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# EMS SHIFT SCHEDULING: CAN WE DO BETTER?

The role of shift lengths on fatigue and errors

# LONG SHIFTS CAN PUSH EMS PROVIDERS TO THE PHYSICAL AND MENTAL BREAKING POINT.

Research continues to mount that connects lengthy and erratic shift schedules with poor patient outcomes, operational errors and work-life balance among EMS providers.

This EMS World e-book, a collaboration between TCP Software's Aladtec Scheduling and EMS World, takes a deep look into the current state of EMS shift scheduling, examines the relationship between shift length and operational errors, and proposes evidence-based strategies to reduce errors while improving working conditions among staff.

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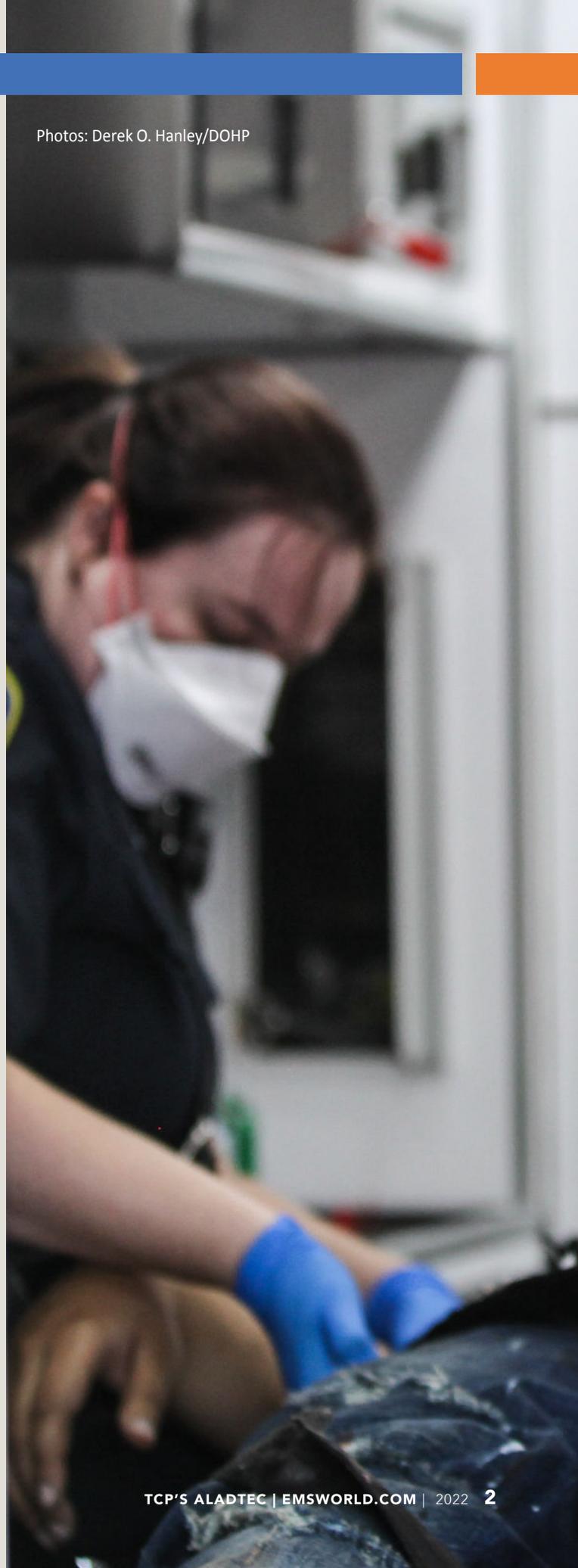
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# PREVENTING AMBULANCE CRASHES: A STUDY OF DATA

## The role of fatigue and driving behaviors in patient and operator safety

By Anna Massefski



The uptick in crashes 8 hours after shift start indicates that even a “short” shift on the truck can push physical limits.

Last year, a comprehensive research project analyzed data from 128 ambulance crashes that were reported to the Massachusetts Office of EMS between August 2018 and August 2021. If you drive an ambulance in Massachusetts (and likely other places), three trends emerged from the data studied.

### The Role of Shift Length

Researchers extracted data from MATRIS (the Massachusetts Ambulance Trip Record Information System) and found that the highest percentage of crashes occurred between 4 p.m. and 5 p.m. This corresponds to the beginning of evening rush hour and to the period about 8-10 hours after the start of most shifts.

The percentage of crashes is also disproportionate to the percentage of total runs, indicating that the increase is not simply because there are more runs happening during that time. A study of nationwide injury data from ambulance crashes found a similar trend, and linked it to fatigue.<sup>2</sup>

Fatigue is a powerful physiological exhaustion that is impossible to fight. The

only cure is sleep, though caffeine or sugar can temporarily keep it at bay. It is normal for the human body to need a rest after several consecutive hours of work. The uptick in crashes 8 hours after shift start indicates that even a “short” shift on the truck can push physical limits.

Of course, while shift length and fatigue are major factors affecting operator safety, the data shows that it’s not the only consideration. Here are two more areas to note.

### Driving ‘Hot’ with a Patient Onboard

In this study, ambulances that crashed while driving with lights and siren (L&S) were 2.8 times more likely to also have a patient onboard, compared to ambulances that crashed while driving normally. Of course, this could be simply because EMS providers are more often driving “hot” with a patient.

To test that, researchers extracted data from MATRIS and generated a baseline of how often ambulances are traveling hot, with and without a patient onboard. Putting the two side-by-side, it’s clear that there is disproportionate risk of crashing when driving L&S with a patient onboard.

