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REVIEWS

Sleep and Circadian Misalignment for the Hospitalist: A Review

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Shift work is necessary for hospitalists to provide on-site 24-hour patient care. Like all shift workers, hospitalists working beyond daylight hours are subject to a misalignment between work obligations and the endogenous circadian system, which regulates sleep and alertness patterns. With chronic misalignment, sleep loss accumulates and can lead to shift work disorder or other chronic medical conditions. Hospitalists suffering from sleep deprivation also risk increased rates of medical errors. By realigning work and circadian schedules, a process called circadian adaptation, hospitalists can limit fatigue and potentially improve safety. Adaptation strategies include improving sleep hygiene before work, caffeine use at the start of the night shift, bright light exposure and planned naps during the shift, and short-term use of a mild hypnotic after night work. If these attempts fail and chronic fatigue persists, then a diagnosis of shift work disorder should be considered, which can be treated with stronger pharmacotherapy. Night float scheduling strategies may also help to limit chronic sleep loss. More research is urgently needed regarding the sleep patterns and job performance of hospitalists working at night to improve scheduling decisions and patient safety. *Journal of Hospital Medicine* 2012;7:489–496. © 2012 Society of Hospital Medicine

For hospitalists, patient care is 24 hours a day. To provide continual patient care, shift work has become a way of life for hospitalists, similar to hospital nurses, residents in training, and emergency medicine physicians. Notably, they belong to a substantial minority of the workforce as shift workers, starting after 6 PM or before 6 AM, approximately one-fifth of the total work force in industrialized nations.[1,2] Unfortunately, shift workers suffer from misalignment of their endogenous circadian system, which regulates daily sleep and alertness patterns, and work obligations beyond daylight hours. Such a misalignment can lead to fatigue, sleep loss, and excessive sleepiness, which can adversely affect personal health and safety, as well as the quality of medical care delivered.[3]

The relationship between shift work, extended work hours, and medical safety is a topic currently under intense scrutiny, as reviewed in the Institute of Medicine's (IOM) controversial report on residents and sleep.[4] This publication led the Accreditation Council of Graduate Medical Education (ACGME) to mandate more changes to residents' work hours,[5] adding to those first implemented in 2003.[6] These restrictions forbid residents from working more than 30 consecutive hours, and required at least 10 hours off between shifts and an average of 1 day off in 7. Subsequent studies suggested that the reduction in resident work hours led to greater resident well-being, fewer attention failures. and fewer medical errors.[3,7]

In 2007, amid growing public concern over sleep-deprived residents and patient safety, Congress requested the IOM investigate additional safeguards for residents.[8] In 2008, the IOM published a report calling for more protection against resident fatigue.[4] They recommended integrating a protected sleep period into any 24-hour shift. If residents cannot get protected sleep time, then the maximal shift duration should not exceed 16 hours—reduced from the previous ACGME recommendation of 30. Further provisions to allow adequate sleep include capping the number of consecutive night shifts at 4, and extending the time off after a night shift. In response, the ACGME recently updated their recommendations effective July 1, 2011,[5] though not following *all* the IOM's recommendations (Table 1).

The growing nationwide emphasis on fatigue prevention within healthcare settings now clearly impacts residents and their training schedule. But why focus only on residents? Why not other physicians, such as hospitalists, who work shifts to cover 24 hours each day? Are they any less prone to making medical errors when fatigued? Given that hospitalists' represent the fastest growing specialty in the history of American medicine,[9] we sought to inform decisions about their scheduling by reviewing normal regulation of sleep and wake patterns, addressing the problems associated

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TABLE 1. Timeline of Duty Hour Adjustments

