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Managing Alertness in Sleep Center Personnel

The sleep medicine community can become a model that can be spread to diverse 24/7 settings throughout society by applying its knowledge of circadian factors, sleep disorders, alertness, and performance

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"My mind clicks on and off . . . I try letting one eyelid close at a time while I prop the other open with my will. My whole body argues dully that nothing, nothing life can attain, is quite so desirable as sleep. My mind is losing resolution and control."
— *Charles Lindbergh*, The Spirit of St Louis

It has been more than 70 years since Charles Lindbergh's historic transoceanic flight and yet the issue of managing alertness in operational settings remains a prominent safety problem. Our society continues to evolve at a dramatic pace. We now operate on a "24/7" basis, extending these round-the-clock activities to global proportions. Technology has been one contributor to significant changes in human activities and productivity. It has increased our capabilities and been accompanied by staggering levels of automation. (Take a look inside a Boeing 777 aircraft next time you have the chance.)

The Issue

However, while society has evolved technologically to create 24/7 global operations, human physiology has not evolved at all. Over time, we have maintained our vital need for sleep and the daily programming by our circadian clock. Scientific research has clearly shown that sleep loss and circadian disruption can reduce all aspects of human capability. Performance can be significantly degraded and becomes more variable, sleepiness increases, and mood is worsened with sleep loss and circadian disruption. These vulnerabilities create the opportunity for more errors, incidents, and accidents to occur and thereby represent an individual and societal safety risk.

Extensive scientific data have accumulated demonstrating that this safety risk exists across a variety of 24/7 operational settings.1,2 For example, there is now a classic list of high-visibility societal disasters in which fatigue was a significant factor. These include accidents such as the Exxon Valdez marine grounding, Three Mile Island and Chernobyl nuclear power plant disasters, the Bhopal chemical plant accident, and the Space Shuttle Challenger tragedy. In each accident, some fatigue-related factor, such as long duty periods, circadian/time of day, or sleep loss, was identified as contributory or causal.

In every mode of transportation, fatigue, sleep loss, and circadian disruption are acknowledged as safety risk factors. In aviation, specific accidents have been attributed to fatigue. For example, a DC-8 crash in Guantanamo Bay, Cuba, and a Korean Airlines accident both involved fatigue.3,4 One study of a confidential aviation reporting system suggested that 21% of incidents were fatigue related, with most occurring between 12 am and 6 am.5 One National Transportation Safety Board (NTSB) study indicated that 40% of fatal crashes involving commercial truck drivers were attributed to fatigue.6 In 1995, a Department of Transportation/FederalHighway Administration Safety Summit identified fatigue as the number one safety priority. One study of train engineers found that 36% showed signs of physiological sleep during night trips. During these trips, half failed to

Data from a variety of shift work settings have demonstrated similar risks. One study found that 75% of surveyed shift workers reported sleepiness on the job, and 20% indicated they had fallen asleep.8 NASA surveys of corporate aviation and regional airline pilots have found that 70% to 80% reported having "nodded off" in the cockpit during a flight.9,10 Recent National Sleep Foundation (NSF) polls have added further evidence regarding sleepiness in shift workers.11 The NSF Sleep in America Poll 2000 found that 20% of shift workers reported frequently or occasionally making errors due to sleepiness; 29% indicated that sleepiness interferes with daily activities a few days a week. Also, 68% of the shift workers reported that they experienced a sleep problem a few nights per week or more during the past year.

Drowsy Driving

One risk associated with sleepiness in shift workers extends beyond the work period: drowsy driving. The National Highway Traffic Safety Administration estimates that annually 100,000 crashes involve fatigue. As a result of these drowsy driving accidents, there are an estimated 71,000 injuries and 1,500 fatalities. In the NSF poll, 51% of the respondents reported driving while drowsy in the past year and 17% indicated they had nodded off. In shift workers, 20% to 30% reported a fatigue-related driving mishap in the past year.