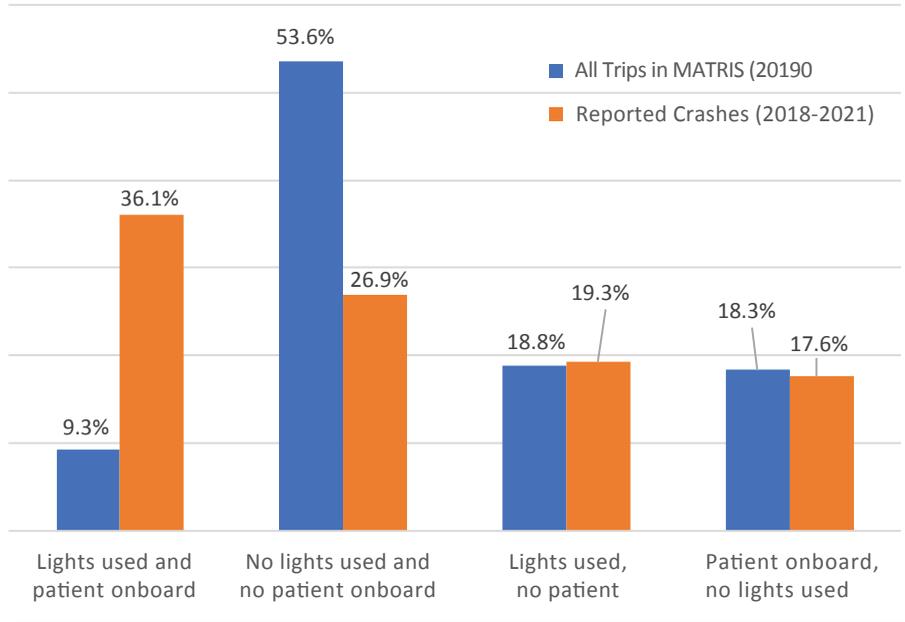


Figure 1. Lights and Siren Use and Patient Onboard During All Trips Compared to Reported Crashes

A study of nationwide data also found a similar trend, and the authors hypothesized that the heightened risk stems from the driver operating alone while their partner is in back with the patient.<sup>1</sup> It makes sense—it’s one thing to drive hot with one’s partner in the passenger seat, clearing the right side and helping navigate. But when the driver is alone up front and distractions

fall on a lone driver, driving becomes more dangerous.

Causality was outside the scope of this project—this data does not show that L&S cause crashes. But because of the statistically significant relationship between L&S use and whether a patient was onboard, the need for careful driving practices becomes clear.

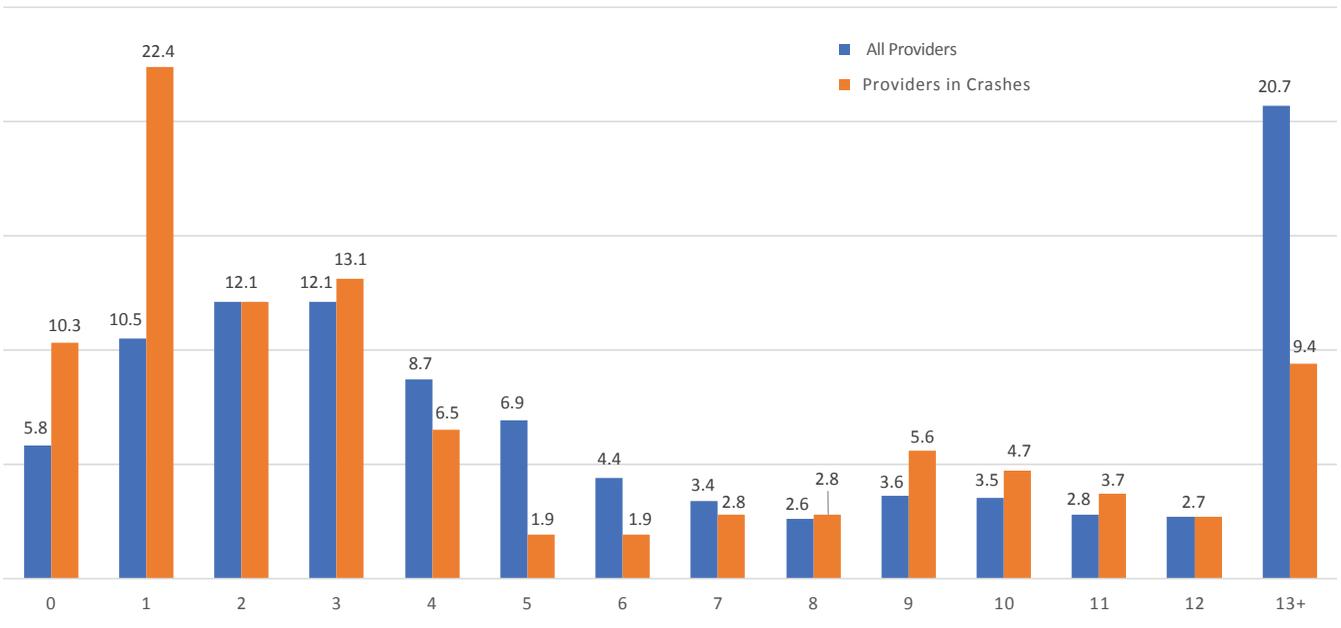


Figure 2. Years Since Initial EMS Licensure of Providers Involved in Crashes Compared to All Providers, as Percents

## Less than 2 Years of Experience

New EMS providers tend to have a very steep learning curve, and EMS's trial-by-fire culture doesn't mix well with safe ambulance operation. This study found that even though people with less than 2 years of experience make up only 15% of those certified in Massachusetts, those providers were driving during 33% of reported crashes. There was also a huge jump in crash incidence after the first year, indicating that after a year of getting adjusted, new providers are at even higher risk of crashing.

