Effects of working environments with minimum night lighting on night-shift nurses' fatigue and sleep, and patient safety

夜間照明を最小限とした交代勤務看護師の勤務環境が疲労・睡眠・患者安全に及ぼす影響

Effects of working environments with minimum night lighting on night-shift nurses' fatigue and sleep, and patient safety

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Abstract

Objectives: Nurses working day and night shifts often suffer from insomnia or similar types of disorders because exposure to room lighting inhibits melatonin secretion, resulting in a disturbed circadian rhythm. This study investigated whether dark room lighting would be preferable to brighter rooms for nurses with regard to insomnia and similar disorders and quality of life, as a result of maintaining melatonin secretions during night shifts.

Methods: The study was a non-randomized open label crossover trial between night shifts using dark (light intensity of approximately 110 lx on the desk surface) and bright (approximately 410 lx under the same conditions) room lighting. The duration of the study was 4 months per subject, consisting of a 4-week dark phase, a 2-month transitional phase, and a 4-week bright phase. A total of 20 nurses were enrolled in the trial from November, 2015 to February, 2016, at a hospital in Japan. The subjects all started with a dark phase, and this was followed by a bright phase. A self-administered questionnaire was given to the subjects on enrollment and collected at the end of the intervention

Results: The nurses felt better with a dark environment, but it was not statistically significant. Concentration at work declined significantly after the night shift compared with before it only in the case of a well-lit environment ($p<0.05$). Conversely, fatigue and sleepiness were significantly higher in a dark environment than in a bright environment ($p<0.05$). There were no significant differences in any items with regard to quality of sleep on waking. In addition, no significant difference was seen in the number of reported incidents/accidents between the two types of environment.

Conclusion: The dark room lighting during night shifts did not clearly improve satisfaction with and comfortableness of work among nurses; rather, it was associated with fatigue and sleepiness. However, it was not inferior in terms of work concentration and hospital risk management. Further study will therefore be necessary to find the best work lighting environment for nurses.

Keywords: shift work, illumination, circadian rhythm, sleep quality, clinical safety

Introduction

Recently in Japan, hospital nurses have been working in two shifts: in the daytime (8:45 am to 5:15 pm at the study hospital; 8 hours 30 minutes with a break), and at night (4:45 pm to 9:15 am the next day; 16 hours 30 minutes with a break). Night-shift nurses take a break or nap for 2 hours during the long working hours. Some hospitals employ nurses who work the night shift only, but nurses generally work both the day and night shifts. In addition, the government sets a recommended number of nurses based on the seriousness of the hospitalized patients' conditions.

In humans, a lighting environment of more than 300 lx inhibits melatonin secretion even with a short exposure time of one to two hours[1, 2, 3]. With an exposure time of more than a certain number of hours, a lighting environment of 120 lx or higher also inhibits melatonin secretion[4]. This inhibition has a harmful effect on the circadian rhythm of night-shift nurses working in the usual type of lighting environment, disrupting naps or sleep rhythms after the night shift[5]. There are many reports that consecutive shift changes between night and day disrupt the circadian rhythm and lead to problems such as insomnia, which is one of the reasons why nurses leave their jobs[6, 7, 8]. Moreover, lifestyle (including exercise, sleep patterns, timing of meals, and alcohol consumption) is considered to have an impact on circadian rhythm among such nurses.

It is important for hospital managers to stop nurses from quitting their jobs because of this environmental health issue. Humans temporarily stop feeling sleepy in an extremely well-lit environment of approximately 5000 lx[8]. There are some reports that short exposure to extremely bright light changes the sleepiness of night-shift workers[9, 10, 11]. However, temporary waking during the night may worsen the circadian rhythm. Since there is little scientific evidence regarding how minimum lighting at night influences the health care of shift-work nurses, we aimed to find an ideal solution to minimize the disruption of the circadian rhythm induced by light intensity.

