



## Prevention, Identification, & Management of Fatigue in Graduate Medical Education

Office of Graduate Medical Education  
Duke University Hospital

The Accreditation Council on Graduate Medical Education requires all training programs to “...educate *faculty and residents ...to recognize the signs of fatigue...and adopt and apply policies to prevent and counteract the potential negative effects.*” Examples of such policies include, specialty -specific duty hour requirements such as maximum of 80 duty hours per week, in -house call no more frequently than one in three nights, a minimum of one 24- hour period off each week, a minimum of 10 hours free between consecutive duty periods, and duty periods of no more than 24 hours with up to an additional 6 hours for continuity or education. **Every ACGME-accredited residency program in the United States must adhere to these regulations**, although there are some differences among the specialties.

The American Medical Association Council on Ethical and Judicial Affairs considers physicians attending to their own health and wellness, as well as the health of their colleagues, an ethical imperative.

Duke’s own institutional duty hours policy (adopted in 2001) predated but anticipated that of the ACGME. All Duke ACGME and ICGME programs must be in full compliance. Only one Duke program currently has pursued the internal process necessary to seek a duty hours exception from their RRC.

Compliance with duty hours is monitored. Residents are urged to report any concern regarding duty hours, fatigue and other issues to the **GME hotline 681-2999**.

Parallel to the focus on “duty hours” are efforts to increase the awareness of fatigue’s impact on trainee well- being, learning, and patient safety. These include dissemination of:

- evidence -based information regarding the prevention, recognition and management of fatigue,
- awareness of institutional sleep experts and options, and
- access to national and specialized resources.

Restricting duty hours *alone* does not preclude fatigue. Of particular concern, is that the very strategies that training programs may adopt in a good faith effort to adhere to the 80-hour workweek may result in unintended adverse consequences. Programs may feel their work is “done” if they demonstrate compliance with duty hours standards, even though 80 hours is twice the work week duration of the average employed American. Programs may miss identifying persistent fatigue. Although perhaps better rested, resident stress may increase if residents are concerned about losing significant learning opportunities, procedural experience, and interaction with colleagues. Residents may feel

trapped by competing demands between work hours and professionalism. They may feel support is lacking from senior residents and faculty who may have an inadequate understanding of this mandate and perhaps are resentful of restrictions on duty hours.

Sleep deprivation results in adverse physiologic changes such as hypoxemia, insulin resistance, increased sympathetic activity, a blunted arousal response, immunologic changes, and diminished motor coordination. It impairs cognitive processes resulting in diminished attention, vigilance, decision-making, and memory. It increases tolerance for risk and decreases motivation for learning. Other professions, such as aviation and the military, have previously recognized the potential impact of both acute and chronic sleep loss on job performance. Belenky, a psychiatrist who has studied sleep for the Army notes, "...If you're sleep deprived, you're not going to make good decisions." The same observation seems valid in other professions. Fatigue has been linked to errors resulting in serious accidents (Exxon Valdez Bhopal, Chernobyl, and Three Mile Island). It is estimated to be responsible for 15-20 percent of transportation accidents, more than attributed to drugs and alcohol combined.

The Institute of Medicine highlights the importance of medical errors as a major cause of mortality and morbidity. Fatigue probably contributes to at least some of these errors.

Other western countries have substantially decreased the resident workweek and will potentially decrease hours even further. Denmark currently mandates a 37½-hour work week compared to the Australian duty hour limit of 72 hours. The UK will adopt a 48-hour workweek for its residents.

Fatigue, called by some authors "excessive daytime sleepiness", and may be due to a variety of factors. These may exist on their own or in combination and include:

- too little sleep,
- fragmented sleep,
- disruption of the circadian rhythm (such as occurs with night float work)
- a myriad of other conditions which may masquerade as fatigue such as anxiety, depression, thyroid disease or other medical conditions, or medication side effects,
- primary sleep disorders.

