Sleep Deprivation in the Workplace: The Hidden Side of Health and Wellness

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Introduction

We spend about one third of our lives sleeping. If asked, most of us would probably agree that getting an adequate amount of sleep is important. So why is sleep overlooked in many of our daily lives? Why do we take shortcuts and not get enough sleep? Has sleep and getting enough rest been taken into consideration when we look at safety in the workplace? Maybe it is time that it has gotten more attention. Consider the following event: On Dec. 1, 2013, a train engineer operating a New York City commuter train fell asleep at the controls as the train was traveling 82 mph into a 30 mph curve in the Bronx. The engineer caught himself nodding off at the controls just before the curve but it was too late. The result was a derailment which left seven train cars and the locomotive toppled over, with some of the cars just inches from the river. Four people died in the accident and dozens were injured. The engineer of this train might have experienced a “microsleep.”

There have been other catastrophes due to fatigue throughout recent history, including Three Mile Island, Union Carbide Chemical Plant in Bhopal, Chernobyl and the Exxon-Valdez. Sleep deprivation played a part in all of these tragedies. But what about everyday fatigue and sleep deprivation in the workplace? As Safety & Health Professionals, I am sure that we would all agree that impaired reaction time, judgment and vision along with increased moodiness and aggressive behaviors are not good for safety, but these are all effects of sleepiness and fatigue on employees who are sleep deprived. The level of risk of being injured at work increases greatly for those employees that are sleep deprived. It has been estimated that these highly fatigued workers are 70% more likely to be involved in accidents and those who report disturbed sleep are nearly twice as likely to be killed in a work-related accident.

So while the focus in Safety & Health tends to be compliance, risk management, prevention through design, and behavior-based safety, let us spend some time reviewing one of the “Hidden Sides of Health & Wellness” which is sleep deprivation. This is one area that affects everyone and can control the quality of our daily lives. More importantly, sleep deprivation and fatigue can have dramatic effects on our personal health, performance in the workplace, and can attribute to the root cause of many workplace incidences which send employee’s home in a different condition as when they arrived at work.
Why Is Sleep Important?

Sleep, Like Food and Water, Is Essential for Life

Sleep is vitally important for all human functioning including cognitive and physical performance. Adequate sleep protects our immune system and new evidence shows a relationship to weight gain and aging. Positive health benefits of getting enough sleep include the following:

- Restores energy levels
- Repairs cell damage
- Promotes muscle and tissue growth
- Improves mood

These positive health benefits ultimately mean employees who are more productive, experiencing faster recovery times when injured, and helps to improve morale in the workplace.

The challenge is getting your employees to realize sleep’s importance and how it can dramatically affect their quality of life outside of work. One tool used to meet this challenge is raising awareness. Awareness is a large factor in keeping employees safe.

There is no question that sleep is very important to each one of us. Studies have proven that getting adequate sleep and rest keep us healthier, more productive, motivated, and it decreases the prevalence of obesity and depression. Other important safety and health benefits include increased alertness and awareness which contribute to employees using better judgment and making the right decisions in order to keep them safe at work and even avoid experiencing microsleep.

Consequences of Sleep Deprivation in the Workplace

When we consider the consequences of not getting enough sleep, it has been found that sleeping less than seven hours per night increases the risk of disease. Sleep deprivation has been linked to risk-taking behavior. The fact is that extended sleep deprivation can cause extreme chronic health problems and consequences including an increased risk of hypertension, diabetes, obesity, depression, heart attack, and stroke. The Institute of Medicine Report titled “An Unmet Public Health Problem” stated “the cumulative effects of sleep loss and sleep disorders represent an under-recognized public health problem and have been associated with a wide range of health consequences … hundreds of billions of dollars a year are spent on direct medical costs related to sleep disorders such as doctor visits, hospital services, prescriptions, and over-the-counter medications.”