The author hypothesized that disruption of shift workers' circadian rhythms could be prevented if night lighting was kept below 120 lx (hereafter, "a dark environment"), a level which does not inhibit melatonin even with long-term exposure[1, 2, 3, 4]. Of note is the fact that 120 lx complies with the Japanese regulations (the Industrial Safety and Health Act), which set 70 lx as the minimum for work involving rough activities and 100 lx for a room in a hospital.

The objectives of this study were to investigate whether dark room lighting brings improvements in terms of 1) comfort and concentration, 2) quality of sleep and fatigue, and 3) not interfering with work performance (malpractice/incidents/accidents) among nurses.

Methods

The study was conducted at a 430-bed general hospital that mainly provides acute care,

located in a Japanese city with a population of approximately 330,000. The hospital had been designed to minimize lighting. The reason the hospital used dark room lighting at the work stations of its wards was as follows: When nurses worked a night shift, they had to go back and forth between dark patient rooms and relatively much brighter work stations. Some nurses in this hospital had complained about this. Also, in order for nurses to reach the patients in the hospital, the design located the work stations near each patient room. This meant that if the work station was too bright, the patients might feel uncomfortable. Therefore, all wards were constructed to have "dark conditions", with only 110 lx in the work spaces.

The subjects were nurses who worked both night and day shifts in a general ward. Nurses working in the intensive care unit or emergency department were not included because of significant differences in duties and lighting environment.

Dark conditions were defined as approximately 110 lx on the desk in the staff station with the minimum night lighting, while general well-lit conditions were defined as approximately 410 lx on the desk, with additional celling lights used to create well-lit conditions during the second half of the study period. During daytime hours, well-lit conditions of approximately 630 lx were maintained, while the dark conditions were 600 lx, which is an equivalent level to each other.

The subjects regularly worked the night shift about 5 times per month, while the day shifts were much more frequent. The study measured the impact of the night shift with or without dark lighting through a questionnaire completed on the last day of a run of consecutive day shifts and on the first day shift after a night shift. Over the total 4-month study period, the subjects passed through the following 3 phases: 1) dark-lighting night shifts for the first month, 2) a transitional washout phase with bright-lighting night shifts for the following 1 months, and 3) the third phase, with bright-lighting night shifts for 1 month.

1. Study period

Figure 1 shows the study duration and conditions. Taking into consideration daylight exposure times, dark conditions were taken to be from November 17 to 30, 2015, during a period when the ward was routinely operated under such conditions. Well-lit conditions were taken to be from February 16 to 29, 2016, and from one month before that, a period was added to provide a 1-month washout. This season was intentionally selected because daylight was minimal.

Reports of medical treatment problems related to work performance were analyzed for each month of exposure. Dark conditions were taken to be the period from November 1 to 30, and well-lit conditions were taken to be the period from February 1 to 29, 2016, when the ward was actually run under such conditions.

2. Endpoints

A self-administered questionnaire was given to the subjects at enrollment and collected at the end of the intervention.

1) In the questionnaire, the questions about lighting environment were "Lighting on the desk" and "Lighting in the staff station", with 5 levels from "1: Too dark" to "5: Too bright". For both questions, "Appropriate" was defined as "3: Appropriate". The other answers were defined as "Inappropriate". The subjects answered the questionnaire after every period of work. (Appendix 1)

2) The questions about lighting environment and work performance were taken from "SAP: Subjective Assessment of Workplace Productivity"[12], which was developed by the Japan Sustainable Building Consortium and is widely used as a questionnaire survey to evaluate intellectual productivity in architectural spaces conducted on the users thereof. The measured items were satisfaction with the lighting environment and concentration on work. Higher scores meant worse fatigue and sleepiness. The subjects calculated their scores after every period of work. (Appendix 1)

3) The questions about fatigue and sleepiness were taken from "Subjective Symptoms (2002)", developed by the Industrial Fatigue Research Committee of the Japan Association of Industrial Health[13]. This assessment was performed before and after work to for comparison, and higher scores indicated stronger fatigue/sleepiness. The questions about sleep quality assessed on waking were taken from the "OSA Sleep Inventory MA versionVersion"[14], which is a self-assessment of sleep quality. (Appendix 2)

