	Single	73	29.0
	Living with partner	29	11.5
	Domestic partnership	14	5.6
	Divorced	16	6.3
	Separated/Widowed	6	2.4
Race/Ethnicity	White	204	81.9
	Hispanic	31	12.4
	Black	6	2.4
	Asian	8	3.2
Student Status	Yes	59	23.3
	No	194	76.7

Table 1. Participant characteristics ($n = 254$).

Note. Percentages are based on valid responses and may not total 100% because of rounding and missing data.

Variable	1	2	3	4	5	6	7	8
1. Overall Sleep Quality	—							
2. Sleep Sufficiency	.650***	—						
3. Sleep Latency	.324***	.333***	—					
4. Nighttime Awakenings	.240***	.270***	.138*	—				
5. Work-Related Sleepiness	.429***	.427***	.109	.201**	—			
6. Epworth Sleepiness Scale (ESS) Total	.129*	.157*	.238***	.087	.313***	—		
7. Sleep Disturbance Index	.371***	.347***	.245***	.313***	.303***	.336***	—	
8. Fatigue-Related Driving Accident/Near-Miss	.031	.036	.120	.049	.136*	.217***	.122	—

Table 2. Pearson correlations among primary study variables ($n = 254$).

Note. Values are Pearson correlation coefficients. ESS = Epworth Sleepiness Scale. Sleep Disturbance Index was derived from selected Pittsburgh Sleep Quality Index (PSQI) items and is not the validated global PSQI score. Pairwise deletion was used for missing data. The negative correlation with fatigue-related driving incidents reflects the coding of the dichotomous driving incident variable. * $p < .05$. ** $p < .01$. *** $p < .001$.

sufficiency was associated with greater work-related sleepiness ($r = -.43, p < .001$), more sleep disturbance ($r = -.35, p < .001$), and longer sleep latency ($r = -.33, p < .001$).

Higher ESS scores were significantly associated with greater work-related sleepiness ($r = .31, p < .001$), higher sleep disturbance scores ($r = .34, p < .001$), longer sleep latency ($r = -.24, p < .001$), and the fatigue-related driving incident variable ($r = -.22, p < .001$). The negative correlation reflects the coding of the dichotomous driving incident variable, in which respondents reporting a fatigue-related accident or near-miss were assigned the lower numerical value. Greater sleep disturbance was in turn associated with more frequent nocturnal awakenings ($r = .31, p < .001$), poorer sleep quality ($r = -.37, p < .001$), and greater work-related sleepiness ($r = .30, p < .001$).

Occupational scheduling variables also showed meaningful associations with fatigue outcomes. Longer shift lengths were associated with greater work-related sleepiness ($r = .25, p < .001$) and lower perceived sleep sufficiency ($r = -.13, p = .034$). Nontraditional work schedules were associated with higher ESS scores ($r = -.15, p = .020$). The two intent-to-leave items were strongly intercorrelated ($r = .62, p < .001$). Intent to leave one's current employer showed a small positive association with work-related sleepiness ($r = .14, p = .030$); intent to leave EMS showed a small association with nontraditional scheduling ($r = -.13, p = .039$). Associations between sleep variables and retention outcomes were generally modest in magnitude.

DIFFERENCES BY CERTIFICATION LEVEL

Independent-samples t-tests found no statistically significant differences between EMTs and paramedics in either Sleep Disturbance Index scores (EMTs: $M = 8.99$, $SD = 5.33$; paramedics: $M = 8.31$, $SD = 4.04$; $t[244] = 1.10, p = .274, d = 0.14$) or ESS total scores (EMTs: $M = 8.09$, $SD = 4.31$; paramedics: $M = 7.65$, $SD = 4.24$; $t[247] = 0.80, p = .422, d = 0.10$). Sleep-related difficulties seemed to be present at similar levels across certification levels within the present sample.

SLEEP MEDICATION USE

Exploratory analyses compared sleep disturbance and daytime sleepiness between providers reporting and not reporting sleep medication use. Providers using sleep medications showed modestly higher sleep disturbance scores ($M = 9.59$, $SD = 4.45$) than

non-users ($M = 8.39$, $SD = 4.87$), though this difference did not reach statistical significance ($t[238] = 1.71$, $p = .090$, $d = 0.25$). No significant group difference in ESS scores was observed ($t[241] = -1.09$, $p = .275$). These findings suggest a trend toward greater sleep difficulty among medication users that requires further investigation but should be interpreted cautiously given the small effect size and nonsignificant p -value.

