

DIFFERENT EFFECT OF SHIFT WORK ON FATIGUE AND WORK RELATED STRESS IN EMERGENCY ROOM NURSES AT THE HOSPITALS IN BADUNG AND DENPASAR REGENCY, BALI, INDONESIA

I Gusti Ngurah Juniarta^{1*}, Teguh Wahyu Sardjono², Dewi Kartikawatiningsih³

¹Master Nursing Student, Faculty of Medicine, Universitas Brawijaya

²Lecturer, Department of Parasitology, Faculty of Medicine, Universitas Brawijaya

³Lecturer, Department of Nursing, Faculty of Medicine, Universitas Brawijaya

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*Correspondence:

I Gusti Ngurah Juniarta

Postgraduate Program, Faculty of Medicine, Universitas Brawijaya

Jalan Veteran, Ketawanggede, Kecamatan Lowokwaru, Kota Malang, Jawa Timur 65145

Email: ngurah_juniarta@yahoo.com

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ABSTRACT

Background: Shift work is a way to maintain proper health care daily at hospital. Shift work may affect fatigue level of nurse and work related stress in Emergency Room (ER) nurses. Generally there are two types of shift work, such as two and three division time a day. The three-division time shift includes 6-6-12 shift and 7-7-10 hours shift, and two-division time includes 12-12 hours shift. Lack of studies discusses about shift work on fatigue and work related stress in ER nurses.

Objective: The aim of this study was to identify the differences of the effects between 6-6-12 shift, 7-7-10 shift, and 12-12 shift on fatigue and work related stress, and determine the dominant indicator influencing fatigue and work related stress in emergency nurses at the hospitals in Badung and Denpasar regency, Bali Indonesia.

Methods: This was an observational analytic study with cross sectional approach. Purposive sampling was done to recruit 102 nurses from eight emergency departments at Badung and Denpasar regency. Occupational Fatigue Exhaustion Recovery (OFER) questionnaire was used to measure fatigue, and Expanded Nursing Stress Scale (ENSS) questionnaire was used to measure work related stress. Univariate analysis was used to analyze demographic characteristics of each ER. Kruskal-Wallis test with post hoc Mann Whitney were used to determine the different score of fatigue and work related stress between each group, and Structural Equation Modeling (SEM) was used to identify contribution of fatigue toward work related stress of ER nurses.

Results: There were significant difference of the effect of shift work on fatigue, between 6-6-12 shift and 12-12 shift with $p = 0.037$, and between 7-7-10 shift and 12-12 shift with $p = 0.003$; and significant difference of the effect of shift work on work related stress, between 6-6-12 shift and 12-12 shift with $p = 0.474$, and between 7-7-10 shift and 12-12 shift with $p = 0.128$. SEM results show that fatigue contributed about 61% to increase work related stress in ER nurses.

Conclusion: There was significant difference of the effects on fatigue between two and three-division time of shifts, and there was no difference of the effect on work related stress for each group. Fatigue statistically increased work related stress in ER nurses.

Keywords: shift work, emergency nurse, fatigue, work related stress

INTRODUCTION

Emergency Room (ER) is a special unit in every hospital that gives 24-hour health service, and, to support its optimal service, shift work is applied ([von Treuer, Fuller-](#)

[Tyszkiewicz, & Little, 2014](#)). Shift work, although having a positive impact, also has a negative impact for ER nurses as a profession that have shift work. Some of the negative

impacts identified from the application of shift work such as increased blood pressure and pulse rate, physiological headache, changes and decreased sleep time, risk for weight gain, increased work related stress and increased fatigue for nurses who works in the ER ([Kim et al., 2013](#)). Among those impacts, fatigue and work related stress become a concern nowadays in emergency nurses.