In private EMS systems, it is not unusual for new hires to have less than ten minutes of training behind the wheel before they're set loose. Like most states, Massachusetts does not require CEVO training, proficiency evaluation, or prior driving experience for EMS providers. In fact, many new providers get their driver's license with their EMT license.

New hires have the right to ask their training officer for dedicated driving instruction and practice that includes backing and driving with lights and siren.

## Conclusion

This project looked at a relatively small sample size, but its findings are still compelling. More significantly, they emphasize that ambulance crashes can happen anywhere at any time. For EMS practitioners, the greatest responsibility is to get themselves, their partner, and their patient safely to the destination.

## About the Project

"Preventing Ambulance Crashes in Massachusetts" was a joint project conducted with the Massachusetts OEMS for a master's thesis project. The project won second place in NASEMSO's 2022 Abstract Contest and was presented at the Highway Incident and Transportation Systems

Committee meeting at NASEMSO's 2022 Annual Meeting. For a copy of the full paper, or to discuss how to conduct a similar project in your system, contact [anna.massefski@gmail.com](mailto:anna.massefski@gmail.com).

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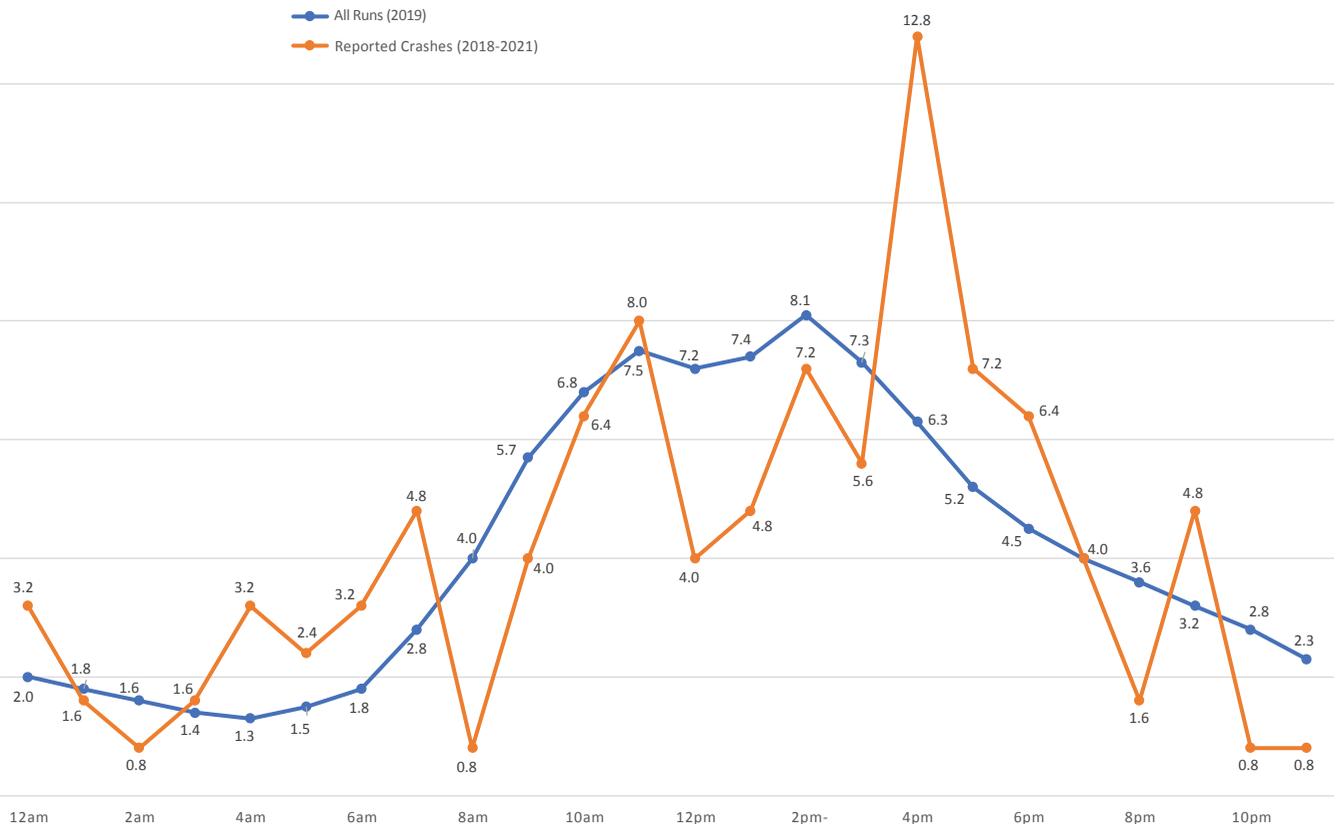


Figure 3. Reported Crashes by Hour Compared to All Runs by Hour, as Percents

# EMS SCHEDULING AND FATIGUE: RISKS AND REMEDIES

## Long shifts degrade performance and can contribute to errors in patient care

By Katherine Benoit, BA, NREMT

Shift work and rotating schedules are just two aspects of an incredibly dynamic job.

