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The Impact of Shift Work on Sleep:

What Happens When Mother Nature Meets Anesthesia Practice

> *Daytime is so you can see where you are going. Nighttime is so you can lie in bed and worry.*
>
> – Sally Brown
> *Taken from the "Peanuts" comic strip*

From Charles Schulz's beloved comic strip "Peanuts", Charlie Brown's little sister, Sally, delivered this pearl about a nighttime struggle to sleep that is all too familiar to nurse anesthetists. Nurse anesthesia practice certainly carries its own set of challenges to getting a good night's sleep. Recognizing the problem of sleep deprivation and fatigue in our profession, the AANA issued the practice document, *Patient Safety: Fatigue, Sleep, and Work Schedule Effects: Practice and Policy Considerations*, along with research articles and resources on sleep management found at aana.com/fatigue.[1-4]

Shift work is a major cause of sleep deprivation and disruptions in CRNA practice, as we must provide anesthesia services around the clock. Shifts start early, end late, or go all night long, interfering with our biological need for sleep.[5] However, fatigue from lack of sleep is an accepted part of our work culture and largely ignored as a problem or concern.[6] The desire to sleep is often seen as a sign of laziness and weakness, and an obstacle to getting more work done. Work schedules that interfere with adequate sleep are driven by the status quo and economic incentives.[7]

Anesthesia practice requires vigilance, the ability to recognize and respond quickly to subtle or obvious changes in a patient's condition, and effective communication with colleagues and patients.[7] Sleep deprivation compromises these important aspects of our practice. Additionally, we are at risk for developing chronic illnesses and injury as a result of shift work and sleep disruptions. Therefore, it's important to understand normal human sleep physiology, the impact of shift work, and evidence-based strategies for minimizing hazards to ourselves and our patients.

Normal Physiology of Sleep

Two internal mechanisms, the homeostatic sleep drive and circadian alerting system, drive cycles of sleep and wakefulness.[8] Beginning in the morning, the homeostatic sleep drive builds throughout the day as chemical somnogens accumulate in our brains until we fall asleep. Unopposed, the homeostatic sleep drive would subject us to multiple bouts of sleep throughout the 24-hour day. The circadian alerting system, or endogenous internal 24-hour clock, also builds throughout the day in opposition to the homeostatic sleep drive. In mid-afternoon, this alerting system briefly lags behind our drive for sleep, causing the dip in alertness that many of us are familiar with. The circadian alerting system rises until about 8 or 9 p.m., briefly overriding the homeostatic sleep drive, making us more alert and creating what's known as the "forbidden zone" for sleep. Afterwards, the circadian alerting system wanes, our brains secrete the sleep-promoting hormone melatonin, and the homeostatic sleep drive rises, all causing us to fall asleep. As we sleep, the homeostatic sleep drive subsides along with the circadian alerting system, which reaches its nadir at about 3-4 a.m. Afterwards, the circadian alerting signal increases while the homeostatic sleep drive decreases, causing us to wake up. This process is designed to produce 16 hours of wakefulness and 8 hours of sleep.

The suprachiasmic nucleus (SCN) of the hypothalamus is the locus of control for sleep.[9] Neuronal and glial cells of the SCN receive retinal stimuli, namely light, that influence the sleep-wake cycle and hormonal rhythms. While central circadian rhythms are endogenous and can exist without external cues, they can be influenced by external time-givers, or zeitgebers, the strongest of which is light.[8] Exposure to natural or artificial light after night fall or before sunrise can have a profound impact on sleep patterns.