Viewed from its type, most of the shift work applied in Indonesia is a rotational shift work and characterized by dividing working hour to two or three times a day ([Dillingham, 2017](#)). According to the preliminary study at several hospitals in Badung and Denpasar regency, there are two kinds of shift work that is applied, namely: 1) shift work that divides working hour become three times a day, such as six hours for morning shift, six hours for noon shift, and twelve hours for night shift (6-6-12); and seven hours for morning shift, seven hours for noon shift, and ten hours for night shift (7-7-10). 2) shift work that divides working hour into two times a day, 12 hours for half day shift and 12 hours for night shift (12-12). The 6-6-12 shift is applied in Surya Husadha Hospital, Prima Medika Hospital, BaliMed Hospital, and Kasih Ibu Hospital; the 7-7-10 shift is applied at Bali Royal Hospital (BROS) Denpasar, and Siloam Bali Hospital, and 12-12 shift is applied at BIMC Hospital in Kuta and BIMC Siloam Hospital in Nusa Dua.

Based on the results of a survey conducted in the United Kingdom, out of 700 nurses, as many as 60% (420 people) experienced work related stress ([Ford, 2014](#)). In addition, another study conducted in Brunei states that nurses who work in the ER are 4 times more likely to experience violence from patients and their relatives compared to nurses working in other rooms, and 2.8 times more likely to experience work-related fatigue ([Rahman, Abdul-Mumin, & Naing, 2017](#)). Other literature also mentions that ER nurses tend to experience fatigue more quickly and 66% higher work related stress than nurses working in wards ([Weigl & Schneider, 2017](#)). In this case, it can be said that the ER nurse is one of the health professions who work with shift and are at risk

to get stress and fatigue ([Salilih & Abajobir, 2014](#)).

Fatigue and work-related stress are the problems not only for nurses as a shift worker, but also for quality of care in hospital. However, fatigue can also affect work related stress of ER nurses ([Undap, Ratag, & Kawatu, 2016](#)). ER is a unit with full stressors; such as process of handling patients in limited time, unexpected number of patients, and also types of complaints that vary from all patients, which requires a quick decision-making. All of these things will increase fatigue and work related stress. In fact, more problems will be coming if fatigue and work related stress occur continuously, which will result in chronic fatigue or exhaustion ([Debora, 2016](#)). If it is not immediately identified and solved, both of these factors obviously will affect patient safety in the hospital.

Additionally, working long hours will incriminate the physical and mental of nurses, especially if the number of patients out of the capacity of the ER. It can also raise the conflict between professions in the ER team. In addition, the lack of time to socialize both in the family and the community become one of the impacts of the shift work.

Based on the results of preliminary study, researcher also obtained information that the measurement and evaluation of fatigue and work related stress of nurses in ER are never been done. Therefore, this study aimed to compare the effect of shift work on fatigue and work related stress, and determine the dominant indicator for each shift work groups in emergency rooms of the hospitals in Badung and Denpasar regency.

METHODS

Study design

This research was a quantitative research with observational analytic design and cross-sectional approach. This research was conducted from January 20th, to February 27th,

2018 in eight Emergency Rooms of the hospitals at Badung and Denpasar regency.

Conceptual framework

Emergency nurses work in shift work, which leads to fatigue as one of its negative effect. There are three indicators affecting the level of fatigue, namely: i) Chronic fatigue condition, which is from accumulation of fatigue that ER nurses feel from work, ii) Acute fatigue condition, which come directly after work, and iii) Intershift recovery, which is the time needed to recover after work. Those three indicators will affect fatigue level as long as they work. Besides, the other important problem, which may affect quality of care, is work related stress. According to Expanded Nursing Stress Scale (ENSS) questionnaire, there are 9 indicators were identified as condition which can influence work related stress of ER nurses. These indicators were 1) lack of experience related to death and critical condition, 2) conflict with other professional, 3) feel lack of preparation to support patient or patient family emotionally, 4) problems with fellow co-workers, 5) conflict with the supervisor, receiving minimal support from administrator, 6) working more due to lack of organizational capability, unfamiliarity with work units, staffing and unexpected scheduling in new complex work environments, 7) uncertainty of care and less information related to the patient's health condition, 8) fear of failure to do nursing intervention because patients and their families make unreasonable requests, and 9) experiencing discrimination and isolation. From these indicators, lack of studies conducted in Indonesia to determine dominant indicators influencing fatigue and work related stress in ER nurses.