4) The questions about a "sleepy feeling on waking" covered 5 factors: sleepiness on waking, sleep induction and maintenance, dreaming, recovery from fatigue, and sleep duration. These 5 factors constituted 16 questions. Higher scores indicated a better sleep quality. The questionnaire could be filled out any time during and after the shift. For the night shift, a question about "sleepy feeling on waking" after a nap was added. (Appendix 3)

5) As regards "questions about malpractice/incidents/accidents", from among all the reports usually made at this medical facility, incident/accident reports were quantitatively compared by severity level. From these reports, we examined

whether any reports mentioned that the lighting environment, such as light intensity or visibility, had an effect. The severity levels were 8 levels that were usually used, ranging from a near-miss (level 0) to death (level 5). Levels 3 and 4 were further divided into "a" and "b", meaning with "b" was more severe than "a". Here, level 3b or higher was defined as an accident[15]. Level 3b was defined as "a temporary injury of severe degree, for which extensive treatment was needed (severe change in vital signs, ventilator, surgery, extension of hospital stay, hospital admission for as an outpatient, bone fracture, etc.)". Thus, the levels above 3a included all serious matters. The author performed data collection and analysis using this classification. The analysis used a final severity level decided by an independent clinical safety committee of the hospital and not by the report at that time.

3. Analysis method

The t-test was used for the difference in average values. Fisher's exact test was used for the difference in numbers by group. $p<0.05$ was set as the criterion for statistical significance. Tables 3, 4, and 5 compare the results between two conditions, and the results before and after night shifts under the same conditions. Table 6 is an analysis of incident/accident reports. It examines the results in a 2x2 table divided up by condition and severity, for both day shifts and night shifts. Furthermore, as regards the total numbers of reports, together with comparisons between conditions, the totals for the day shifts and night shifts on the surveyed ward were also compared with those on other wards at the same time.

4. Ethical standpoint and conflict of interest

This study was approved by the Ethics Committee of Fukushima Medical University (No. 2546). There is no conflict of interest on the part of the author with regard to this study.

Results

1. Flow for subject

Out of 30 nurses who had the study explained to them at the ward, 20 nurses enrolled in the study after giving informed consent. As shown in Figure 2, one subject withdrew from the study because a nurse transferred to another ward. Another subject who transferred from another ward in the hospital joined in the middle of the study period. Out of the 20 participants, 19 provided questionnaires for the dark exposure phase. Among these, the data for two subjects

were not used: one used sleeping pills and the other did not answer questions. As a result, the data for the remaining 17 subjects were analyzed in the study. For the bright exposure phase, the data for 10 subjects were used for the analysis. Nine subjects did not respond to the questionnaire for the bright phase and the other did not answer the necessary questions. (Figure 2)

2. Light intensity assessment at the end of work

Questionnaires were obtained from 19 nurses for the dark conditions, and 11 nurses for the well-lit conditions. Subjects who did not answer the necessary questions were excluded from the study. Consequently, 17 nurses were included in the analysis of the dark conditions, and 10 nurses for the well-lit conditions (Table 1). There were no differences in terms of age, work experience and corrected eyesight.

The mean score for light intensity for the night shift was a little too dark in the case of the dark conditions (2.4 ± 0.71 light on the desk; 2.6 ± 0.62 light in the work station), and a little too bright in the case of the well-lit conditions (3.6 ± 0.97; 3.6 ± 0.97). However, this was not statistically significant. Combining the light intensity for the desk and the room, Table 2 shows that more nurses answered with "Dark conditions are appropriate", but this was not statistically significant (dark condition, appropriate 9; inappropriate 8 vs. well-lit condition, appropriate 4; inappropriate 6).