FATIGUE-RELATED DRIVING SAFETY

Providers who reported having experienced a fatigue-related motor vehicle accident or near-miss incident demonstrated significantly higher ESS scores than those without such history ($M = 9.33$, $SD = 4.38$ vs. $M = 7.28$, $SD = 4.10$), $t(240) = 3.45$, $p = .001$, $d = 0.49$. This moderate effect size indicates meaningfully greater daytime sleepiness among providers reporting fatigue-related driving events, supporting H3. Providers with fatigue-related driving history also demonstrated higher sleep disturbance scores ($M = 9.70$, $SD = 4.44$) relative to those without such history ($M = 8.41$, $SD = 4.87$), although this comparison approached but did not reach statistical significance, $t(238) = 1.90$, $p = .059$, $d = 0.27$. Given the observed differences in daytime sleepiness between groups, additional analyses were conducted to examine whether sleep- and scheduling-related variables independently predicted fatigue-related driving outcomes when considered simultaneously.

To further examine factors associated with fatigue-related driving incidents, a binary logistic regression was conducted using fatigue-related motor vehicle accidents or near-miss incidents as the dependent variable. Predictor variables included ESS total score, sleep disturbance, work-related sleepiness, secondary EMS employment, shift length, work schedule, overall sleep amount, nontraditional scheduling, and sleep medication use.

The overall logistic regression model (Table 3) was statistically significant, $\chi^2(9) = 24.38$, $p = .004$, indicating that the set of sleep- and scheduling-related variables reliably distinguished between providers who did and did not report fatigue-related driving incidents. The model explained approximately 14.2% of the variance in fatigue-related driving outcomes based on the Nagelkerke R^2 value, with an overall classification accuracy of 73.4%.

ESS total score emerged as a significant independent predictor of fatigue-related driving incidents, Wald = 7.27, $p = .007$. Higher ESS scores were associated with greater likelihood of reporting a fatigue-related

Predictor	Wald χ^2	p	Interpretation
Epworth Sleepiness Scale (ESS) Total	7.27	.007	Significant positive predictor
Work Schedule	4.52	.033	Significant predictor
Sleep Disturbance Index	—	> .05	Not significant
Work-Related Sleepiness	—	> .05	Not significant
Secondary EMS Employment	—	> .05	Not significant
Shift Length	—	> .05	Not significant
Sleep Sufficiency	—	> .05	Not significant
Nontraditional Schedule	—	> .05	Not significant
Sleep Medication Use	—	> .05	Not significant

Table 3. Binary logistic regression predicting fatigue-related driving accidents or near-miss incidents ($n = 254$).

Note. ESS = Epworth Sleepiness Scale. Predictor variables included ESS total score, Sleep Disturbance Index, work-related sleepiness, secondary EMS employment, shift length, work schedule, perceived sleep sufficiency, nontraditional scheduling, and sleep medication use. Only ESS total score and work schedule emerged as statistically significant independent predictors.

Statistic	Value
Model $\chi^2(9)$	24.38
p	.004
Nagelkerke R^2	.142
Overall Classification Accuracy	73.4%

Table 4. Model summary.

accident or near-miss event. Work schedule characteristics also independently predicted fatigue-related driving outcomes, Wald = 4.52, $p = .033$, suggesting that scheduling structure may contribute to operational driving risk even after accounting for sleep-related variables.

Other variables, including sleep disturbance, work-related sleepiness, secondary EMS employment, shift length, overall sleep amount, nontraditional scheduling, and sleep medication use, did not independently predict fatigue-related driving incidents within the full model. Although several sleep-related variables demonstrated bivariate relationships with fatigue-related driving history, ESS total score remained the strongest independent predictor within the multivariable model. This pattern shows that functional daytime impairment may represent a more direct operational risk factor than general sleep quality measures alone.

These findings suggest that daytime functional sleepiness and operational scheduling characteristics may represent more direct correlates of fatigue-related driving risk among EMS providers than general sleep quality measures alone.

