

# Promoting Sleep Among Medical Trainees

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*\*order does not denote contribution*

*Type of Paper: Position Paper*

*Approved: October 23<sup>rd</sup>, 2021*



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Canadian Federation  
of Medical Students

**FEMC**  
Fédération des étudiants et des  
étudiantes en médecine du Canada



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Date 2021-10-04

POSITION PAPER

## Summary

Proper sleep is a biological necessity (1,2). However, sleep deprivation is pervasive throughout medical training, commonly seen as unavoidable for both staff and trainees, and featuring prominently in popular culture depictions of medical settings. Though exact studies of sleep timing at Canadian Medical Schools are sparse, more general studies (5-10) and the anecdotal fact that most medical students report being sleep deprived highlight this reality. Recent research has created a robust set of evidence that clearly demonstrates both short and long-term consequences of sleep deprivation. These consequences affect both the mental and physical well-being of medical learners and raise concerns for the safety of patients who are being cared for by sleep-deprived students (See Tables 1-3).

Numerous factors contribute to the normalization of sleep deprivation amongst medical learners. Most prominent are the need to provide sufficient duty hours for coverage of medical services, the additional long study hours required adequate exposure during medical training, and medicine's culture of selflessness and competitive excellence. However, by setting educational schedules and policies that mandate sleep deprivation, medical schools demand medical learners and patients to bear the brunt of the consequences. Recent efforts have begun to address working hours during training, but we believe special attention needs to be paid to sleep, as the majority of health consequences are more directly related to lack of proper sleep as opposed to long working hours.

Given the pervasiveness of sleep deprivation and its associated consequences within our medical system, stakeholders at every level of medicine including hospital administration, medical staff, learners, and patients serve to benefit from systematic change. The main objectives of this position paper are to highlight the evidence around the consequences of sleep deprivation, discuss the reasons for its prevalence in medical training, and provide recommendations for potential strategies that may begin to mitigate it.

## RECOMMENDATIONS

- 1) Canadian medical schools should collect and make publicly available data regarding the quality and quantity of sleep, sleep-related behaviours (i.e. sleep hygiene), and their determinants among medical students and trainees. Furthermore, associated parameters of well-being and academic performance among their medical trainees across years of training should also be collected and published.
- 2) Canadian medical schools should leverage existing evidence to develop clear and explicit policy statements around minimum sleep requirements of 7-9 hours for medical trainees that are consistent with the above noted principles.
- 3) Canadian medical schools should develop and evaluate interventions to promote sleep among sleep-deprived medical trainees, including education programs, alternative scheduling strategies, and, most importantly, duty hour policies aimed to optimize sleep for medical trainees.
- 4) Canadian medical schools should implement culture-change interventions that aim to shift the prevailing discourse from

devaluing the need for sleep towards upholding it as a basic physiological requirement.

## SUPPORTING EVIDENCE & RATIONALE

1. The evidence of the short term and long-term consequences of sleep deprivation has grown substantially (Tables 1-3).
2. Very little published Canadian data exists to quantify the degree of sleep deprivation experienced by medical trainees.
3. Despite robust evidence of the implications of less than 7-9 hours of sleep per night among medical staff and students, and despite the Quebec Supreme Court upholding that 26-hour shifts violate worker's rights (14), duty hour reform in the rest of Canada fails to protect sleep time in medical training.
4. Currently, very few interventions have been documented that support medical learners' wellness through optimal sleep in Canada.
5. Medical culture celebrates sleep deprivation as an inevitable rite of passage, as opposed to the hazard to learner and patient health that it represents (11, 18).

# INTRODUCTION & BACKGROUND

Sleep is an essential biological process. It plays a critical role in proper functioning of the brain and multiple bodily systems including metabolism, appetite regulation, the immune, hormonal, and cardiovascular systems. A substantial body of evidence demonstrates the importance of sleep for human physiological and psychological functioning (1,2). However, medical education is well-known to be a time of chronic sleep deprivation. For pre-clinical years, this lack of sleep is due to long days spent in lectures and laboratories; for clinical clerks, long workdays and frequent overnight call shifts are at fault. This is on top of the heavy study burden present throughout medical school. Unfortunately, this is often seen as part of the reality of learning and practicing medicine. As a profession that fundamentally strives to improve health and well-being, mandated sleep deprivation during training is, at best, a large oversight to these goals. In this position paper, we explore the reality of sleep deprivation and its consequences among medical trainees; urging action to mitigate sleep deprivation and its negative consequences.

