

CURRENT STATUS OF WORKING ENVIRONMENT AND CHRONIC FATIGUE FOR NURSES IN CLINICAL CARE

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Abstract Nurses work 23.4 hours of overtime on average per month (Japanese Nursing Association, 2009), which is 13.2 hours longer than the monthly average for general workers (The Ministry of Health, Labor and Welfare, 2013). The purpose of this study is to clarify the current status of the working environment and chronic fatigue for nurses in clinical care. The questionnaire was anonymous and self-administered. The contents of the question are attributes, working environment and chronic fatigue. A total of 1676 female nurses working at 117 different general hospitals located in Japan, participated in our survey. It was found that nurses are not able to fully recover from fatigue and chronic fatigue is likely to accumulate when the following conditions are relevant: they are in their 20s, they work under the working environment with overtime (the time to leave work is irregular) for 20 hours or longer on average per month, or they work on a three-shift pattern. It is necessary to adjust the environment in an organization or society including working structure by paying attention to characteristics of individual fatigue.

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Key words: work environment; chronic fatigue; nurse.

原 著

臨床における看護職者の勤務環境と慢性疲労の現状

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抄録 看護師の時間外勤務の時間は月平均23.4時間(日本看護協会, 2009)であり, これは一般労働者の月平均より13.2時間長い(厚生労働省, 2013)。本調査の目的は臨床における看護職者の勤務環境と慢性疲労の現状を明らかにすることである。属性, 勤務状況, 慢性疲労に関する無記名自記式質問紙調査を行った。対象は回答が得られた300床以上の総合病院117施設に勤務する女性看護職者1,676名とした。20代である, 勤務環境として月平均20時間以上の残業時間(帰宅時刻が不規則)がある, および3交代勤務であるという条件にあてはまる看護職者は, 慢性疲労が蓄積されやすいことが分かった。個々の疲労の特徴に配慮した上で, 勤務体制をはじめとする組織や社会の環境調整が必要であると考えられる。

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キーワード: 勤務環境; 慢性疲労; 看護師。

Introduction

The number of nurses in Japan has been increasing year after year with approximately 1,500,000 nurses in 2011¹⁾. Nurses work 23.4

hours of overtime on average per month²⁾, which is 13.2 hours longer than the monthly average for general workers³⁾.

Consecutive work longer than eight hours as regular working hours causes fatigue for

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nurses as well as decreased alertness and productivity⁴⁾. Association between fatigue and medical errors has also been reported^{5, 6)}. Fatigue is a general term to express various conditions and is categorized as acute fatigue and chronic fatigue. Acute fatigue is further categorized as physical fatigue and mental fatigue resulting from mental overload or physical overload, and chronic fatigue means a state where acute fatigue that cannot be recovered for a long time is accumulated⁷⁾. Fatigue resulting from prolonged labor such as overtime work influences health including physical disorders such as chronic illness and digestive troubles as well as mental disorders such as sleep disorders and depression, and has also been reported to be involved with social problems including traffic accidents⁸⁻¹⁰⁾.

According to the survey conducted by the Japanese Nursing Association, 37.3% of hospitals adopt a three-shift pattern and 28.5% of hospitals adopt a two-shift pattern²⁾. Nurses work longer hours in the case of a two-shift pattern compared with a three-shift pattern, and it has been reported that drowsiness, fatigue and less alertness is likely to occur which could lead to medical errors^{11, 12)}. Ensuring sleeping time is effective for recovery from fatigue and it has been reported that the interval between day shifts is desirable to be 12 hours or longer and the interval from day shift to night shift or from night shift to day shift is desirable to be 24 hours or longer^{4, 13)}.

As a result of revision of medical service fees in 2006, the assignment ratio of nurses was set at 7 to 1, leading to an inevitable increase in the number of nurses by medical institutions. Labor conditions and environment for nurses to be able to continue working also began to be maintained in order to reduce the separation rate. The Japanese Nursing Association¹⁴⁾ is developing various projects including the "project to promote employment of nurses in

various working arrangements. On the other hand, survey results by the Japanese Nursing Association revealed that overtime hours are longer in comparison with other occupations as mentioned in the above, and chronic fatigue is suspected without being able to fully recover from fatigue after resting on holidays only. The purpose of this study is to clarify the current status of the working environment and chronic fatigue for nurses in clinical care.

