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# Sleep and Transportation Safety: Role of the Employer

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## INTRODUCTION

Transportation accidents remain a major cause of preventable injury and death. In 2017, transportation incidents accounted for 47% of the 5147 fatal work injuries in the United States (Fig. 1).[1] It was the most lethal year for heavy and tractor-trailer truck drivers since fatality data began to be recorded by occupation in 2003. Those most at risk in the transportation industry continue to be driver/sales workers and tractor-trailer truck drivers. The motoring public is also at risk of serious injury and death from trucking accidents.

Thus, the impact of fatigue and sleep disorders on transportation safety is significant. In 2014, drowsy driving was the documented cause of 82,000 crashes, 37,000 injuries, and 886 deaths (2.5% of all fatal crashes).[2] These are just the recorded numbers. The National Transportation Safety Board (NTSB) estimates drowsy driving causes 7% of all crashes and 16.5% of all fatal crashes (~5000 deaths per year).[2] Investigations by the NTSB into all transportation modes have identified that 20% of serious transportation accidents are fatigue related.[3]

A recent survey of US highway drivers found nearly half admit to falling asleep or nodding off while driving at some point during their lifetimes, and 4% report doing so in the previous

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30 days.[4] Although these are sobering statistics, it is likely that the impact of sleepiness and fatigue on transportation safety is considerably higher than is currently estimated[5] because of the limitations of data collection. It is important for employers to acknowledge that professional drivers are not immune to this danger because a large proportion of all large truck crashes are estimated to be caused by drowsy or fatigued drivers.[6]

Employers of transportation workers have a unique opportunity and responsibility to optimize working conditions and hazard controls to prevent fatigue-related transportation accidents. They can accomplish this through a combination of sleep disorder screening and monitoring measures, engineering controls, fatigue prevention/management policies, and education.

## THE EMPLOYER AS STAKEHOLDER IN FATIGUE-RELATED TRANSPORTATION SAFETY

For employers, fatigue among transportation and other safety-sensitive personnel poses a substantial risk for lost productivity, errors, and liability for damages and harm that may come to those involved in fatigue-related accidents. Such risk cannot simply be calculated as a cost of doing business, because transportation accidents can have catastrophic effects on the environment, private and public property, and loss of human life. For example, a fatigue-related operator error led to a 2010 oil tankship collision in Texas that caused $2.2 million in damages by releasing 1,749,000 L (462,000 gallons) of oil into the environment, which required evacuating 136 residents from their homes.[3,7] The NTSB determined the collision was caused by the employee's untreated obstructive sleep apnea (OSA) and work schedule. In 2015, a passenger train in New York derailed when it entered a curve where the maximum authorized speed was 30 mph (48 km/h). The train was traveling at 82 mph when it entered the curve and derailed, resulting in 4 passenger deaths and injury to more than half the remaining passengers on board. The NTSB determined that the engineer had fallen asleep because of "undiagnosed severe OSA exacerbated by a recent circadian rhythm shift required by his work schedule."[8,9] The employer in this case was faulted for not having a medical screening policy in place for detecting sleep disorders, and for the absence of available technological controls (automated braking) to circumvent the human error.

In surveys exploring employer and employee attitudes regarding fatigue as a safety issue, employees were consistently less likely to view fatigue as a safety risk than their employers, [10] underscoring the need for increased training and awareness in the workplace around fatigue-related safety risk. Because of the frequency with which fatigue is identified as contributing to serious transportation accidents, the NTSB has issued more than 200 fatigue-related recommendations to improve transportation safety.[3] These recommendations include repeated calls for screening procedures to identify whether workers are at high risk of sleep disorders such as OSA.[9,11,12] Although no regulation currently requires screening for sleep disorders, employers would be wise to adopt such preplacement screening examinations as part of their responsibility, given they can, and have been, sued for failing to screen their workers.

