The Trauma Professional's Blog

Trauma MedEd #70

Topic: Sleep Loss & Fatigue Subscribe: www.TraumaMedEd.com September 2020

Facts On Fatigue & Sleep Loss

Nearly every trauma professional has experienced sleep loss at some time in their training or practice. Some specialties are cursed with it more than others. In the old days, we were told to just suck it up. It was almost a rite of passage that everyone was expected to go through.

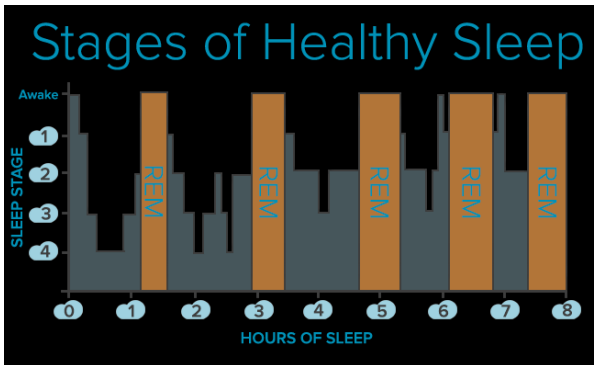
It was also believed that sleep loss was something that could be made up by sleeping more the next day or at some later date. The idea of a "sleep deficit" was commonplace. We used to think just sleeping in the next day (or weekend) was enough to make up for a previous hell night spent awake.

Unfortunately, this has been found to be untrue. Sleep researchers have found very specific and important functions that are carried out during different stages of sleep. If these stages are shortened or eliminated for even a single night, they can never be fully compensated for.

The two critical stages of sleep (that we know of now) are deep sleep and dream (REM) sleep. Deep sleep usually starts within 30 to 60 minutes of falling asleep and lasts for 30-90 minutes depending on age. This phase is critical because the brain cells shrink in size, opening more space between them. The lymphatic system of the brain (the glymphatics) then flushes CSF through the system, removing metabolites and debris, beta amyloid and tao proteins, to name a few. These are strongly associated with Alzheimer's disease, and loss of deep sleep may be one of the links between sleep problems and dementia.

The other critical phase of sleep is REM sleep. REM sleep cycles usually begin after deep sleep is finished, and occur every 90 minutes or so throughout the night. Each cycle becomes longer as the night progresses.

Dreams occur during this stage, and the function is to consolidate daytime experiences and memories with existing memory. Disturbances in dream sleep lead to memory problems.



Trauma Conferences

The vast majority of trauma meetings, symposia, and conferences have been cancelled. I am excited to say that a few are moving forward with their plans, providing valuable conferences in an electronic format. These include large meeting held by the American College of Surgeons, as well as the AAST.

Here is the one remaining conference that I will be speaking at this year by telepresence. Check it out and say hello when you sign in!

Stormont Vail Trauma Symposium (Virtual)
Topeka, KS
October 16, 2020
Meeting info link TBA

Inside This Issue

1 **Facts On Fatigue And Sleep Loss**

2 **Impact on EMS Providers**

2 **Impact on Nurses**

3 **Impact on Physicians And APPs**

4 **What To Do About Fatigue And Sleep Loss**

This chart shows a typical night of healthy sleep lasting eight hours. Stage 4 is deep sleep, with one long burst and two short bursts separated by a REM cycle. Note that REM cycles are relatively regular at about 90 minutes, and that each cycle gets longer as the night goes on. This fact will be important as described later in this newsletter.

Here are some of the problems that are caused by disturbed or missed sleep:

- **Hypertension**. Even a single missed night of sleep causes an elevation of blood pressure the next day. Chronic sleep issues are associated with a higher risk for hypertension.
- **Memory problems.** Sleep deprivation in general is associated with memory issues. Memories are consolidated and linked to other memories during the dream or REM phase of sleep.
- **Immune compromise.** Sleep deprivation makes one much more susceptible to infectious disease and less able to recover quickly.
- **Glucose intolerance.** A singe night of poor sleep increases insulin resistance and serum glucose levels.
- **Weight gain.** Chronic sleep disturbances are highly correlated with unanticipated increases in weight. Part of this is due to changes in the GI hormones leptin and ghrelin, which provide cues to when to start and stop eating.
- **Decreased sex drive.** Hormone disturbances of all sorts are commonly found with disordered sleep.
- **Fatigue.** Chronic sleep problems often lead to this. The details are spelled out below.
- **Burnout.** This is a state of mental, physical, and emotional exhaustion brought about by chronic stress, of which sleep loss may be a part.