Lack of knowledge and awareness about sleep deprivation adds to the danger of fatigue in the workplace. Some people are not aware of the risks of sleep deprivation. In fact, they may not even realize that they are sleep deficient. Even with limited or poor-quality sleep, they may still think that they can function well. This lack of sleep also may lead to “microsleep”. Microsleep refers to brief moments of sleep (2-3 second sleep episodes) that occur when you are normally awake. What makes a microsleep so dangerous is that you can not control or predict it, and you might not even be aware of it (reference the New York City commuter train accident in...
the Introduction). For example, have you ever driven somewhere and then not remembered part of the trip? If so, you may have experienced microsleep.6

Sleep-related fatigue costs for U.S. businesses have been estimated at $150 billion a year due to:

- Absenteeism
- Workplace accidents
- Lost productivity

Two thirds of adults report experiencing sleep problems at least a few nights per week according to a 2008 sleep study.2 When you take a closer look at the effects of sleepiness in the workplace, according to a 2000 National Sleep Foundation “Sleep In America Poll”, sleep deprived employees reported having difficulty with the following:

- Concentration 68%
- Handling stress 65%
- Listening 57%
- Solving problems 57%
- Decision making 56%
- Relating to others 38%

How many of these states and conditions can affect employee safety performance? The answer is all of them. When we really break down what can lead to unsafe actions and behaviors, you will probably find many of these items listed as contributing factors in the cause of an accident or injury. This same poll identified the following additional work problems that employees encountered due to sleepiness:

- Being late to work 14%
- Staying home from work 4%
- Falling asleep at work 7%
- Making errors 19%

There is no question that all of these problems that employees can encounter due to lack of sleep and rest can greatly effect how safe and productive they are at work. At this point, the message of how serious the consequences of sleep deprivation in the workplace can be should be well understood. Now let’s switch gears a little bit and focus on sleepiness and driving.

Most of us drive an automobile and there are many job positions that require employees to drive a vehicle. We know that vehicle/car accidents are the number one cause of workplace fatalities, yet almost 20 percent of all serious car crash injuries in the general population are associated with driver sleepiness3 with an average of over 80,000 crashes per year involving drowsy driving.4 One survey revealed that over one third of working adults have nodded off or fallen asleep while driving.5 When we compare fatigued driving to driving under the influence of alcohol, studies have shown that 17 hours of sustained wakefulness/being awake produces driving performance impairment of 0.05% BAC. When they increased the sustained wakefulness to 24 hours, then the impairment changed to 0.10% BAC.8 These results of these studies bring up the question- why isn’t getting adequate sleep taken more into consideration when we drive a
vehicle? Driving under the influence of alcohol is illegal and we also have a general understanding that it is very dangerous. If working adult drivers knew and were aware that fatigued driving could be just as dangerous as driving under the influence then sleep would probably be taken more seriously and getting enough rest would be made more of a priority in our daily lives. That leads us to our next question, “What is considered an adequate amount of sleep?”

**How Much Sleep Do We Need?**

The average American sleeps less than seven hours each night. This contributes to 37% of adults who say that they are so tired during the day that it interferes with their daily activities. How much sleep do we really need? Your sleep need is the average amount of sleep you must obtain on a daily basis to maintain alertness and avoid building up a “sleep debt.” Most adults need between 7-9 hours of sleep each night. The amount of sleep needed does vary between individuals. In fact, when we compare the average sleep needed by two famous scientists, Thomas Edison and Albert Einstein, we find that Edison averaged between 3-4 hours each night as an adult, and Einstein averaged 10 hours each night as an adult.

The 7-9 hours’ sleep need remains the same throughout adulthood, but seniors may struggle to get all those hours in one night. Older adults tend to sleep more lightly, less efficiently, and wake up more frequently during the night because they are more likely to have medical problems, along with sleep disrupters and disorders. This may lead to more daytime napping, which can interfere with their nighttime sleep. With the growing aging workforce, having an awareness of sleep deprivation among senior employees will continue to become that much more important over time.