These examples highlight the need for employers to recognize the crucial role they play in fatigue and sleep disorder management, as key stakeholders in transportation safety. Optimal management of sleep-related transportation safety has multiple benefits for employers. As mentioned, employers may be deemed responsible for damage caused by their employees that arise in the course of performing their jobs. When employers have appropriate measures in place to screen, treat, and eliminate fatigue-related risk, their liability is minimized, and accident rates decline significantly. In addition, companies may see financial benefits from improvements in presenteeism, health care costs, employee morale, public relations, and other less tangible rewards that support company success.

## LEGAL LIABILITY OF EMPLOYERS IN TRANSPORTATION SAFETY

Employers should take a proactive approach to identify fatigued workers because they may be held legally responsible for the actions of employees if the actions resulting in injury or property damage are performed as part of their employment.[13] The legal term for this is respondeat superior, meaning “let the master answer”, and this principle holds the employer vicariously liable for the acts of an employee. Vicarious liability is determined by how much the employer had the right to direct and control the employee’s actions. In addition, employer liability may arise during the hiring process if employers fail to screen applicants for conditions that may impair safe operation of vehicles.[14]

Many businesses attempt to protect themselves from liability by hiring independent contractors, rather than employees. However, businesses risk losing this liability protection as they exert more control over drivers by directing the number of hours driven, routes taken, and when rest breaks are authorized.[15] At a certain point, courts will find that although the contractual relationship was characterized as an independent contract, the behaviors of the business and driver transformed it into an employer-employee relationship regardless of what was written on paper.[16]

Alternatively, when an employee works directly for the transportation employer, then the employer is usually held liable for injuries to third parties resulting from a crash.[13] This situation is especially likely when the employee has fallen asleep while operating a vehicle in the past, because it increases the foreseeability of the resulting accident.[17]

Employer policies and procedures to identify sleep disorders are critical because sleep disorders are common and employees are often unaware of their conditions.[9,14,18-20] At a minimum, it is recommended that employers refer employees with suspected sleep disorders to medical providers for assessment and treatment. OSA is the most common cause of excessive daytime sleepiness and is estimated to affect 22 million Americans, with 80% moderate to severe, but undiagnosed.[20] Screening for OSA in transportation workers can be readily performed using objective anthropometric and medical criteria that are routinely collected as part of medical certification and preplacement medical examinations. Employers are also recommended to document having advised the worker of the increased risk of performing work-related duties while drowsy, along with potential civil or criminal responsibility, and any company policies or procedures they are expected to follow if an employee is identified as, or personally feels, too fatigued to work.

In addition to injured third parties suing the employer under a theory of vicarious liability, injured workers coming off long work days who have been injured driving home have also sued their employers.[13] Thus far, courts have not been willing to hold employers liable for worker injuries after work because the employers scheduled the worker for excessive work time.[21,22] However, given the cost of litigation, employers may want to mitigate this risk by coordinating or providing employees with transportation home at the end of long or extended shifts.

## The Legal Landscape for Sleepy Drivers

In the United States there is no federal requirement to objectively screen for sleep disorders in commercial motor vehicle drivers, rail workers, or pilots. The medical examinations required for each profession typically ask a screening question such as, “Do you have sleep disorders, pauses in breathing while asleep, daytime sleepiness, loud snoring?” However, this subjective questionnaire approach has been documented as failing to capture most commercial drivers with sleep disorders because they often fail to report these symptoms even when they are present.[23,24]

If a sleep disorder is not captured on a preplacement or routine medical assessment and an accident happens, courts have generally found both the driver and the employer responsible for the accident, reasoning that sleepiness is recognizable by drivers and that accidents resulting from falling asleep are reasonably foreseeable.[25] Although most driving case law has addressed cases involving the general public and found the driver has a duty to pull off the road to rest when fatigued,[13,25] courts surely extend this expectation to commercial drivers, whom they hold to a higher standard.

An illustrative example of an employer being found liable for a sleep-related accident by one of its employees is Dunlap v W.L. Logan Trucking Co., in which the driver of a tractor trailer fell asleep at the wheel, killing a woman.[17] In this case, the court found the employee directly liable and the employer vicariously liable for the death because the employee was acting within the scope of his employment.