**S**leep is essential to basic human functions like your appetite, temperature regulation, memory, and awareness.<sup>1</sup> Sleep impacts all aspects of your life, from mental and physical health to financial and spiritual well-being. Additionally, the sleeper you are, the more likely occupational injuries and accidents are to occur.<sup>1</sup>

As EMS providers, most of us know what it feels like to not get a sufficient night of sleep, but what effects does it really have on us? Let's break down the science of sleep, the issues that arise in EMS work from insufficient and irregular sleep, and what that means for the communities we serve.

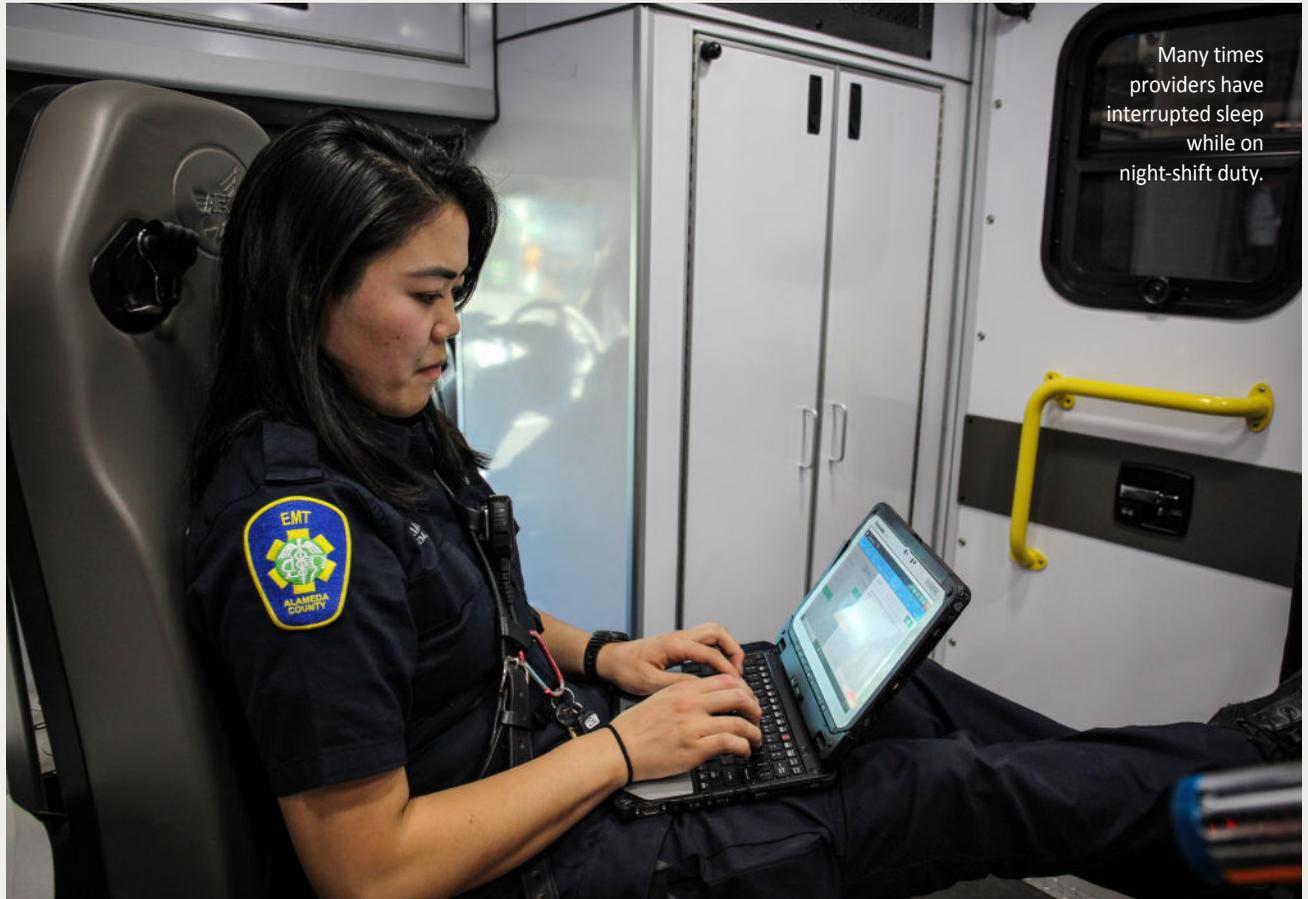
### Sleep Science

Sleep is a state of altered consciousness with biometric signs such as decreased pulse, decreased blood pressure, and slowed breathing.<sup>2</sup> Your brain continues to work and is actively processing information.<sup>2</sup>

To understand sleep better, researchers have defined different stages of sleep: non-REM (NREM is divided into three levels, N1, N2, and N3) and REM (rapid eye movement). Throughout the night we cycle through these stages from NREM to REM, with NREM stages corresponding to the depth of our sleep.<sup>2</sup> For example, our deepest sleep is found during the N3 stage, when we are hardest to wake. The N1 stage is typically when people are still responsive to their senses while falling into a deeper sleep.<sup>2</sup> Think of it this way: NREM equals a still brain in an active body; REM equals an active brain in a still body. Dreams, muscle atonia, and rapid eye movements all occur during REM sleep.<sup>2</sup>

For adults, as the night goes on, bouts of REM sleep get longer and longer.<sup>2</sup> Allowing





Many times providers have interrupted sleep while on night-shift duty.

our bodies to sleep for longer periods of time gives it the amount of REM sleep we need to feel fully rested. Without adequate REM sleep, we develop a sleep debt, something that cannot be fully reversed once it's happened.<sup>1</sup> While many of us fall victim to thinking a nap can make up for lost sleep, naps cannot fully reverse our sleep debt. For those of us who regularly get insufficient sleep, that deficit is here to stay.

