Chapter 7
Fatigue and the Care of Patients

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Abstract This chapter examines the ethical questions that are raised by fatigued medical professionals in the care of their patients. The chapter starts with a review of the science of sleep deprivation and explains why fatigued physicians are at high risk for medical errors. The chapter then provides an ethical analysis of fatigue in the context of physicians' duties to their patients and arrives at the conclusion that physicians who treat patients while impaired by fatigue violate certain ethical responsibilities to their patients. The chapter finishes up with a review of the current regulation of physician work hours in the United States and shows that, while progress has been made, there may be a need to establish coherent and enforceable limitations on work hours for all practicing physicians.

Keywords Fatigue • Ethics • Sleep Deprivation • Physician Work Hours

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Case Presentation
You've been very busy over the past week performing surgeries and taking multiple night calls. It's now 5 pm on a Friday and you've just completed your week when your office calls to tell you that there has been a scheduling error and you must take an additional night of call for your private group practice. You try to rest but at 10 pm you receive a call that a patient with a ruptured abdominal aortic aneurysm will be coming emergently to the operating room. You begin the surgical procedure, but as the surgery progresses, you become acutely aware that you are severely impaired by fatigue. You begin to wonder whether you will be able to stay awake and alert for the duration of the surgery.

Introduction

Since the time of William Osler, physicians in training have spent long days and sleepless nights working in hospitals to learn from their sick patients and sage professors. While the work was arduous and the hours long, both the professors and their young apprentices, who, more often than not, were unmarried and lived in the hospital, believed that the innumerable hours spent caring for patients was a necessary component of a quality medical education [1].

Over the years, however, evidence has been accumulating that fatigue caused by sleep deprivation may be harmful not only to the health of physicians but to their patients as well. The fact that physicians at all levels, from the intern to the highly experienced clinician, are at risk for fatigue has important ethical and legal implications in the care and treatment of patients.

This chapter starts with a review of the three different types of sleep deprivation and their effects on neurocognitive performance. The second section examines the moral and ethical principles supporting a duty by the medical profession to ensure a practice environment where physicians are not impaired by fatigue. The third section reviews the current regulation of work hours for physicians in the United States.

Effects of Sleep Deprivation on Physician Performance

The purpose of sleep remains elusive, but no matter how hard we try, sleep cannot be eliminated from our daily lives without important biological and neurological consequences [2, 3]. Although the precise amount of sleep modern humans need on a daily basis is unknown, sustained periods of sleep deprivation can cause substantial problems at both a personal and a societal level.

For individuals, sleep deprivation causes excessive daytime sleepiness, declines in neurocognitive and motor function, decreased libido, and depressed mood, all of

which can not only interfere with personal and professional relationships but also put individuals at risk for errors in judgment, accidents, and even death [4–6].

On a societal level, sleep deprivation has been implicated in a substantial number of motor vehicle accidents in the United States. According to a study commissioned by the United States (US) National Highway Traffic Safety Administration, over a 5-year period of time, it was estimated that approximately 1.35 million drivers may have been involved in traffic accidents attributable to some form of fatigue [7].

Sleep Deprivation Physiology

Three different but overlapping types of sleep deprivation cause the mental and physical impairments one normally sees in response to periods of restricted sleep. They are classified as acute sleep deprivation, chronic partial sleep deprivation, and sleep inertia.

Acute Sleep Deprivation

Acute sleep deprivation, defined as no sleep or a reduction in the usual total sleep time over a period of 1–2 days, is commonly seen in physicians and others who work shifts of 24 hours or more. Acute sleep deprivation is characterized not only by a significant decline in cognitive function, but also self-assessment and decision-making ability, memory, motor skills, and attention [5, 8–10]. The decline of cognitive function is similar to the effect of a blood alcohol concentration that is above the legal limit for driving (about 0.1%) [11].

Chronic Partial Sleep Deprivation

Chronic partial sleep deprivation, defined as several successive nights of sleep for less than 5–6 hours, causes a similar decline of cognitive function, decision-making, performance, and vigilance [12]. Subjects in a study who slept only 6 hours each night over a period of 2 weeks had similar declines in neurocognitive performance as study subjects who had been awake continuously for 24 hours [4]. Acute sleep deprivation synergistically worsens chronic partial sleep deprivation to the extent that alertness and performance are impaired more than either type of sleep deprivation by itself [13].

