

Improving sleep quality relieves occupational stress in nurses of cardiac surgical intensive care unit.

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Abstract

Background: This study aimed to investigate the status and correlation between occupational stress and sleep quality of the nurses working in the cardiac surgical Intensive Care Unit (ICU).

Methods: Sixty cardiac surgical ICU nurses from two central hospitals in Shanghai were investigated by a general information questionnaire and the Occupational Stress Inventory Revised Edition OSI-R (OSI-R) and Pittsburgh Sleep Quality Index (PSQI) from October 2013 to February 2014. The Pearson's correlation was used to analyse the data.

Results: The total score of Occupational Stress Inventory Revised Edition (OSI-R) was 401.76 ± 24.98 . The scores of occupational role, personal strain and personal resource questionnaires were 147.88 ± 17.65 , 90.78 ± 12.59 and 114.78 ± 19.76 , respectively. The total score of PSQI was 6.26 ± 3.41 , which was significantly higher than that of the normal population of China ($P < 0.01$). The occupational role of cardiac surgical ICU nurses was negatively correlated with sleep efficiency ($P < 0.05$), and positively correlated with daytime dysfunction ($P < 0.01$) and SQI ($P < 0.05$). The individual stress response was negatively correlated with sleep duration ($P < 0.05$), and positively correlated with daytime dysfunction ($P < 0.01$). Personal resources were negatively correlated with sleep quality, time to fall asleep and sleep duration ($P < 0.05$), and positively correlated with sleep efficiency and sleep quality index ($P < 0.05$).

Conclusions: The occupational stress level and sleep quality of cardiac surgical ICU nurses are below the average level, and certain correlation exists between occupational stress and sleep quality. Improving the sleep quality of cardiac surgical ICU nurses is an effective way to relieve the occupational stress.

Keywords: ICU nurse, Cardiac surgery, Occupational stress, Sleep quality.

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Introduction

Occupational stress is a physiological and psychological pressure caused by the imbalance between the personal objective requirements and adaptability under occupational condition [1]. For nurses, the occupational stress refers to mental and physical imbalances, which is caused by the fact that the physiological and psychological diathesis of the nurse is not compatible with the requirement of practical work [2]. With the rapid development of social economy, occupational stress has become a new occupational hazard factor following chemical, physical and biological factors, etc. Current researches have demonstrated that occupational stress may cause many related diseases, which can seriously affect the work efficiency and health of nurses, resulting in sleep problems [3]. Because of the special working environment, high-intensity workload and other factors alike, the incidence of occupational stress and sleep problem of nurses in the cardiac surgery ICU is higher than that of the general ward

nurses [4]. In recent years, although scholars began to pay attention to the research on occupational stress and sleep quality of nurses, the research on their relationship is lacking. This research investigated the status and correlation between occupational stress and sleep quality of the nurses in cardiac surgical ICU to improve their sleep quality.

Material and Methods

Patients

Sixty cardiac surgical ICU nurses from two central hospitals in Shanghai were included from October 2013 to February 2014.

Inclusion criteria: Registered nurses, a working time in ICU of ≥ 0.5 years, the time of shift work lasting for \geq one month, and the informed consent.

Exclusion criteria: Learning in the other hospital during this survey, illness and pregnancy, postgraduates from other hospital, and trainees.

Rating scale

General information questionnaire was designed, which included information about gender, age, education, title, length of service, marital status and work nature. Occupational Stress Inventory Revised Edition (OSI-R) scale was used, which was compiled by the Osipow and revised by the West China School of Public Health, Sichuan University [5]. The revised version in China was used to measure the occupational stress, individual strain and strain capacity of the tested subjects, which together reflect the occupational stress (Cronbach's $\alpha=0.952$). The questionnaire was composed of Occupational Role Questionnaire (ORQ), Personal Strain Questionnaire (PSQ), and Personal Resource Questionnaire (PRQ). ORQ contained six items: heavy task, unadaptable task, ambiguous task, conflicting task, responsibility and work environment. PSQ contained four items: business, mental status, interpersonal relationship and physical stress response. PRQ also contained four items: the recreation, self-health care, social support and rational thinking. Each item contained ten entries, and a total of 140 entries were included, all of which were assessed with the 5-point Likert scale. The high scores of ORQ and PSQ reflected a higher level of occupational stress and stronger individual stress response. The high score of PRQ reflected a stronger coping ability of occupational stress and a lower the degree of tension.