Sample

The total sample of this study was 102 ER nurses selected using purposive sampling technique from eight hospitals. The inclusion criteria were functional nurses who worked based on shift, had experiences in morning, noon, and night shift, had working experience in ER at least for three months, and agreed to become a respondent by signing informed consent. The exclusion criteria were nurses in

charge as a leader or structural in ER and also functional nurses who took a break/annual leave from work.

Measurement

A demographic questionnaire was used to describe respondents' age, sex, education level, marital status, and length of working experience. Occupational Fatigue Exhaustion Recovery (OFER) questionnaire was used to measure fatigue ([Winwood, Winefield, Dawson, & Lushington, 2005](#)), and Expanded Nursing Stress Scale (ENSS) questionnaire was used to measure work related stress score of ER nurse ([French, Lenton, Walters, & Eyles, 2000](#)). These questionnaires were translated to Bahasa Indonesia before used by English proofreader from Pusat Pelatihan Bahasa Brawijaya University. The validity of instruments was tested on 25 respondents so that the degree of freedom (df) is 23, then r_{table} value used was 0.396. For OFER questionnaire, all 15 statements had $r_{value} > r_{table}$ so that all of these statements were valid. But for ENSS, one of total 59 statements was not valid ($r_{value} < r_{table}$), then only 58 statements were valid. The reliability test for the two questionnaires was conducted by comparing Cronbach's alpha value with r_{table} (0.396). The statistic results showed Cronbach's alpha value of >0.396 . Thus, all questionnaires were valid and reliable.

Ethical consideration

This study was approved by the Ethics Committee in the Faculty of Medicine, Udayana University with ethical clearance no: 104/UN.14.2/KEP/2018. Informed consents were performed in each respondent before data collection.

Data analysis

Kruskall Wallis test and post hoc with Mann Whitney with $\alpha \leq 0.05$ were used to determine the difference of score of fatigue and work related stress between three groups of ER nurses based on their shift work. Structural Equation Modeling was used to determine the dominant indicator that influences fatigue and work related stress. In multivariate analysis, each variable and its indicators were given a

code to make the analysis easier. Independent variables were transformed into dummy variables, from three variables become two variables. Dummy 1 stands for 6-6-12 shift group with code 1 and others are 0; Dummy 2 stands for 7-7-10 shift group with code 1 and others are 0. As for dummy variables were created, it could be said that 12-12 shift group becomes a comparison group. Fatigue variable was given a code F, and for its indicators were given code F1 (Chronic fatigue condition), F2 (Acute fatigue condition), and F3 (Intershift recovery). Work related stress was given a code S, and for its indicators were given code S1 (Lack of experience related to death and critical condition), S2 (Conflict with other professional health such as surgeons and doctors), S3 (Feel lack of preparation to support patient or patient family emotionally), S4 (Problems with fellow co-workers), S5 (Conflict with the supervisor, receiving minimal support from administrator), S6 (Working more due to lack of organizational capability, unfamiliarity with work units, staffing and unexpected scheduling in new complex work environments), S7 (Uncertainty

of care and less information related to the patient's health condition), S8 (Fear of failure to do nursing care because patients and their families make unreasonable requests), and code S9 (Experiencing discrimination and isolation).

RESULTS

As shown on Table 1, most respondents on this research are males as many as 65 nurses (63.7%), Majority of respondents aged 26-35 years as many as 73 people (71.6%), and had bachelor level as educational background as many as 53 people (52%), and were married as many as 58 respondents (56.9%). In addition, the respondents had working experiences for 25-48 months as many as 34 people (33.3%). Mostly respondents in Surya Husadha Hospital were working on 6-6-12 shift, BROS Hospital in 7-7-10 shift, and BIMC Nusa Dua in 12-12 shift. Bivariate analysis result were shown in Figure 1 and Figure 2 with box plot.