A more recent example occurred 2013 when a Greyhound bus went off the road in Ohio and flipped over less than an hour into its journey.[26] Six passengers were ultimately awarded $6 million for their injuries, which included compound fractures, multiple surgeries, as well as neck and back injuries. From an employer’s perspective, this case is significant because the driver was evaluated for a Department of Transportation Medical Certification examination 6 weeks before the accident occurred. The examining physician determined the driver was at risk of OSA and recommended that he undergo an in-laboratory sleep study and only issued a 3-month medical certification, rather than the typical 1-year to 2-year certification that the driver had received after prior examinations. Instead of requiring the recommended sleep study, which the employer’s written policy also required, the driver was directed to follow up in a medical clinic, where he was cleared of sleep apnea based only on a limited physical examination and was allowed to return to work by his employer without the requisite sleep study. Two days later, the fatigue-related accident occurred. At deposition, Greyhound’s medical director acknowledged that “A physical exam alone is not going to say one way or the other whether a person has sleep apnea.”[26]

For an employer invested in fatigue risk management, the identification of a driver at high risk for OSA during his medical certification should have triggered further medical review by the company's medical director, leading to compliance with the recommended diagnostic tests and possible suspension of safety-sensitive operations by that employee until they were sufficiently evaluated and treated.

Depending on where a transportation company operates, it is also important for employers to recognize that some states go beyond allowing injured parties to sue for monetary compensation. For example, Arkansas and New Jersey have laws that explicitly make it a crime to drive while drowsy, meaning the driver can go to prison for up to 10 years and face a fine up to $100,000 for vehicular homicide.[27,28] Although both of these laws require the driver to have been awake (not necessarily driving) for the preceding 24 hours for the law to apply, states such as Maine, New York, and Tennessee have all considered laws that would make it a crime if the driver is simply impaired by fatigue.[29-31] Even in places where there is no threshold established in legislation, in any tragic accident drivers may still find themselves facing a prosecutor and jury trying to decide how tired is too tired to drive. Because studies have shown people are poor judges of their own impairment from fatigue and sleepiness, it is critical that employer controls and programs are in place to identify, monitor, and manage fatigue-related safety risks.[14,18-20]

## BENEFITS TO EMPLOYERS TAKING AN ACTIVE ROLE IN REDUCING FATIGUE RISK

When employers transition from taking passive positions to active roles in the management of fatigue-related risk, not only do they diminish their legal liability but their businesses stand to benefit in multiple ways. Reduction in fatigue-related accidents results in reduced costs for damages, insurance, business disruptions, and revenue loss. However, optimizing sleep can also improve productivity, employee morale, and health care cost savings. This improvement is evident in the case of Schneider National, a transportation and logistics company that successfully implemented a sleep disorder screening and management program.

As a logistics and transportation company, Schneider relies on healthy and alert drivers, and recognizes the impact that fatigue-related incidents can have on safety and the company's bottom line. In the mid-2000s, they developed a plan to overcome many of the traditional barriers that made it challenging to ensure employees with sleep disorders such as OSA were properly identified and treated. Such barriers include:

- Identifying individuals at risk of having or developing OSA
- The high cost and inconvenience of diagnostic testing via overnight polysomnography (PSG)
- The cost, discomfort, and cumbersome nature of typical OSA treatment equipment

Recognizing these obstacles, Schneider's contracted sleep health provider developed a screening program using a simple questionnaire to categorize drivers into one of 4 levels of

risk for further sleep disorder testing.[32] Those in the high-risk categories would receive PSG diagnostic testing, results of which were analyzed within 24 hours. For OSA-positive employees, treatment was initiated almost immediately thereafter with equipment specifically designed to be compatible with the truck's sleeper berth. The drivers were paired with a sleep clinician and technicians for training on their new machines, along with realtime troubleshooting. Compliance with autoPAP (autoadjusting continuous positive airway pressure) treatment was objectively monitored with electronic data collection that was regularly updated. In addition, and importantly, all expenses, from diagnostic testing to treatment equipment, were covered under the employee health care plan with no out-of-pocket cost to the driver.[10,33]