Table 3 shows the results for satisfaction with the lighting environment and concentration at work. The mean scores for satisfaction with the lighting environment were higher for the day shift than for the night shift, but there was no significant difference between the dark and well-lit conditions. The mean scores for concentration at work were higher for the well-lit conditions on the last day shift before the night shift than the dark conditions (well-lit conditions, 4.09 ± 0.94 vs dark conditions, 3.39 ± 0.70) ($p<0.05$). On the day shift before and after the night shift, there was no difference as regards the dark conditions. However, there was a significant difference as regards the well-lit conditions with regard to concentration at work (last day-shift before a night-shift, 4.09 ± 0.94 vs first day-shift after a night-shift, 3.50 ± 0.71) ($p<0.05$).

3. Fatigue and sleepiness

Questions on "subjective symptoms" about fatigue and sleepiness covered 5 factors: instability, uneasiness, grogginess, lethargy, and drowsiness. Table 4 shows the means and standard deviations (SD) by factor.

Generally, the mean scores were higher for the dark conditions than the well-lit conditions, which indicates that nurses felt subjective symptoms more in the case of the dark conditions. The items which were statistically significantly higher for the dark conditions were drowsiness before work on the last day shift before a night shift than well-lit conditions (2.71 ± 1.19

vs 1.73±1.00), and lethargy on the first day after the night-shift (1.96±0.87 vs 1.32±0.48) ($p<0.05$). Furthermore, for some items, the dark conditions had a higher trend than well-lit conditions ($p<0.1$). On a night-shift day, there were no significant differences in any symptoms.

4. Self-assessment of sleep quality on waking

Table 5 shows a self-assessment of sleep quality. Sleep induction and maintenance showed a higher trend in case of well-lit conditions on the last day-shift before a night-shift than dark conditions (well-lit conditions, 52.13±9.94 vs dark conditions, 46.33±7.84) ($p<0.1$). However, there were no significant differences in any items between the dark and well-lit conditions.

5. Work performance on safety

Table 6 shows the number of incident/accident reports. These were divided into accidents (3b or higher) and incidents (3a or lower). The percentages of the number of reports for the whole hospital were compared for the day shift and night shift, but no significant differences were found. Regarding the ratio of the total number of reports for day shift and night shift, there was no significant difference in the study ward between different conditions. However, comparing the totals for the study ward and other wards during the well-lit period, the study ward had significantly more reports for the night shift than the other words ($p<0.05$). Furthermore, as regards medical treatment problems, there were no light intensity-related reports during the entire study period.

Discussion

In the evaluation of light intensity on the night shift, there was no significant difference in the proportion of nurses who responded with "Appropriate". Dark conditions of 120 lx or lower, in which melatonin is not inhibited, did not cause the nurses to evaluate the light intensity on the night shift as inappropriate.

On the other hand, in this study, although objective light intensity on the day shift was not so different, concentration at work was significantly reduced in the well-lit conditions on a day shift after a night shift. Considering the fact that satisfaction with the lighting also decreased (although it was not statistically significant) for the dark conditions. There was not much difference before and after a night shift for the dark conditions, and that there was no significant difference as regards sleep evaluation between the different conditions. It is possible that a night shift under well-lit conditions may influence the impression of lighting on the day shift, or may disturb concentration at work on the day shift after a night shift. However, satisfaction with the

lighting and ease of concentration at work were pointed out in a previous study[16], and since not only brightness at work but also glitter in the work space caused by lighting fixtures. The difference in illumination from the background, and the difference in the brightness entering the visual field might have an effect; further analysis (such as luminance analysis) will be required in the future. On the other hand, concentration at work before a night shift was significantly higher in the case of the well-lit conditions than dark conditions, and the differences before a night shift between the two groups may have affected the results in this study.

For feelings of sleepiness, there were no significant differences in any items between the dark conditions and well-lit conditions. Although this result did not support the hypothesis that a dark environment prevents disruption of the circadian rhythm in night-shift nurses[1, 2, 3, 4], considering the result of this study, the author found that a dark environment is not inferior to a well-lit one.