Quality Pittsburg Sleep Index (PSQI) was designed by Buysse et al. [6], which consists of 7 aspects (18 entries in total), such as sleep quality, time to fall asleep, sleep time, sleep efficiency, sleep disturbance, hypnotic drug and daily functional disorder. The reliability and validity of the scale was verified by Liu et al. The Cronbach's α , a measure of internal consistency, was equal to 0.845. Each aspect was divided into 4 grades based on 0-3 point. The total score of the PSQI was obtained by adding the score of each aspect together (0-3 point), and it ranged from 0 to 21. The higher the total score was, the lower the sleep quality would be. The PSQI of ≤ 7 represented that the sleep quality was acceptable, and that of ≥ 7 points indicated that the sleep quality was low.

Investigation methods

Before the survey, the researchers received unified training, and they adopted unified instruction. The informed consent was acquired from the subjects, the researchers handed out the questionnaires, the subjects were required to fill out the questionnaires anonymously on their own, and the questionnaires were recovered on the spot after they were sealed. A total of 60 questionnaires were distributed, and were recovered, with a recovery rate of 100%.

Statistical analysis

SPSS 15.0 was used to analyse the data. The occupational stress scale and sleep quality index score of cardiac surgical ICU nurses with different characteristics was compared by with variance analysis. Comparison between the sleep quality index of cardiac surgical ICU nurses and the normal value of China was done with independent t test. The correlation between sleep quality and occupational stress in ICU nurses was done with Pearson correlation analysis. $P<0.05$ was considered significant.

Results

General information of Cardiac Surgical ICU nurses

Sixty nurses were included, and the male/female ratio was 5/55. The average age was 30.18 ± 7.15 years (range: 21 to 48), and 45 nurses were younger than 30 years. For educational level, five were graduated from technical secondary schools, 16 were graduated from junior colleges, 39 were undergraduates and or with a higher level. For professional rank, there were 32 nurses, 23 nurse practitioners, and 5 nurses-in-charge. For length of service, 20 worked more than 10 years, and 40 worked less than 10 years. For marital status, 33 were married, and 27 were unmarried. For the nature of work, 15 work on regular day shift, and 45 on alternating day and night shift.

Occupational stress scale and sleep quality index score of different cardiac surgical ICU nurses

The total score of OSI-R was 401.76 ± 24.98 . The scores of occupational role questionnaire, personal strain questionnaire and personal resource questionnaire were 147.88 ± 17.65 , 90.78 ± 12.59 and 114.78 ± 19.76 , respectively. The total score of sleep quality index was 6.26 ± 3.41 . The results showed that there were no significant differences in occupational stress among nurses with different gender, educational background and professional title ($P>0.05$), and there were significant differences in occupational stress among nurses with different age, length of service, marital status, work nature ($P<0.05$). There were no significant difference in sleep quality index among nurses with different gender, educational background, and professional title ($P>0.05$), and there were significant difference in sleep quality index among nurses with different age, length of service, marital status, and work nature ($P<0.05$) (Table 1).

Sleep quality index score of cardiac surgical ICU nurses

The total score of cardiac surgical ICU nurses was 6.26 ± 3.41 (range: 1 point to 17 points). Thirty-one nurses had a total score of above 7 points (52%). The sleep quality index score of the nurses was significantly different from that of the normal value in China [6] ($P<0.01$) (Table 2).