In addition to the stages of sleep, researchers focus on Process S (the sleep-wake homeostatic process) and Process C (circadian rhythms).<sup>2,3</sup> Process S works to encourage sleep the longer you are awake and encourages being awake the longer you are asleep.<sup>2,3</sup> Seems straightforward, right? But now throw in the circadian rhythms, or Process C. This is your internal clock that regulates the sleep-wake cycles, secretion and production of hormones, and temperature in your body.<sup>2,3</sup> It is largely controlled by the suprachiasmatic nuclei (SCN), situated in the hypothalamus.<sup>2</sup> Circadian rhythms operate on a 24-hour

## EMS providers need to be aware of the risks associated with working while sleep-deprived and fatigued.

period, with light being the ultimate sign to our bodies for optimal sleep/wake times.<sup>4</sup> When it's dark our body produces melatonin—the hormone catalyst for sleep.<sup>4</sup> The more we are exposed to light, the less our body encourages sleep.<sup>4</sup>

Processes S and C do not operate in isolation. In fact, they work together in almost every capacity. As Process S nears the top boundary of Process C, sleep is triggered in the body. The opposite happens as Process S reaches the bottom boundary of Process C.<sup>3</sup> In monophasic circumstances this cycle happens twice for every circadian cycle. For humans, we usually experience polyphasic conditions, where these dual cycles occur more often with continual sleep.<sup>3</sup>

### Problems for EMS Providers

For EMS providers, shift work and rotating schedules are just two aspects of an incredibly dynamic job. Many times providers have interrupted sleep while on night-shift duty; we may wake up earlier than our circadian clocks would like us to; and some of us never have a set schedule, and as a result our sleep is misaligned with our work hours.<sup>2</sup> Circadian rhythm disruptions come with myriad health risks, like sleep disorders, cardiovascular disease, and diseases with an immunological component.<sup>1</sup> Research has also found that providers on shift-work schedules have increased rates of heavy drinking, job stress, and poor psy-

chological health as opposed to those with more regular sleep-wake schedules.<sup>1</sup>

Working more than 24 hours at a time is not uncommon but poses substantial safety and care risks.<sup>5,6</sup> In many situations an EMS provider will get little to no sleep during a 24-hour shift.<sup>7</sup> In fact, one study showed those working 24-hour shifts reported the highest levels of fatigue and fair/poor health.<sup>8</sup> Working these long shift hours puts the EMS provider at higher risk for cognitive and motor impairments, sometimes to the same extent as being intoxicated.<sup>1,8</sup>

Perhaps the most detrimental effect from lack of sleep for EMS providers is fatigue. Fatigue is defined as a "subjective, unpleasant symptom which incorporates total body feelings ranging from tiredness to exhaustion, creating an unrelenting overall condition which interferes with an individual's ability to function to their normal capacity."<sup>16</sup>

With the danger of adverse events like ambulance crashes, EMS providers need to be aware of the risks associated with working while sleep-deprived and fatigued.<sup>7</sup> In fact, it is estimated that more than half of EMS providers report severe fatigue, both mentally and physically.<sup>1,6,8</sup> Some providers acknowledge the feelings of dread and guilt with going into work while fatigued but do it anyway for many reasons.<sup>8</sup> EMS providers often feel the burden of being short-staffed, needing the money to pay for necessities, and having a strong passion for helping others that often comes before their own well-being, including obtaining healthy sleep.<sup>7</sup>

These factors all add up to increase the chance an EMS provider experiences *dysynchrony*, the misalignment of our circadian rhythms to the environment.<sup>1,2</sup> In other words, EMS providers are at risk of largely insufficient sleep, misaligned sleep-wake patterns, and overall poor sleep quality. Variable schedules, long shifts, financial needs, and a passion for helping others put many EMS providers in a position to ignore the health risks of insufficient sleep.

## Impact on our Communities

A 2012 study found 90% of EMS respondents believed their behaviors compromised the safety of themselves and their patients within the last three months.<sup>8</sup>

Those working long shift hours had the highest rate of believing they put the safety of themselves or others at risk. Respondents who were reported as fatigued were five times more likely to report believing safety had been compromised. It should be a standard that the first patient a provider sees on their shift receive the same level of care as the last patient, which cannot happen when sleepiness and sleep deprivation are part of the scene.

Moreover, this study documented that medical errors or adverse event (AEs) are more likely with poor sleep.<sup>8</sup> Specifically, there was a 40% occurrence for one or more medical errors/AEs in the past three months, with EMS providers ages 17–25 in the highest group. Reports of a medical error or AE were 50% more likely when combined with poor sleep than with good sleep.

While little research has focused on the association between fatigue and medical errors in EMS, there has been considerably more for the in-hospital environment.<sup>1</sup> Physicians in training who work regular 24-hour shifts make five times as many serious diagnostic errors, are 50% more likely to get into a motor vehicle accident, and make 36% more serious medical errors compared to someone working a 16-hour shift.<sup>5</sup> We know the hospital setting has a myriad of control factors when providers make decisions—alerts before sending orders, more time to make judgement calls, and the benefit of a full team to converse with. EMS providers conversely make split-second decisions in moving vehicles, with less-prominent alerts to our care decisions. Knowing the amount of control in a hospital setting is much more defined than the EMS environment, it is crucial this relationship be explored for greater insight on the damage we may be doing to ourselves and our patients.