This study found that differences in the lighting environment did not cause problems in work performance. This indicates that a dark environment at least does not have a negative effect in that regard. In other words, the ratio of incidents during the day shift to those occurring during the night shift was 3:4, and for the well-lit conditions, the ratio was 1:4. The number of night-shift incidents was significantly larger in the case of the well-lit conditions. A bright lighting environment for ICU nurses working the night shift reduces sleepiness but increases the number of psychomotor errors[19]. The word of this hospital has designed that when the nursing staff's working space is bright, the patient rooms can be also bright. At nighttime, after 21:00, for this study, the patient rooms were dark so that the patients could sleep well. Therefore, there was speculation that the bright light may have affected patients' awareness and sleeping conditions.

Study Limitation

The available sample size was not sufficient to detect statistical significance in multiple endpoints.

There may have been other biasing factors regarding fatigue and feeling sleepy (such as exposure to sunlight, exercise, and alcohol consumption) for which information was not collected. Other missing information included the patients' medical conditions, new hospitalization cases during the night shifts, and the number of empty beds.

Conclusion

Caring for the health of night-shift workers so as to prevent rapid turnover of staff due to unfavorable work environment is important for hospital management as well as patient safety.

Although ideally a further large-scale study should be conducted, this study potentially suggests that having lower lighting on night shifts is acceptable as such nurses' work environment at general words of hospitals.

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Fig. 1 Study period and conditions