"Too little sleep" may be the most common reason for sleepiness among medical trainees, occurring when residents get less sleep than optimal. Although there is individual variation, most adults require an average of 8.2 hours of sleep each night. Residents may not have developed "good sleep habits" in college and medical school for adequate sleep even on their nights "off".

Alternatively, the duration of sleep may be optimal but the sleep itself is disrupted. Insufficient time may be spent in the "deeper," "restorative" stages of sleep. Though "in bed", trainees may be interrupted by frequent phone calls, pages, the need to follow up on patients, or to supervise more junior trainees. Residents may also be interrupted by the interruptions of residents who share the same call space. Even the "anxiety" of call, or anticipation of sleep interruption can impair sleep. Call from home, though not counted

in the duty hours, may still put residents at risk due to sleep disruption with frequent phone calls.

Residency training may disrupt natural circadian rhythm. This problem may be exacerbated as programs implement solutions, such as “night floats” to adhere to duty hour requirements. Night float systems and shifts may put residents on duty during periods in which there are predictable mismatches between endogenous rhythms of sleep and awake. Energy lows, for example, characteristically occur around 3-7 am and 3-5 PM. Residents may be more prone to errors during these times. It is extremely difficult to adapt to “shift work”, regardless of how it is scheduled or its duration. Over 90% of individuals never adapt and may be at risk for sub-optimal performance.

Residents may also display symptoms of “fatigue” or attribute symptoms to fatigue when the etiology is in fact anxiety, depression, stress, burnout, or career dissatisfaction.

Finally, residents, as do other individuals, may have a primary, undiagnosed sleep disorder such as obstructive sleep apnea, narcolepsy, and insomnia.

Disruption in sleep leads to a sleep debt. Performance can be impaired with two hours less sleep than “normal” per night. Significant sleep debt may occur if sleep is sub-optimal over as few as 2-3 nights. Adverse health consequences may occur if sleep debt is allowed to accumulate. Sleep debt requires several consecutive full nights sleep for adequate recovery, depending upon the number of days during which the sleep debt was accumulated as well as the individual’s susceptibility and ability to “recover”. Though it is difficult to quantify what is “sufficient”, the individual should feel “rested” after their recovery sleep period.

## **The literature on sleep, fatigue and residents**

There is a considerable body of literature on fatigue and graduate medical education trainees. A multicenter survey of residents in a variety of specialties suggests that residents have Epworth Sleepiness Scale (a sleep scale which assess an individual’s tendency for dozing) values comparable to patients with diagnosed sleep disorders such as sleep apnea and narcolepsy.

In-service training exam scores among family practice residents correlated with their amount of “sleep” prior to the test. Internal medicine residents post-call were less accurate in ECG interpretation.

Emergency Room residents documented fewer components of a history and physical examination depending upon their Shift. They also performed less well during a simulation of intubation skills.

Surgical residents demonstrated more errors and required more time than usual during simulations of common procedures. Measured postoperative complications increased by

45% for resident surgeons for those procedures they performed the day following their night on call.

Cognitive and procedural abilities declined among sleepy pediatric residents.

20% of anesthesia residents indicated that sleepiness prevented them from performing clinical duties and 12% attributed errors to fatigue.

Residents self reported decay of professionalism, empathy, and attentiveness to patient well being when tired.

A national sample of first and second year residents correlated working more than 80 hours per week with a greater likelihood of personal accident or injury, serious conflict, significant medical error, significant weight change, increased use of alcohol and other medications “to cope”. Residents reported sleeping on average fewer than six hours per night.

Several studies have examined the relationship between sleep deprivation and fatigue to the well being of the health care provider. Needle stick accidents increase by 50% at night (compared to the day), increasing the risk of exposure to blood borne pathogens.

Motor vehicle collisions increase. Pediatric house officers were more likely than faculty to fall asleep while at the wheel either while driving or stopped at a traffic light (49% of the residents vs. 13% of the faculty) and more likely to have a motor vehicle accident (20 vs. 11). Most incidents occurred post-call. Nearly 60% of ER residents reported a near miss motor vehicle collision, 80 percent of which followed their work on a night shift. The risk increased with the number of night shifts they did per month.

