

Sleep Quality Among First-Year Internal Medicine Residents in Siriraj Hospital

Nitipatana Chierakul, M.D., Kanokwan Boonyapisit, M.D., Nukool Keurueangkul, M.D.

Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: Sleep loss affects function of humans in terms of cognition, learning, and also memory. Suboptimum sleep is inevitable during residency training especially in internal medicine. Regulation of maximum hours of work per week and duty period for in-training physicians has been established in some countries, but not yet in Thailand. This study aims to describe the sleep hygiene, perception of reduced sleep hours, and daytime performance of internal medicine residents during the first year of training in one major teaching hospital in Thailand.

Methods: Self-administered questionnaires were distributed to first-year internal medicine residents after informed consent at the time of orientation before training for baseline data, then at 6 and 12 months after training.

Results: Among 56 participants, the mean age was 27 ± 1 years, and 30 of them were female. Average sleep hours was significantly decreased ($p < 0.001$) from 7.0 hr at baseline (M0) to 6.0 hr at month 6 (M6) and 6.1 hr at month 12 (M12). On the contrary, the Epworth Sleepiness Scale (ESS) was significantly increased after being the trainee (5.7/24 at M0, 8.6 at M6, and 8.0 at M12, $p < 0.001$). Perception of reduced sleep hours did not change significantly after training (42.9/65 at M0, 43.5 at M6, and 43.0 at M12, $p > 0.46$). Daytime function in terms of fatigue, irritability, depressed mood, impaired memory, poor concentration, and decreased learning ability were significantly increased at M6 and remained stable at M12, except for the further increment of irritability and impaired memory ($p < 0.05$). Conflict events with colleagues were significantly increased at M12 and medical errors were significantly increased at M6 and stable at M12 ($p < 0.05$).

Conclusion: Internal medicine residency training greatly influences the sleep quality of physicians. Tendency towards sleep loss may be one of the stressful environments determining their self-reported impairment of day-time functions.

Keywords: Sleep loss, internal medicine, residency training

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INTRODUCTION

Residency training creates a stressful environment in terms of a lot of materials to learn, heavy work load, and also frequent or some night shifts. Inevitably, residents usually exist in a state of chronic and partial sleep deprivation

most of the time during their training. In a national survey in the United States, first-year residents reported sleeping an average of 5.7 ± 0.9 hours per night.¹ For those who slept 5 or fewer hours per night, a tendency toward more medical error and conflict with colleagues was established. Impairment of cognitive function and clinical performance of residents from acute and partial chronic sleep deprivation was also revealed in a meta-analysis.² The effect was lesser than those non-physicians, this may result from the experience and perception of sleep loss among the

Correspondence to: Nitipatana Chierakul

E-mail: nitipat7@gmail.com

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residents. On average, each first-year internal medicine resident in Siriraj Hospital works 90 hours per week (includes 32 hours of night-call duty). This study aims to describe the sleep hygiene, perception of reduced sleep hours, and daytime function of internal medicine residents during their first year of training.

MATERIALS AND METHODS

Self-administered questionnaires were distributed to first-year internal medicine residents of Siriraj Hospital in academic year 2011, at the time of an initial orientation (month 0; M0), and then at 6 and 12 months (M6 and M12) after training. Baseline data included health status and medications, sleep hygiene, and problems during sleep for screening of sleep disorders. In both initial and follow-up questionnaires, sleep hours and quality (0-4), Epworth Sleepiness Scale (ESS, score 0-24), daytime function, and perception of reduced sleep hours were collected (score 13-65). For daytime performance, fatigability, irritability, depression, memory impairment, attention deficit, ineffective learning and working ability, car accidents, conflicts with colleagues, and medical

errors were questioned. Perception of reduced sleep hours was deducted from comment as level of agreement for the impact of sleep deprivation in various aspects. Permission to conduct this study was approved by the Siriraj Institutional Review Board (SIRB), and informed consents were completed by all participations.