These data show that there are societal and individual risks associated with sleep loss and circadian disruption. These risks extend to health care settings. For example, in one study, surgeons were allowed an uninterrupted 8-hour sleep period or were sleep deprived for a night. The surgeons' performance was then evaluated using a virtual reality surgery simulator. Results showed that in the no-sleep condition there were 20% more errors and performance was 14% slower compared to the undisturbed sleep condition.12 In a study from Johns Hopkins, 44% of house staff reported falling asleep while stopped at a traffic light. Overall, 49% of house staff reported having fallen asleep at the wheel, with 90% of these events occurring post-call.13

Modern society now relies heavily on diverse settings that operate 24/7. Some examples include round-the-clock operations in transportation, health care, public safety (law enforcement, firefighting), military, energy, manufacturing, and technology (telecommunications). Of course, sleep disorders centers are health care settings that also operate 24/7 by definition. Therefore, the same fatigue-related risks associated with these other settings are relevant to personnel involved in sleep disorders centers.

NASA Cockpit Rest Study depicts pilots wired up with EEG and wrist activity monitoring equipment. The pilot on the right is completing a reaction time test with an early version of the psychomotor vigilance test.

A Comprehensive Approach

Effectively addressing this issue in 24/7 settings can be a complex and contentious task. There are some significant challenges. For example, there are diverse operational requirements in round-the-clock settings. Also, there are tremendous individual differences, such as age, training and experience, and sleep/wake patterns. Well known to the sleep community, the underlying sleep and circadian physiology is complex. Given these three considerations, it is impractical, perhaps even naïve, to believe that there is an easy solution to this issue. In fact, these three challenges preclude a simple solution, a one-size-fits-all approach, or the existence of a "magic bullet" that will eliminate fatigue in 24-hour operations. Given the nature of human design, rather than an objective of eliminating fatigue (which may be physiologically impossible), an attainable goal would be to effectively manage alertness and reduce fatigue-related risks.

approach. Therefore, to be effective, a core Alertness Management Program (AMP) should involve at least these components: education, alertness strategies, scheduling, and healthy sleep.14 This AMP approach can be used to address fatigue-related risks in diverse settings. However, the following discussion outlines some of the specific application issues in sleep disorders centers.

Education is a critical foundation for the implementation of any AMP. Ironically, most sleep disorders center personnel would be assumed to already possess a foundation of sleep and circadian knowledge. However, daily tasks are often fairly technical and focused on the clinical care of others. Therefore, it should not be assumed that all sleep center personnel are knowledgeable about fatigue-related risks. A core education program should include information about sleep basics and circadian factors. Specifically, how these physiological factors create alertness and performance risks should be addressed. An introduction to alertness strategies also should be included in this educational foundation. Clearly, a variety of formats and forums should be identified to communicate this information, provide updates as appropriate, and ensure that new personnel are introduced to the issues.

Alertness Strategies

There are a variety of strategies that have been scientifically demonstrated to effectively improve alertness and performance. Rather than rely on one approach, a range of strategies should be introduced and guidance provided on their effective use. Some examples of effective alertness strategies include planned naps, strategic caffeine use, physical activity, and lighting. A specific focus should include information and strategies to address drowsy driving. Besides providing information and guidance on alertness strategies, sleep center policies can be examined to determine how they might impede or support the use of these strategies.

One effective alertness strategy needs further discussion given the context of this article. An extensive scientific literature exists of laboratory studies demonstrating that naps can improve alertness and performance.15 A NASA study extended these findings to operational settings by examining planned naps in pilots during actual flight operations.16 Results from the NASA study showed that a short, 40-minute planned nap resulted in a 34% improvement in performance and a 100% improvement in alertness. In real-world 24/7 operational settings, planned naps can be a critical strategy to address the spontaneous and uncontrolled sleep episodes that are known to occur. However, a standard sleep medicine approach to napping is that it should be discouraged because it represents poor “sleep hygiene,” especially in insomnia. This critical distinction should be considered prior to discouraging or endorsing the use of planned naps. A planned nap used in an operational setting for safety reasons should not be automatically equated to representing poor sleep hygiene in an insomniac. A planned nap, used strategically, can be critical to reducing fatigue-related risks and improving safety in 24/7 settings.