The status and correlation between occupational stress and sleep quality of the nurses in cardiac surgical ICU

The occupational tasks and sleep efficiency of ICU nurses were negatively correlated with sleep efficiency (P<0.05), and were positively correlated with daytime dysfunction (P<0.01) and total scores of PSQI (P<0.05). The individual stress

response was negatively correlated with sleep duration (P<0.05), and was positively correlated with daytime dysfunction (P<0.01). The individual response resources were negatively correlated with sleep quality, time to fall asleep and sleep duration (P<0.05), and was positively correlated with sleep efficiency and the total score sleep quality index (P<0.05) (Table 3).

Table 1. The occupational stress scale and sleep quality index score of cardiac surgical ICU nurses with different characteristics.

| Contents | N | Rate (%) | ORQ | PSQ | PRQ | PSQI |
|---------------------------------|----|----------|----------------|---------------|----------------|--------------|
| Gender | | | | | | |
| Male | 5 | 8 | 145.71 ± 20.57 | 91.12 ± 11.81 | 120.61 ± 22.70 | 6.51 ± 3.48 |
| Female | 55 | 92 | 145.20 ± 19.59 | 90.58 ± 12.37 | 118.11 ± 23.11 | 6.82 ± 2.68 |
| F | | | 1.165 | 1.538 | 1.947 | 1.161 |
| P | | | 0.321 | 0.151 | 0.06 | 0.325 |
| Age (years) | | | | | | |
| ≤30 | 23 | 38 | 144.91 ± 16.58 | 85.58 ± 12.39 | 119.43 ± 23.13 | 3.62 ± 2.70 |
| >30 | 37 | 62 | 150.38 ± 15.41 | 92.12 ± 11.84 | 112.72 ± 22.73 | 6.51 ± 3.51 |
| F | | | 10.571 | 11.651 | 10.698 | 19.278 |
| P | | | 0 | 0 | 0 | 0 |
| Educational status | | | | | | |
| Polytechnic school graduate | 5 | 8 | 142.62 ± 12.98 | 91.04 ± 15.23 | 111.27 ± 22.74 | 6.51 ± 3.52 |
| Junior college | 16 | 27 | 146.81 ± 14.27 | 91.12 ± 13.76 | 114.39 ± 22.75 | 6.47 ± 3.49 |
| Undergraduate and higher degree | 39 | 65 | 145.31 ± 14.51 | 90.58 ± 12.42 | 116.11 ± 23.16 | 6.69 ± 2.73 |
| F | | | 1.738 | 1.634 | 2.157 | 1.621 |
| P | | | 0.065 | 0.141 | 0.056 | 0.152 |
| Professional title | | | | | | |
| Nurse | 32 | 53 | 147.55 ± 11.97 | 91.62 ± 13.71 | 111.32 ± 23.13 | 6.55 ± 11.70 |
| Senior nurse | 23 | 38 | 146.35 ± 16.87 | 93.51 ± 12.91 | 114.55 ± 23.08 | 6.48 ± 17.13 |
| Supervisor nurse | 5 | 9 | 150.76 ± 21.51 | 91.54 ± 11.10 | 115.42 ± 18.83 | 6.39 ± 14.59 |
| F | | | 1.698 | 2.332 | 2.063 | 1.678 |
| P | | | 0.125 | 0.102 | 0.123 | 0.127 |
| Working time (years) | | | | | | |
| >10 | 20 | 33 | 145.37 ± 14.19 | 90.68 ± 15.51 | 120.11 ± 23.18 | 4.82 ± 2.75 |
| ≤10 | 40 | 67 | 154.01 ± 18.68 | 97.21 ± 12.67 | 112.61 ± 22.78 | 7.43 ± 3.56 |
| F | | | 15.817 | 10.712 | 11.658 | 12.578 |
| P | | | 0 | 0 | 0 | 0 |
| Marriage (n) | | | | | | |
| Unmarried | 27 | 45 | 150.26 ± 14.37 | 90.21 ± 12.69 | 118.86 ± 22.80 | 3.81 ± 3.58 |
| Married | 33 | 55 | 145.38 ± 13.21 | 95.68 ± 15.54 | 112.11 ± 23.21 | 6.93 ± 2.78 |
| F | | | 14.322 | 14.355 | 15.885 | 18.268 |