Method

1. Participants

Participants included 1,676 females among 1,779 who provided answers among 2,753 nurses working for 117 general hospitals with 300 or more beds in 14 prefectures in Japan, and from those whom consent to provide cooperation to the survey was obtained in advance.

2. Study period

September 2012 to March 2013

3. Survey method

A data search system for medical care and healthy life (<http://www.cgj.co.jp/hospital/eByoin/index.php>) was used to extract hospitals. A total of 357 facilities with 300 or more beds in 14 prefectures in eastern Japan registered in the data search system were selected. Next, a questionnaire survey was requested in writing to directors of nursing at the intended general hospitals, and consent to participate in the survey was obtained from 117 facilities to which 10 to 30 copies of questionnaire sheets were sent, totaling 2,753 questionnaire sheets requesting distribution to nurses. The questionnaire was anonymous and self-administered, and returned in a return envelope after completion. To maintain consistency in the time spent for completion, we requested the subjects to complete the

questionnaire in writing when they finish their day shift.

4. Survey details

1) Attributes and working status of subjects

Gender, age, marital status, presence of a pre-school child, and presence of a family member requiring nursing care in the same household were surveyed as basic attributes of subjects. The department, years of experience (at the current hospital), whether or not a managerial position is held, and working structure were surveyed as work attributes.

In regards to the working condition of subjects at the time of day shift, time for lunch break, ideal time for lunch break, overtime hours, whether the time to leave work is consistent or inconsistent, commuting time, and medical near-miss event reports for the recent month were surveyed to review their association.

2) Chronic fatigue symptoms

The cumulative fatigue symptoms index (CFSI) was used to measure chronic fatigue¹³⁾. This is a subjective scale of mental and physical overloads from labor and living, consisting of 81 questions about daily health conditions as classified into eight characteristics. These 81 questions required “○” “×” answers. Eight characteristics include “NF-1 (decreased vitality)” indicating the state of insufficient stamina, “NF2-1 (general fatigue)” and “NF6 (chronic fatigue symptoms)” indicating physical overloads, “NF2-2 (physical disorders)” where mental and physical overloads are expressed as physical disorders, “NF3 (irritability)” as a response to overloads and expression of complaint, “NF4 (decreased willingness to work)” indicating social overloads such as dissatisfaction with the workplace, and “NF5-1 (anxiety)” and “NF5-2 (depression)” indicating mental overloads. With this scale,

average complaint rates for each characteristic are obtained, a pattern is described with a diagram in a radar chart format and compared with general pattern values, and overloads are interpreted including cumulative fatigue symptoms based on the pattern (design). Average complaint rates were indicated in percentages after dividing the number of total complaints for the relevant characteristic by the number of items for each characteristic and the number of subjects included.

Average complaint rate (%) = {total complaints for the relevant characteristic / (number of items for each characteristic x number of subjects included)} x 100

5. Data analysis method

Participants were divided depending on their attributes and working status, and unpaired t-test and one-way analysis of variance (ANOVA) were conducted for comparison between two groups and among three or more groups, respectively, in regards to the difference in the factors of the number of complaints in the CFSI. Furthermore, significant difference among groups was obtained with multiple comparisons (Turkey’s honestly significant difference test [Turkey HSD method] was used if equal variance was assumed, and Games-Howell method was used if it was not assumed). SPSS15.0J for Windows was used for statistics with $p < 0.05$ significance level. Next, a radar chart was prepared by combining attributes and working environment with significant difference in NF-6 (chronic fatigue symptoms) in the CFSI, to obtain a response pattern for the relevant group and review on chronic fatigue. NF-6 were utilized as a characteristic because it consists of question items that represent overloads on physical aspects such as “get exhausted from daily work” as well question items that represent chronic fatigue symptoms such as “often feel fatigue even when I wake up

in the morning” and “cannot get rid of fatigue from work.”

6. Ethical consideration

This study was approved by the Ethical Committee at the School of Medicine, Hirosaki University. Subjects were explained in writing that they were voluntarily providing cooperation to the survey, that individuals cannot be identified because the questionnaire sheet is anonymous, and that they are considered to have agreed with the survey upon replying.

Results

Questionnaire sheets were distributed to 2,753 participants at 117 facilities and answers were obtained from 1,779 participants (64.6% collection rate). The number of effective answers was 1,771 including 95 males and 1,676 females, while general pattern values of CFSI scale change depending on the gender; therefore analysis was conducted on only females since they were the majority of respondents.