## *How Much Sleep do Medical Students Get?*

Healthy sleep is described as sleep of sufficient duration, quality, and regularity of timing without sleep disturbances or disruptions. Evidence suggests the vast majority of humans require 7-9 hours per night to support optimal health and functioning (3,4). Data from the US and other countries indicate a majority of medical students report suboptimal sleep patterns (5), getting an average of 6.45 hours per night (6). However, this average poorly captures the sleep irregularity that occurs during clinical rotations especially during call shifts as well as stressful study periods: trainees on call average less than three hours of sleep per night, and often go sleepless (7,8). Student self-reporting shows that 70% of students felt the amount of time they slept was less than what they need for good health (9,10). As medical students advance through their training, they sleep less than in pre-clinical years and score higher on sleepiness indices (9,11,12).

## *What causes poor sleep in medical training and beyond?*

The prevailing rationale is that long hours during medical training offer a valuable educational experience, supporting continuity of care and high-quality training. Such schedules are seen to be necessary to provide sufficient time to be prepared for the demands of clinical practice (13). It is also often seen as the reality of our medical system that long work hours from trainees are required to run services. Upon entering medical school, students deal with an increased workload and stress from progressively increasing clinical and academic requirements, all of which erode their sleep (5,14,15). During clinical years, with the exception of Quebec (16), Canadian medical schools regularly schedule interns for 26 or more hour call shifts an average of 1 in 4 days (17).

Indeed, sleep deprivation can be seen to be part of the hidden curriculum of medicine. The culture of medicine devalues physicians' and trainees' need for sleep. Whereas fatigue is seen as a collective hazard in other industries, residents see fatigue as an inescapable part of their training; a personal challenge to be managed and overcome (18). This intensive training schedule has been called a rite of passage at teaching hospitals (13). While it would be deemed prohibitively dangerous for sleep deprived pilots to fly in Canada, it is the norm among those providing medical care across the country.

Tables 1 and 2 below highlight some of the well-established short and long-term consequences of sleep deprivation, while Table 3 includes a review of the evidence of consequences of sleep deprivation within the medical profession specifically.

**Table 1. Short-Term Consequences of Sleep Deprivation**

Increased autonomic stress response (19,20)	Emotional dysregulation (21)
Low mood (22,23)	Decreased quality of life (27)
Headache and abdominal pain (28)	Poor physical performance (29–31)
Decreased driving ability and increased risk of collision (32–34)	Impaired cognitive performance (24–26)

**Table 2. Long-Term Consequences of Sleep Deprivation**

Diabetes (36)	Hypertension (37–39)
Cardiovascular disease (39,40)	Obesity (41–43)
Alzheimer’s disease (44)	Cancer (45,46)
Increased Suicide (48) and overall mortality (35,48)	Depression and anxiety (47)

**Table 3. Documented Consequences of Sleep Deprivation in the Medical Profession**

Lower academic achievement and worse study concentration (49,50)	Decline in clinical expertise and increased medical errors (51, 65,71)
Decreased cognitive performance and decreased performance on clinical tasks (52)	Impaired technical performance of surgeries and intubations (53–58)
Impaired language and math (59)	Decreased ECG interpretation skills (60)
Less empathy (61,62)	Increased ICU errors (63)
More motor vehicle accidents (64)	More exposures to blood-borne pathogens (67)
More workplace (e.g. needle stick) injuries (66)	Family and marital stress (69,70)
Anxiety, stress, and negative mood (68)	Increased burnout and job dissatisfaction (71)

*How can we improve sleep among medical trainees?*

Several strategies have been undertaken in different locations to ensure sufficient sleep among medical trainees. These interventions include sleep education programs (72) and protected sleep times (three-hour naps) during call shifts (73). Duty hour caps were instituted in Quebec as of 2011 after the Quebec Supreme Court ruled that 24 hour shifts violated the Quebec Charter Rights of resident doctors, capping duty hours to a maximum of 16 consecutive work hours (74). Similarly, the Accreditation Council for Graduate Medical Education (ACGME) capped duty hours to 80 hours per week and 16 hours per shift for first year residents in 2011 in an effort to bolster resident wellness and patient safety. The EU has been the most progressive with duty hour reform. There, medical trainees fall under the European Working Time Directive (EWTD), established in 2003. Worker duty hours are capped at 48 hours per week, at least 11 hours of rest per 24 hours period, one day off per week, and 20 minutes rest every 6 hours. Though these policies focus most on workload hours, inherent to being able to achieve a reasonable amount of sleep is having a work schedule that provides sufficient time to do so. Because the time demand of clinical medical training is so great, duty hours restrictions are the most common strategy cited to increase sleep and well-being among medical trainees. Indeed, the 2019 CFMS position statement on workload policies across Canadian medical schools recommended weekly maximum hours, including and excluding call, while also recommending that students should not be scheduled for more than 12 out of 14 days, which would limit the number of weekend calls to two days every two weeks (75).