	2003 ACGME Limits	2008 IOM Recommendation	2010 ACGME Limits
Maximum work hours per week	80 hr, averaged over 4 wk	No change	No change
Maximum shift length	30 hr (admitting patients up to 24 hr, with 6 hr of transition activities)	30 hr (admitting patients up to 16 hr, with 5 hr protected sleep between 10 PM to 8 AM, and remaining hours for transition activities)	PGY-1: 16 hr; PGY-2 and above: 28 hr (admitting patients up to 24 hr, with 4 hr of transition activities)
Minimum time off between shifts	10 hr after shift	10 hr after day shift; 12 hr after night shift; 14 hr after any extended shift of 30 hr and not return until 6 AM the next day	10 hr after shift; 14 hr free after 24-hr shift for "intermediate level residents"
Maximum frequency of in-hospital night shifts	No limits	4 night maximum, with 48 hr off after 3 or 4 consecutive shifts	6 consecutive night maximum

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; IOM, Institute of Medicine; PGY, postgraduate year.

with misalignment between sleep and work, and identifying strategies to realign circadian schedules.

NORMAL SLEEP AND CIRCADIAN RHYTHMS

An understanding of sleep physiology begins with the endogenous circadian timekeeping system. At the center of this timekeeping system is a master circadian clock, located in the suprachiasmatic nucleus (SCN) of the hypothalamus. Cells within the SCN generate a near 24-hour rhythm, transmitted through neural connections, to rhythmically influence the entire central nervous system and other bodily systems.[10]

The SCN and the circadian rhythm interact with the need to sleep (sleep homeostasis) to form the 2-process model of sleep–wakefulness.[11] In this model, progression of biological day (a time when wakefulness and its associated functions are promoted) coincides with a rise in homeostatic pressure to sleep (see Figure 1). Daytime alertness is maintained by increasing SCN neuronal activity to counterbalance rising sleep pressure. After peaking in the early evening, SCN activity falls to begin biological night (a time when sleep and its associated functions are promoted). To facilitate the onset of biological night, the SCN coordinates the activity of sleep-promoting centers and the release of melatonin from the pineal gland which promotes sleep.

This endogenous circadian clock runs slightly longer than 24 hours and must be resynchronized daily to the 24-hour day, a process known as entrainment. This occurs primarily through environmental exposure of retinal–hypothalamic links to the light–dark cycle. The intensity, duration, and wave length of light all influence the circadian system,[12] but perhaps most importantly is the timing. In general, light exposure in the evening will shift the circadian clock later (phase delay shift), whereas light exposure in the morning will shift the clock earlier (phase advance shift). Exogenous melatonin can also shift the circadian system. However, when endogenous levels of melatonin are high, ingested melatonin has little influence on sleep.[13]

Balancing sleep and wakefulness requires an interweaving of endogenous and exogenous factors. This balance is disturbed if we try to sleep or be wakeful during incorrect endogenous biological times, a process called circadian misalignment.