The results of the program from a safety perspective were an unequivocal success. Those in the program who were fully compliant with OSA treatment were found to have a 4-fold to 5-fold lower preventable crash risk compared with comparable drivers with OSA who were never compliant with treatment, after matching for experience and miles driven. In addition, the crash rates for OSA treatment–compliant drivers were statistically no different from drivers at low risk for OSA.[33]

For Schneider, the program has also paid dividends in reducing employee turnover and improving the health of their workforce, reportedly resulting in health care plan savings of $300 to $400 per driver per month for drivers with OSA receiving treatment under the program.[10]

## STEPS EMPLOYERS CAN TAKE TO MINIMIZE FATIGUE-RELATED RISK

The NTSB has issued more than 200 fatigue-related recommendations to improve transportation safety. A review by Marcus and Rosekind[3] published in 2017 categorized these recommendations into 7 focus areas:

1. Scheduling policies and practices: hours of service, time off between work assignments, company scheduling practices, and circadian disruptions.
2. Education/raising awareness: programs to increase knowledge related to human fatigue, sleep and circadian rhythms, and actions to counteract the effects of fatigue.
3. Organizational strategies: organizational activities to reduce and manage fatigue among employees, such as nonpunitive programs for employees to self-report as fatigued, or to decline work assignments because of fatigue.
4. Healthy sleep: medical issues associated with sleep disorders, such as the diagnosis and treatment of sleep apnea, or the appropriate use of medications for the treatment of insomnia.
5. Vehicle and environmental strategies: technology to detect and address operator fatigue (eg, alertness for rail crew), including adequate rest areas for commercial truck drivers.

6. Fatigue management plans: development, use, and evaluation of fatigue management plans to manage the effects of fatigue in transportation operations.

7. Research and evaluation: topics in need of research or analysis to understand and effectively address fatigue in transportation operations.

Employers can minimize fatigue-related safety risk by addressing these focus areas.

## Scheduling Policies and Practices

Approximately 30 million adults in the United States are shift workers: those who work outside the traditional 9 AM to 5 PM work day. Of these shift workers, 10% meet criteria for a shift work disorder by experiencing insomnia or excessive sleepiness during wakefulness accompanied by a reduction of total sleep time not caused by voluntary sleep restriction.[34]

Transportation workers are over-represented among shift workers, which challenges them to work safely because their natural circadian cycles diminish alertness during the performance of safety-critical tasks at night.[34] Accidents in the transportation industry also commonly result from decreased vigilance caused by excessive daytime sleepiness as a consequence of disruptions in the natural sleep-wakefulness cycles of shift workers. In addition, shiftwork and OSA cause synergistic and significant impairment.[23] Therefore, employees with OSA should preferably work during daytime hours on nonrotating shifts even when treated with CPAP.

If shiftwork is unavoidable, schedules should be informed by the latest sleep research, designed to optimize short-term and long-term health benefits and minimize sleep disturbance. For example, many chronobiologists recommend fast-forward rotating shifts, in which workers transition clockwise from day to evening to night over intervals of 2 to 3 days, with 2 to 3 days off for recovery following the night shift. The fast rotation prevents permanent shifts in circadian cycles and helps to minimize accumulation of sleep debt.[35]

## Education and Training

A 2016 survey of transportation workers and their employers found that workers were less likely than their employers to consider fatigue and sleepiness to be significant safety risks.[10] Employers can help raise awareness of fatigue as a major factor in transportation safety and the measures they are taking to mitigate the risk. Sleep hygiene and fatigue management training should be incorporated into safety training and monitoring programs. In addition, employers can educate workers on the health benefits the employees can reap as individuals by making healthy sleep an integral part of their personal and professional responsibilities.