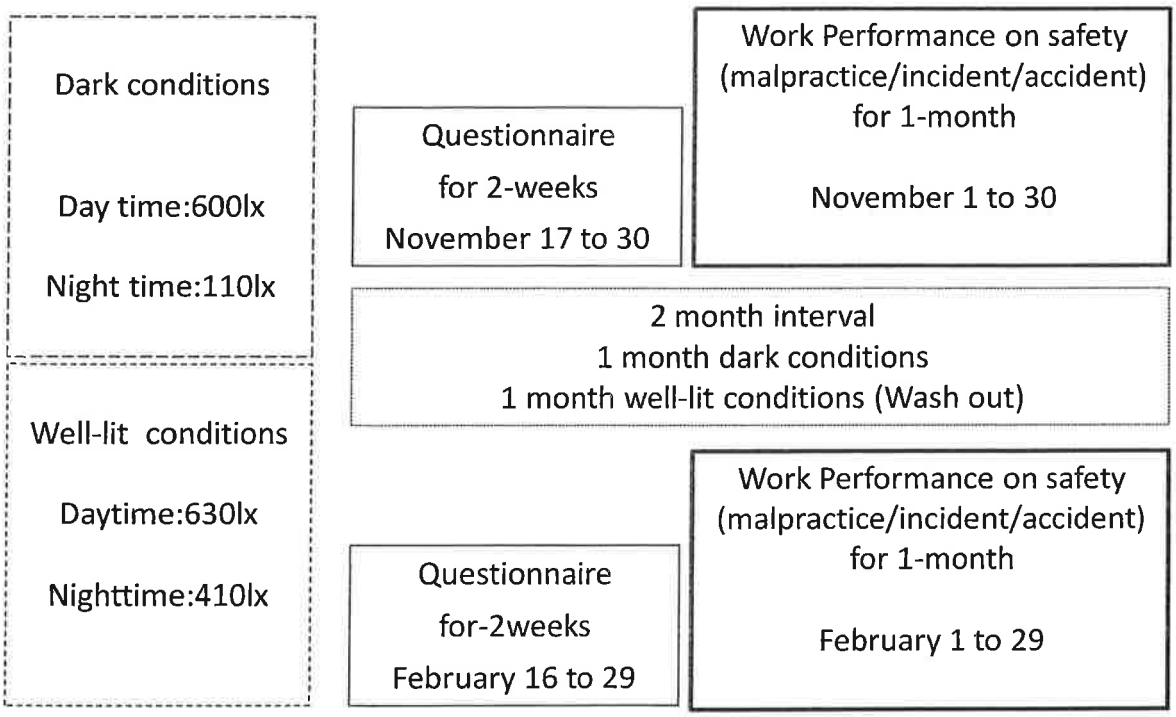

Fig. 2 Subjects flow

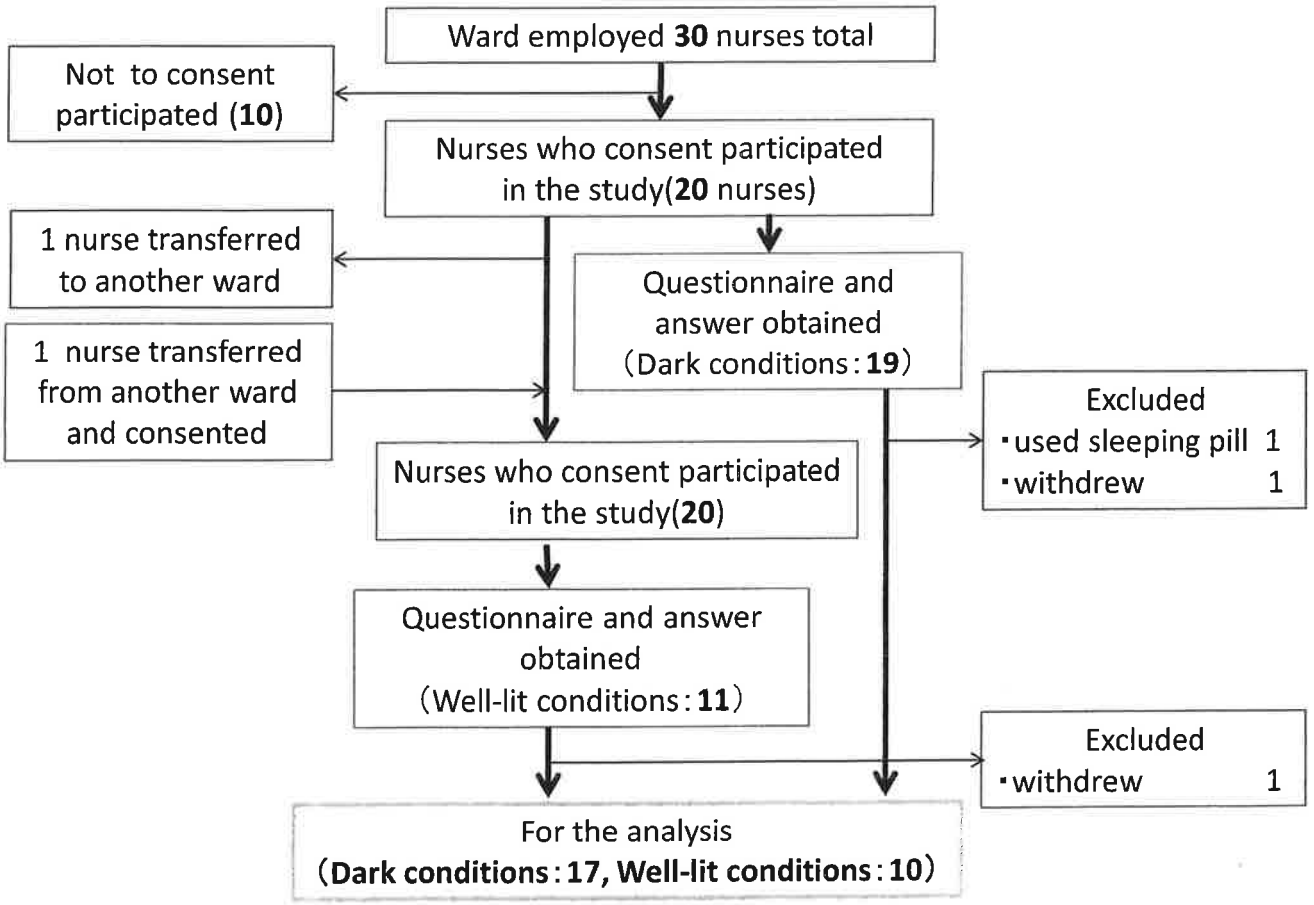

Table 1 Background of subjects

	Dark condition				Well-lit condition			
Sex **male female unknown total**	0	12	5	17	1	6	3	10
Age (Average±SD)	34.6±13.2				36.0±13.1			
Work year (Average±SD)	12.4±13.6				13.6±13.4			
Sleep disorder	0	11	6	17	0	7	3	10
Sleeping drug	0	12	5	17	0	7	3	10
Past illness*								
Allergy		1						
Asthma		1				1		
Myoma of the uterus		1						
Fatty liver 1						1		
Slipped disk		1						
Corrected eyesight Left Right	0.96±0.29		0.91±0.34		0.72±0.41		0.80±0.62	

*: No duplication of past illness for each subject

Table 2 Evaluation of lighting intensity on night shift by brightness conditions

	Combining the light intensity		Light intensity*	
	Appropriate	Inappropriate	Light on the desk	Light in the work station
Dark conditions	9 (52.9%)	8 (47.1%)	2.4±0.71	2.6±0.62
Well-lit conditions	4 (40.0%)	6 (60.0%)	3.6±0.97	3.6±0.97

"Appropriate" was defined a two answers, "3: appropriate" to both questions. Other answers were defined as "inappropriate"

*: Average±SD

Table 3 Satisfaction with lighting environment and concentration at work by brightness conditions and time

	Last day-shift before a night-shift		Night-shift		First day-shift after a night-shift	
	Satisfaction	Concentration at work	Satisfaction	Concentration at work	Satisfaction	Concentration at work
Dark conditions	3.56±0.92	3.39±0.70*	2.89±0.83	2.78±0.81	3.44±0.63	3.57±0.76