Information, strategies, and policies specifically related to drowsy driving should be evaluated and, as appropriate, implemented. The NSF and the AAA Foundation for Traffic Safety have a variety of materials that can be used for a drowsy driving program. Sleep centers have beds and these could be a resource for personnel following an all-night shift prior to driving home. The effective use of caffeine and other strategies also should be considered. It is important to address widely used strategies that are less effective or provide information about how long effects might last. For example, classic strategies such as turning up the volume on the radio, opening the car window, and turning on the interior light have been shown to be effective but generally for only about 15 minutes. This could provide just the needed time to pull over and take a nap.

fatigue. An initial activity in this area could be to analyze sleep center schedules as they currently exist. Discussing all of the relevant scheduling factors is beyond the scope of this article. However, some factors that could be considered are shift lengths, start and end time of shifts, policies regarding extending shifts or double shifts, day/night or night/day shift transitions, rest opportunities prior to work, recovery opportunities, number of consecutive shifts, and day vs night shift differences. This analysis can be used to identify the current strengths and risks associated with a sleep center's schedules. Once analyzed, this data can be used to design appropriate approaches that support the strengths and address the risks. Where needed, policies can be developed to implement new approaches or solidify scheduling strengths.

The healthy sleep component of an AMP should address sleep disorders. By definition, sleep disorders centers involve the clinical diagnosis and treatment of individuals with sleep disorders. Sleep medicine professionals are continually educating the community-at-large regarding the prevalence of sleep disorders in the general population. There is no reason, or data, to suggest that the prevalence of sleep disorders in sleep center staff is any different. Consider the significant efforts by individual sleep centers, the American Academy of Sleep Medicine, the National Center on Sleep Disorders Research, and the NSF to educate the public about the existence and prevalence of sleep disorders. Obviously, the standard and quality of care intended for every person in the general population with a sleep disorder should be extended to the personnel involved in providing this care. One provocative issue to investigate: does the health insurance available to your sleep center staff cover sleep disorders?

Managing Alertness

Effectively managing alertness in 24/7 settings is a prominent societal issue. Finding appropriate and successful approaches to reducing fatigue-related risks offers significant benefits in safety and productivity. Many successful initiatives have already been introduced and others are currently under way. For example, in 1995, a joint NTSB/NASA symposium was the first multi-modal gathering to address fatigue in transportation.17 The NASA Ames Fatigue Countermeasures Program has ongoing educational activities to transfer information into aviation and other operational settings.18,19 The American Trucking Association has conducted research and implemented educational activities. The railroad industry has a range of initiatives that involve federal activities and individual company programs. Public transit has held symposia and implemented educational activities. The Air Transport Association has implemented a comprehensive Alertness Management Initiative for the airline industry. These are only a few examples of the diverse operational settings that have acknowledged this issue and implemented activities to address it.

The Challenge

Effectively managing alertness in our complex, 24/7 world will require significant changes in societal attitudes and behavior. Many of the effective approaches discussed here, or currently in use, do not represent rocket science. However, it is naïve to believe that there are not significant challenges and barriers to change. If it were simply a matter of telling everyone that they should get more sleep, the situation would already be different. Efforts required to change individual and societal attitudes and behavior regarding safety risks can be significant. They also can lead to real changes, for example, increased use of safety belts, reduced incidences of driving while drunk, and a greater focus on health behaviors such as diet and exercise.

Each individual in the sleep medicine community should be a role model for changing these attitudes and behaviors. We should begin by initiating these efforts at home, in our own lives, and at our sleep centers. Here are six simple questions to ask yourself right now: 1) Did you get 8 hours of sleep last night? 2) Over the past 7 days, have you accumulated a

you acknowledged being fatigued and acted on it? 5) In the last year, have you driven while drowsy? 6) Do your children get enough sleep? If you are reading this article, you should know the “correct” answers, and the risks associated with the “other” answers.

It is important that the sleep medicine community take a lead role in the societal changes required to successfully address this critical safety and productivity issue. If the sleep medicine community does not lead on this issue, it could be perceived as being hypocritical. It is important that we do not identify risks for the rest of society and propose policies for other 24/7 settings, yet ignore or be unwilling to address these same issues in the sleep medicine community.

Addressing this important issue provides an excellent opportunity to apply our extensive knowledge regarding sleep, circadian factors, sleep disorders, alertness, and performance. Successful application of this knowledge and expertise can provide tremendous benefit in our own lives and those of our colleagues. Even more important, the sleep medicine community can become a model that can be spread to diverse 24/7 settings throughout our society.

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