Table 1 Respondents' Characteristics (N =102)

Characteristics	Shift Work 6-6-12			Shift Work 7-7-10		Shift Work 12-12		Total (%)	
	Surya Husadha		BaliMed	BROS	Siloam	BIMC Kuta	BIMC Nusa Dua		
Sex									
a. Male	10	3	6	12	11	9	8	6	65 (63.7)
b. Female	11	5	4	6	7	4	-	-	37 (36.3)
Age (year)									
a. 17-25	1	1	8	3	3	2	1	3	22 (21.5)
b. 26-35	17	7	2	14	14	11	6	2	73 (71.6)
c. 36-45	3	-	-	1	1	-	1	1	7 (6.9)
Education Level									
a. Diploma 3	11	2	5	13	4	7	3	4	49 (48)
b. Bachelor	10	6	5	5	14	6	5	2	53 (52)
Marital status									
a. Married	15	5	2	14	9	4	7	2	58 (56.9)
b. Single	6	3	8	4	9	9	1	4	44 (43.1)
Work experience (month)									
a. 3-24	2	1	4	4	3	1	-	-	15 (14.7)
b. 25-48	5	4	5	1	9	4	3	3	34 (33.3)
c. 49-72	5	1	1	2	2	8	1	-	20 (19.6)
d. 73-96	2	1	-	4	3	-	3	2	15 (14.7)
e. 97-120	1	1	-	4	-	-	-	1	7 (6.9)
f. > 120	6	-	-	3	1	-	1	-	11 (10.8)
	21	8	10	18	18	13	8	9	102 (100)

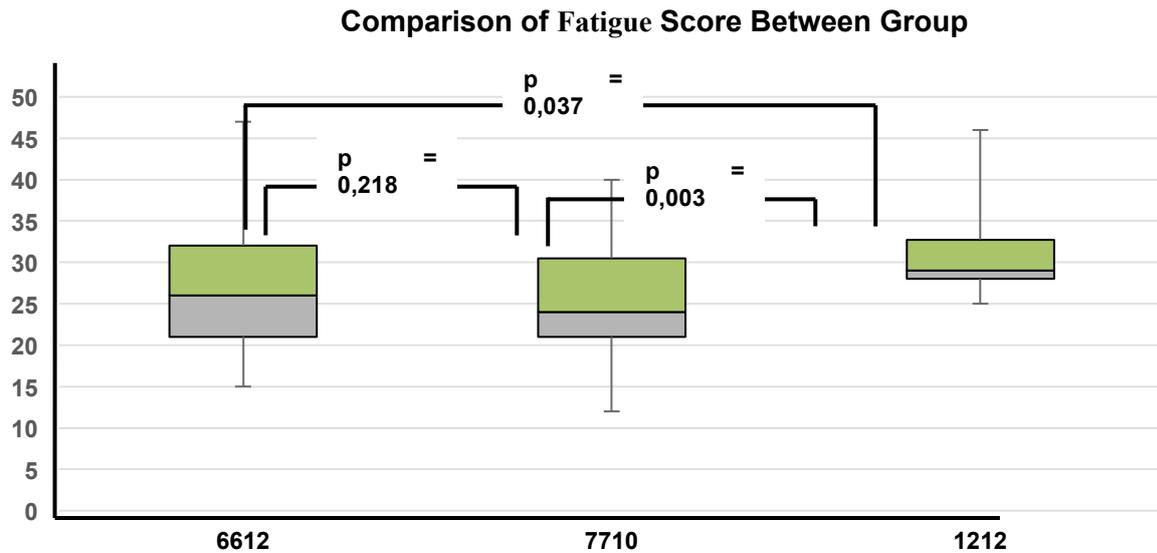


Figure 1 Difference of Fatigue Score Between Shift Work Groups

Figure 1 shows that there was a significant difference in fatigue score between the 6-6-12 shift group and 7-7-10 shift group against shift 12-12 group ($p < 0.05$). There was no significant difference between 6-6-12 shift and

7-7-10 shift group ($p = 0.218$). From the figure 1, it shows that the 12-12 group has slightly a higher score than 6-6-12 and 7-7-10 shift groups.



Figure 2 Differences of Work Related Stress Score Between Shift Work Group

Figure 2 shows that there was no significant difference of work related stress score between three shift groups ($p > 0.05$). It can be said that shift work affects work related stress, but there

was no different score between these groups. For multivariate analysis results were shown in figure 3.