Sleep Inertia

Sleep inertia, the third physiological consequence of sleep deprivation, is defined as a state of reduced alertness and performance upon awakening [14]. Sleep inertia is most pronounced for the initial 10–15 minutes after awakening but, in some individuals,

may take hours to resolve entirely [15]. The magnitude of the neurocognitive impairment can be similar to the effects of 26 hours of continuous sleep deprivation [16].

These three types of sleep deprivation processes work synergistically such that a physician working at night for one week who is disturbed from sleep in the middle of the night will suffer not only from acute sleep loss but also suffer from chronic partial sleep deprivation and sleep inertia. Such a physician in this sleep-deprived state is at very high risk for making medical errors that compromise the safety of patients.

Strategies to Reduce the Effects of Sleep Deprivation

It has been difficult to address the problem of sleep deprivation because of the degree to which people suffer neurocognitive decline after periods of sleeplessness varies dramatically from individual to individual. Intrinsic factors, such as age and gender, as well as factors that can be modified, such as motivation and training, all interact to determine the degree to which an individual may be affected by sleep deprivation [16, 17].

In individuals, a nap for 30 minutes during a night shift can substantially improve overall cognitive performance and diminish feelings of fatigue [18]. For some, however, the sleep inertia that occurs after awakening can impair cognitive performance for variable periods of time following the nap [19]. In one study, a group of emergency room physicians took 40 minute naps during their night shifts. While they had memory impairment immediately upon awakening, they later showed improved attention and driving performance [20].

Cognitive enhancers such as caffeine and modafinil have been shown to improve neurocognitive function during episodes of acute sleep deprivation and fatigue [21]. Caffeine can make individuals feel more alert and allow them to stay awake for extended periods of time. In a study of novices receiving simulation-based training in laparoscopic procedures, 150 mg of caffeine (equivalent to about one cup of coffee) [22] reversed some of the neurocognitive effects of sleep deprivation [23] but higher doses, equivalent to about four cups of coffee, were needed to have any lasting improvement in cognitive function [24].

Modafinil is a pharmaceutical drug that, similar to caffeine, temporarily mitigates cognitive decline and the subjective sense of fatigue by improving attention, working memory, and cognitive flexibility [24]. Unlike amphetamines, however, modafinil is not known to cause behavioral excitation [25–27] or rebound hypersomnolence [27–29].

Shift pattern manipulation has been the primary means by which the medical profession has sought to ameliorate the effects of sleep deprivation. The Accreditation Council for Graduate Medical Education (ACGME) in the United States mandates that all residents in their first postgraduate year work maximum shift durations of 16 hours and have at least 8 hours each day free of clinical duties when working for extended periods of time. Currently, attending physicians do not have restrictions on the number of hours they may work.

Ethics of Physician Fatigue: The Physician Charter

In 2002, The American Board of Internal Medicine Foundation, the American College of Physicians Foundation, and the European Federation of Internal Medicine collaborated to author *Medical Professionalism in the New Millennium: A Physician Charter,* a document that was subsequently endorsed by more than 130 medical organizations around the world. The charter is based on three fundamental principles operative in the practice of medicine: (1) patient welfare; (2) patient autonomy; and (3) social justice. Revolving around these fundamental principles, the *Physician Charter* has "commitments" that include patient confidentiality, honesty in our interactions with patients, professional competence, quality of patient care, maintenance of appropriate relations with patients, and professional responsibility [30].

Primacy of Patient Welfare

The *Principle of the Primacy of Patient Welfare* is the ethical precept that requires physicians to provide patient care that primarily upholds the best interests of their patients and cannot be compromised by market forces, societal pressures, autonomy interests, or administrative exigencies [30]. A few of the Physician Charter "commitments" that correspond with this fundamental principle are relevant to the ethics of physician fatigue.

First, the Physician Charter declares a commitment to "professional competence," which, among other things, mandates that the medical profession as a whole work towards "improving quality of care" and "strive to see that all of its members are competent" by "ensur[ing] that appropriate mechanisms are available for physicians to accomplish this goal" [30]. Second, the Charter not only mandates that physicians maintain clinical competence but also requires physicians to work with other professionals "to reduce medical error, and increase patient safety" [30]. Moreover, "[p]hysicians … must take responsibility for assisting in the creation and implementation of mechanisms designed to encourage continuous improvement in the quality of care" [30]. And finally, the Physician Charter declares a third commitment to "maintaining appropriate relations with patients," that includes avoiding the exploitation of patients for private purposes [30].