How do I know how much sleep that I need? Look and pay attention to these warning signs:

- Overwhelming tiredness
- Clumsiness
- Communication difficulties
- Hunger that is difficult to satisfy
- Easily triggered and intense emotions
- Low stress tolerance
- Poor concentration and ability to focus
- Falling asleep in less than five minutes

If you are noticing these warning signs, then you are most likely sleep deprived, and it is time to keep a sleep diary journal. The sleep diary journal documents what time you went to bed and what time you woke up. Other information that you can track in the journal is the following:

- Room temperature
- Environmental disturbances such as noise and light
- Quality of sleep
- Noting of stress level and other moods prior to bed
• Pre-Sleep activities, like timing and amount of exercise, any eating of late-day food, when and what medications were taken, when and how much intake of alcohol and/or caffeine, and if any late day naps were taken

Just like an accident or near-miss investigation scenario at work, the more information that is documented allows you to assess and evaluate your sleep habits and environmental conditions that you are exposed to. You can then identify any trends and patterns that need to be corrected. Ultimately, the tracking of the amount and quality of sleep that you are getting is important in order to avoid getting into “sleep debt.”

What Is “Sleep Debt”?

Sleep debt is a mathematical relationship between the hours of sleep that you need each night (7-9 hours) minus the hours of sleep that you actually get. Each hour of lost sleep is added to your sleep debt until this debt reaches 20 hours, which is the maximum “sleep debt ceiling.” After the 20-hour debt ceiling, any additional accumulation increases the chance that you may not be able to reverse the long-term effects of sleep deprivation, which could cause serious health issues. Also, the larger your sleep debt, the more likely you will experience microsleeps.2

Sleep debt is different than financial debt. Your sleep debt can only be reduced by getting extra sleep (“sleep savings”) but paying back this sleep debt is not as easy as paying back financial debt. You can not sleep ahead to build up your “sleep savings” to counter any future sleep debt. Sleep debt is accumulated faster than just the actual number of hours of sleep lost, as shown in Exhibits 1 & 2.

<table>
<thead>
<tr>
<th>SLEEP DEBT BENCHMARK- 8 Hours of Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hr. Day = 16 hrs. Being Awake + 8 hrs. Sleep</td>
</tr>
<tr>
<td>16 / 8 = 2 (2 : 1 ratio)</td>
</tr>
<tr>
<td>2 : 1 Benchmark Ratio (Wakefulness to Sleep)</td>
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</tbody>
</table>

Exhibit 1. Eight hours of recommended sleep gives us a 2:1 ratio between wakefulness and sleep for calculating sleep debt.

<table>
<thead>
<tr>
<th>CALCULATING SLEEP DEBT- 6 Hours of Sleep</th>
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<tbody>
<tr>
<td>24 hr. Day = 18 hrs. Being Awake + 6 hrs. Sleep</td>
</tr>
<tr>
<td>18 / 6 = 3 Hours</td>
</tr>
<tr>
<td>3 Hours of Sleep Debt instead of 2 Hours of Lost Sleep*</td>
</tr>
<tr>
<td>*(Lost Sleep- 8 Hours recommended minus 6 Hours actual sleep)</td>
</tr>
</tbody>
</table>

Exhibit 2. Sleep debt accumulates faster than the actual number of hours of lost sleep.
This year alone, the United States will accumulate a sleep debt of about 105,682,763,550 hours so if you have sleep debt you are not alone. At this rate, the U.S. could experience a “sleep bankruptcy.”

How do I know if I have sleep debt? By keeping track with a sleep diary journal, you can monitor your sleep activity in relation to sleep needed on a weekly basis. Another option is the Home Sleep Latency Test. Sleep latency is the time spent when you shift from being awake to falling sleep. To conduct this test, find a comfortable place to sleep and a volunteer to watch you and record the time. After conducting this test three or four times during the daytime hours, determine the average amount of time that it takes you to fall asleep. Once you know how long, you can compare it to Table 1 to see where you are at with sleep debt.