1. Attributes of subjects

Basic attributes of subjects are shown in Table 1. The average age of subjects was 37.5 ± 10.0 , with 452 participants in their 20s, 556 in their 30s, 443 in their 40s and 225 in their 50s or older. In regards to marital status, 854 were married and 822 were single. Two hundreds sixty two participants had a pre-school child and 1,363 did not. One hundred sixteen participants were providing nursing care to a family member in the same household and 1,552 were not.

Next, work attributes of subjects are shown in Table 2. In regards to departments, 1,115 participants worked in a hospital ward, 149 in an outpatient department, 91 in an intensive-care unit and 87 in an operating room. The average years of experience were 11.0 ± 9.2 , i.e.,

Table 1 Basic attributes

		n=1676	
		N	(%)
Age	20s	452	(27.0)
	30s	556	(33.2)
	40s	443	(26.4)
	50s or older	225	(13.4)
Marital status	Married	854	(51.0)
	Single	822	(49.0)
Pre-school Child	Yes	262	(15.6)
	No	1363	(81.3)
Caring for Elders	NA	51	(3.0)
	Yes	116	(6.9)
	No	1552	(92.6)
	NA	8	(0.5)

Table 2 Work attributes

		n=1676	
		N	(%)
Departments	Ward	1115	(66.5)
	Outpatient	149	(8.9)
	Intensive care unit	91	(5.4)
	Operating room	87	(5.2)
	Other	221	(13.2)
Years of experiments (years)	NA	13	(0.8)
	<10	918	(54.8)
	≥ 10 to <20	397	(23.7)
	≥ 20	339	(20.2)
Managerial positions	NA	22	(1.3)
	Yes	547	(32.6)
	No	1124	(67.1)
Shift patterns	NA	5	(0.3)
	3 shift pattern	605	(36.1)
	2 shift pattern	604	(36.0)
	Days	176	(10.5)
	Other	290	(17.3)
	NA	1	(0.1)

918 participants worked for less than 10 years, 397 worked for 10 years or longer to less than 20 years, and 339 worked for 20 years or longer. There were 547 participants in managerial positions and 1,124 in non-managerial positions. For shift pattern, 605 participants worked on a three-shift pattern and 604 on a two-shift pattern, which was almost equivalent in numbers. One hundred seventy six participants worked the day shift only and there were other shift patterns (on-call, on-duty, shortened work,

mixture of two-shift and three-shift, etc.)

2. Working status of subjects

The working status at the time of day shift is shown in Table 3. The average lunch break was 50.1 ± 13.7 minutes, while the ideal lunch break was 62.9 ± 14.0 minutes. Seven hundreds seventy one participants took lunch break for 60 minutes or longer and 904 participants took lunch break for less than 60 minutes. The average overtime for the past month was 18.3 ± 29.6 hours, with 572 participants less than 10 hours, 443 participants for 10 hours or longer to less than 20 hours, and 576 participants for 20 hours or longer. Three hundreds seventy nine participants answered that the time to leave work is consistent and 1,288 participants answered inconsistent. The average time to leave work was 20.4 ± 1.6 and the average one-way commuting time was 25.2 ± 19.0 minutes.

The number of medical near-miss event reports for the past month is shown in Table 4 along with report details. Eight hundreds seventy four participants answered that there was no medical near-miss event report, which was the highest number; however 646 reported once or twice and 138 reported three times or more. Two hundreds twenty three participants reported medical near-miss event reports relating to drugs such as injection and IV as well as prescription, administration, management, etc. of oral medicine, which was the highest number. The next highest was 57 participants whose reports were relating to care upon treatment followed by use and management of drains, tubes, etc.

3. Association between living environment and chronic fatigue

Each group was divided depending on marital status, pre-school child, family member requiring nursing care (in the same household), managerial position, lunch time and time to

Table 3 Working status of day shift

		n=1676	
		N	(%)
Lunch break time (min)	<60	904	(53.9)
	≥ 60	771	(46.0)
Ideal lunch brake time (mean \pm SD)		62.9 \pm 14.0 min	
Overtime (mean \pm SD)		18.3 \pm 29.6 h/month	
Overtime (h/month)	<10	572	(34.1)
	≥ 10 to <20	443	(26.4)
	≥ 20	576	(34.4)
	NA	85	(5.0)
Leave work	Consistent	379	(22.6)
	Inconsistent	1288	(76.8)
	NA	9	(0.5)
Leave work time (mean \pm SD)		20.4 \pm 1.6 h.	
One-way commuting time (mean \pm SD)		25.2 \pm 19.0 min.	