Well-lit conditions	4.09±0.94	4.09±0.94*+	2.80±1.30	3.40±1.17	3.20±0.79	3.50±0.71+

Average±SD

*: Difference between dark conditions and well-lit conditions ($p<0.05$).

+: Difference between the last day before a night-shift and the first day-shift after a night-shift ($p<0.05$).

Table 4 Symptoms before and after work by work-shift and brightness condition

		Last day-shift before a night-shift		Night-shift		First day-shift after a night-shift	
Symptom	Conditions	Before work	After work	Before work	After work	Before work	After work
Instability	Dark conditions	2.11±1.00	1.67±0.98	1.95±0.97	2.20±0.91	1.80±0.93	1.84±1.20
	Well-lit conditions	1.55±0.96	1.64±1.13	1.54±1.27	1.96±1.48	1.58±0.93	1.38±0.72
Uneasiness	Dark conditions	1.91±0.86	1.87±1.04	1.72±0.74	2.26±0.91	1.72±0.85	1.81±1.10
	Well-lit conditions	1.56±0.73	1.75±1.10	1.83±0.88	2.24±1.23	1.42±0.60	1.44±0.74
Grogginess	Dark conditions	1.74±0.75#	1.72±0.70	1.59±0.84	2.27±0.81	1.71±0.84#	1.89±1.03
	Well-lit conditions	1.27±0.60#	2.00±0.99	1.43±0.73	2.02±1.24	1.16±0.26#	1.52±0.63
Lethargy	Dark conditions	1.97±0.79#	2.14±0.89	1.92±0.78	2.89±0.92	1.96±0.87*	2.32±1.09
	Well-lit conditions	1.45±0.66#	2.31±0.93	1.43±0.73	2.18±1.26	1.32±0.48*	1.72±0.63
Drowsiness	Dark conditions	2.71±1.19*	2.53±1.07	2.24±1.03	3.69±1.05#	2.36±1.13#	2.29±1.31
	Well-lit conditions	1.73±1.00*	2.35±1.31	1.78±0.95	2.92±1.23#	1.66±0.79#	2.02±1.07

Average±SD

*: Difference between dark conditions and well-lit conditions $p<0.05$#: Difference between dark conditions and well-lit conditions ($p<0.1$).