REGRESSION ANALYSES: INTENT TO LEAVE CURRENT EMPLOYER

A multiple linear regression (Table 5) examined whether ESS scores, Sleep Disturbance Index, perceived sleep sufficiency, work-related sleepiness, shift length, and nontraditional scheduling predicted intent to leave one's current EMS employer. The overall model was not statistically significant ($F[6, 233] = 1.09$, $p = .372$, $R^2 = .027$, adjusted $R^2 = .002$), accounting for approximately 2.7% of variance in the outcome. Work-related sleepiness approached significance as an independent predictor ($B = .430$, $\beta = .15$, $p = .052$), suggesting a trend toward greater turnover intent among providers experiencing greater on-shift fatigue. Remaining predictors such as ESS scores ($\beta = -.06$, $p = .410$), sleep disturbance ($\beta = .05$, $p = .512$), sleep sufficiency ($\beta = .003$, $p = .969$), shift length ($\beta = .007$, $p = .915$), and nontraditional scheduling ($\beta = .031$, $p = .641$), did not independently predict turnover intent. Collinearity diagnostics were satisfactory, with VIF values ranging from 1.03 to 1.41.

REGRESSION ANALYSES: INTENT TO LEAVE EMS

A parallel regression (Table 5) examined predictors of intent to leave EMS entirely. The overall model was again nonsig-

Predictor	Intent to Leave Employer β	p	Intent to Leave EMS β	p
Epworth Sleepiness Scale (ESS) Total	.06	.410	.04	.624
Sleep Disturbance Index	.05	.512	.01	.858
Sleep Sufficiency	.003	.969	.02	.832
Work-Related Sleepiness	.15	.052	.15	.059
Shift Length	.007	.915	.14	.033*
Nontraditional Schedule	.031	.641	.01	.851

Table 5. Multiple linear regression models predicting intent to leave current employer and intent to leave EMS ($n = 254$).

Note. β = standardized regression coefficient. VIF values ranged from 1.03 to 1.41, indicating no evidence of problematic multicollinearity. Neither overall regression model reached statistical significance. Consequently, individual regression coefficients, including the significant shift-length coefficient in the intent-to-leave-EMS model, should be interpreted cautiously. $p < .05$.

Statistic	Intent to Leave Employer	Intent to Leave EMS
F	1.09	1.21
Degrees of Freedom	(6, 233)	(6, 233)
p	.372	.300
R^2	.027	.030
Adjusted R^2	.002	.005
Nontraditional Schedule	.031	.01

Table 6. Model summary.

nificant ($F[6, 233] = 1.21, p = .300, R^2 = .030, \text{adjusted } R^2 = .005$). Although shift length emerged as a statistically significant individual predictor ($\beta = .14, p = .033$), providers working longer shifts reported lower intent to leave EMS, the overall regression model was not statistically significant. Therefore, this finding should be interpreted cautiously. Work-related sleepiness again approached significance ($B = .364, \beta = .15, p = .059$), with greater on-shift sleepiness trending toward higher turnover intent. ESS scores ($\beta = -.04, p = .624$), sleep disturbance ($\beta = .01, p = .858$), sleep sufficiency ($\beta = .02, p = .832$), and non-traditional scheduling ($\beta = .01, p = .851$) did not independently predict this outcome. VIF values remained acceptable, ranging from 1.03 to 1.41.

DISCUSSION

The study findings point to a pattern in which fatigue and poor sleep are not minor issues in EMS, but everyday realities for many providers that have real effects on operational safety and, to a lesser degree, decisions about staying in the profession. Nearly two-thirds of respondents characterized their sleep as poor or fairly poor, nearly three-fifths reported insufficient sleep, and almost half reported significant sleepiness at work. These proportions are consistent with prevalence data reported across prior EMS studies and are not marginal or confined to a fatigued subgroup: they describe the average experience of EMS providers in this sample (O'Brien et al., 2025; Patterson et al., 2010; Patterson et al., 2012a).

The normalization of fatigue within prehospital care culture runs deep (Patterson et al., 2018a). Working a 24-hour tour after a day shift, holding two or three EMS jobs simultaneously, sleeping in fitful 90-minute increments between overnight calls are not experiences unique to individual providers, but structural features of how many EMS systems are staffed and operated (Rivard et al., 2020). The current findings show that higher levels of daytime sleepiness were associated with greater reports of fatigue-related driving incidents, providing measurable evidence of the real-world impact of poor sleep in EMS. That relationship is the clearest and most practically significant finding to emerge from the data. Providers who reported fatigue-related motor vehicle accidents or near-miss events had meaningfully higher ESS scores than those who did not, with an effect size in the moderate range. Emergency vehicle operation already carries inherent risk: intersection crossings against traffic signals, high-speed response through urban environments, and navigation under stress, and this suggests that a substantial subset of providers may be performing these tasks while also being significantly fatigued. The finding that nearly 30% of respondents had experienced a fatigue-related accident or near-miss at some point in their careers is consistent with documented risks among other overnight and shift-working transportation populations (Lee et al., 2016) and underscores the operational scope of the problem. The multivariable analyses further strengthened this finding. ESS scores remained a significant independent predictor of fatigue-related driving incidents even after accounting for scheduling characteristics, shift length, sleep disturbance, work-related sleepiness, and sleep medication use. In contrast, broader sleep quality measures did not independently predict driving outcomes within the full model. This pattern may indicate that daytime functional impairment, rather than sleep quality alone, may represent the more immediate operational risk factor within EMS settings (Dinges, 1995). From a practical standpoint, this distinction matters. Providers may normalize poor sleep quality while underrecognizing the degree to which excessive day-