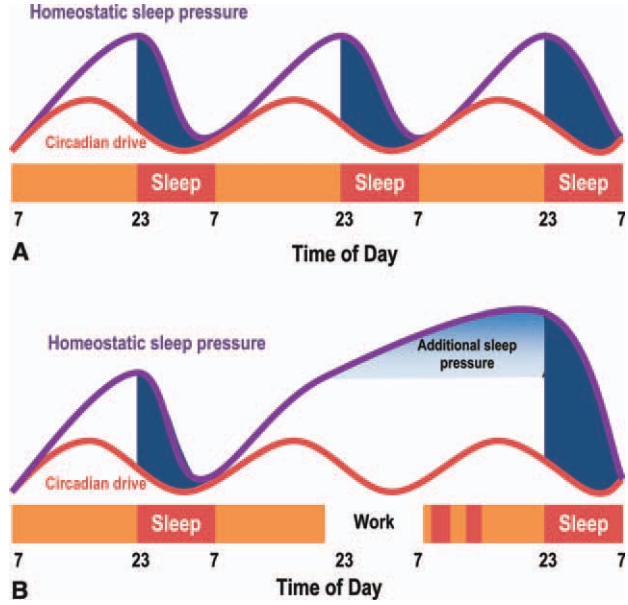

FIG. 1. Two-process model of sleep regulation. (A) Normal sleep pattern. Homeostatic pressure to sleep builds during the day, as does circadian activity to maintain wakefulness. Circadian activity falls after sleep onset to maintain sleep, despite a reduction in sleep homeostatic drive. (B) Night shift pattern, acute. Homeostatic sleep pressure rises above normal levels when nighttime sleep is missed. Circadian activity is unchanged, and limits the duration and quality of daytime sleep (small shaded bars). Adapted from Borbely,[11] used with kind permission from Springer Science and Business Media.

DELETERIOUS EFFECTS OF CIRCADIAN MISALIGNMENT

Hospitalists and other shift workers required to work during the biological night risk circadian misalignment and, consequently, poor sleep, shift work disorder, errors on the job, and possibly long-term health consequences.

Chronic Sleep Loss

When working at night or in the early morning, nearly 75% of shift workers encounter some amount of at-work fatigue and sleepiness.[14] After the shift is over, objective assessments among rotating shift workers[15,16] and interns[7] demonstrated that day sleep is 1 to 4 hours shorter than night sleep. Chronic or

recurring night shifts can therefore lead to chronic sleep loss. While it seems reasonable that permanent night shift workers have greater circadian adjustment to suit their work schedule, little evidence supports this argument.[17] Permanent night shift workers may sleep a little longer during the day than rotating shift workers. Yet, the sleep quality does not match night sleep, presumably from conflict between external factors, such as light and activity, and the scheduled sleep period.

Shift Work Disorder

If severe and chronic, sleepiness and impaired performance during work hours and poor sleep during the day can be enough to warrant a diagnosis of shift work disorder (SWD), one of the several circadian rhythm sleep disorders (CRSD). The prevalence of SWD among rotating and night workers is estimated to be 10%–25%.[18] Patients with SWD can experience similar levels of nighttime sleepiness as patients with narcolepsy and sleep apnea.[19] These patients experience reduced satisfaction with the work schedule, and suffer higher rates of depression, ulcers, and sleepiness-related accidents, compared to other shift workers.[18] What distinguishes those shift workers who suffer from ''normal'' fatigue and those with SWD is not easily identified. The International Classification of Sleep Disorders-2 (ICSD-2) lists the diagnostic criteria for SWD[20]:

1. Symptoms of insomnia associated with a work schedule that overlaps the usual time for sleep.
2. Symptoms are directly associated with shift work schedule over the course of at least 1 month.
3. Sleep log monitoring for at least 7 days demonstrates circadian and sleep-time misalignment.
4. Sleep disturbance is not better explained by another sleep disorder or by a medical, neurological, or mental disorder; medication use; or substance-use disorder.

Symptoms must be present for at least 1 month, and comorbid mood or sleep/wake disorders (commonly found in this disorder) need to be treated. SWD is more common among night shift workers, although those workers starting shifts between 4 AM and 7 AM (early morning shift) are also subject to SWD.[21] Type of work schedule, along with physical or mental disorders, domestic responsibilities, and commute times are examples of factors that may increase vulnerability for SWD.[18] In addition, genetic factors may explain the considerable inter-individual differences in susceptibility to SWD. For example, a polymorphism in the circadian gene, *PER* 3, present in 10%–15% of the population, is believed to decrease tolerability to acute sleep loss,[22] while genetic variation in the adenosine A2A receptor may be associated with resistance to the effects of sleep loss.[23] If a hospitalist suspects a diagnosis SWD, they should seek evaluation by a physician specializing in sleep medicine.