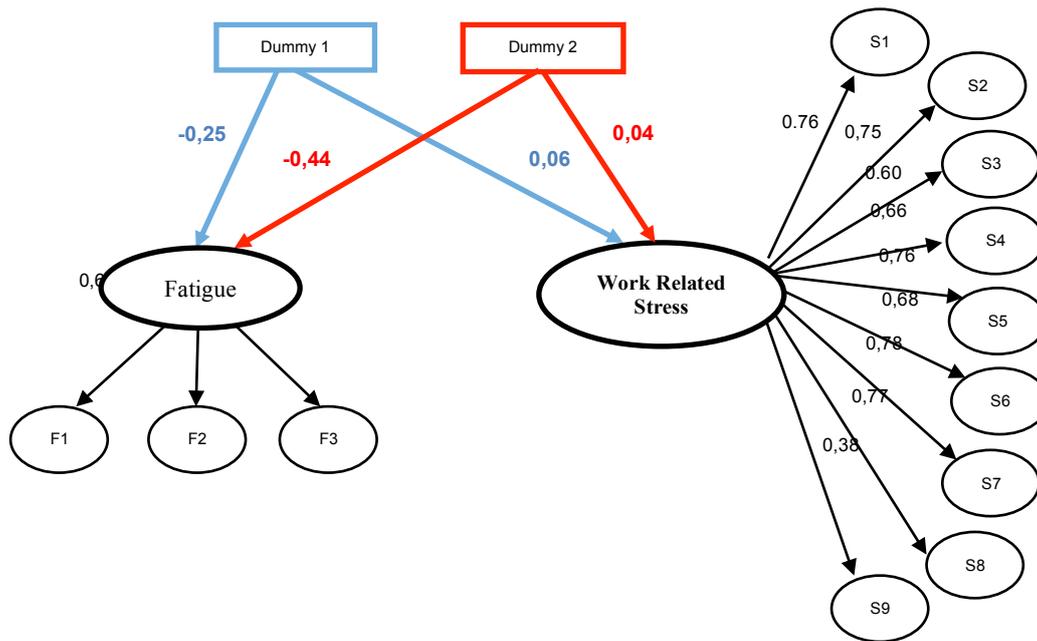


Figure 3 Results of Multivariate Analysis with SEM

SEM analysis results shows that the most dominant indicator increasing the nurse's fatigue was chronic fatigue condition (F1) with value of 0.62. For the work related stress, the most influencing indicator was the uncertainty of care and less information related to the patient's health condition (S7) with a value of 0.78. In Dummy 1 and Dummy 2 variables which lead to fatigue variable, the difference value results in negative which means 12-12 group were more tiring compared to the 6-6-12 and 7-7-10 group with value of -0.25 and -0.44 respectively. As for work related stress, the difference between three shift groups was not too significant. The different value was positive, which means that 6-6-12 shift group and 7-7-10 shift group have a slightly higher stress score when compared to 12-12 group. In other words, although the difference in fatigue score was significant for the three groups, work related stress between the three groups was not statistically different.

DISCUSSION

In accordance with the results of Kruskal-Wallis bivariate analysis with post hoc Mann-Whitney, there was statistically significant

difference in fatigue score between three groups with value of $p < 0.05$. Besides, it can be seen between the group of 6-6-12 and group of 7-7-10 that the fatigue score was not significantly difference ($p = 0.218$). It can be explained that the longer duration of daily shift work will result in a significant increase in fatigue, especially for nurses who work in the ER (Pryce, 2016). The same result also found in previous research conducted in Surakarta, which states that there was a significant influence ($p = 0.001$) between the shift work toward the level of fatigue of nurses (Prमितasari & Sri Darnoto, 2016). In this case, it can be said that the longer duration of work performed by a nurse in an environment with high stressors such as the ER, fatigue will increase significantly.