## Organizational Strategies

Employers should create a culture in which fatigue-related safety is valued and supported by policies and practices. Care must be taken so as not to create perverse incentives, whereby employees may be penalized for not continuing to work when too fatigued or sleepy to do so. For example, members of the Owner-Operator Independent Drivers Association have expressed concern that regulations designed to keep them safe can paradoxically force them to stay on the road when dispatchers at companies that hire their services cite these

regulations in support of assigning additional tasks, without regard to road and traffic conditions, weather, and driver fatigue that may jeopardize safety.[36] These drivers express feeling compelled to accept these assignments despite fatigue or adverse conditions, because the employer expects they can work to the limits of the regulation. Employers should keep in mind that although the Federal Motor Carrier Safety Administration (FMCSA) regulations were established to limit sleepy drivers on the road, complying with the regulations does not guarantee a driver will not be fatigued, and employers are encouraged to trust their drivers when they are tired or in adverse road conditions.

## Healthy Sleep: Identifying and Treating Sleep Disorders

Employers should screen individuals considered for safety-sensitive positions for sleep disorders, including OSA. Employers should be concerned about untreated OSA because it has been linked to $65 billion to $165 billion in costs caused by lost productivity as well as increased health and safety costs and higher rates of accidents.[6]

Objective screening criteria are preferred because commercial drivers usually do not report their symptoms because of concerns (perceived or real) of the negative economic and occupational impact of an OSA diagnosis.[6,23] These concerns range from the inconvenience of diagnostic testing and treatment to loss of income and employment. Accordingly, screening should use and rely primarily on objective risk factors such as male gender, age, body mass index (BMI), neck circumference, and hypertension, rather than subjective self-reported symptoms.

Although not required by regulation,[11] to mitigate the significant threat of substantial harm to employees and the general public, employers should require safety-sensitive transit workers to undergo testing for OSA who meet the following criteria[37]:

- All people with BMI ≥40
- All people with a BMI 33 to 40 and 3 or more of the following:
  - Male or postmenopausal female
  - Age ≥42 years
  - Neck circumference
    - Greater than 43 cm (17 inches) for men
    - Greater than 39.5 cm (15.5 inches) for women
  - Mallampati class 3 or 4
  - Witnessed apneas
  - Loud snoring
  - Micrognathia or retrognathia
  - Hypertension (treated or untreated)
  - Type 2 diabetes (treated or untreated)

- Hypothyroidism (untreated)
- History of stroke, coronary artery disease, or arrhythmia

Workers diagnosed with OSA should be disqualified from safety-sensitive tasks until they are successfully treated.

Employers in the transportation industry and their occupational physicians should be vigilant regarding the medications their workers are taking because many can affect daytime alertness. As a general rule, medications depressing the central nervous system deserve careful deliberation in transportation workers because they can adversely affect safety-sensitive duties.[34] In addition, although there may be temptation to prescribe wake-promoting stimulants (eg, modafinil, armodafinil), these are not a substitute for fatigue prevention and management strategies, and should only be used in specific cases with expert guidance as adjuncts.

FMCSA regulation section 391.41(b)(12) states:

A person is physically qualified to drive a commercial motor vehicle (CMV) if that person does not use a controlled substance identified in 21 CFR 1308.11, Schedule I, an amphetamine, a narcotic, or any other habit-forming drug. Exception: A driver may use such a substance or drug, if the substance or drug is prescribed by a licensed medical practitioner who is familiar with the driver's medical history and assigned duties; and has advised the driver that the prescribed substance or drug will not adversely affect the driver's ability to safely operate a CMV. This exception does not apply to methadone.

Medical examiners are required to carefully assess the effects of a driver's medications on their ability to operate a vehicle safely before qualifying the driver to do so commercially.

Employee education is also critical in this regard, because common over-the-counter medications, supplements, and legally obtained prescriptions may be disqualifying when they adversely affect the driver's ability to drive safely.[38-45]

Table 1 gives guidance to prescribing physicians providing care to transportation workers regarding common medications that have sedating side effects,[34] which the FMCSA advises against in transportation workers, and offers alternatives that could be considered.