Table 4 Medical Near-Miss Event reports

		n=1676	
		N	(%)
No. of report (No./month)	0	874	(52.1)
	1-2	646	(38.5)
	≥ 3	138	(8.3)
	NA	15	(0.9)
		n=490	
Content	Drug-related	223	(45.5)
	Care-related	57	(11.6)
	Drains, tubes	56	(11.4)
	Treatment	35	(7.1)
	Examination	28	(5.7)
	medical equipment	16	(3.2)
	Other	75	(15.3)

leave work to obtain the average number of complaints in the CFSI and analyze the association, as shown in Table 5.

In regards to marital status, the average number of complaints was high for each characteristic except NF3 in the singles group. It was significantly high in the case of NF1 ($p < 0.05$) as well as NF2-2, NF4, NF5-1 and NF5-2 ($p < 0.01$) in the singles group.

In the case of presence of a pre-school child, the average number of complaints was high for each characteristic except NF3 and NF6 in the group without a pre-school child. It was significantly high in the case of NF2-1 ($p < 0.05$) as well as NF5-1 ($p < 0.01$), NF1, NF2-2 and NF4

Table 5 Association between living environment and chronic fatigue

			Mean (SD)							
			NF1	NF2-1	NF2-2	NF3	NF4	NF5-1	NF5-2	NF6
			9	10	7	7	13	11	9	8
		(n)								
Marital status	Married	854	1.73(2.03)	2.37(1.93)	0.74(1.03)	1.09(1.33)	1.65(2.17)	1.53(1.84)	1.45(1.69)	2.93(2.25)
	Single	822	1.95(2.22)	2.50(2.09)	0.99(1.26)	1.05(1.41)	2.21(2.60)	1.92(2.18)	1.8(1.97)	2.94(2.33)
	p		0.037	0.173	<0.001	0.541	<0.001	<0.001	<0.001	0.886
Pre-school Child	Yes	262	1.45(1.80)	2.15(1.91)	0.54(0.80)	1.32(1.36)	1.42(2.03)	1.40(1.83)	1.52(1.61)	3.03(2.19)
	No	1363	1.92(2.18)	2.49(2.03)	0.92(1.20)	1.03(1.37)	2.03(2.47)	1.79(2.05)	1.64(1.88)	2.92(2.31)
	p		<0.001	0.012	<0.001	0.001	<0.001	0.004	0.265	0.474
Caring for Elders	Yes	116	2.04(2.33)	3.03(2.17)	0.91(1.23)	1.00(1.36)	2.10(2.71)	1.61(2.05)	1.60(1.82)	3.10(2.56)
	No	1552	1.82(2.12)	2.38(1.98)	0.86(1.15)	1.07(1.37)	1.91(2.39)	1.73(2.03)	1.62(1.84)	2.92(2.26)
	p		0.274	0.001	0.618	0.575	0.411	0.548	0.929	0.444
Managerial positions	Yes	547	1.84(2.11)	2.49(1.88)	0.80(1.10)	0.95(1.29)	1.91(2.28)	1.68(1.93)	1.50(1.75)	2.91(2.22)
	No	1124	1.84(2.15)	2.40(2.07)	0.90(1.19)	1.13(1.41)	1.94(2.48)	1.74(2.08)	1.68(1.88)	2.94(2.32)
	p		0.996	0.350	0.094	0.009	0.836	0.577	0.054	0.797
Lunch break Time(min)	<60	904	1.98(2.20)	2.53(2.03)	0.94(1.21)	1.12(1.41)	2.16(2.51)	1.85(2.12)	1.72(1.92)	3.22(2.32)
	≥60	771	1.67(2.04)	2.32(1.98)	0.77(1.09)	1.01(1.33)	1.65(2.27)	1.57(1.92)	1.51(1.74)	2.59(2.20)
	p		0.047	0.902	0.096	0.139	0.013	0.059	0.023	0.017
Leave work	Consistent	379	1.57(2.05)	2.05(1.94)	0.69(1.09)	0.99(1.40)	1.50(2.15)	1.49(1.89)	1.33(1.73)	2.23(2.17)
	Inconsistent	1288	1.92(2.15)	2.55(2.01)	0.91(1.16)	1.10(1.37)	2.06(2.48)	1.79(2.07)	1.71(1.87)	3.15(2.27)
	p		0.005	<0.001	0.001	0.185	<0.001	0.012	<0.001	<0.001

p values were determined by the t-test.