Errors

Disruption of the circadian rhythm influences neurocognitive and psychomotor function, and can lead to human error. Human errors that result in serious accidents or injuries typically result from interaction of circadian rhythm misalignment with multiple other factors, including task duration and complexity, motivation and proficiency, and level of sleep deprivation.[24] Though difficult to isolate from the environmental and work experience factors, consistent evidence identifies circadian misalignment as a cause of errors and serious accidents. Most evidence comes from night shift workers trying to remain awake when the circadian signal for alertness is low, or attempting sleep when the circadian alerting signal is high. Compared to day workers, night shift workers are 1.63 times more likely to suffer a fatal accident.[25] A study of critical care nurses revealed a prominent circadian pattern of inadvertent sleep episodes during work with the highest peak between 2 AM and 6 AM.[26] In addition, nurses working the night shift have been shown to commit more medication administration errors than day workers.[27]

Medical errors among resident physicians during extended shift durations is well documented.[28] On the other hand, not much research has examined error rates among attending physicians. In 1 small study, attending surgeons made more cognitive errors using a simulated laparoscopic exercise as the amount of on-call overnight sleep decreased.[29] A large, single-center review reported an increased rate of complications among post-nighttime surgical procedures performed by attendings who slept 6 hours or less the preceding night.[30] Notably, proposed legislation would require physicians who have been awake 22 of the preceding 24 hours to inform patients of the potential safety impact of their sleep deprivation prior to providing clinical care.[31]

Chronic Health Morbidity

Several studies reveal the effect of shift work on chronic health conditions among healthcare workers, such as obesity, cardiovascular disease, and certain cancers (eg, breast, colorectal). These results are summarized in Table 2, with the largest evaluation of healthcare shift workers coming from the Nurses' Health Study.[32–34]

Some believe that adverse health outcomes in shift workers derive from ''circadian stress''—an alteration of psychosocial and physiological homeostasis (eg, increased cortisol and catecholamine output) resulting from circadian misalignment.[35] Based on data suggesting an increased risk for certain cancers among shift workers, the International Agency for Research of Cancer, a unit of the World Health Organization, announced that shift work resulting in circadian misalignment is ''probably carcinogenic.''[36] Researchers propose several biologic mechanisms to explain the

TABLE 2. Chronic Health Risks Associated With Shift Work

Disease	Study Design	Population	Comparison	Health Risk	Adjusted Risk Factors
Acute myocardial infarction	Prospective cohort[32]	79,109 US nurses	Working ≥3 night shifts/mo for ≥6 yr	RR 1.51 95% CI (1.12-2.03)	CAD risk factors, aspirin use, hormone replacement therapy
Obesity (BMI ≥30)	Cross-sectional[72]	27,485 Swedish workers	Shift-workers vs day workers	OR 1.41 95% CI (1.25-1.59)	Age, socioeconomic status
Breast cancer	Prospective cohort[33]	116,087 US nurses	Working ≥3 night shifts/mo for ≥20 yr	RR 1.79 95% CI (1.06-3.01)	Breast cancer risk factors
Colon cancer	Prospective cohort[34]	78,586 US nurses	Working ≥3 night shifts/mo for ≥15 yr	RR 1.35 95% CI (1.03-1.77)	Family history of colon cancer, dietary intake, activity

Abbreviations: BMI, body mass index; CAD, coronary artery disease; CI, confidence interval; OR, odds ratio; RR, relative risk; US, United States.

increased cancer risk—most revolve around the alteration of the melatonin circadian cycle, found in night shift workers,[37] and subsequent disruption of its believed cancer-protective biologic pathways.

Overall, however, the heterogeneous nature of shift work limits conclusions regarding the long-term health of shift workers. That is, as the shift work intensity and composition varies, and as the number and timing of these shifts change, so too can the adverse health consequences.