Table 5 Self-assessment of sleep quality on waking by work-shift and conditions

			Last day-shift before a night-shift	Night-shift		First day-shift after a night-shift
Factors	Elements	Conditions	On waking (mean±SD)	On waking (mean±SD)	After a nap (mean±SD)	On waking (mean±SD)
I	Sleepiness on waking	Dark conditions	38.09±12.84	40.93±8.75	32.82±9.44	38.67±10.40
		Well-lit conditions	42.48±11.92	41.83±13.10	37.47±14.06	40.38±12.43
II	Sleep induction and maintenance	Dark conditions	46.33±7.84#	46.11±7.41	37.95±9.45	46.55±9.86
		Well-lit conditions	52.13±9.94#	46.56±10.85	31.15±11.62	48.50±12.78
III	Dreaming	Dark conditions	43.78±13.12	46.85±10.57	51.74±10.81	48.04±12.60
		Well-lit conditions	51.19±9.74	51.22±13.20	54.66±8.94	52.97±8.90
IV	Recovery from fatigue	Dark conditions	41.37±11.78	42.11±10.41	31.17±8.93	42.01±8.04
		Well-lit conditions	45.08±11.48	44.30±12.57	33.90±9.27	45.92±12.74
V	Sleep duration	Dark conditions	41.92±7.99	47.82±9.83	28.45±7.54	43.15±8.63
		Well-lit conditions	40.04±13.33	42.64±11.12	30.28±8.79	41.88±9.54

#: Difference between dark conditions and well-lit conditions ($p<0.1$).

Table 6 Number of incident/accident reports on severity or occurrence time during study period

			0	1	2	3a	Subtotal	3b	4a,b,5	Subtotal	Total
Dark conditions (November 1 to 30, 2015)	Whole hospital except study ward	All day	16 (11.8%)	68 (50.0%)	43 (31.6%)	9 6.6%	136 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	136 (100.0%)
		Day-shift	10 (16.4%)	37 (60.7%)	10 (16.4%)	4 (6.6%)	61 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	61 (100.0%)
		Night-shift	6 (8.0%)	31 (41.3%)	33 (44.0%)	5 (6.7%)	75 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	75 (100.0%)
	Study ward	All day	1 (3.6%)	9 (32.1%)	18 (64.3%)	0 (0.0%)	28 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	28 (100.0%)
		Day-shift	0 (0.0%)	6 (50.0%)	6 (50.0%)	0 (0.0%)	12 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	12 (100.0%)
		Night-shift	1 (6.3%)	3 (18.8%)	12 (75.0%)	0 (0.0%)	16 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	16 (100.0%)
Well-lit conditions (February 1 to 29, 2016)	Whole hospital except study ward	All day	18 (12.7%)	57 (40.1%)	59 (41.5%)	8 (5.6%)	142 (98.6%)	2 (1.2%)	0 (0.0%)	2 (1.2%)	144 (100.0%)
		Day-shift	15 (23.4%)	29 (45.3%)	17 (26.6%)	3 (4.6%)	64 (98.5%)	1 (1.4%)	0 (0.0%)	1 (1.4%)	65 (100.0%)
		Night-shift	3 (3.2%)	28 (35.9%)	42 (53.8%)	5 (6.3%)	78 (98.7%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	79 (100.0%)
	Study ward	All day	1 (5.0%)	12 (60.0%)	6 (30.0%)	1 (5.0%)	20 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	20 (100.0%)
		Day-shift	1 (25.0%)	1 (25.0%)	2 (50.0%)	0 (0.0%)	4 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (100.0%)
		Night-shift	0 (0.0%)	11 (68.8%)	4 (25.0%)	1 (6.3%)	16 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	16 (100.0%)

*

*: Difference between totals for the study ward and other wards ($p<0.05$).

Day-shift: 8:15 am to 5:15 pm. Night-shift: 5:15 pm to 8:15 am next day.