There is mixed evidence in regard to the success of these interventions (76). In the face of extended work hours, education alone may not be sufficient (72). Protected sleep time, however, supported increased sleep duration and improvements in attention in some situations (74). Indeed, with respect to the EWTD, a survey of UK medical graduates suggested the majority of MD’s felt it benefited work-life balance (77). Additionally, there was a reported decrease in fatigue-related complaints, suggesting an increase in overall sleep as a result of the reforms (82). However, there is general uncertainty whether this is always the case. In 2017, the ACGME duty hour cap was reversed as the hope for benefits associated with the policy were not realized. In this case, it was unclear if the duty hour cap was truly reflected in reduced hours worked by residents. Behaviours among trainees such as not taking their post call days off were not reflected in official documents. Further, it was also noted that some residents may have been pressured to underreport their hours, or administration may have disclosed schedules which did not reflect the true hours worked (78).

Even in the case of truly reduced scheduled hours, workplace performance demands, educational requirements, and career competitiveness have not changed. These are ultimately drivers of greater work hours and concurrently reduced sleep. It is worth noting that in regard to the previous ACGME and EWTD, concerns were raised, particularly by procedural specialties, about the duty hour restriction and its impact

on being able to acquire the necessary skills to perform in their specialty. Also, it is a common concern that a reduction in work hours and protected sleep time would negatively impact hospital care by limiting service availability. Unfortunately, with the EWTD as well as other interventions, there are few studies indicating the impact of such reductions in duty hours on sleep specifically. However, given the growing evidence of the consequences of poor sleep on both medical outcomes and physician and trainee health, these studies are currently our best insight in how to approach this serious problem.

## KEY PRINCIPLES

1. Sufficient sleep is fundamental for optimal physical and mental health in the short and long-term for medical students.
2. Optimal sleep is important for the medical trainee given its fundamental role in learning and assimilation of information as well as bolstering mental health. Canadian medical students require sufficient sleep to manage the cognitive, emotional, and physical toll of medical training.
3. The best evidence indicates that at least 7-9 hours of sleep opportunity per night is necessary for optimal functioning of most individuals, including medical students. Such sleep is most ideally undertaken in a consistent, circadian fashion.
4. Medical education institutions should adopt work, education, and training practices consistent with best evidence for the health and well-being of their trainees.
5. Policies, in general, ought to be implemented and enforced in a consistent and transparent manner.

## RECOMMENDATIONS

The CFMS has compiled a list of recommendations for Canadian medical institutions to support greater sleep as a key component of wellness among medical students.

### 1. Collecting and Publishing Data Regarding Sleep in Medical Training

**Concern 1:** Medical students in general are shown to be chronically sleep-deprived, which can have short- and long-term deleterious effects on students' learning, and mental and physical health.

**Concern 2:** There is a paucity of data specific to Canadian Medical Schools available in regard to trainee sleep duration, timing, and consistency during training and possible associated performance and health effects

**Recommendation 1:** Canadian medical schools should collect and make publicly available data regarding the quality and quantity of sleep, sleep-related behaviours (i.e. sleep hygiene), and their determinants among medical students and trainees.

**Recommendation 2:** Furthermore, associated parameters of well-being and academic performance among their medical trainees across years of training should also be collected and published.

#### Supporting Evidence & Rationale

Despite the increasingly recognized importance of sleep for wellness and nearly all aspects of mental and physical performance, very little data exist quantifying sleep among medical students. Anecdotally, no Canadian Medical student escapes their training without enduring extended periods of sleep disruption; however, little published Canadian data was found in our search. As an emerging foundation of health that is relatively undervalued within the medical profession, an evidence base is required to further clarify at regional and national levels the nature and extent of sleep deprivation across training years and services. Publicly available data will allow researchers to undertake analyses that facilitate a present understanding of sleep among medical trainees, as well as to quantify the impacts of future interventions to improve sleep.

## 2. Implementing Specific Sleep Policy Goals

**Concern 1:** There is a clear lack of policy statements around sleep for medical trainees from existing medical educational institutions in Canada.