HOSPITALISTS AND NIGHT SHIFTS

Hospital medicine is the fastest growing specialty in the history of medicine, with an estimated 30,000 practicing hospitalists in 2010.[38] Survey results from 2009 indicate that hospitalists staff 58% of hospitals; 89% of hospitals with more than 200 beds (J. Miller, Society of Hospital Medicine, personal communication). One reason for the growth in the number of hospitalists at academic medical centers has been the imposed work-hour restrictions for residents.[39]

Across the county, hospitalist programs use a variety of shift work systems to ensure 24-hour patient care. Among those programs that provide continuous onsite coverage, many staff 3 shifts—day, late afternoon/evening (swing), and night shifts. Some permanently partition the scheduling, with dedicated night hospitalists or ''nocturnists.''[40]

Hospitalists do not have mandated work-hour restrictions and, in general, are older than resident physicians. Whether or not hospitalists who trained before the era of work-hour regulations are better prepared for practicing in a ''real-world, after-hours'' scenario than hospitalists with previous work-hour restrictions is a matter of debate. That said, hospitalists who are fatigued, just like residents, may be at increased risk for committing medical errors, particularly when the fatigue is unrecognized. Yet, limiting hospitalists' work hours would have obvious financial implications, likely similar those from resident work-hour reductions.[41] As part of the ACGME 2011 recommendations, faculty and residents now must be trained to recognize signs of fatigue and sleep deprivation, and adopt management strategies such as naps or backup call schedules. Fatigue that results in excessive sleepiness while at work may manifest as weariness, difficulty concentrating, headache, irritability or depressed mood, and feeling unrefreshed after sleeping.[42]

STRATEGIES TO IMPROVE CIRCADIAN ADAPTATION

Hospitalists can help limit fatigue and improve performance and safety through circadian adaptation: a multimodal approach to realign work and circadian schedules. Depending on whether the shift starts at night or in the early morning (4 AM to 7 AM), circadian adaptation aims may differ. For night shift workers, the overall aim is to delay the timing of circadian rhythms such that the highest propensity of wakefulness occurs during the night work period, while the highest propensity for sleep occurs during the day.[17,43] For early morning shift workers, circadian rhythms for wakefulness and sleep propensity should be shifted earlier. Circadian adaptation involves not only sleeping well before work, but also preventing dips in wakefulness during work. Adaptation strategies are listed in Table 3.

Improved Sleep Before Work

As an essential first step, hospitalists must get a full night's rest before starting a night shift, as sleep debt will worsen fatigue while at work. Tips for proper sleep hygiene are listed in Table 4. Some shift workers stay up late the night before a scheduled night shift, in order to sleep during the day and awaken shortly before their scheduled night shift, to combat fatigue at work. Such an approach to shift work is typically met with 3 barriers. First, environmental factors often prevent 6 hours of uninterrupted day sleep. Second, 6 hours of continual day sleep is typically difficult because rising circadian activity often limits the sleep period to just a few hours. Third, an adequate amount of sleep prior to a night shift will itself not be enough to prevent sleepiness from occurring after midnight—reducing the fall in circadian activity is also essential to maintaining alertness and performance.

TABLE 3. Circadian Adaptation Strategies

	Night Shift[60]	Early Day Shift (Starting at 4 AM-7 AM)
Prior to shift	Avoid sleep debt	Avoid sleep debt
	Proper sleep hygiene	Proper sleep hygiene
	Planned napping	Bright light exposure
	Caffeine use	
During the shift	Bright light exposure	Caffeine use
	Planned napping	
After the shift	Avoid bright light	Avoid late evening bright light (when applicable)
	Melatonin prior to sleep	Initiate sleep early
	Careful use of other hypnotics	

TABLE 4. Steps to Improve Sleep Hygiene

Physical activities[73]	Adhere to regular wake and sleep schedule
	Engage in regular exercise early in the day
	Avoid caffeine, nicotine, and alcohol use 6 hr prior to sleeping
	Avoid stimulating or stressful activities 30 min prior to sleeping
Proper sleep environment	Well ventilated, temperature-controlled bedroom
	Use heavy curtains to provide as much darkness as possible
	Comfortable mattress and pillow
	Remove television and pets from the bedroom
	Housemates should help provide quiet sleep environment