## Conclusions

With this new knowledge about sleep and its relationship to our physical/mental health and the impact that has on our communities, change needs to happen. According to the National Sleep Foundation, the adult person should get an average of 7–9 hours of sleep each night.<sup>9</sup> Working in EMS, providers are responsible

for performing at the highest standard due to the high stress and high-risk nature of the work. Battling fatigue while also working complicated patients in complicated environments is a recipe for medical errors and adverse events.

It's disheartening to know federal law limits how long people work in most aspects of the transportation industry, like commercial pilots (limited to eight hours of flight in a 24-hour period), but there remain no guidelines or restrictions for EMS providers.<sup>1,8</sup> Looking to the future, regulations for shift hours on a federal level and more discussion around feelings of fatigue while at work will encourage providers to speak their truth about the safety of themselves and others on shift.

By making sleep a more common subject in the workplace for EMS providers, we hope to normalize a sufficient night's sleep, improve the overall well-being of providers, and be able to give all patients the same high-quality level of care.

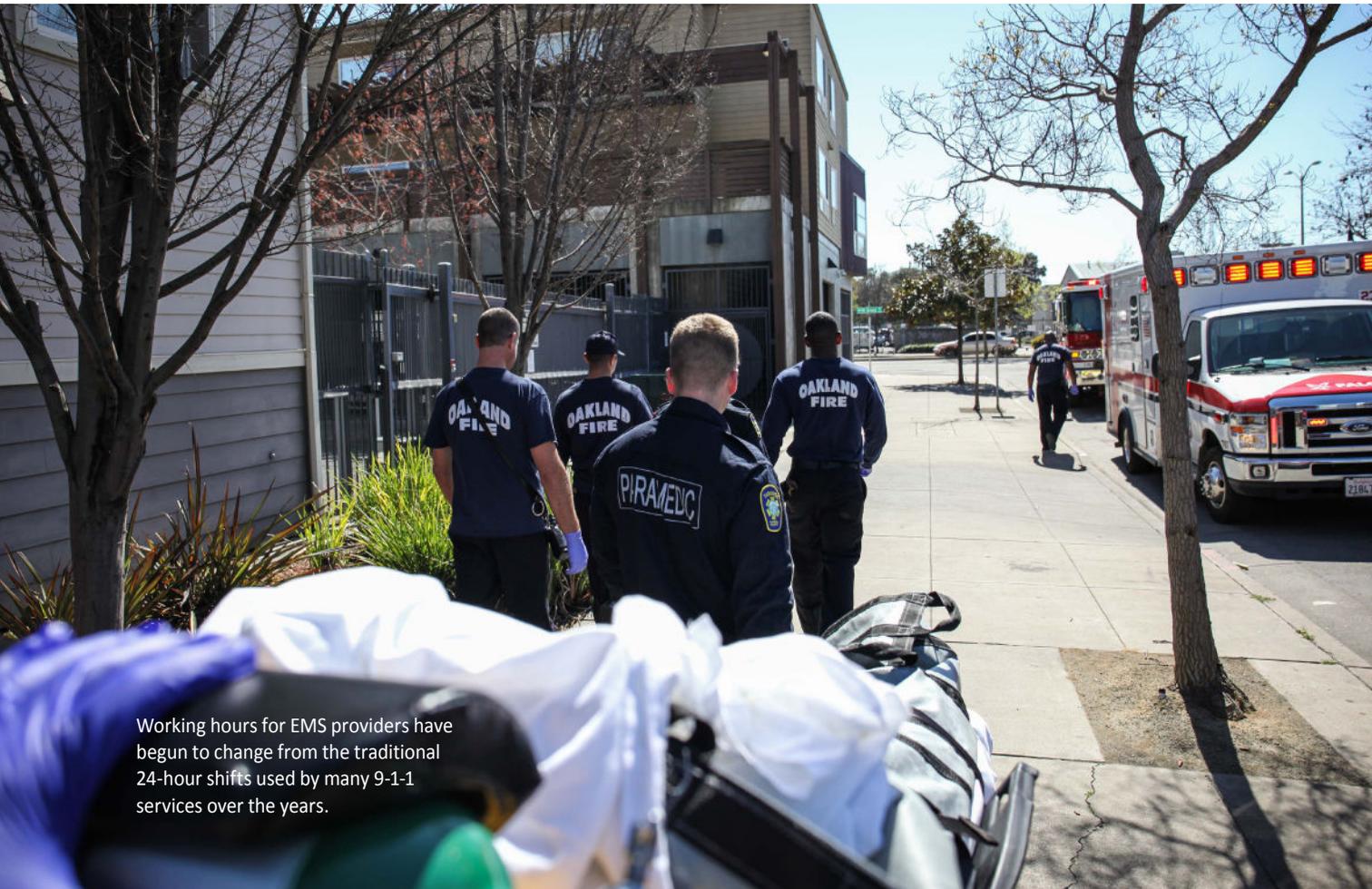
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# WHY THE EMS WORKFORCE IS SHRINKING

Shift length and leadership issues are among the main drivers

By John M. Dabbs



Working hours for EMS providers have begun to change from the traditional 24-hour shifts used by many 9-1-1 services over the years.