## **Symptoms and signs of sleep deprivation**

Psychomotor function after 24 hours without sleep is equivalent to a blood alcohol content of 0.08%, a level recognized legally as inebriation. As is true with alcohol, one cannot depend on the individuals to perceive their own degree of impairment. Studies confirm residents, as true of other individuals, can’t adequately evaluate their own degree of sleepiness. Furthermore, the ability to recognize “sleepiness” declines the sleepier someone is.

Characteristic symptoms of sleepiness may be unrecognized. These include:

- repeatedly yawning and nodding off during conferences,
- “microsleeps”...a few seconds of “Sleep” the “awake” resident may not even recognize
- increased tolerance for risk,
- passivity,
- inattention to details,
- decreased cognitive functions,

- irritability,
- motor vehicle collisions (or near misses),
- increased errors,
- impact on sleep process itself,
  - voluntary and involuntary latencies (the time to fall asleep) shorten,
  - increased number of “microsleeps”.

One of the first skills lost is the ability to do something quickly. If you slow down at a task, you may be able to compensate. But if the task requires a quick response, errors are more likely. Time pressure + fatigue is a major risk.

Of particular significance for residents, perhaps, is sleep inertia, the confusion and dysfunction that occurs upon awakening from sleep during deep NREM sleep, sleep in the middle of the night, or following a period of sleep deprivation. This may occur after as brief an interval as 30 minutes of sleep. This disorientation may include a period of amnesia for the period of awakening. The impairment from sleep inertia may be greater than that from sleep loss. Opinions in the sleep medicine field differ on the significance of sleep inertia.

Residents may be vulnerable to error when awakened during the night. Increased metabolic activity, such as exercise may minimize effects. Although the research evidence is inconsistent and people react with a great deal of individual variability, be aware this phenomenon may occur and may color judgment and responses for the first 10 minutes (and up to 2 hours) following arousal.

To minimize its impact:

- get out of bed,
- stand up,
- turn on the lights,
- try to nap every 12 hours; the earlier in a period of sleep deprivation “on call” the better,
- consider the use of *prophylactic* caffeine

## **Prevention/Treatment/Management of Fatigue**

It is probably inevitable there will be some sleep loss and fatigue in the course of medical training. However, it must be managed so it doesn't interfere with patient care and safety, education, and resident well being. Developing strategies to minimize the effects of sleepiness in physicians is paramount. Learning to recognize and manage fatigue is essential. Anecdotal and empirical evidence to suggest that limits on work hours in and of themselves do not guarantee well-rested and optimally functioning residents. Work hour limits are difficult to enforce, particularly if residents have workaholic tendencies or if faculty does not support work hour restrictions. In addition, resident behavior outside of the work place is difficult to govern (i.e. moonlighting activities, home responsibilities, etc.). Residents are adults who cannot be forced to be adequately rested.

The prevention, treatment and management of resident fatigue are a shared responsibility of accrediting bodies, Duke Hospital, programs, faculty and residents.

### *Accrediting bodies*

Accrediting bodies have set “the rules.” These should be construed as minimums. Some states have additional regulations.

Programs/Institutions should:

- adhere to Duke duty hour requirements and specialty specific duty hour requirements (whichever is the more stringent),
- minimize prolonged work (> 24 hours of clinical duties),
- protect periods designed to address sleep debt ( i.e. the minimum of at least 24 hours off each week free from all clinical responsibilities)
- reduce non–essential tasks and enhance learning during clinical time,
- reduce non-essential interruptions (i.e. added ancillary services, triage of phone calls by charge nurse etc)
- assist residents to identify co-existent medical issues which impair their sleep (i.e. undiagnosed sleep disorder, depression, stress),
- educate regarding awareness and management of fatigue
- Critically appraise the best way to implement shift work.
- Provide napping resources
- Explore options with residents to return home safely

Duke should provide accessible call rooms with a conducive rest environment. If there are difficulties with call rooms contact the GME office at **681-2999**.