| | | | | | | |
|-----------------------------------|----|----|----------------|---------------|----------------|-------------|
| P | 0 | 0 | 0 | 0 | | |
| Working characteristic (n) | | | | | | |
| Day shift | 15 | 25 | 147.72 ± 13.62 | 88.68 ± 15.56 | 111.32 ± 23.23 | 3.82 ± 2.80 |
| Day/night shift | 45 | 75 | 161.17 ± 15.21 | 96.21 ± 12.72 | 119.43 ± 22.83 | 7.51 ± 3.61 |
| F | | | 18.758 | 11.625 | 11.697 | 23.531 |
| P | 0 | 0 | 0 | 0 | 0 | 0 |

Table 2. Comparison between the sleep quality index (x) of cardiac surgical ICU nurses and the normal value of China.

| Group | n | Sleep quality | Time to fall asleep | Sleep time | Sleep efficiency | Sleep disturbance | Hypnotic drug | Daily functional disorder | PSQI |
|------------------------------------|-----|---------------|---------------------|-------------|------------------|-------------------|---------------|---------------------------|-------------|
| Nurses in the cardiac surgical ICU | 60 | 1.15 ± 0.79 | 1.08 ± 0.82 | 1.39 ± 0.62 | 0.42 ± 0.59 | 1.08 ± 0.44 | 0.29 ± 0.53 | 1.47 ± 1.04 | 6.26 ± 3.41 |
| National norm | 112 | 0.63 ± 0.67 | 0.70 ± 0.86 | 0.70 ± 0.58 | 0.15 ± 0.47 | 0.45 ± 0.44 | 0.06 ± 0.24 | 0.73 ± 0.83 | 3.88 ± 2.52 |
| t | | 12.861 | 11.773 | 17.754 | 4.922 | 15.891 | 3.873 | 16.881 | 18.072 |
| P | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 3. The correlation between sleep quality and occupational stress in ICU nurses (R).

| Contents | Occupational task | Individual stress response | Individual response resources |
|---------------------------|-------------------|----------------------------|-------------------------------|
| Sleep quality | 0.058 | 0.043 | -0.208* |
| Time to fall asleep | 0.027 | 0.034 | -0.232* |
| Sleep time | -0.02 | -0.087* | -0.239* |
| Sleep efficiency | -0.075* | -0.005 | 0.176* |
| Sleep disturbance | 0.582 | 0.051 | 0.012 |
| Hypnotic drug | 0.039 | 0.002 | 0.054 |
| Daily functional disorder | 0.112** | 0.097** | 0.019 |
| Total scores | 0.079* | 0.057 | 0.082* |

Note: *P<0.05; **P<0.01

Discussion

Analysis of the occupational stress of cardiac surgical ICU nurses

Our research showed that there were significant differences in occupational stress among nurses with different age, working time, marital status and work nature. However, there were no differences in occupational stress among nurses with different gender, educational background and professional title. With the increase in age of the cardiac surgical ICU nurses, occupational stress level was significantly increased. There are two reasons for the results. First of all, the nurses with an age < 30 years spent a short time on clinical practice, and are engaged in basic nursing work with low technical content, such as oral and perineal care. Second, most of nurses with an age ≥ 30 years play an important role in working and teaching, which not only take on heavy nursing work in the front line, and need to

handle the emergencies of critically ill patients, but also undertake responsibilities of training junior nurses. In addition, they are confronted with a series of family problems such as marriage problems, childbirth, and child rearing and education. Therefore, their occupational stress level is high. For the length of service, the level of occupational stress is consistent with a growing age. Different marital status has different effects on occupational stress level. The occupational stress level of single nurses is low, because there may be lower economic pressure and more free time, and they can relax themselves with more recreation. On the other hand, the married nurses have to face variable problems such as children's education and family economic pressure, which makes them have little time to relax themselves, leading to a higher occupational stress level. For the different nature of work, occupational stress of cardiac surgical ICU nurses on daytime/night shift is higher. Because work in night may cause endocrine disorders, making

them feel fatigue and anxious. Also, the frequent night shifts make the nurses have a little leisure time.

