Council for Public Interest in Anesthesia

Working on the Night Shift: An Emerging Health Risk?

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More than 15 million Americans are shift workers, including nurses, physicians, emergency medical personnel, policemen, firemen, and factory workers. Up to two-thirds of these workers reportedly fall asleep on the job at least once a week.

Most people have routine work hours with time left over for recreation and rest. At night, the body usually turns its attention to growth, repair, rest, and recovery. Although working at night was not considered a health risk until recently, experts are beginning to recognize the significant stress and biological changes triggered by frequently rotating or continuous night shift work. Recent studies indicate a major impact on human physiological functions and on individual workers' health and job effectiveness.

Although there are many gaps in our understanding of the effects of shift work on health, research associates it with sleep problems, fatigue, gastrointestinal complaints, depression, anxiety, heart disease, and substance abuse. Accidents and medical errors are also more common on the night shift.

Humans are biologically programmed as a day-oriented species. The human body contains genetic codes for critical life rhythms such as heartbeat, breathing, blood pressure, temperature, hormones, and digestion that rise and fall in predictable 24-hour cycles known as circadian rhythms. Researchers have demonstrated that changes in circadian rhythms lead to changes in hormonal levels and produce disturbed sleep and fatigue.

Circadian rhythms are controlled by encoded genes that carry the specific instructions to produce certain proteins. The master circadian clock is found in a region called the suprachiasmatic nuclei (SCN) in the hypothalamus of the brain. The SCN is made up of two tiny clusters of several thousand nerve cells that "sense" time based on external cues such as sound, light, and darkness. The SCN controls the timing, quantity, and quality of the hormones and neurotransmitters the body produces and eventually secretes. The levels of these proteins rise and fall in rhythmic patterns that control biological function.

This flow of activity is demonstrated by fluctuations in temperature, wakefulness, gastric activity, heart rate, blood pressure, metabolism, and hormone levels, with the most prominent circadian variations being in the sleep-wake cycle, the temperature regulation system, and the endocrine system. When the normal circadian rhythms are disrupted by lack of sleep or by crossing time zones, it may take days or weeks for the body to readjust. The American Academy of Sleep Medicine (AASM) estimates that 25 percent of all sleep problems are directly related to circadian sleep disorders.

Shift work disrupts this complex pattern of sleep-wake cycles, causing sleep deprivation, lack of rest and recuperation, and fatigue that may result in diminished cognitive functioning and job performance, increased stress, and more work-related accidents. This fatigue, or "jet lag" type of syndrome, is characterized by feelings of inertia, sleepiness, insomnia, disorientations, digestive problems, irritability, poor mental agility, and reduced efficiency for routine tasks. Emerging studies suggest that healthcare workers experience these symptoms, which contribute to human error and work accidents, more commonly than those employed in industries with tightly controlled working patterns, such as aviation.

Shift work has been associated with errors in task performance by medical residents, and studies of nurses show a correlation to problems with concentration, stress, and poor job performance. Studies indicate:

- 60 percent to 80 percent of shift workers experience chronic sleep problems
- Shift workers are four to five times more likely to have stomach disorders
- 80 percent of shift workers suffer from symptoms of chronic fatigue.

Several studies report increased alcohol consumption, particularly among nurses who work overtime with shift work. Higher drug use, divorce, and spousal abuse rates are also reported. Claims data show higher numbers of workplace injuries associated with evening and night shift.

Sleep-wake cycles relate to the daily rhythm of eating, body temperature, and hormone release. We fall asleep as adrenal hormone levels and body temperature drop. We return to wakefulness as our levels of hormone and body temperature increase. This temperature cycle reflects overall metabolic rate that corresponds to demands for levels of alertness. Ability to concentrate, alertness, and attentiveness decrease as body temperature reaches its low point, typically occurring between 4-6 a.m. This makes the early morning hours a time of great vulnerability for workers, including surgeons, nurses, and anesthesia providers. Accidents such as Three Mile Island, Chernobyl, the Titanic, and Bhopal disasters all occurred in the early morning. Other studies have shown a high incidence of residents and nurses falling asleep while driving home after extended night call.

Emerging Patterns of Health Risk

A growing amount of data points to shift work as a factor in many medical conditions. While many of these disorders have other known nonoccupational risk influences, it is thought provoking to note that recent studies suggest a common theme related to biological disruptions of shift work.

Findings demonstrate that night workers had poorer dietary habits and metabolic profiles compared with day workers who had a similar overall health status. It is not clear whether certain food choices and eating during the night cause these problems or if they are merely aggravating factors. Digestion slows down at night with the body producing lower levels of the hormones and enzymes needed for normal function. As a result of this reduction, shift workers often experience unwanted weight changes, heartburn, diarrhea, and other gastrointestinal problems.

Night work can lead to weight gain and obesity according to a study linking sleep loss and obesity. In this study, obesity, high triglycerides, and low concentrations of HDL cholesterol seem to cluster together more often in shift workers than in day workers.

The differences in health status between day workers and shift workers are also associated with a higher prevalence of some cardiovascular risk factors. The risks of coronary heart disease for women working at night for long term intervals seems to be higher than those working during the day. Studies have shown that potassium, uric acid, glucose, cholesterol, and total lipids all increased during night work.

Preliminary data from several recent studies suggest an increased incidence of breast cancer in women who work at night, most likely due to exposure to light at night, which tends to disrupt the production of estrogen and suppress melatonin, a powerful antioxidant. Other research concerning the incidence of colorectal cancer for nurses who primarily work at night is also of concern. Previous studies have also shown that women who work at night experience an increased risk of miscarriage, low birth weight, and preterm births. Other research supports an associated higher risk of common infections with shift work, particularly for those who routinely rotate through three-shift cycles.

Shift Work and Nutrition

Trying to maintain a healthy diet can be challenging at any time, but for shift workers, the change in schedule puts an extra strain on the body. People who experience a dramatic change in their natural circadian rhythms should change their eating patterns to avoid unhealthy consequences. Other changes in night-time eating patterns may be necessary, like avoiding vending machine processed foods and soft drinks. Additionally, as people get older, they become more synchronized to their built-in biological rhythms and become less tolerant of shift work.

Although individual susceptibility varies considerably with age, gender, and personality traits, the impact of working irregular hours and demanding work schedules affects safety, employee and family wellness, work related stress, absenteeism, turnover, healthcare costs, and productivity. Shift work is certainly nothing new to medicine, which has always provided care around the clock. As healthcare organizations and industry moves to a global workforce, the numbers of shift workers are likely to increase.

The degree of impact on worker health has led to certain recommendations for managing shift work and employee health risks. For example, research linking health risks with night work has led to the European Union implementing standards that require employers to offer a free health assessment before any individual starts working at night. Other recommendations concern optimizing the design of the shift schedule, giving attention to the work environment, and educating employees on the potential health and safety effects of rotational shift work and night call. In particular, education in stress recognition and reduction techniques is helpful. In the end, it is about recognizing the risks and developing personal strategies to achieve a healthy, balanced approach to managing your work, play, and rest schedules.■

Resources

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Nature's laws lay hid in the night.

Alexander Pope 1688-1744