Night float systems are increasingly used to comply with duty hours. It takes at least a few “nights” to adjust to the night float schedule. And another few nights to adjust to a return to “routine hours.” Programs should minimize the short term use of a night float system (for instance a resident who does night float Monday-Thurs and has the weekend “off” to be on their own schedule, who returns to “night float” for another 4 nights. With that weekend “off” residents will usually need “to sleep”. Over 90% of individuals never habituate to night float..even if they work them chronically. Night floats should be designed to take advantage of the fact that it is easier to rotations from days, to evenings to nights, rather than vice versa.

### **Program Directors should include specific discussions regarding the management of fatigue in their regular discussions with each resident/residency group**

Program directors should directly ask about issues pertaining to getting adequate sleep, resident safety such as concerning post-call driving, and resident concerns about the balance between professionalism and work hour restrictions. Where an individual

program has particular issues with fatigue, enlist residents in developing particular program solutions.

Driving home post call is a particular concern for the safety and wellbeing of residents. It takes 4 seconds to drive off the road and have a motor vehicle collision. 4 second “microsleeps” are common in sleepy residents. Some states (NJ) have adopted laws which now make a criminal, not just civil offense) for motor vehicle collisions after 24 hours without sleep. Other states will probably follow.

For many residents, the ability to manage fatigue will be a necessary life long skill.

### **Recognize vulnerability and symptoms in residents and colleagues**

Although there is individual variation, most adults need ~ 8 hours of sleep per night. The impact of too little sleep is cumulative. You can’t “will yourself” to act against the neurobehavioral effects of sleep loss. Sleepiness is affected by the amount of time since you last slept, whether or not you have any pre-existing sleep debt, as well as the time of day reflecting circadian rhythm. People typically under-estimate their degree of sleepiness. So as with alcohol, by the time you think you’re sleepy you’re probably profoundly affected. Your performance level will fall especially with tasks that require a great deal of attention. Even if you feel you’re not at risk, consider that your colleagues may be. Watch out for your fellow residents.

### **It is not normal to fall asleep in a lecture**

If it is a boring lecture, noted author Dinges says, “You’ll be awake and annoyed but not asleep.” If you are nodding off or falling asleep this is a major symptom that you’re too fatigued. You’re experiencing “microsleep.” Your system is making you sleep without you being able to control this phenomenon. This makes you extremely vulnerable for diminished attention and cognition. You can more easily make poor judgments medically and/or sustain a motor vehicle collision when you’re driving home post call.

### **Residents must set priorities for “time off”**

Residents should be careful stewards of their time off. There is a temptation to cram way too much into the hours free from programmatic responsibilities. During off hours pursuits include time for professional reading, family and friends, hobbies, and spiritual and community connections. Although all of these are important, protect your recovery time.

You should practice setting reasonable priorities, especially if this is something that you have not had sufficient practice with during your years in college and medical school. It will be an important habit for the rest of your career.

Excessive fatigue can affect every facet of your life. Try to be appropriately selfish about your needed sleep time. You can honestly never, for instance, read enough. Do don't short change your sleep to try to "read it all."

Sometimes you're approached about making a swap of schedules and you certainly want to accommodate a colleague. But consider your own sleep need as part of this decision and you may need to pull in a chief resident or program director to see if you're the best person to meet this need.

Of particular concern is moonlighting. There are certainly marked financial needs faced by today's residents and the pressure to meet those needs may force housestaff to sacrifice time needed for rest. Inquire in the House Staff Office about Duke resources and opportunities for deferment. Think carefully through the level of debt burden you are comfortable carrying and the consequences of that debt if it adds to your workload. Come talk to GME about financial planning resources if you would find them useful.

## **Practical Strategies**

### **Habits for healthy sleep**

Healthy sleep patterns are more likely if you develop a healthy sleep routine. Some of these seem obvious but deserve a reminder.