Generally, nurses are required to provide optimal services for patients who come to the ER. However, as one effect of shift work, fatigue could decrease nurse capacity to maintain a comprehensive service (Antill, 2016). It is said that the decrease in nurse ability to perform optimal services is influenced by the duration of work and the duration of rest. Shift work will affect the duration of work as well as the optimal

recovery time required by a nurse after work. Similar with previous study stated that the main cause of fatigue in nurses is the change in circadian rhythm, which lead to change the quality and quantity of sleep, individual health, work environment, and workload in the environment ([Yumang-Ross & Burns, 2014](#)). Canadian Nurse Association also mentions that the existence of a shift work will affect sleep patterns, individual stress, work patterns, and demands from the work ([CNA, 2008](#)).

Viewed in terms of duration of work time, 12-12 shift has longer time of night work or curfew compared to 6-6-12 shift and 7-7-10 shift. Curfew is a biologically clock of human to sleep and recover their physic and mental after daily activities. The existence of longer night shift will certainly result in changes in the circadian rhythm. Study said that the longer night shift work they get, shift workers will experience chronic fatigue higher than nurses who rarely get night shift ([Øyane, Pallesen, Moen, Åkerstedt, & Bjorvatn, 2013](#)). This is the reason why fatigue score was higher on 12-12 shift than 6-6-12 shift and 7-7-10 shift group.

Every single nurse has their own resilience in managing fatigue, it might be the reason why the data distribution for fatigue scores uneven for each group. Seen from the duration of work, 12-12 shift group was higher than 6-6-12 shift and 7-7-10 shift group. In a week, nurses with 12-12 shift work three to four times, and the rest are off or free day. Although the duration of the free day can be said to be longer than the shift 6-6-12 and shift 7-7-10 groups, nurses with shift 12-12 are expressed their feeling that they are more tired due to previous work accumulations. Besides, there is an irregular schedule that leads unbalanced between work hours and recovery time, which is caused by the hindrance that comes from nurses. For example, the nurses who should have a morning shift, because of something like religious activities, cultural activities, family events, or illness so that he/she switch their schedule to another day or exchanged with other nurses or applying for annual leave. This event could affect the duration of work, as

well as the duration of rest in the future. In accordance with Yumang and Burns statements, this irregular shift work hours, and longer duration of work than rest periods are the main factors leading to chronic fatigue in nurses ([Yumang-Ross & Burns, 2014](#)).

Nurse work related stress is a problem as well as a challenge for the management of an organization particularly in the hospital. Based on results of the analysis, it is statistically showed that there was no significant ($p > 0.05$) difference in score between each group. This may be due to difference of workload, work duration each shift, and self-motivation. Supported by previous research results indicated that workload, work motivation, and different work environment will affect the work related stress of a nurse ([Murharyati & Kismanto, 2015](#)). First, from the workload, according to the data obtained during the study, 6-6-12 shift group has the number of visits ranged from 400 to 1574 patients per month or equivalent to 13 to 53 patient visits per day. The 7-7-10 shift group has the number of visits ranged from 944 to 1583 patients each month or about 32 to 53 patient visits per day., and 12-12 shift group has the number of visits ranged from 150 to 481 patients per month or equivalent to 5 to 16 patient visits per day. From those data, it is concluded that the number of patient visits for 12-12 shift group significantly less compared with 6-6-12 and 7-7-10 shift group visits. According to the previous study, the number of patients who come in a day will affect the workload of the nurse, so it can be said that the nurse group with 6-6-12 and 7-7-10 shift have higher workload than 12-12 shift group ([Prमितasari & Sri Darnoto, 2016](#)).

Second factors that increase work related stress is duration of the work. It is said that work duration will change nurses' circadian rhythm and cortisol's level. There was a significant increase in cortisol level from the day off to the first and subsequent work first and significantly decreased after shift work towards holidays and off after night shift ([Marchand, Durand, & Lupien, 2013](#)). These results are also supported by another study

which reveals that the longer the duration of recovery time for shift worker, the more optimal the person's performance will be ([Lombardi et al., 2014](#)). Based on recent study, it is said that the working hours and workload arrangements for each time of shift are not the same. This will lead to differences in coping mechanisms, differences in fatigue levels and of course different levels of work related stress. If connected to the situation in ER, which is characterized by unpredictable amount of patients, unpredictable emergency cases, different patient triage systems, priority mechanism of patient handling, fast decision making, and heavy workload, nurse will get fatigue easily than nurses' who work in other units. In other words, work related stress would continue to occur as long as a person works with a shift, but will decrease with sufficient recovery time ([Rodwell & Fernando, 2016](#)).