<table>
<thead>
<tr>
<th>Time</th>
<th>Sleep Debt</th>
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</thead>
<tbody>
<tr>
<td>0-5 minutes</td>
<td>Severe sleep debt</td>
</tr>
<tr>
<td>5-10 minutes</td>
<td>Moderate sleep debt</td>
</tr>
<tr>
<td>10-15 minutes</td>
<td>Mild sleep debt</td>
</tr>
<tr>
<td>15-20 minutes</td>
<td>Little or no sleep debt</td>
</tr>
</tbody>
</table>

Table 1. Sleep latency test is the amount of time it takes you to fall asleep in order to determine your sleep debt condition.

Once you have determined and know the amount of sleep that you need each day in order to feel rested, alert and at your top performance, now it is time to start paying back your sleep debt. Sleep debt has to be paid in “installments” and these “payments” usually need to be spread over several days or weeks. You cannot have a marathon sleep during the weekends to catch up on sleep loss. You can only pay back sleep debt in increments of 1-2 hours. If you are 10 hours or more in sleep debt, do not expect to pay it all back at once. One best practice recommendation is to pay back your sleep debt by going to bed 30 minutes earlier each night over an extended period of time and using that as your installment payments. If you use this approach then you will want to monitor your progress by documenting your sleep in your sleep diary journal.

How to Help Conquer the Effects of Fatigue in the Workplace

There are many different wellness ideas and suggestions out there for you to use and bring with you into the workplace on how to eliminate sleep deprivation amongst your employees. While you cannot force your employees to utilize better sleep practices (“sleep hygiene”), you can sure educate them. I am sure that most of us would agree that it is not any fun to feel tired and irritable. How about asking employees “Do you enjoy being stressed? Less productive? Making errors? While we know what their answers would be and we would never probably ask them those questions, we also know that they do not want to be involved in an accident or be injured. Then why is there sleep deprivation in the workplace? The answer is lack of awareness and
education. Sleep studies and information on healthy sleep is a relatively “new frontier” that needs to be communicated to employees in order to help them make the right choices at home. Your first strategy then should be to communicate and educate.

Another idea to consider is the use of a “buddy system” where your employees watch over each other. Remember, tired and fatigued employees will not recognize their symptoms or admit that they are sleep deprived. The buddy system incorporates accountability into the strategy by assigning two employees to check on each other and monitor their “buddy’s” condition which ultimately helps employees to be more responsible for their actions and behaviors.

One administrative strategy is to schedule the more demanding tasks of your workforce during the times when your employees are most alert. When are employees typically most alert? When you consider a daytime work schedule or working on first shift you should try to schedule these more important and demanding tasks outside of the “mid-afternoon dip.” The “mid-afternoon dip” shows a relationship between how alert your employees are to the time of the day when they are working. What time of the day are they most alert and when is alertness lowered? This time frame starts just after lunch break or around 1:00 in the afternoon. This is the timeframe that you should avoid scheduling more demanding tasks for your employees. See Exhibit 3.

Exhibit 3. The Mid-afternoon dip represents the time of the day when employees are least alert performing their jobs due to our biological clocks and circadian rhythms.

Another “rule of thumb” or guideline for your employees and you to use when determining the time of day when you may experience a lower level of alertness when performing tasks is to estimate the approximate time (EX.: 10:00-6:00) when you were sleeping the night before. Next, determine the median/middle time of that sleep range and add 12 hours to that
approximate time (EX.- 2:00). By adding 12 hours to the middle time of your previous sleep session you would have the approximate time when you might experience being tired and least alert while at work.