- Aim for 7-9 hours of sleep per night. This is especially true after a period of sleep loss, such as a busy rotation, is anticipated.
- On the days following your time "on call" and particularly your 24 hour period per week off, make sure you're getting sufficient catch up sleep; at least enough to feel "rested" when you wake up. It's tempting to try to "make up" everything you haven't been able to accomplish due to your busy professional schedule, but make rest a priority.
- Keep to a routine when possible. Going to bed and arising about the same time may help.
- Get adequate exercise but avoid it directly before sleep.
- Eat right. Try not to go to bed hungry however eating a large meal within 3 hours of sleep may keep you awake.
- Make the bedroom comfortable with appropriate mattress, pillow, cooler temperature, sound and lighting level.
- Develop relaxation rituals before sleep such as reading, meditation, or listening to music. Your workday may have been extremely intense. You may come home to additional responsibilities, even enjoyable ones, such as spending time with a significant other or children. Decompressing helps sleep.
- Protect sleep time. Turn off the phone. Ask your family/significant others, friends to help you. Try not to incur a sleep debt from non work activities
- Get light exposure when you're awake

### **Naps**

Naps can prevent and ameliorate *some* degree of fatigue. However, there are some caveats that should be observed.

- Brief (1-2 hours) napping *prior* to prolonged period of sleep loss, such as 24 hours on call, can enhance alertness. Consider a two-hour nap prior to a 24-hour period of expected wakefulness.
- To be therapeutic during a shift, naps should ideally be frequent (every 2-3 hours) and brief (15-30 minutes);
- Naps work best the “earlier” they are in a period of sleep deprivation. if you can pick just one nap..get it as early in the period of sleep deprivation as possible.. Better to “top off the tank early than wait till very fatigued.
- Time naps during circadian window of opportunity, between 2-5 a.m. and 2-5 p.m.
- Longer naps, such as those more than 30 minutes duration *may* be counter-productive in terms of “sleep inertia”..But probably better than “no nap”. Instead know how to counter sleep inertia..get moving, get upright, bright lights, caffeine, etc
- Utilize quiet, environmentally comfortable locations for naps, ideally where there are no other interruptions such as colleagues dictating or using the computer. Hand over beepers and clinical responsibilities to another colleague when possible.

Recognize these are general guidelines but there is however a great deal of individual variability to napping.

### **Safe Driving**

Driving can put you and others at risk. Motor vehicle collisions increase with fewer than 5 hours of sleep. The first ethical principle of physicians “*primum non nocere*” (first, no harm) applies to all we do as physicians, including driving. It takes 4 seconds to run off the road. Signs of drowsiness include difficulty focusing on the road or keeping your eyes open, nodding off, yawning, drifting from one lane to another, missing exits, and amnesia for some period of the drive

- Consider how close you should live to the hospital. It may be appealing to live 30-40 minutes away, but this may increase your risk of driving home post call.
- avoid driving if you’re tired
- chewing gum, loud music, opening the windows...these strategies don’t work to keep you “awake at the wheel” if you’re tired.. Instead, don’t drive.
- Realize you may not perceive just how tired you are. Even if you feel perfectly well, you are still vulnerable
- Consider getting a ride home with a friend, use public transportation (when available) or even a taxi. A cab is less expensive than a ticket or an accident.
- Consider taking a nap before driving home post call. Strategically use caffeine
- Immediately stop driving if you find yourself becoming drowsy. Find a safe location and nap.

## Caffeine

Using caffeine, a central nervous stimulant, “strategically” can help manage fatigue. **It is not a sleep substitute.** Tolerance quickly develops. If you intend to use caffeine to counteract fatigue, minimize the regular social use of caffeine so that it will be more effective when consumed. Caffeine may modulate symptoms but does not substitute for sleep.

The effects of caffeine generally occur within 15-30 minutes. If you use it just before you drive home its stimulant effects may not kick in until you are home and ready to go to sleep.

Avoid regular caffeine use (the social use of caffeine) if you plan to use to abate sleepiness. Instead use it for its “drug effect” when you are on call only.