**T**he EMS workforce is shrinking at a time when calls are up in most jurisdictions. Many states are seeing the same number of people entering the workforce and getting licenses as usual while the number of active practitioners drops. EMTs and paramedics are keeping their licenses active but in many cases not working on the streets. The net effect is fewer EMS providers dealing with more calls than ever.

The larger health care workforce is also in dire straits, with nursing shortages leaving many hospital beds unavailable because they aren't staffed. This shortage increases EMS wait times to offload in facilities around the country, leaving fewer of its resources free. Patients can't be discharged because ambulances aren't available. They may be tied up with other patients in the emergency department, waiting to offload and with more calls holding. The stresses

on both field personnel and hospital staff are among the reasons many are rethinking their chosen careers.

Job satisfaction is near an all-time low in health care and emergency medical services. Like their brethren in the food service industry, our workers are often underappreciated, overworked, and underpaid. Providers who make a living wage aren't necessarily thriving either. Experienced providers with the credentials should make a decent

living, not just enough to pay the bills and buy groceries. I believe this is part of why we're deep into a recruitment and retention crisis. We were already there before the pandemic; then COVID-19 put a match on our industry, making more people rethink their profession sooner.

## The Role of Pay

Several studies have been conducted of people who left the EMS workforce. Their reasons for leaving included several recurring themes:

- Insufficient pay for the work performed
- Lack of appreciation from the public
- Working hours and forced overtime
- Poor management
- Lack of benefits

There are many reasons agencies can't pay employees more. These generally include low reimbursement rates for EMS services, the tax burden on the local community, or an unwillingness to raise salaries above what officials believe is a fair wage. Most public officials aren't aware of the training required to become an EMT or paramedic and the hazardous conditions in which providers operate daily. Police deal with armed criminals, firefighters deal with fire and hazardous materials, and EMS providers are often present during all these calls and more, providing emergency care and dealing

## Self-Promotion

Appreciation from the public is hard to get without providing exemplary customer service. It also doesn't hurt to toot your own horn with a designated public relations officer. Depending upon the size of the department, this could be a full-time position or a supervisor who also does PR as part of his duties. It doesn't hurt to spread the work around, as long as one person coordinates and oversees the efforts.

Every agency normally has a website and social media accounts and issues press releases. The PR coordinator should write and disseminate the news releases but can recruit other employees to work on the website and manage the Facebook feed. Being part of the team and helping with these tasks increases employees' value—just don't overburden them. They need time to do the job, direction, and oversight to keep everything within company guidelines.

with biohazards while helping with the aftermath.

Reported *Fortune* in late 2021: "Today, with tools like MIT's Living Wage Calculator, we can put a dollar amount on what it takes for individuals to earn a 'decent living' in every county in the country. But this information is typically not leveraged by corporate America when establishing pay practices. By benchmarking against market competitors and median pay rates, corporate HR departments wind up setting pay too low, and executives doesn't realize their workers are struggling financially. They aren't talking to their workers and assess-

ing whether they can make ends meet after each paycheck. This disconnect is hurting their business and undervaluing workers' skills."

The job listings on a popular EMS site's careers page have a paramedic pay range from \$15–\$40 an hour. This may be a solid living wage for entry-level personnel based on their location. But are we taking location into account? We need more than an entry-level living wage to recruit new providers to our services and a wage where employees can thrive if we're going to retain personnel and recruit experienced providers. A competitive wage allows employees to thrive—make car payments, go on vacations, make house payments, and save for retirements and emergencies.

## What's the Solution?

Replacing people is expensive. The American Ambulance Association's 2021 Ambulance Industry Employee Turnover Study found the average cost to recruit and attract, screen and select, and onboard and train a new EMT was more than \$6780. For a paramedic that increased to \$9112.

"The problem," the report notes, "is in identifying solutions to the problems underlying turnover. Based on the reasons listed for turnover, two possibilities are increasing career and promotional opportunities and increasing pay." One possibility, the authors concluded, was to implement organizational interventions associated with psychologically healthy workplaces. These can include increased attention to employee health and safety; introducing programs to allow for career growth and development outside traditional career ladders; scheduling to allow for increased work-life balance; increased employee involvement; and introducing performance management programs.

## Leadership Issues

Working hours for EMS providers have begun to change from the traditional 24-hour shifts used by many 9-1-1 services over the years. As call loads have increased, so has the downtime necessary to perform our jobs safely. I am aware of many services that have forced overtime on personnel because their relief called in sick. This is dangerous! The Federal Motor Carrier Safety Administration sets rules for commercial drivers who conduct interstate commerce; maybe EMS should consider similar regulations for the safety of our people and customers.

We see many employees disgruntled when passed over for promotions. Even more problems arise when younger and newer employees find themselves managed by people who aren't good managers. Many systems simply promote people based upon being good field providers. But a good field provider isn't necessarily a good manager or supervisor. Leadership roles require different skill sets. These are often skill sets that can be learned, but

agencies need to put the time and effort into training personnel to be good managers and supervisors. Leadership is not intuitive to many people, yet it's often a desired trait that is lacking.

Following the rule of three-deep leadership can provide depth and security to organizations' structure. The person above you should know your job, and at least two people below you should be trained to do it. None of us are going to live forever, and

should we be fired, suffer an accident that puts us out of commission for a few weeks, or something else, our agency and people will suffer if we don't prepare them.