As discussed previously, sleep deprivation leads to substantially decreased neurocognitive performance that, in turn, may lead to considerably increased risks for patients. A fatigued physician who suffers from severe sleep deprivation – whether acute, chronic, or both – may display neurocognitive performance that is so impaired as to render the physician incompetent to treat patients [11, 31]. Physicians in such a state will necessarily provide a lower quality care to their patients. Thus, the *Principle of the Primacy of Patient Welfare* along with the commitments to professional competence and quality of care mandates that physicians should be properly

rested in order to maintain levels of neurocognitive performance that would ensure the delivery of an adequate quality of care to patients.

Some ethicists, however, may argue that mandating physicians to be well-rested is unethical. Physicians, after all, have their own autonomy interests including the right to decide their own work hours [32]. Such a position is valid provided the physicians' own autonomy interests do not lead to fatigue and the possibility of providing lower quality of care to patients. If physicians choose to work in a manner that causes their own fatigue, they are subordinating their patients' best interests to their own autonomy interests that, in turn, violates their commitment to maintain appropriate relations with their patients and infringes on their ethical commitment to increase patient safety [32].

The second argument against any mandate relates to cost. Limiting physician work hours to ensure they are rested increases costs for hospitals, medical centers, and private practices [32]. In order to cover for the lost work hours of current physicians on staff, such institutions may find it necessary to hire more physicians at an additional expense. The *Principle of the Primacy of Patient Welfare* requires physicians to dedicate themselves to serving the best interests of patients in a manner that must not be compromised by market forces or administrative exigencies [30]. An interest in costs, therefore, cannot be superior to concerns for patient safety.

Finally, some ethicists may argue that, for the sake of continuity of care [32], physicians should not be required to be well-rested. They may assert that patients' best interests are better served by the attention of the same physician over many continuous hours rather than by a series of physicians who provide fragmented observations and treatment [32]. Shorter working hours inevitably lead to more frequent transfers of patient information from one physician to the next that, in turn, increases the probability of errors in communication [32]. Under this patient's best interest argument, the continuity of care may promote the *Primacy of Patient Welfare* by longer rather than shorter physician work hours. For this argument to succeed, however, the benefits to the patient must outweigh the increased risk of fatigue-related medical errors. Indeed, there may be cases in which continuity of care may benefit the patient more than being cared for by well-rested physicians but, at a certain point, the treating physician's fatigue will become so severe and debilitating that the probability of harm from continued treatment would clearly outweigh the benefits of continuity of care. Thus, continuity of care arguments cannot justify allowing physicians to work in an unlimited capacity.

Patient Autonomy

The *Principle of Patient Autonomy* of the Physician Charter has a more recent history. Events in history, such as the abuse of Nazi prisoners of war and the Tuskegee Syphilis Study, gave rise to the ethical concept that patients themselves have the right to determine what should be done to their bodies.

According to the *Principle of Patient Autonomy*, "physicians must be honest with their patients and empower them to make informed decisions about their treatment" [30]. Within the parameters of ethical and professional constraints, "patients' decisions about their care must be paramount" [30]. The Physician Charter commitment that corresponds with this principle is the commitment to "honesty with patients" [30]. This commitment mandates physicians to "ensure that patients are completely and honestly informed …." [30]. Furthermore, patients must be "empowered to decide on the course of therapy" [30]. For the patient's consent to be validly informed, the physician must provide the patient with the information needed to understand the procedure, including the nature and purpose of the treatment, as well as its risks, potential benefits, and available alternatives [30].

As explained previously, physicians who are severely sleep deprived present substantially increased risks for their patients. Patients, in fact, are interested to know whether their physicians are sleep deprived. A study in the United States showed that the vast majority of patients feel anxious about their safety when they learn that the doctor who is about to perform surgery on them has been on duty for 24 consecutive hours [33]. Furthermore, another study reported that 80 percent of patients would want to be treated by a different physician if they discover their assigned physician has been on duty continuously for 24 hours [34]. Considering that physician fatigue presents a substantial added risk of injury to patients and is something patients consider to be an important factor in deciding about their treatment, the *Principle of Patient Autonomy* and the commitment to honesty with patients mandate disclosure of this added risk.