NF1; decreased vitality, NF2-1; general fatigue,

NF2-2; physical disorders, NF3; irritability, NF4; decreased willingness to work, NF5-1; anxiety, NF5-2; depression, NF6; chronic fatigue symptoms.

($p < 0.001$) in the group without a pre-school child.

Relating to presence of a family member requiring nursing care in the same household, the average number of complaints was high for NF-1, NF2-1 NF2-2, NF4 and NF6 in the group with a family member requiring nursing care, and was significantly high for NF2-1 ($p < 0.01$).

The average number of complaints by managerial position was equivalent for NF-1 in the managerial and non-managerial groups, was slightly high for NF2-1 in the managerial group and was slightly high for other characteristics in the non-managerial group. It was significantly high for NF3 only, in the non-managerial group ($p < 0.01$).

The average number of complaints by lunch break was high for all characteristics in the group with less than 60-minute break, and was significantly high for NF1, NF4, NF5-2 and NF6 ($p < 0.05$).

The average number of complaints by the time to leave work was high for all characteristics in the irregular group, and was

significantly high for NF5-1 ($p < 0.05$) as well as NF1, NF2-2 ($p < 0.01$), NF2-1, NF4, NF5-2 and NF6 ($p < 0.001$).

4. Association between working environment and chronic fatigue

The average number of complaints in the CFSI was obtained to analyze association by dividing into each group by age group, department, years of experience, working structure, overtime, and the number of medical near-miss event reports (Table 6).

There was no significant difference for NF-1 and NF4 in the case of each age group. In regards to NF2-1, the average number of complaints was significantly lower for the 30s compared with other age groups ($p < 0.05$). For NF2-2 and NF5-1, it was significantly higher for the 20s compared with other age groups ($p < 0.05$). For NF5-2, it was significantly higher for the 20s compared with 30s and 50s ($p < 0.05$). In regards to for NF3 and NF6, it was significantly lower for the 50s compared with other age groups, i.e., significant difference