Analysis of sleep quality of cardiac surgical ICU nurses

This study showed that the sleep quality index score of cardiac surgical ICU nurses was significantly higher than the normal value of China ($P < 0.01$), and 31 patients (52%) had sleep problems, which was higher than the percentage reported by Liu et al. The results showed that the age, length of service, marital status and work specialty are important factors that affect the sleep quality of cardiac surgical ICU nurses, which may be related to the special nature of cardiac surgical ICU nursing. After heart surgery, which is a kind of fine surgical operation, the patients' condition changes fast, emergencies often occur, and the nurses often need to deal with dead and dying patients. Therefore, the nurses need to be adaptable, and ready to undertake the rescue tasks. The elder nurses with longer length of service have rich work experience and solid foundation of specialized knowledge can handle the emergencies easily. On the other hand, younger nurses with short length of service lacks a strong strain capacity, which leads to a high level of stress in the work, leading to an increase in the pressure, and cannot sleep at night.

In addition, because the number of nurses working on middle/night is small, the patients are always unstable in early morning, and the nurses have to bear a larger workload while they feel fatigue, their body and mind are under great pressure. They cannot adjust themselves immediately during the day; therefore, when they try to fall asleep, the brain cortex is excited, and they need a longer time to fall asleep, and even need to take sleeping pills to help sleep, which further affects the work of the second day, resulting in a vicious cycle [7]. It was reported that the shift lead to sleep disorders, seriously affecting the body's biological rhythms and human biological clock, and most of night shift nurses will have different degrees of neurasthenia, gastrointestinal tract disorders, endocrine disorders, and low immunity [8].

The status and correlation of occupational stress with sleep quality of the nurses in cardiac surgical ICU

The reliability and validity of PSQI was verified by Lu et al. [9]. It is suitable for Chinese population. The occupational tasks and sleep efficiency of ICU nurses were negatively correlated with sleep efficiency ($P < 0.05$), and positively correlated with daytime dysfunction ($P < 0.01$) and total scores of PSQI ($P < 0.05$). The individual stress response was negatively correlated with sleep duration ($P < 0.05$), and significantly positively correlated with daytime dysfunction ($P < 0.01$). Dang et al. [10] believe that long-term poor sleep can cause anxiety, agitation, irritability, and other negative emotions in the workplace. Kimil et al. [11] also hold that people with low sleep quality have a negative attitude towards things. As the negative attitude is closely related to mental diseases, the nurses with low sleep quality can easily feel dissatisfied and even disgusted and have other negative

feelings. With the increase in the burden of occupational tasks and the individual stress response, sleep problems become more and more serious, leading to a vicious circle. The results showed that the individual response resource was negatively correlated with sleep quality, the time to fall asleep, and sleep time ($P < 0.05$), and positively correlated with sleep efficiency and the sleep quality index score ($P < 0.05$), which indicates that if the nurses are unable to deal with the problems, they will experience more negative emotions, which then affects their sleep quality. As a result, the gradual increase in the severity of the sleep problems leads to difficulty in maintaining a good working status and in focusing attention. Instead, they are more likely to experience frustration, thus increasing the degree of occupational stress.