What is fatigue? Many trauma professionals, as well as workers in numerous other fields, complain about fatigue. It's one of those things that everyone knows it when they see it. But it's tough to provide a good, objective description.

Fatigue is a state of physical and/or mental lack of energy and motivation. This is a bit different from drowsiness, which is a need to sleep. However, multiple bouts of sleep deprivation are one potential factor in creating fatigue.

Let's examine some of the effects of sleep disturbances on trauma professionals in the prehospital setting, nurses, and physicians / advanced practice providers. At the end, I will review some tips, tricks, and policy and practice changes that may help.

Impact On Prehospital Providers

EMS providers work a wide variety of shifts in order to provide 24/7 service availability. In order to accomplish this, rotating shifts, overnight duty, and frequently interrupted sleep is commonplace.

A group from the Emergency Medicine Department at the University of Pittsburgh administered a survey to groups of EMS professionals attending a large conference. It consisted of 45 questions that sought information on demographics and health, sleep quality, and fatigue.

Here are the factoids:

- Of the roughly 1,300 attendees, only 119 questionnaires were completed. This is rather surprising because a $5 bounty was paid to each participant when they turned it in.
- **Only bout one third reported working 8-hour shifts.** About 25% worked 12-hours shifts, and 15% worked 24-hour shifts.
- **Nearly 85% were overweight or obese** using the BMI >25 standard. Yet 70% reported they were in good health.
- 20% had been told they had a **weight problem**, and 20% were told they had **high blood pressure**. And 60% had two or more medical conditions.
- The mean Pittsburgh Sleep Quality Index (PSQI) was 9 points out of 20, whereas the normal is 3 of 20.
- The Chalder Fatigue Questionnaire score indicated that nearly **half of the providers were experiencing severe mental and physical fatigue**.
- PSQI scores were much worse in those reporting severe fatigue.

Shift length has been correlated with fatigue. In this study, a minority of providers worked 8-hour shifts. And a third worked at more than one agency, making

it possible to experience extreme variations in time available to sleep.

Bottom line: This is a small sample from a larger group, which always raises the question of whether the results are applicable to the entire population. But nonetheless, they are impressive.

Overall, sleep quality was very poor. This probably had a big impact on the overall poorer health reported, as well as the high level of fatigue. The ultimate result is that impaired providers are doing their best to provide top-notch care. Unfortunately this is setting up both the medics and their patients for less than desirable outcomes.

Reference: Sleep quality and fatigue among prehospital providers. Prehosp Emerg Care 14(2)187-193, 2010.

Impact On Nurses

Although 8-hour shifts are the most common work arrangement around the country in all most occupations, they are a bit less common in nursing. Nurses have work and sleep patterns equivalent to prehospital providers. And critical care nurses probably have the most variable and punishing work patterns.

One may think that just increasing to a 12-hour shift is not that big of a deal. The nursing school at the University of Auckland performed their own survey of ICU nurses in two separate hospitals in New Zealand. They administered the Occupational Fatigue Exhaustion/Recovery Scale and evaluated differences in relation to a number of demographic variables.

Here are the factoids:

- There were a total of 67 participants in the two hospitals and all worked 12-hour shifts.
- Nurses at one hospital (A) worked mostly day or mostly night shifts and tended to be younger. Shifts were more mixed at the other (B).
- **About half of the nurses reported low to moderate fatigue acutely, and two thirds reported this level between shifts as well.**
- Factors that correlated with increased fatigue were **younger age, fewer children, less years of experience, and less exercise**.
- Higher fatigue levels were reported at hospital A, which had the younger, less experienced nurses.

Bottom line: This is another survey study, but it does illustrate some common issues. Some factors could be changed by rearranging the shift structure to all day or all night shifts. Exercise was associated with less stress and could be encouraged. But the nature and pace of work in the ICU remains constant and is difficult to control for. Some strategies for positive change are listed on the next page of the newsletter.

Reference: Exploring the impact of 12-hour shifts on nurse fatigue in intensive care. Applied Nurs Res 50:151191, Dec 2019.