Subject characteristics were described using descriptive statistics, including mean with standard deviation and percentage. The comparison of parameters at M0, M6, and M12 were done using Student's t-test or Mann-Whiney U test for continuous data and Chi-square or Fisher exact tests for categorical data. A two-tailed p-value < 0.05 was considered as denoting statistical significance. The software SPSS version 18.0 was employed for all the analyses performed.

RESULTS

Baseline clinical characteristics of all 56 participants have been shown in Tables 1 and 2. Female was more prevalent than male counterpart and most of them were single. Their health status and sleep behaviors were quite acceptable. Although the body mass indexes (BMI) were within normal

TABLE 1. Baseline characteristics of 56 first-year internal medicine residents.

Parameter	Value
Number of female (%)	32 (57)
Number of married status (%)	8 (14)
Mean weight	58.3 ± 12.3 kg
Mean height	1.66 ± 8.9 m
Mean body mass index (BMI)	21.0 ± 3.1 kg/m ²
Mean weight change in the past year	0.6 ± 2.2 kg
Number with regular exercise (%)	8 (14)
Number with co-morbidities (%)	
Allergic rhinitis	13 (23)
Dyspepsia	5 (9)
Thyroid disease	2 (4)
Migraine	1 (2)
Current medications (%)	
Antihistamines	8 (14)
Proton-pump inhibitors	3 (5)
Oral contraceptive pills	1 (2)
Number of smoker (%)	0
Number of social drinker (%)	27 (48)
Number with habitual caffeine consumption (%)	37 (66)

TABLE 2. Baseline sleep characteristics.

Parameter	Value
Number with possible sleep disorders (%)	
Sleep latency > 30 min	28 (50)
Regular use of hypnotics	0
Obstructive sleep apnea	1 (2)
Habitual loud snoring	4 (8)
Sleep talking	1 (2)
Limb movement during sleep	2 (4)
Early wake up due to subconscious worry	4 (8)

range with minimal changes in the past year, regular exercise had not been established. Frequent caffeine consumption was common among this group of physicians.

Only the minority of the participants seemed to have sleep problems which is comparable to the general population in Thailand at the same age. However, half of the participants reported difficulty to fall asleep, as the perception of sleep latency was more than 30 minutes (Table 2).

Average sleep hours were significantly decreased from 7.0 hours at M0 to 6.0 hours at M6, and 6.1 hours at M12, although sleep efficiency could be retained as the percentage of sleeping

hours to time in bed was over 90% (Table 3). On the contrary, sleep quality satisfaction was decreased after being the trainee. An ESS was significantly increased and number of sleepy residents ($ESS \geq 9$) increased from one-fourth to nearly half of them. Perception of reduced sleep hours did not change significantly after becoming a resident. Overall impaired daytime performance was significantly increased at M6 and remained stable at M12, except for the further increment of irritability and ineffective memory. Conflict events with colleagues were significantly increased at M12 and medical errors were significantly increased at M6 and stable at M12.

TABLE 3. Sleep characteristics and daytime performance changes.

Evaluation	M0	M6	M12	p-value
Time in bed (hr)	7.0	6.0	6.1	< 0.001* #
Sleeping time (hr)	6.3	5.5	5.4	< 0.001* #
Sleep quality satisfaction score (1-4)	3.0	2.5	2.6	< 0.001* #
Epworth Sleepiness Scale (0-24)	5.7	8.6	8.0	< 0.001* #
Epworth Sleepiness Scale ≥ 9 (%)	23.2	50.0	44.6	< 0.001* #
Perception of sleep loss (13-65)	42.9	43.5	43.0	NS
Impaired daytime performance (%)				
Easily fatigue	44.6	73.2.	85.7	0.002 *, < 0.001 #
Irritability	21.4	30.3	55.4	< 0.001 #, 0.006 [†]
Depressed mood	10.7	26.7	35.7	0.026 *, 0.002 #
Ineffective memory	35.7	69.6	85.7	< 0.001 * #, 0.034 [†]
Poor concentration	41.1	62.5	67.8	0.019 *, 0.004 #
Decreased learning ability	62.5	78.5	76.8	< 0.001 * #
Car accident	5.4	5.4	10.7	NS
Conflict with colleagues	3.4	NA	16.1	0.026 #
Medical errors	10.7	25.0	14.3	0.041 *