Those who oppose the disclosure to patients of a physician's degree of fatigue argue along two lines. First, they argue that physicians should assess their own physical or mental preparedness to perform their clinical responsibilities in particular clinical situations. A fatigued surgeon, for example, may want to perform a simple surgical procedure but decide that he or she is not sufficiently rested to perform a more complex surgery. Second, they argue that if sleep deprivation requires disclosure to patients then issues such as family conflict, stress at work, financial difficulties, or other factors that may affect the physician's clinical ability to focus and make medical decisions in the care of patients should also be disclosed [35].

To argue, however, that physicians should assess their own physical or mental preparedness to fulfill their clinical responsibilities in a particular clinical situation presents a false dichotomy. Varying degrees of fatigue and of treatment complexity present differing degrees of added risks to patients. If the fatigue-related risk is large, physicians should be ethically obligated to refrain from the treatment of patients in accordance with the *Principle of the Primacy of Patient Welfare* and its corresponding commitments. Conversely, if the fatigue-related risk is trivial, the physician need not disclose their fatigue. In between these two extremes are circumstances in which the added risk is such that the physician's work is permissible provided the patient has been advised of the risk and has provided consent.

The second argument posited is that if sleep deprivation requires disclosure to patients then other factors such as family strife, financial concerns, and the like

should be similarly disclosed. Whether the physician should disclose these personal factors, however, depends not on the intrinsic nature of the phenomenon but rather on whether the personal factors will put the patient's safety at risk. Thus, where other factors, such as family conflict or financial concerns, do give rise to a high degree of added risk to patients, then these factors may require disclosure as well.

Thus, the *Principle of Patient Autonomy* and the corresponding commitment to honesty with patients mandate that physicians disclose their own fatigue when such degrees of fatigue may give rise to substantial additional risk to their patients.

Social Justice

The third of the three fundamental principles is that of *Social Justice* which requires the medical profession to promote a "fair distribution of health care resources" and to "work actively to eliminate discrimination in health care, whether based on race, gender, socioeconomic status, ethnicity, religion, or any other social category" [30]. A relevant Physician Charter commitment that corresponds with this principle is the commitment to "improving access to care." According to this commitment, "medical professionalism demands that the objective of all health care systems be the availability of a uniform and adequate standard of care" [30]. Thus, physicians should "work to eliminate barriers to access [to health care] based on education, laws, finances, geography, and social discrimination" [30].

Fatigued physicians violate the *Principle of Social Justice* because they do not provide the same quality of medical care to their patients as when they are not impaired by fatigue. Some ethicists may reasonably argue that limiting physicians to work only when they are not fatigued is also a violation of the *Principle of Social Justice*. In geographical areas with shortages of qualified physicians, limiting physician work hours will exacerbate any physician shortage and may actually reduce access to medical services for certain patients. While limiting physician work hours to prevent fatigue may not be practical in some settings, this does not imply that limiting physician work hours in all settings is justified [32]. Instead, the work hours of physicians must be structured in a manner that accommodates settings where medical services are in short supply. Flexible physician work hour limitations that are sensitive to different practice settings do not violate the *Principle of Social Justice* and the commitment to improving access to care but actually promote them.

Ethical Duty to Limit Physician Fatigue

The principle of *Primacy of Patient Welfare* and the related commitments to professional competence, improving quality of care, and maintaining appropriate relations with patients provide strong justifications for requiring physicians not to work while

impaired by fatigue. Indeed, consideration of patients' welfare must trump all other interests, including the physicians' own autonomy interests and the financial considerations of medical institutions. Although the desire for continuity of care may counsel against providing fragmented treatment in some circumstances, consistent with the *Primacy of Patient Welfare*, this interest does not support the notion that physician work hours should be structured in a manner that allows physicians to work while fatigued.

Similarly, the *Principle of Social Justice* and the related commitment to improving access to care would be well served by structuring physician work hours that are flexible and sensitive to settings that suffer from workforce shortages.

While the *Principle of Patient Autonomy* and the related commitment to honesty with patients do not directly call for limitations on physician work hours, they suggest that fatigued physicians have a duty to inform patients of their status when their fatigue is severe enough to carry a substantial added risk to their patients.