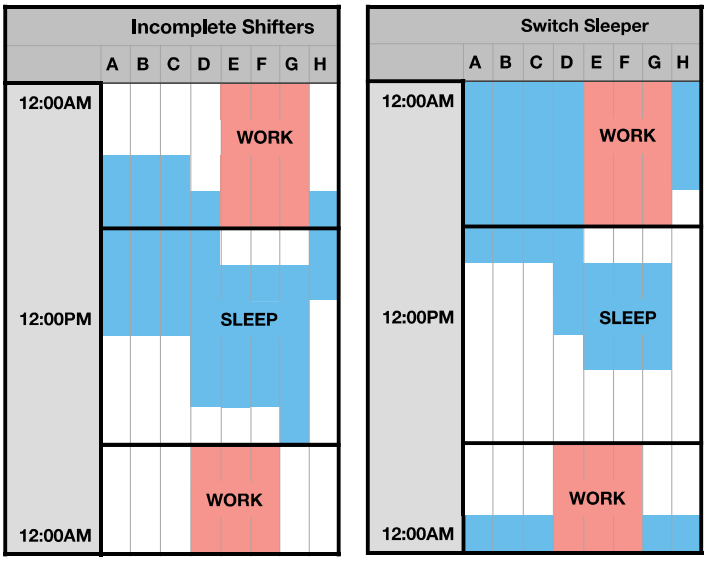
Shift Work and Sleep Disruptions

Shift work is defined as work hours outside of the traditional working period, meaning between 7 p.m. and 6 a.m.[9,10] By juxtaposing various work shifts with normal sleep physiology, the impact on sleep patterns and circadian rhythms becomes apparent. Besides our central clock, the cardiovascular, endocrine, gastrointestinal, and reproductive systems have circadian rhythms as well.[8] Sleep/wake patterns outside the normal 24-hour clock cause misalignment with central and peripheral circadian rhythms, increasing the risk of obesity, diabetes, cardiovascular disease, and infertility among shift workers.[11] Some workers experience shift work intolerance, characterized by persistent fatigue, sleep disturbances, aggression/sensitivity, and regular need for sleep medication.[12] In contrast, certain individuals carry a genetic predisposition that enables them to tolerate shift work, particularly midnights.[13]

The early morning shift begins between 4 a.m. and 7 a.m.[14] Workers either wake up, commute, or start work when the circadian alerting system reaches its nadir. Early morning shift workers are prone to delayed alertness after waking, known as sleep inertia. This group also experiences high rates of excess sleepiness, sleep disturbances, and risk of auto accidents similar to night shift workers.

Evening shift workers tend to get the most sleep, averaging 7.6 hours per night compared to the average 7 for a daytime worker.[14] Since this shift doesn't require getting up early, it is recommended for those with shift work disorder. If regularly awakened early each morning, evening shift workers may experience significant sleep loss and impairment over time. Social isolation is a major drawback to the evening shift.

The night shift opposes circadian rhythms that promote wakefulness during daylight and sleep at night.[14] Over successive shifts, sleep loss accumulates and may exceed that from evening and rotating shifts. The end of the night shift coincides with a low point in the circadian alerting system, leaving workers sleepy during the drive home.



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What to Do

The AANA, Anesthesia Patient Safety Foundation, and The Joint Commission propose several fatigue countermeasures. Anesthesia professionals should not work in excess of 12 hours without adequate breaks for rest and refreshments.[1] Naps reduce sleep loss, particularly on the night shift.[16] The Joint Commission advocates availability of call rooms conducive to napping for night shift workers.[15] Strategic use of caffeine promotes wakefulness, as caffeine antagonizes the somnogen adenosine.[8] Because artificial light exposure delays the onset of sleep, lights should be dimmed and electronic devices avoided at least one hour before bedtime.[8] Blue light emitted from electronic devices is highly disruptive to sleep inducing circadian rhythms.[8]

Clockwise and slow shift rotation is recommended over counterclockwise and rapid shift rotation.[14] With clockwise rotation, shift start times are progressively later, allowing for more time off between changes in shifts. With slow rotation, various shifts are spread out over longer periods of time. One week of day shifts, followed by evening and/or night shifts is an example of slow clockwise shift rotation. Conversely, counterclockwise rotation involves shifts that start progressively earlier, with less time off between changing shifts. Rapid counterclockwise rotation involves brief intervals of changing shifts, as in rotating from night to evening to day shifts within a short time frame.

Incomplete shifting and switch sleeping are two possible adaptive strategies for night shift work.[17] Incomplete shifting involves delaying sleep until 2-3 a.m. and waking late in the morning on days off. Switch sleeping involves a normal sleep/wake pattern on days off and sleeping late on the first day of a night shift. Night shift workers who used these two sleep patterns had a lower incidence of cardiovascular disease and sleep disturbances.

In addition to fatigue countermeasures, common sense strategies to avoid cardiovascular disease, weight gain, diabetes, and cancer should be followed to minimize the impact of shift work on our overall health.

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By understanding the impact of shift work on sleep regulation and human physiology and utilizing AANA resources, nurse anesthetists can take steps to minimize the negative consequences to their health and to patient safety. Healthcare policy makers and administrators should incorporate fatigue management strategies into workplace operations to ensure workers' fitness for duty, sustain a healthy workforce, and promote patient safety.

AANA Resources

aana.com/fatigue
aana.com/stress
aana.com/workplacewellness

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