time sleepiness affects attention, vigilance, and reaction time during emergency vehicle operation (Van Dongen et al., 2003).

The relationship between nontraditional scheduling, shift length, and sleep outcomes also merits attention. Providers working overnight or rotating schedules reported higher ESS scores, consistent with the well-established circadian mechanisms through which nocturnal work impairs sleep quality and daytime alertness (Barth et al., 2022; Boivin & Boudreau, 2014). Longer shifts were associated with greater work-related sleepiness and lower perceived sleep sufficiency, which is perhaps an intuitive finding, though one that carries practical implications for systems considering whether 12- or 24-hour tour structures adequately support provider functioning across the duration of the shift (Patterson et al., 2018b; Weaver et al., 2015). These findings generally supported the hypothesis that nontraditional scheduling structures and extended shifts would be associated with poorer sleep-related outcomes among EMS providers.

Contrary to what might be expected, providers working longer shifts reported lower intent to leave EMS rather than a higher intent. This finding likely reflects occupational and attitudinal selection rather than a protective effect of long hours. Providers who choose or remain in 24-hour tour positions may be those who are more deeply embedded in EMS culture, more financially reliant on consolidated shift structures that permit secondary employment (Rivard et al., 2020), or simply more adapted to the demands of extended operational tours. Regardless of the mechanism, the finding cautions against interpreting shift length as a straightforward marker of dissatisfaction. However, because the shift-length coefficient emerged within an overall nonsignificant regression model, this finding should be interpreted cautiously and requires replication.

More broadly, the regression results demonstrate that sleep disruption as measured here is not a strong independent predictor of turnover intent. This is consistent with the hypothesis (H5) that anticipated a modest rather than robust relationship, and it reflects the genuinely multidetermined nature of retention decisions within EMS (Cash et al., 2024; Crowe et al., 2018; Powell et al., 2025). A provider who is fatigued, underpaid, managing organizational dysfunction, and working without adequate support is more likely to leave than one for whom only one of those conditions applies. Sleep disruption does not operate in isolation; it amplifies existing occupational strain without being its primary driver (Patterson et al., 2015).

Nevertheless, the repeated near-significance of work-related sleepiness as a predictor of turnover intent across both regression models suggests that on-shift fatigue may carry some incremental association with retention outcomes that a larger and more statistically powered study might detect more reliably. The present analyses should not be interpreted as ruling out a meaningful sleep-retention link, only as failing to confirm it within this sample and model specification.

EMS has historically rewarded endurance over recovery and treated exhaustion as a credential rather than a risk factor (Patterson et al., 2018a). Providers who raise concerns about fatigue may encounter institutional resistance, implicit peer pressure toward stoicism, or structural barriers such as staffing shortages, mandatory overtime, or financial necessity, that make adequate sleep genuinely difficult to prioritize even when motivation exists. Interventions that do not account for this cultural context are unlikely

to produce lasting change (Barger et al., 2018). Effective fatigue management in EMS will require not only educational programs or scheduling modifications, but a meaningful shift in how operational leadership conceptualizes and responds to provider sleep health as a safety-critical variable (Patterson et al., 2018a).

LIMITATIONS

The study relied exclusively on self-reported data, introducing potential for recall and social desirability bias. Given the normalization of fatigue within EMS culture, some providers may have underestimated their own impairment or reported functioning more adequate than objective assessment would confirm (Van Dongen et al., 2003). The cross-sectional design precludes causal inference; observed associations between sleep disruption and occupational outcomes may reflect shared variance with broader organizational stressors rather than independent effects of sleep per se.