Many employers offer benefits like health insurance, sick time, personal days, and vacation days. How many also offer tuition assistance, family leave, and financial coaching? The more benefits an agency can offer its employees, the more valuable the agency becomes.

## Study: Does Less Sleep Lead to More Anger Among EMTs?

By James Careless

It's a fact: Less sleep makes EMS personnel more prone to negative moods and anger, at a time when the profession is more stressful and dangerous than ever.

That's the takeaway from the article "Multilevel analysis of sleep quality and anger in emergency medical service workers". It was published in the June 2022 edition of *Sleep Health*, the journal of the National Sleep Foundation. The article is based on a study of 79 EMS professionals who completed a daily survey each day for eight consecutive days, which included questions about sleep quality and anger.

"It is well established that EMS personnel often experience poor sleep quality and that poor sleep can have serious health consequences," said study leader Dr. Bryce Hruska, Assistant Professor of Public Health in Falk College at Syracuse University. "Less attention has been paid to the relationship that poor sleep quality has with negative mood and anger. This is an important consideration because anger can foster toxic work environments, interfere with effective teamwork, and contribute to less effective patient care."

### Two Simple Facts, and Two Not-So-Simple Ones

Based on the surveys completed by the study's 79 EMS participants, "we found that workers experiencing poor sleep quality reported anger levels that were 35% higher compared to workers typically experiencing fair sleep quality," said Dr. Hruska. "We also found that even a worker who typically experiences fair sleep quality will have anger levels that are 5% higher on days when they experience poor sleep."

This being said, "we know that different people experience different levels of sleep quality and anger," he told EMS World. "This is called a between-person difference. We also know that the same person can experience different levels of sleep quality and anger from day-to-day. This is called a within-person difference."

These latter two facts complicate the sleep quality/negative mood relationship in the EMS workplace, because these differences stem from different sources. "Between-person differences may come from routine experiences or habitual behaviors, such as consecutive

night shifts, regular over caffeineation, and regular consumption of sugary snacks," said Dr. Hruska. "Meanwhile, within-person differences result from acute experiences that vary from day-to-day, such as critical events, or conflicts with supervisors or coworkers."

### Recommended Actions

Having analyzed the surveys, Dr. Hruska believes that addressing between-person behaviors is a higher priority in addressing and mitigating sleep quality-related anger issues, but that both factors need to be managed in order to produce positive change.

"To reduce the impact that poor sleep quality has on anger, we should focus on addressing routine experiences and habitual behaviors," he said. "This could include limiting consecutive night shifts; delivering sleep hygiene education; packing nutritious meals/snacks for shifts; and relaxation training in between calls."

"That being said, day-to-day experiences do have a detectable, although comparatively smaller, impact on sleep quality, so they should not be ignored," added Dr. Hruska. "Strategies for addressing these day-to-day experiences could include having the opportunity for downtime following critical events or other highly stressful events, as well as communication/conflict resolution skills training for EMS personnel."

### The Bottom Line

EMS workers regularly experiencing poor sleep quality experience more anger on the job. Even workers who typically have better sleep quality can experience anger elevations after poor sleep. "These findings suggest that interventions targeting both between- and within-person factors impacting sleep may be important for addressing sleep quality's influence on anger in the EMS profession," Dr. Hruska concluded.

Put another way, sleep deprivation causes more conflict between workers. So better sleep habits mean better morale and fewer conflicts.

## Other Options

Many providers have chosen to move beyond the streets. EMS providers can often find jobs in hospitals, medical and dental offices, amusement parks, and industrial settings. Those who transition to these alternative careers do so for several reasons.

Dustin Housewright, an EMS captain at Eastman Chemical Company in Kingsport, Tennessee says, "I'd probably narrow it down to these reasons: The pay is often better; they want to get away from 24-hour shifts; and they are burned out or heading there."

Housewright says an industrial setting lets him work without having to run nonstop for an entire shift. Those making this change will require expanded training that could include fire suppression, hazmat response, technical rescue, and more. Many industries have multifunction departments where they issue permits (hot work, confined-space entry, etc.). The industrial provider may be the sole on-site medical provider and have to deal with drug screens and Occupational Safe-

ty and Health Administration regulations as well. Housewright says he'd encourage anyone considering such a transition to look at the job requirements and see if a ride-along is available, as this type of job isn't for everyone.

Al Jenkins, safety manager at Dollywood theme park Pigeon Forge, Tennessee, says many of their new hires are tired of the stress of running emergency calls and working 24-hour shifts. Most of their EMS personnel are former 9-1-1 service providers who were on the verge of burnout. Jenkins says it makes a big difference in their outlook on life and job satisfaction to come to work and see smiling faces and people who seem appreciative.

Those thinking about transitioning to work at a theme park or other nontraditional environment should be prepared and keep their credentials up, according to Jenkins. They'll still need to maintain their EMS license, CPR, ACLS, BCLS, etc. They'll also have to learn about safety inspections and park-related duties. Everyone I met at Dollywood was happy to be working there, and all had 9-1-1 or aeromedical backgrounds.

## Conclusion

The predominant theme found in most informal surveys is providers on the street feel they are increasingly burned out and underappreciated by the public and their agencies. They also report supervisors being seriously underprepared for advancement and a lack of job training for managers.

Companies with established employee development programs retain employees longer than agencies that don't invest time and effort in developing their workforce for advancement. Are we afraid the employees we train to lead will leave after we build them into better people? We should be afraid they will stay if we don't make them better.

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Providers looking for more shift stability often gravitate to industrial or commercial job settings.



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