Napping

Napping prior to a night shift, or during the work shift, can improve alertness and performance and decrease accident rates.[44,45] During shift work, naps of 20 to 50 minutes in duration have demonstrated improvements in reaction time, and restoration of performance to that seen at the start of the shift. Napping early in the night shift can improve objective measures of alertness.[44] To avoid increased drowsiness that sometimes occurs when waking from a nap, naps should not be longer than 50 minutes, and can be as short as 10 to 15 minutes.[44,46] Although effective, napping may be impractical for many workers due to time or space constraints. To facilitate brief naps, hospitalist practices should ensure they have a dark, quiet call room for use by overnight hospitalists.

Bright Light Exposure

Studies demonstrate that light exposure during the night shift improves circadian alignment, mood, and performance during the night shift.[47,48] Light exposure ranged from 6 hours to 5 light treatments of 15 minutes each, with brightness ranging from 2,500 to 10,000 lux (approximating outdoor daylight; typical office lighting provides 200-500 lux).[47,49] Results demonstrate that bright light exposure during the night shift acutely improves alertness and performance, though not to daytime levels.[50] The greatest circadian adjustments occur in groups using both bright light during the night shift and light avoidance the following morning.[51] Dark sunglasses and a dark home environment can decrease bright light exposure during the day. Though little evidence exists to support widespread application of bright light devices in hospitalists' call-rooms, a hospitalist practice should consider installing one to promote circadian adaptation if physicians working overnight have multiple consecutive shifts. Likewise, these physicians should be vigilant and wear dark sunglasses during the day after their night shift—even a few minutes of light exposure at the wrong time of the day may disrupt the intended circadian adaptation.

Wake-Promoting Agents

Numerous studies demonstrate that 150 mg to 400 mg of caffeine (a 16 oz "grande" cup of coffee from Starbucks contains between 200 to 500 mg of caffeine[52]; a Diet Coke contains 46 mg/12 oz[53]) reduces sleepiness, increases alertness, and improves performance during the night shift.[54,55] Thus, judicious use of caffeine may be recommended in hospital practices during extended work hours. Other wake-promoting agents, such as modafinil and armodafinil, are US Food and Drug Administration (FDA)-approved in the treatment of excessive sleepiness associated with SWD. Typically taken 30–60 minutes before the start of the night shift, these medications have been shown in trials, enrolling mostly permanent night shift workers, to reduce excessive nighttime sleepiness and improve performance.[19,56] Armodafinil used to treat SWD-associated excessive sleepiness, has been safely tolerated for durations of 1 year or more.[57] However, these agents are not approved for use in patients without a diagnosed sleep disorder.

Melatonin

Exogenous melatonin has been used to reset circadian rhythms in patients with CRSDs.[58] Melatonin administered in the late afternoon to early evening directs the largest phase advance. In contrast, melatonin given in the morning produces the largest phase delays.[59] When taken after a night shift, melatonin (at a dose 1.8 to 3.0 mg) can improve day sleep quality and duration.[60] Despite this result, melatonin's effectiveness in improving circadian adaptation has been mixed.[61] For example, improvements in nighttime alertness during the night shift were not seen, despite the use of melatonin to facilitate daytime sleep beforehand.[62] Hospitalists may consider a trial of melatonin to improve circadian alignment and facilitate daytime sleep, but its chronic use and long-term safety has not been adequately studied.

Hypnotics After Work

Hypnotics such as temazepam 20 mg,[63] triazolam,[64] and zolpidem[65] taken after night shift work have been shown to improve day sleep quality under simulated conditions, but do not improve shift work performance. These medications should be reserved for

judicious short-term use in patients with insomnia associated with SWD.

NIGHT SHIFT SCHEDULING TO REDUCE CIRCADIAN MISALIGNMENT

When providing 24-hour, on-site medical care, questions may arise about how to incorporate circadian adaptation into the daily schedule.