## Technology/Engineering Controls

As with any hazard, if elimination of risk is not possible, engineering controls to mitigate risk are desirable rather than relying on individual human factors or performance, such as the application of personal protective equipment or safety practices (eg, the strategic use of caffeine and napping) to effectively minimize the hazard. Employers in the transportation industry can use increasingly sophisticated systems to detect and even compensate for sleepy drivers and operators. For example, an automated braking system at rail stations and turns acts as an operator-independent failsafe against speed-related derailments or crashes, which have caused catastrophic accidents in the past. As automated driving technologies mature in the coming years, employers in the trucking industry can integrate technologies that both detect driver fatigue and intervene to keep them alert, and also take control of the vehicle to

avoid lane departures, speeding, and collisions. This technology is increasingly available in consumer vehicles, and can assist with lane control, warning when an obstacle is ahead, and braking before a collision is detected by the driver. Other available technologies include computer-analyzed steering wheel movements to detect when a driver is fatigued, but before the driver falls asleep. Devices that directly monitor a driver's eyes or electrodermal activity can also detect fatigue before the driver falls asleep, triggering an alert to arouse the driver. It is anticipated that such technological engineering controls will play an integral role in improving transportation safety in the future.

### Fatigue Management Plans

Fatigue management plans organize and formalize employers' efforts to minimize fatigue-related risk. They should include statements of intent and scope; clearly delineate work hours and overtime policies; identify fatigue-related safety issues; and outline mitigation strategies, including training, medical screening, engineering controls, and strategies for reporting and investigating fatigue-related incidents and near misses.

For fatigue management plans to succeed, they must be science based, data driven for the specific transit industry, cooperatively designed by all stakeholders, integrated into a culture of workplace safety and health management, and continuously improved using feedback and evaluation.[46] Senior leadership must nurture a culture of trust between managers and workers as well as having accountability for the program.[6] A successful program will not only improve fatigue-related safety risk but also improve morale, productivity, work satisfaction, and well-being for employees and for the company.

### Research and Evaluation

In addition, as in all endeavors, ongoing research is integral to deepening the understanding of fatigue-related safety risk; its impact on employers, workers, and the public; and what methods are optimal for its mitigation. As shown by Schneider National, private corporations can collaborate in numerous ways with the scientific research community to further the collective understanding of how fatigue-related risk can be minimized in transportation safety. Employers of all sizes can contribute to ongoing research in numerous ways, including data collection, active collaborations with researchers, and through financial support of ongoing research. At a minimum, employers should analyze their own safety data, regularly evaluate their fatigue management plans, collect feedback from stakeholders, and track progress.

## SUMMARY

Despite tremendous progress that has been made in transportation safety over the past century, transportation incidents remain one of the leading causes of industrial accidents, often with serious adverse consequences to human life, public property, and the environment. Human fatigue is increasingly recognized as an important factor in transportation safety, and employers play a vital role with their employees in ensuring fatigue-related risk is minimized. The NTSB has identified 7 focus areas employers can address to reduce fatigue-related transportation safety risk. By taking an active role as

stakeholders in transportation safety, employers not only reduce their risk of adverse safety events and limit their legal liability but may also benefit from improvements in productivity, morale, and health care costs, all of which contribute to a healthier workforce, healthier companies, and safer travel for everyone.

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**KEY POINTS**

- Fatigue is a major cause of transportation accidents.
- Employers share responsibility for fatigue-related accidents, and may be legally liable for accident consequences.
- Employers play a significant role in mitigating fatigue-related risk, and may benefit by optimizing fatigue risk management.
- Multiple complementary strategies should be used for reducing fatigue-related safety risks.