Impact On Physicians And APPs

Many physicians and advanced practice providers (APPs) routinely have a rather random schedule of predictable shifts interspersed with longer call shifts. The length can vary from 8 hours to more than 24 hours on duty. As you might imagine, sleep disruption is expected because of the random nature of patient needs.

A Saudi Arabian medical group examined work patterns and sleepiness in a group of junior residents spanning medicine, surgery, pediatrics, and obstetrics. The study reviewed the effects of on-call related sleep deprivation on mood and alertness. They used the Profile of Mood States and Stanford Sleepiness Scale instruments to accomplish this.

Here are the factoids:

- A total of 88 junior residents at a single university hospital were studied over a one year period.
- About 85% had interrupted sleep, 10% had normal sleep (!), and 5% didn't sleep at all in a given night
- 85% of residents slept 5 or fewer hours while on-call, with one third sleeping less than 2 hours.
- Interestingly, the medicine and pediatrics residents in Saudi Arabia seemed to have more very low sleep nights that the surgery or OB residents.
- Pre-call alertness was the same in all residents, but post-call alertness declined as a function of the amount of sleep. Surprise!
- Mood scores indicating depression, decreased vigor, confusion, and fatigue increased significantly as sleep decreased.

Bottom line: This is an interesting glimpse of post-call sleepiness and mood change in residents. It underscores the fact that sleep loss affects us all, regardless of age, sex, discipline, or geographic boundaries.

Reference: Effect of on-call-related sleep deprivation on physicians' mood and alertness. Annals Thoracic Surg 8(1):22-27, 2013.

What To Do About Fatigue And Sleep Loss

I think we all get it. Lack of sleep, or even interrupted / disordered sleep are bad. There are many people who claim they can do just fine on five hours of sleep (or less), and a few genetically gifted individuals who are actually wired to do so. For many years, I was convinced that 5 ½ hours was my sweet spot.

But as I have learned more recently, more sleep is better, up to a point. Going beyond nine hours or so is associated with an increase in all-causes mortality. This may be a statistical fluke, but it might be of concern.

I strongly encourage anyone who wants to learn more about the importance of sleep to read *Why We Sleep* by Matt Walker, PhD. He is the director of the Sleep Science Laboratory at the University of California, Berkeley. It was an eye opener for me, and I'm convinced I've shortened my own lifespan by several years due to the schedule I've kept as a trauma professional.

We know that sleep loss and fatigue affects performance. Effects such as cognitive slowing, more variable performance, neglect of nonessential activities, decreased motivation, and problems with learning, memory and problem solving are commonplace. Why would our patients want a clinician afflicted with any of these to lay hands on them?

But what can we do about this problem? Obviously, irregular shift work and long duty hours are never going to go away.

Here are some general tips for everyone:

- **Optimize scheduling**. In general, wake periods should not exceed 17 hours, especially for night shift workers. Allow at least 10 hours for rest periods. Remember the sleep chart on Page 1? Note how the REM sleep cycles get longer as the night goes on. Trying to make more awake time by abbreviating sleep time drastically decrease REM sleep. This exacerbates memory, learning, and focus issues.
- **Use stimulants strategically**. Use appropriate amounts starting **several hours** after waking. You should be wide awake when you get up, right? And avoid caffeine at least 8 hours prior to bed due to its long half-life.
- **Naps can be life savers**. For both providers and patients. However, this extremely valuable practice is looked down upon in many countries.
- **Increase social interaction on the job**. This, coupled with staying on one's feet, improves alertness.
- **Go to the light.** Natural sunlight is the key to maintaining a solid circadian rhythm. Get at least 5 minutes exposure in the morning if you can.

And some tips for specific groups of trauma professionals:

- **Nursing and Physicians / APPs**
  - **Limit night shifts to 8 hours.** There is a greater risk for patient care errors and more adverse health consequences when working consistently longer times at night.
  - Schedules should **allow at least 10 continuous hours off each day** to allow at least 7 hours of sleep.
  - **Work breaks** of 10-15 minutes every 2 hours reduce fatigue.
  - Establish non-punitive procedures for clinicians who are too fatigued to work.
- **Prehospital**
  - **Eliminate 24-hour shifts.** This is a bit controversial in the EMS community, but the literature supports it.
  - **Monitor and measure fatigue.** Then introduce policy changes and interventions to reduce it.
  - **Encourage napping**, if feasible.