How Should Shifts Be Rotated?

When scheduling shifts with different start times, evidence suggests that sleep disturbance is reduced with a clockwise progression in shifts (eg, day shift to evening shift to night shift). This reduction in sleep disturbance is thought due to increased time between shifts and the circadian timekeeping tendency to extend beyond 24 hours.[66]

When Should the Night Shift Start?

Those hospitalist programs using an evening ''swing'' shift from afternoon to late evening may have the option of using a 12-hour night shift starting around 7 PM, or a shorter night shift beginning later at night. Though there are no data among hospitalists to suggest which night shift start time and duration would lead to the least amount of fatigue and errors, healthcare providers working a 12-hour night shift may have increased morale due to fewer shifts, but may suffer a reduction in the quality of care provided compared with working an 8-hour night shift.[67] In either case, shift workers given flexibility in scheduling have been shown to have positive effects on sleep.[68]

Should Night Shifts Be Bunched?

The decision to bunch night shifts together depends on how many night shifts are required, and how quickly circadian adaptation can occur. Under simulated conditions, circadian adaptation can yield significant changes in sleep/wake cycles in as little as 4 days.[48] In real-world settings, more time may be required to achieve significant shifts in the circadian cycle. Therefore, hospitalists who have 7 or fewer night shifts during the academic year may want to space the shifts out to prevent sleep debt on consecutive shifts, since significant circadian adaptation would be difficult to achieve in less than a week. In this situation, after a night shift, the hospitalist should have at least one 9-hour sleep period at night to relieve their sleep debt before staffing another night shift.[69] Consecutive night shifts require at least 2 nighttime sleep periods of 9 hours to recover from sleep debt.[70] The IOM recommends setting a limit of 4 consecutive night float shifts for resident physicians, however, a recent systematic review of resident night float models did not find data supporting use of a 4-night-maximum model.[28]

If more than 7 night shifts are required, then scheduling the shifts close together with use of circadian adaptation techniques may result in increased nighttime alertness, less fatigue, and fewer errors while at work than widely spacing out the shifts. For example, 1 recent study simulated 8 night shifts over a 10-day period, and compared circadian schedules and work performance between those subjects who used circadian adaptation strategies and those that did not.[71] Circadian adaptation techniques included: four 15-minute bright light pulses during each night shift, dark sunglasses when outside, dark bedrooms and delayed sleeping until 3 AM on the nights off in between the night shift blocks. The group who shifted their circadian schedule improved night shift alertness and performance as measured by neurophysiological testing, while permitting sufficient daytime sleep after work, as well as late-night sleep on days off. The group without circadian interventions did not shift their circadian schedule as significantly as the intervention group, and performed worse on the performance testing.

TABLE 5. Research Questions

Are hospitalists more immune to fatigue than resident physicians?
Are hospitalists better able to recognize fatigue while at work than resident physicians?
Does 1 shift work schedule promote better circadian alignment than other shift schedules?
Do consistent nighttime hours of nocturnists make them more prone to commit medical errors than hospitalists rotating their shifts?

CONCLUSIONS

The nationwide use of hospitalists to provide 24-hour patient care continues to expand, thus subjecting more hospitalists to work hours asynchronous with the light–dark cycle. Resultant circadian misalignment can result in fatigue while at work, shift work disorder, and, potentially, an increased rate of medical errors. Recognition of these dangers among resident physicians has prompted the ACGME to intensify their regulations on work hours, shift schedules, and time off between shifts. However, no such recommendations exist for hospitalists or emergency physicians and nurses.

Given the potential risk to both physicians and patients, we recommend more research examining the effects of circadian misalignment within the hospitalist community. Sample research questions are offered in Table 5. More information is urgently needed to provide evidence-based practice guidelines to ensure the safety of this growing workforce and the patients they treat.

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