**Concern 2:** Duty hour policies frequently mandate, at an institutional level, medical trainees forgo sleep for 24+ hours to meet educational requirements. This has been challenged and upheld in court as a violation of the Canadian Charter of Rights and Freedoms in Quebec (2011).

**Recommendation 1:** Canadian medical schools should leverage existing evidence to develop clear and explicit policy statements around minimum sleep requirements.

**Recommendation 2:** These requirements should be targeted towards achieving a minimum of at least 6 hours and ideally 7-9 hours daily for medical trainees that are consistent with the above noted principles.

**Recommendation 3:** In situations where this is not possible due to clinical workloads, the maximum practical amount of rest/sleep should be given (e.g. 1-2 hours of protected break or sleep time during an overnight call shift).

### Supporting Evidence & Rationale

A previous CFMS paper from 2019 highlights the need for duty hour reform amongst medical trainees. We applaud and uphold this effort, and further point to the additional medical school-related obligations that increasingly impinge on time for basic personal health activities such as sleep. Post-duty study is a basic expectation to achieve satisfactory clinical evaluations, and intense competition for residency programs leads most medical students to engage with a wide variety of scholarly and extra-curricular activities. These engagements - now a basic expectation among medical students - in combination with heavy duty hours, impinge heavily on sleep and other health-related behaviours.

While we recognize that sleep deprivation among medical trainees is fundamentally a complex systems-level issue, leadership and policy statements are required to chart a corrected course towards greater trainee wellness, balancing the simultaneous needs of educating medical students and residents while providing appropriate care to the Canadian public. We advocate for Canadian medical undergraduate programs moving beyond generalized statements of support for medical trainee “wellness” in favor of making explicit, quantified target statements of ideal hours of sleep per night. At this time, a recommendation of 7-9 hours per night would be in keeping with current best evidence. This, in combination with greater data collection, will allow for accurate benchmarking and indicators of success. Policy statements should also include advocating for programs to undertake scheduling policies that explicitly strive to maximize unbroken sleep in a given 24-hour cycle, and minimize disruption of circadian rhythms.

### 3. Interventions for Sleep Promotion

**Concern 1:** The National Steering Committee on Resident Duty Hours recommended “duty periods of 24+ consecutive hours without restorative sleep should be avoided and only undertaken in rare or exceptional circumstances”. However, this remains the norm for clerks and residents across Canada.

**Concern 2:** Due to the compromise in mental and physical functioning, there are concerns for patient safety after extended periods of sleeplessness (18+ hours).

**Recommendation 1:** Canadian medical schools should develop and evaluate interventions to promote sleep among sleep-deprived medical trainees, including education programs, alternative scheduling strategies, and, most importantly, duty hour policies aimed to optimize sleep for medical trainees.

**Recommendation 2:** Given the limited number of published studies, interventions should be individualized to the setup of each specific program

**Recommendation 3:** Interventions that have previously shown some success in some studies should be considered as a starting point (72-78). These include sleep education programs, protected sleep time and duty hour caps.

**Recommendation 4:** We would also recommend consideration of other interventions with anecdotal evidence of possible usefulness. These include ensuring comfortable and available call rooms. Providing additional staff, resident, or student evening coverage to allow rest periods for students on overnight call. Implementing triage protocols that allow non-urgent consults and ward issues to be delayed during certain overnight periods to optimize the chance of rest.

**Recommendation 5:** That strategies that are trialed by programs be documented and published in order to improve the available knowledge base.

#### Supporting Evidence & Rationale

Despite the relatively limited knowledge of current sleep among Canadian medical trainees as discussed above, the negative health outcomes of sleep disruption are well-documented. Therefore, current understanding of sleep deprivation is such that there is no longer a reasonable excuse to continue ignoring this aspect of medical training. Additionally, the 2011 ruling from the Quebec Supreme Court suggests mandated 26-hour shifts violate workers’ rights, and medical trainees should not *de facto* absolve themselves from workers’ rights enjoyed in every other industry by entering the medical profession. Indeed, as a leading health profession in society, medical professionals ought to engender the best ideals of health promotion. Workers should not be subject to health-compromising work conditions (i.e. sleepless nights) except in extreme circumstances. Despite this, there appear to be very little documented reports of interventions to ensure optimal sleep among Canadian medical trainees.