- 400-600 mg (3-4 cups of brewed coffee) is a usual dose, but some individuals may be overly sensitive to this amount.

| substance                        | Caffeine content |
|----------------------------------|------------------|
| 8 ounce cola                     | 23 mg            |
| 8 ounces diet cola               | 35 mg            |
| 8 ounces brewed Coffee           | 135 mg           |
| 8 ounces ice tea                 | 40 mg            |
| 1 ounce dark chocolate           | 20 mg            |
| Excedrin, 2 tablets              | 130 mg           |
| No Doz maximum strength 1 tablet | 200 mg           |

Center for Science in the Public Interest [www.cspinet.org/new/cafechart.htm](http://www.cspinet.org/new/cafechart.htm), accessed 2-17-04

- Consider using caffeine 30 minutes **prior** to drive home following night call.
- Useful only for temporary relief of sleepiness. (The benefit typically lasts 3-5 hours)
- Adverse effects include disruption in sleep quality, tolerance, diuresis and irritability
- Sleep inertia symptoms can be minimized

## Other medications/drugs

It is important for residents to avoid self-medicating or prescribing casually for colleagues. The NC Medical Licensing Board **does not allow** self-prescribing. It is far better for residents, as for patients, to have a regular physician who coordinates their care. Your license can be at risk if you violate the rules of the Board.

- Sleep medications to increase sleep (sedative hypnotics) or stimulants should be used only **after** a complete medical/sleep consultation.

- Melatonin induces sleep onset and may be used for circadian rhythm disturbances. There are few data applicable to evaluate its use for residents.
- Sedative hypnotics such as zolpidem (Ambien) and zaleplon (Sonata) and/or behavioral therapy may be prescribed for certain sleep disorders and the military is testing these products for settings of sleep deprivation. They are not indicated for chronic use.
- Adverse medication effects are common and include headache, drowsiness, disorientation, GI disturbance and dizziness.
- Alcohol should not be used to enhance sleep and disrupts optimal sleep quality.
- Avoid the use of over-the-counter stimulants.
- Stimulants such as methylphenidate (Ritalin), dextroamphetamine (Dexedrine), modafinil, and pemoline should not be used unless prescribed by one's own personal physician for an appropriate medical condition.
- Alcohol is a drug with sleep effect. Try to avoid or minimize. Realize the impact of fatigue and alcohol on performance and driving are cumulative

## Resources

If a resident or faculty member is concerned about a resident having a potential sleep disorder, they can obtain help through the sleep disorders specialists at Duke including:

- Dr. Aatif Husain, 684-8485, [husai001@mc.duke.edu](mailto:husai001@mc.duke.edu)
- Dr. Rod Radtke, 681-3448, [radtk002@mc.duke.edu](mailto:radtk002@mc.duke.edu)
- Dr. Kevan Vanlandingham, 684-3532, [vanla004@mc.duke.edu](mailto:vanla004@mc.duke.edu)
- Dr. Andrew Krystal, 681-8742, [krystal@phy.duke.edu](mailto:krystal@phy.duke.edu)

Sleep loss and sleepiness are pervasive problems during residency training and can account for serious professional errors and personal problems. Symptoms and signs are often difficult to recognize. Whereas there are many ways to deal with the sleepiness and fatigue, the only real treatment is getting adequate sleep. Other management strategies should be individualized, especially if there is an underlying sleep disorder.

## Acknowledgements

Contributors: Drs. Husain, Morgenlander, Wright, and Andolsek.

References available upon request.

For additional information, consider

1. The SAFER (Sleep, Alertness and Fatigue Education in Residency) program developed by the American Academy of Sleep Medicine (AASM) with representatives from the ACGME and AMA. They have (for purchase) an educational module designed to increase knowledge and awareness about sleep and fatigue among the medical community which includes a slide set, syllabus, and pre and post tests.

<http://www.aasmnet.org/safer.htm>

2. Dr. David Dinges Presentations for ACGME and AAMC. These are available through their respective web sites: [www.acgme.org](http://www.acgme.org) & [www.aamc.org](http://www.aamc.org).

The GME office has copies of both of all of these resources.

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