M0 = month 0, M6 = month 6, M12 = month 12, NS = not significant, NA = not available

* = M6 compared to M0, # = M12 compared to M0. [†] = M12 compared to M6

DISCUSSION

Sleep deprivation can affect clinical performance of physicians and may have an impact on patient safety. In specific clinical encounters, physicians' sleep schedules can be attributed to the efficacy of their actions and interactions.^{3,4} Learning ability has also been shown to be significantly affected by acute and chronic sleep loss, especially those depending upon high levels of vigilance and procedural skills.⁵ In residents perception, sleep loss and fatigue during training also had a major impact on their personal and social lives.⁶

Internal medicine residency training inevitably caused sleep deprivation as this study demonstrated significant decrease in sleeping time and overall sleep quality satisfaction after commencement of their residency. Hence, the excessive daytime sleepiness (EDS) became more prevalent and affected about half of them after training for 6 months. For the perception of reduced sleep hours, the higher initial score without change over time, might have resulted from the participants tendency to accept and prime themselves for sleep deprivation and its consequences.

Daytime performance was obviously more impaired as the training advanced, although, the causal relationship with sleep loss has not been explored in this study. Daytime work of internal medicine residents requires function of complex thinking and sustained attention. Therefore, if they have to perform multi-tasks while they are not fully alert, the feeling of fatigue, depression, and also irritability can easily develop. The consequences are the process of learning which includes memory and concentration may not operate in an effective way. The occurrence of more medical errors or conflicts with colleagues after training, may reflect the stressful environment of the residents. Negative effects tended to increase as the time passed by, especially irritability and impaired memory. Confounding factors other than sleep loss may play some roles and amplify the detrimental effect over professional achievement. Increased serious medical errors of first-year residents after they worked frequent shifts of 24 hours or more was demonstrated in a prospective randomized study, and decreased significantly

after working in shorter shifts.⁷ Extended work shifts in first-year residents has also been shown to increase the tendency to fall asleep while driving and leads to motor vehicle accidents.⁸

Residency duty hour restrictions have been implemented by the American Council for Graduate Medical Education (ACGME) since 2003 and later revised in 2011, with the aim to reduce the risk of adverse events deriving from sleep deprivation and to promote residents' well being. This mandated that work is limited to 80 hours per week for first-year residents and duty period must not exceed 16 hours in duration. Initially most of the key clinical faculty, who came from various internal medicine residency training programs affiliated with US medical schools, were concerned about its adverse effects in terms of patient care, education, and professionalism.⁹ Nevertheless, the comprehensiveness of training and adequate sleep should be considered for balancing between designed competence and precision health care delivery. From the national survey of the residents, they strongly agree with the improvement in quality of life. However, the possible negative effects over their education, preparation for senior roles, and quality of patient care were greatly concerned.¹⁰ Residents commonly adopted a trial-and-error approach for various countermeasures for sleep loss without scientific support.¹¹ Potential countermeasures such as protected sleep period, napping, and low-dose caffeine for transient relief of the fatigue, has been implemented. The feasibility for ensuring a 5-hour protected sleep period after work shift for 16 hours has been shown recently.¹² It also has clearly been demonstrated that the increment of overnight sleep duration is related to improvement in the alertness of the residents next morning. However, even with daytime post-call nap, it still took two nights' sleep to make a full recovery of performance because of the limited sleep duration in general for residency.¹³

Although this is the first study concerning area of sleep loss among postgraduate training in Thailand, some limitations should be mentioned. First, we could not demonstrate that the daytime performance declination was caused by impaired sleep quality due to the nature of this descriptive

research. Secondly, we did not use objective measurement such as psychomotor vigilance test or Thai Stress test, in addition to the subjective assessment by questionnaires. Further prospective study for effective intervention of inadequate sleep among internal medicine residents will improve the quality of life of our future physicians.

CONCLUSION

Internal medicine residency training in Siriraj Hospital influences the impaired sleep quality of trainees. Tendency towards sleep loss may be one of the stressful environments determining their self-reported impairment of daytime performance, and should be given more attention.

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