Duty Hour Limitations for Physicians in the United States

When graduating medical students begin their residencies, they embark on an intense course of training that involves long hours, challenging patient care situations, regular shifts of overnight call, and increasing levels of responsibility. In the past, these resident physicians worked in hospitals without any regulation of their work hours. Some in the medical profession defended these long working hours as necessary to expose residents to diverse populations of patients, to develop skills in triaging patients, to learn multitasking skills, and have the opportunity to be actively involved in the care of their patients. Studies have shown, however, that residents working these long hours experienced high rates of depression and burnout [36–38].

Despite emerging concerns about the long working hours of residents, some thought shorter working hours would compromise residents' professional development, interrupt continuity of care, and diminish residents' dedication and commitment to their patients [39]. In addition, the reduction of resident work hours would increase the number of patient transfers of care that, in turn, would increase the potential for medical errors [40].

As evidence of the deleterious effects of sleep deprivation was more widely reported [41], many residency programs in the United States responded by reducing resident call responsibilities but, in many cases, residents continued to work more than 100 hours per week.

New York State Regulations for Duty Hours

In 1989, in the wake of the famous *Libby Zion* case in which a young woman died while under the care of under-supervised fatigued residents [42], New York became the first state to limit the working hours of physicians in training. New York Health

Code section 405 now limits the work of residents to 24 consecutive hours and an average of 80 hours per week over a 4-week period [43]. Interestingly, the statute imposes a special limitation of 12 consecutive work hours per shift not only for residents but also for attending physicians working in the emergency departments of hospitals [43]. The New York State regulations have been plagued by limited compliance and problematic enforcement. Over the years, some New York hospitals have been found to schedule residents beyond the prescribed limits, casting doubt on the effectiveness of the statute [44].

Accreditation Council for Graduate Medical Education Duty Hour Guidelines

Since 2003, the Accreditation Council for Graduate Medical Education (ACGME) has required all accredited medical training programs to implement a policy that limits resident work hours. The ACGME work hour restrictions followed the Institute of Medicine's (IOM) landmark report *To Err is Human* in which resident fatigue was identified as one of the primary causes of medical errors [45], and was a response to society's demand to reduce medical errors resulting from physician sleep deprivation. The implementation of the ACGME duty hour policy was the first attempt to limit resident work hours throughout the United States.

As a follow-up to the ACGME work hour restrictions, the Institute of Medicine reviewed, at the request of the United States Congress, existing data addressing the relationship between resident work hours and the safety of patients. In 2008, the IOM reported a scarcity of research on the topic, but recommended further reductions in resident duty hours [46].

Currently, the ACGME guidelines (revised in 2011) consist of the following for residents in all specialties:

- 80-hour work week averaged over 4 weeks
- maximum of 28 continuous hours
- not more than every third night call on average
- 10 hours off after each long shift
- at least 1 day off per week averaged over 4 weeks
- 16-hour work hour limits for interns.

Despite the ACGME guidelines and duty hour restrictions, subsequent studies showed no change in the rate of patient morbidity or mortality, resident board examination pass rates, or voluntary withdrawal of residents from residency programs [47–49]. Interns, however, did report fewer errors in the care of patients and subjectively felt less sleep deprived [50].

In order to implement the most recent ACGME guidelines, many medical training programs have scheduled residents to work a week of nights. One shift at night, however, causes disrupted sleep and results in significant sleepiness at work [51–53].

Furthermore, consecutive night shifts cumulatively increase sleep loss, sleep deficit, and fatigue [54]. Thus, changing from a traditional call schedule (one call every fourth night) to a week of night shifts does not reduce resident fatigue [55].

The changes in the duty hour requirements for residents are in need of further development to further reduce sleep deprivation and its effects on patient safety. Members of the medical profession should look to other industries to investigate staffing models that optimize continuity-of-care of patients, minimize sleep disruption, and reduce fatigue [56].

Conclusion

Physician fatigue presents a significant risk to patient safety and will continue to do so as long as sleep-deprived and overworked physicians continue to work inordinately long hours. Until we have a better understanding of sleep deprivation and its effects on neurocognitive performance, process improvements must be implemented to protect patients and physicians from being harmed from sleep deprivation. Although regulation of attending and resident physician work-hours must be done thoughtfully and must consider the potential implications for patient safety and access to healthcare, there is little justification for the current state of affairs in which many physicians continue to work long hours in varying states of fatigue.

Future studies that elucidate the causal link between fatigue and clinical performance will guide us in the establishment of duty hour requirements that enhance patient safety and maximize physician performance.

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