Based on our review of the literature, a few possible avenues to enhance sleep may exist. Education programs on the primary importance of sleep, sleep requirements, and sleep hygiene should be employed to ensure medical students have sufficient knowledge and skills to sleep optimally. As discussed above, a policy framework to guide decisions about sleep and duty hours should be made. Based on these policies, efforts should be made to ensure 7-9 hours of unbroken sleep opportunity for medical trainees across years wherever possible. Where this is not possible, such as in overnight or call rotations, medical schools should explore alternate scheduling strategies, such as evening or night shifts or call-protected sleep breaks or rest periods to allow students to mitigate the consequences of sleep disruption. The incongruence between these known harms but lack of interventions demonstrates a critical need for Canadian medical institutions to act. Research and evaluation of reasonable methods to improve scheduling and protect sleep during prolonged shifts are needed.

#### 4. Shifting The Medical Sleep Culture

**Concern 1:** The culture of medicine systematically devalues the need for sleep and often celebrates it as a rite of passage despite its dangerous consequences.

**Concern 2:** Due to this culture in medicine, students feel unable to ask for help when they are sleep-deprived to a degree that is dangerous to their health or to the health of the patients they are treating.

**Recommendation 1:** The information presented here should be further disseminated amongst medical learners and staff in order to highlight that current attitudes in medicine towards sleep are not based on reasonable health science and are not without consequences for learners and patients.

**Recommendation 2:** Canadian medical schools should prioritize implementing culture-change interventions that aim to shift the prevailing discourse from devaluing the need for sleep towards upholding it as a basic physiological requirement.

#### Supporting Evidence & Rationale

As discussed, sleep deprivation is woven into the fabric of medicine and is a key part of the curriculum. Indeed, the ability to work tirelessly for 26 or more hours, multiple days per week, is accepted, embraced, and valorized. The drive to learn more, achieve more, and gain mastery (and employment) in one's chosen area of medicine drives medical trainees to constant work. While there can be a sense of increased confidence and accomplishment that comes from such commitment to one's career, sacrifice of basic personal health requirements should not be seen as noble. Sleep deprivation in particular should not be celebrated. Rather, it should be seen for what it is - a noxious stimulus and risk factor for multiple poor health outcomes. Canadian medical institutions, including residency programs, ought to undertake culture-change interventions to shift the narrative on the acceptability of sleep deprivation among medical trainees as part of the larger ongoing narrative shift of promoting trainee and physician wellness.

#### ADVOCACY PLAN & FOLLOW-UP STRATEGY

We recognize the multifaceted nature of this issue, and its requirement for efforts over time to improve the well-being of medical trainees. An issue which is central to our medical culture and how our medical system currently functions is unlikely to change rapidly. Immediate efforts should focus on a few key areas, which we advocate to be taken up by the CFMS.

The first is to raise awareness that sleep deprivation, though central to medicine, is not without its consequences. This is an important factor in shifting medical culture and attitudes towards sleep. We believe that the creation of this position paper is an important early step in this process, and further dissemination of this information should be prioritized. The second is to improve understanding of sleep amongst medical trainees. The ideal method would be to design and release a sleep survey. For practical reasons, inclusion of more sleep-related questions amongst existing surveys of medical students may be more reasonable. Finally, we strongly advocate for the inclusion of a mandated Sleep Portfolio or a combination of work hours and sleep portfolio within CFMS Student Affairs to continue to advocate on behalf of this issue and work on these tasks.

#### CONCLUSION

Despite its biological necessity, sleep deprivation is common in medical training. It is encountered throughout the training years but is most pronounced during clinical rotations. It is often cited as necessary in order to gain the required clinical expertise to function as a good doctor. A more pertinent reality is that our medical system is currently dependent on learners forgoing sleep in order to provide coverage on various medical services, particularly overnight and on weekends. Learners who are sleep-deprived are at increased risk of serious mental health consequences as well as numerous chronic health conditions.



Patients being treated by sleep-deprived learners are at increased risk of suffering serious medical errors. Given the relationship of this problem to hospital service coverage, medical learner health as well as patient health, this is an issue with stakeholders at every level of medicine.

The complexity of this issue and the lack of studies in this area means that data on the best approach to improving sleep is limited. Ultimately, it is likely that broad recommendations will need to be taken by each individual program and adjusted in a manner that best suits their health system. Efforts to better understand and survey sleep amongst medical students as well as to shift prevailing cultural attitudes towards sleep are good early goals to begin to combat this issue.

We cannot continue to let our learners and patients bear the brunt of the now well-documented consequences of sleep deprivation without undertaking reasonable efforts to change it. Significant work is needed in order to change something as entrenched in our medical system as sleep deprivation. This position paper and associated advocacy for the recommendations outlined herein are an important first step towards mitigating these serious consequences.

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