Some additional recommendations that you can provide to your employees to promote being alert while at work include:

- Taking more frequent short breaks
- Offering training on tips for body stretching and the time to stretch
- Conducting short exercise programs on breaks
- “Eat Healthy” campaigns with educational training and healthier food choices offered in company break rooms

Another key element in conquering the effects of fatigue in the workplace is to promote healthy sleep at home. Employee education and awareness on the importance of sleep, the possible health effects of not getting adequate sleep, and practicing proper “sleep hygiene” at home are crucial in order to get employees to make lifestyle changes that will allow them to be well rested and alert when coming to work.

Sleep Hygiene

“Early to bed, and early to rise, makes a man healthy, wealthy, and wise” stated Benjamin Franklin in Poor Richard’s Almanac back in 1735. That routine would be considered part of your sleep hygiene. What is sleep hygiene? Sleep hygiene refers to sleep practices, habits and environmental factors that are necessary for getting quality restorative sleep. Just as proper housekeeping is important in helping to reduce accidents and injuries in the workplace, sleep hygiene is an important part of maintaining lifestyle habits that keep us from becoming sleep deprived

The first tip for improving your sleep and sleeping well is to stick to a consistent sleep schedule, which means going to bed and waking up at the same time each day including on weekends. This practice helps to set the body’s “internal clock” which regulates our sleep/wake cycles. The following is a list of more sleep hygiene tips that will help you improve and maintain adequate sleep:

- Avoid caffeine and nicotine four to six hours before bedtime
- Avoid alcohol within three hours of going to bed
- Avoid large meals before bedtime and limit late day fluid intake
- Get exposure to natural sunlight
- Exercise regularly, but not within three hours of bedtime
- Avoid taking naps late in the day- nap early or not at all
- Establish a pre-sleep routine of relaxing activities one hour or so before bed

Your sleep environment is also part of your sleep hygiene and should be regulated. Your bedroom should be a quiet, dark, and relaxing environment with a temperature between 60°-75° and the room well ventilated. Removing all TVs, computers, electronic “gadgets”, and work materials out of the bedroom will also improve your sleep environment. Your bed should be
comfortable and used only for sleeping and not for other activities such as reading, watching TV, or listening to music. When employees who work late shifts are taken into consideration, additional sleep hygiene practices should be incorporated such as darkening the bedroom with light blocking and sound absorbing curtains or shades, wearing eye shades and ear plugs, and disconnecting or powering down telephones and cell phones. Running a “white noise” machine (EX.- Fan) might be helpful for “drowning out” noises during the day.

Some of these sleep hygiene tips will be easier to include in your daily and nightly routine than others. The key is to stick with them because then your chances of achieving restful sleep will improve. Keep in mind that not all sleep problems are so easily treated and could signify the presence of a sleep disorder such as sleep apnea, restless legs syndrome, narcolepsy, or another clinical sleep problem. If your sleep difficulties do not improve through good sleep hygiene, you may want to consult your physician or a sleep specialist.

Conclusion

Sleep has been around as long as human beings and is essential for life. Recent research and studies have indicated that proper sleep and rest are also important for being more alert, productive, and safe at work. It contributes to our health, lowering our stress, and how well we age. Sleep affects each one of us and can control our daily lives. It has a lot of “power” so you would think that we would make sleep top priority.

Unfortunately, that is not the case in this day and age. In reality, healthy sleep gets little attention. Our busy everyday lives cause us to take shortcuts and not get the adequate sleep that we need each day. Other reasons why are we so complacent with our sleep? The other main reasons are lack of awareness and education.

As employers, we want our employees to be happy, healthy, and safe. There are many benefits to this. What can help you get there? By providing training and education on the many benefits of sleep, how much sleep each one of us should get daily, and also proper sleep hygiene. You also want to make sure that there is an understanding of the consequences of not getting enough sleep and to avoid getting into “sleep debt”. Expand your Wellness Program to include educational resources on sleep and provide incentives for employees to eat healthier, exercise, track their sleep schedules with a sleep diary journal, and to watch over their fellow co-workers to look for signs of fatigue. It is time to “conquer” sleep deprivation in the workplace and make sleep wellness visible to all employees.

Bibliography