The last one is self-motivation as a reason why there is no difference in work related stress scores between each group. Self-motivation is an internal factor of nurses ([Gunawan, 2016](#)). Because of this factor nurse will give optimal effort to finish all their jobs ([Drake, 2017](#)). In addition, to achieve a goal, a person with high self motivation will have a strong desire to achieve something, then begin to assess the risks from efforts by taking the most minimal portion of risk, taking the initiative movement and always be prepared when the opportunity has arrived ([Cooper, 2015](#)). The existence of self-motivation will also help to realize the purpose and reason why a person survives despite unfavorable conditions. Similarly, in this study, nurses group with 12-12 shift even though their fatigue scores are higher than group of 6-6-12 and 7-7-10 shifts, because of their self motivation was high enough, work related stress score was not significantly different in each group.

Based on the results of multivariate analysis, each type of shift work can affect nurse's fatigue and work related stress. Shift work plays an important role in increasing and decreasing fatigue and work related stress from nurses. In SEM analysis, groups with 12-12

shift have fatigue score higher than group with 6-6-12 and 7-7-10 shift, shown by the difference value on dummy variables, which is -0.25 and -0.44. In other words, the work duration becomes a factor, which greatly affects the fatigue of ER nurses ([Øyane et al., 2013](#)). The longer work duration on one day will affect the nurse's fatigue, which further affects their performance, decreases quality of services, and increases the negative risk to the patient and the ease of conflicts within teammate ([Caruso, 2014](#); [Pryce, 2016](#)). A nurse who works with a shift will experience a change of time to rest and sleep. The nurse will undergo a process of adaptation ranging from rest period changes, sleep quality and quantity, changes of heart rate frequency, chemical changes in the body such as cortisol and adrenaline. From the changes in the circadian rhythm, the nurse will experience tired, lackluster, muscular weakness and cognitive function, all of which are a definition for fatigue ([Antill, 2016](#)).

In accordance with SEM analysis, the indicator that plays a significant role in improving work related stress is an uncertainty of care and less information related to the patient's health condition. For this indicator, some points that include in this are the lack of exposure to information from doctors regarding the health status of patients, doctors who are absent in emergency situations, thus making the nurses fearful of making mistakes in treating patients. Similar statements are also mentioned by Stiehl said that about the problem in the delivery of information by doctors to nurses will affect the results of patient care in the ER ([Stiehl, Forster, Stiehl, & van Walraven, 2003](#)). It can be explained that uncertainty of care caused by the lack of communication between team can affect the response given by nurse to the patients. As we know, nurse is the closest health profession and interacts directly with the patient for 24 hours. If there is a miscommunication between team, nurse will be the first one to be blamed by patients. Another point that became the vital point was the presence of doctors in the ER, most respondents answered the absence of doctors when the emergency situation as a cause of

their stress while working in the ER. The nurse will feel in a burden and dangerous position when the responsibility to make a decision is submitted to them. All of these points are indicators of uncertainty of care process, which can lead to feeling guilty if bad happen after the decision was made, and lastly become the most indicators of work related stress for nurse in this study. As we know the most indicators, which contribute, to increase work related stress of ER nurses, it must become a concern by ER team as well as hospital management team as well. Based on this findings, management of each hospitals must conduct an evaluation about nurse's fatigue and work related stress especially in ER periodically to prevent negative effects on quality of care.

CONCLUSION

There is a significant differences score of fatigue between shifts that divided their work hour into three times a day toward group of shift that divided their work hour two times a day. But there is no significant differences score of work related stress between each group were studied. Chronic fatigue condition becomes dominant indicator of nurse's fatigue, and uncertainty of care and less information related to the patient's health condition become dominant indicator of work related stress.

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