The convenience sample introduces selection concerns. Providers experiencing greater fatigue or dissatisfaction may have been more motivated to participate, potentially inflating prevalence estimates relative to the broader EMS workforce (Rivard et al., 2021). The sample's demographic composition, which was predominantly White, urban, and employed across hospital-based and private services, may not generalize to rural, volunteer, or fire-integrated EMS systems with distinct staffing structures and operational demands (Rivard et al., 2021).

The absence of objective sleep measurement is an additional limitation. Actigraphy, polysomnography, and psychomotor vigilance testing would provide physiologic data not subject to the subjective reporting biases inherent in self-report instruments (Patterson et al., 2014). Similarly, objective operational performance data, such as documented vehicle incidents, clinical error rates, or formal safety reports, were not available and would substantially strengthen the safety-related findings. Secondary employment patterns, caffeine use, commute burden, and family care responsibilities also were not comprehensively examined, despite their likely relevance to sleep and fatigue outcomes (Rivard et al., 2020).

Because numerous statistical analyses were conducted, the possibility of Type I error cannot be excluded. Consequently, statistically significant findings should be interpreted cautiously until replicated in future studies.

FUTURE DIRECTIONS

Future studies should include longitudinal designs focused on understanding how fatigue accumulates across EMS careers and whether chronic sleep disruption predicts clinically meaningful health or occupational outcomes over time. The cross-sectional literature has established that fatigue is prevalent; what remains less understood is its trajectory and long-term consequences for provider health and functioning (O'Brien et al., 2025; Patterson et al., 2012a).

Future studies incorporating objective sleep and performance measurement would substantially advance the field. Wearable sleep tracking, validated cognitive performance batteries, and reaction time assessments could provide a more accurate characterization of the gap between how fatigued providers perceive themselves to be and how they are

actually performing, a gap that existing research indicates may be considerable (Lowe et al., 2017; Van Dongen et al., 2003). Real-time fatigue monitoring interventions have demonstrated initial promise in air-medical settings and represent a productive model for further development in ground EMS contexts (Patterson et al., 2019).

The relationship between fatigue and emergency vehicle operation deserves dedicated investigation. Despite the frequency with which EMS personnel operate vehicles while fatigued and the documented consequences of drowsy driving in other transportation contexts (Dinges, 1995; Lee et al., 2016), the EMS-specific literature on this topic remains sparse. Studies examining reaction time, lane deviation, hazard detection, and near-miss incident rates among fatigued EMS crews would provide valuable data for both policy development and operational safety planning.

Studies evaluating protected rest periods during extended tours, alternative shift configurations, mandatory recovery minimums between consecutive work periods, and formal fatigue monitoring programs could identify which approaches produce meaningful reductions in impairment without exacerbating existing staffing shortages (Martin-Gill et al., 2018; Patterson et al., 2018b; Thielmann & Böckelmann, 2024). Qualitative and mixed-methods research examining provider and supervisory attitudes toward fatigue management would further inform how interventions can be designed to be both realistic within EMS operations and culturally acceptable within EMS environments (Barger et al., 2018).

As EMS systems continue to face recruitment and retention challenges of considerable scope, understanding the mechanisms through which occupational strain translates to provider exit will become increasingly important for the development of effective and sustainable workforce solutions (Cash et al., 2024; Powell et al., 2025).

CONCLUSION

Fatigue is not an incidental feature of EMS work; it is a structural consequence of how the profession is organized and staffed (Patterson et al., 2012a; Patterson et al., 2018a). This study found that poor sleep quality, excessive daytime sleepiness, and work-related fatigue were the norm rather than the exception among the EMS providers surveyed, and that elevated daytime sleepiness was meaningfully associated with fatigue-related driving accidents and near-miss incidents. Scheduling characteristics, particularly overnight and rotating work, contributed to greater sleep disruption and daytime impairment (Barth et al., 2022; Boivin & Boudreau, 2014). Sleep variables showed limited independent predictive value for turnover intent, though work-related sleepiness and shift length demonstrated associations with retention outcomes that merit continued investigation.

The implications of these findings extend beyond individual provider wellness. Emergency medical services exist to deliver safe, effective prehospital care, and the cognitive and operational demands of that work are poorly served by a workforce operating under chronic sleep restriction (Alhola & Polo-Kantola, 2007; Lowe et al., 2017). Addressing fatigue in EMS will require recognition at the organizational and systems level that sleep health is not a personal responsibility to be managed off-duty, but an operational variable that agencies, researchers, and policymakers have a shared stake in protecting (Patterson et al., 2017; Patterson et al., 2018a).

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