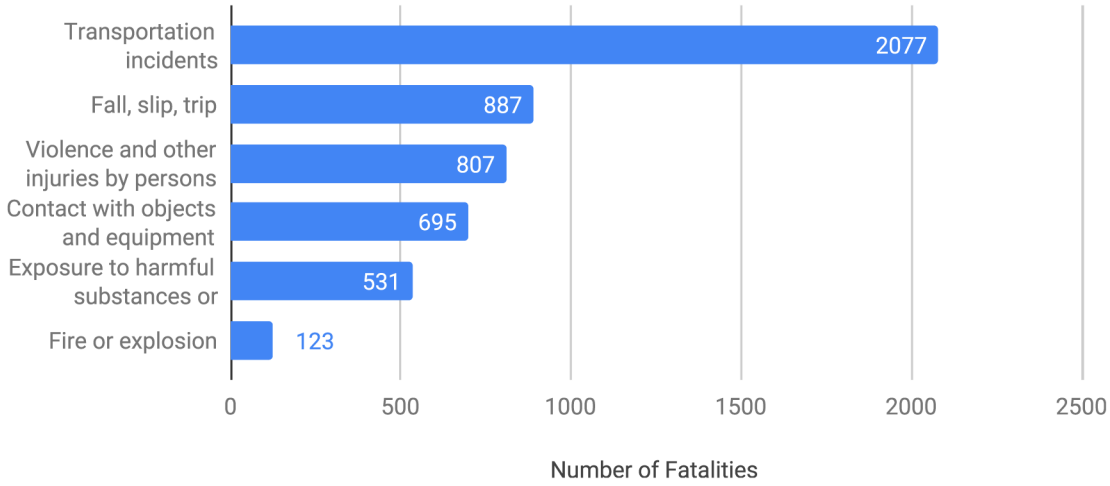


**Fig. 1.**

Fatal occupational injuries for selected events or exposures, 2017. (*From* Bureau of Labor Statistics, Census of Fatal Occupational Injuries Summary, 2017. https://www.bls.gov/news.release/cfoi.nr0.htm.)

**Table 1**

Common sedating medications and potential alternatives

| Sedating Medication | Alternative |
|---|---|
| First-generation antihistamines (eg, diphenhydramine) | Second-generation antihistamines (eg, loratadine and cetirizine)[39] |
| Sedating antidepressants (eg, mirtazapine, trazodone, imipramine, amitriptyline) | Nonsedating antidepressants (eg, sertraline, citalopram,[40] venlafaxine, bupropion)[39] |
| Narcotic pain medications (eg, opiates/opioids). Many are explicitly banned for commercial drivers (eg, methadone)[39] | Pain medications (eg, acetaminophen,[41] NSAIDs,[42] COX-2 inhibitors) |
| Hypnotics (eg, benzodiazepines, barbiturates) | Do not drive until drug is cleared from the body (ie, after 7 half-lives for acute use and 7 half-lives + 1 wk for chronic use). Sleep aid (melatonin: do not drive within 8 h of taking)[43] |
| Anxiolytics (eg, diazepam, lorazepam) | In general, not recommended by FMCSA |
| Muscle relaxants (eg, cyclobenzaprine) | In general, not recommended within 6 d of driving |
| Sedating anticonvulsants (eg, gabapentin, carbamazepine) | In general, use of these medications precludes medical certification if prescribed for epilepsy or other disqualifying conditions outlined by the FMCSA |
| Antipsychotics (eg, quetiapine, risperidone, olanzapine) | In general, use of these medications precludes medical certification if prescribed for disqualifying conditions outlined by the FMCSA If the underlying condition being treated is safe for driving and medication use for the driver is effective, safe, and stable, clearance may be considered for less sedating atypical antipsychotics (eg, risperidone, olanzapine, quetiapine, and ziprasidone)[44] |
| Dopamine agonists for Parkinson disease (eg, pramipexole, ropinirole, pergolide) | In general, not recommended because they may cause narcolepsylike attacks |
| Marijuana, prescribed medically (remains federally banned) | Does not qualify for FMCSA medical certification[45] |

*Abbreviations:* COX-2, cyclooxygenase-2; NSAIDs, nonsteroidal antiinflammatory drugs.