Measures to reduce the occupational stress of cardiac surgical ICU nurses and to improve the sleep quality

The first step to reduce the occupational stress of cardiac surgical ICU nurses and to improve their sleep quality is to schedule the work reasonably to reduce the labor intensity of the nurse. Occupational stress is an important factor of sleep problems, which not only affect their physical and mental health, but also decline work efficiency, thus affecting the quality of care [3]. Therefore, it is significant to ease the occupational stress of ICU nurses and to improve their sleep quality. Maslach et al. [12] showed that support from their superior was more important than that from colleagues when nurses were handling the work stress. Therefore the superiors of nurses should create a harmonious and warm environment, and increase the number of nurses to obtain a ratio of nurse to bed in ICU of 2~2.5:1 [13]. The standards for admittance into ICU should be formulated, and nurses must complete the specialized training before working in ICU. The mode of responsibility system could be adopted to arrange nursing shifts scientifically, to make sure that experienced nurses and inexperienced ones work in the same group to learn from each other [14]. Advanced technologies, such as computer technology and drug distribution system, can be used to improve the efficiency of nursing work [15]. Meanwhile hospital logistics support system, such as venous allocation center and drug transportation, can be strengthened to reduce the labor intensity and load, so as to reduce occupational stress and sleep problems of cardiac surgical ICU nurses.

Secondly, it is important to carry out standardized education and mental health training, to help the nurses adjust their mental state. This study shows that occupational tasks, sleep problems and the ability to cope with stress are closely related. Therefore, head nurses should pay more attention to the occupational tension of subordinates, and be aware of the effect of daytime/night shift on the sleep and health of the nurses. They can help the nurses to adjust their mental status, and to improve their ability to handle the work. Research showed the recovery effect of short nap on sleep deprivation, which is helpful to maintain the work capacity and the level of alertness [16]. If the nap is scheduled at 2:00 AM in a day when people are most likely to fall asleep, best effect can be

achieved [17]. Therefore, nursing managers can make nurses work in pairs and rest alternately to minimize the night sleep deprivation, and to reduce the occupational stress. On the other hand, we should strengthen the health education to reduce the effect of the night shift on the quality of sleep, so as to reduce the influence of sleep on occupational stress. Studies have shown that before continuous work or the work that easily disturbs sleep rhythm; sleep for more than 4 h can obtain good preventive effect [18]. The physical training under the condition of sleep deprivation can enhance the psychological endurance, and alleviate the negative effect of sleep deprivation on physical ability. Secondly, nursing managers can provide various kinds of education and training, for example, they can invite professional psychological experts to give lectures every three months to guide the nurses to release stress and relax themselves, thus to ensure that nurses have the skills to cope with stress. In addition, they can often organize discussion to provide a reasonable way to vent [19]. At the same time, they can help the nurses to build up a positive attitude, and continuously encourage themselves. The head nurses can give timely encouragement and praise to nurses at their progress. Ni et al. [20] show that, the verbal encouragement from the head nurses can obtain better effect than material reward in helping nurses to eliminate negative emotions caused by work pressure.

Finally, humanized management should be used to improve the status and benefits of nurses. Hu et al. [21] believe that if the nurses receive more encouragement and recognition, they will be more positive in facing the work pressure. In today's society, prejudice against nurses still exists. Therefore, the hospital administrators should value the nursing work by treating the nursing work and medical work equally. They can make use of news media to report successful nursing cases to enhance the public's trust in nurses, and improve the patient's respect for the nursing work [22]. At the same time, nurse's salary and benefits can be improved, to make them realize that their income matches their pay [23]. In addition, hospital trade unions should provide a variety of entertainment and leisure opportunities regularly, to help reduce the pressure and occupational stress of ICU nurses, and to maintain their physical and mental health.

There are also some limitations of the current research. First of all, the study only covers two general hospitals in Shanghai with a relatively small sample size. Thus, further studies with a larger sample are needed to verify the conclusion of this study. Secondly, this study is a cross-sectional research and the reliability may be relatively poor, thus the results cannot be generalized to a larger population. Third, the number of male nurses in this study is small. In the future studies, the percentage of male nurses can be increased to investigate their occupational stress and sleep quality.

Conclusions

The occupational stress level and sleep quality of cardiac surgical ICU nurses are below the average level, and certain correlation exists between occupational stress and sleep

quality. Improving the sleep quality of cardiac surgical ICU nurses is an effective way to relieve the occupational stress.

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