Table 6 Association between working environment and chronic fatigue

		Mean(SD)								
		NF1	NF2-1	NF2-2	NF3	NF4	NF5-1	NF5-2	NF6	
		(n)	9	10	7	7	13	11	9	8
Age	20s	452	1.92(2.24)	2.54(2.15)	1.05(1.31)	1.15(1.50)	2.14(2.56)	2.10(2.33)	1.88(1.95)	3.06(2.33)
	30s	556	1.70(2.05)	2.19(1.92)	0.79(1.09)	1.13(1.36)	1.83(2.36)	1.56(1.89)	1.54(1.75)	2.96(2.27)
	40s	443	1.95(2.19)	2.54(2.05)	0.82(1.11)	1.06(1.35)	1.90(2.40)	1.68(1.91)	1.57(1.83)	3.08(2.32)
	≥50s	225	1.81(1.99)	2.62(1.79)	0.77(1.06)	0.78(1.14)	1.80(2.26)	1.42(1.85)	1.40(1.81)	2.32(2.06)
	p		0.216	0.003	0.004	0.001	0.197	<0.001	0.003	<0.001
Departments	Ward	1115	1.89(2.16)	2.47(2.02)	0.88(1.17)	1.08(1.38)	2.01(2.42)	1.77(2.04)	1.68(1.86)	3.03(2.28)
	Outpatient	149	1.83(2.10)	2.22(1.99)	0.79(1.20)	1.26(1.45)	1.80(2.34)	1.52(1.90)	1.58(2.04)	2.70(2.21)
	Operating	87	1.64(1.99)	1.97(2.04)	0.82(1.06)	1.01(1.40)	1.79(2.49)	1.57(1.78)	1.36(1.47)	2.47(2.21)
	ICU	91	1.70(2.13)	2.07(1.86)	0.97(1.20)	0.93(1.31)	1.68(2.31)	1.55(2.05)	1.54(1.75)	2.76(2.33)
	Other	221	1.74(2.10)	2.71(1.98)	0.82(1.12)	0.99(1.30)	1.81(2.49)	1.81(2.17)	1.55(1.81)	2.84(2.35)
p		0.687	0.007	0.753	0.339	0.492	0.480	0.481	0.083	
Years of experience (years)	<10	918	1.86(2.18)	2.37(2.04)	0.91(1.20)	1.13(1.43)	2.03(2.52)	1.86(2.15)	1.73(1.90)	2.96(2.29)
	≥10to<20	397	1.73(2.06)	2.41(1.97)	0.85(1.11)	1.02(1.34)	1.78(2.29)	1.53(1.84)	1.45(1.68)	3.04(2.29)
	≥20	339	1.97(2.14)	2.65(1.97)	0.80(1.11)	1.01(1.28)	1.88(2.30)	1.60(1.88)	1.59(1.88)	2.79(2.27)
	p		0.327	0.084	0.295	0.231	0.200	0.008	0.027	0.315
Shift patterns	3 shift	176	1.48(1.89)	2.28(1.96)	0.77(1.25)	0.97(1.27)	1.49(2.11)	1.52(1.89)	1.40(1.69)	2.68(2.24)
	2 shift	605	2.04(2.15)	2.61(2.04)	0.96(1.19)	1.18(1.39)	2.17(2.53)	1.79(2.07)	1.72(1.93)	3.24(2.35)
	Days	604	1.79(2.17)	2.39(1.93)	0.83(1.14)	0.99(1.38)	1.90(2.38)	1.74(2.04)	1.66(2.02)	2.80(2.22)
	Other	290	1.75(2.15)	2.24(2.11)	0.80(1.04)	1.08(1.37)	1.75(2.36)	1.66(2.02)	1.47(1.76)	2.72(2.26)
p		0.006	0.033	0.103	0.070	0.002	0.437	0.089	0.001	
Over time (h/month)	<10	572	1.60(1.98)	2.15(1.87)	0.76(1.07)	0.97(1.29)	1.59(2.20)	1.54(1.91)	1.46(1.71)	2.51(2.16)
	≥10to<20	443	1.84(2.14)	2.47(2.03)	0.85(1.14)	1.09(1.41)	1.80(2.27)	1.68(2.01)	1.61(1.77)	2.88(2.27)
	≥20	576	2.05(2.23)	2.70(2.08)	0.93(1.21)	1.17(1.43)	2.34(2.62)	1.87(2.11)	1.78(2.00)	3.38(2.32)
	p		0.002	<0.001	0.042	0.054	<0.001	0.022	0.015	<0.001
No. of report (No./month)	0	874	1.67(2.05)	2.23(1.89)	0.76(1.10)	0.98(1.31)	1.78(2.28)	1.53(1.88)	1.48(1.74)	2.75(2.23)
	1-2	646	1.95(2.15)	2.62(2.05)	0.92(1.15)	1.13(1.41)	1.95(2.44)	1.81(2.05)	1.69(1.87)	3.05(2.31)
	≥3	138	2.38(2.42)	2.80(2.35)	1.19(1.41)	1.42(1.56)	2.75(2.97)	2.54(2.62)	2.17(2.25)	3.37(2.42)
	p		0.001	<0.001	<0.001	0.003	0.001	<0.001	0.001	0.002

p values were determined by the one way ANOVA.

Tukey HSD or Games-Howell **p<0.01, *p<0.05.

NF1; decreased vitality, NF2-1; general fatigue, NF2-2; physical disorders, NF3; irritability, NF4; decreased willingness to work, NF5-1; anxiety, NF5-2; depression, NF6; chronic fatigue symptoms.

of p<0.05 in comparison with the 30s and 40s and p<0.01 in comparison with the 20s.

When reviewed by department, the average number of complaints was significantly higher for other departments than operating rooms in the case of NF2-1 (p<0.05). It was the highest for hospital wards in the case of NF1, NF4, NF5-2 and NF6; however there was no significant difference. It was the highest for ICUs in the case of NF2-2, outpatient departments in the case of NF3 and others in the case of NF5-1; however there was no significant difference.

When reviewed by years of experience, the average number of complaints was significantly higher for less than 10 years in comparison with 10 years or longer to less than 20 years in the case of NF5-1 and NF5-2 (p<0.05). It was the highest for 20 years or longer in the case of NF1 and NF2-1, less than 10 years in the case of

NF2-2, NF3 and NF4, and 10 years to less than 20 years in the case of NF6; however there was no significant difference.

The average number of complaints by working structure was the highest for a three-shift pattern and the lowest for a day shift only in the case of all characteristics; and was significantly high in the case of NF1 and NF4 (p<0.01). It was significantly high for a three-shift pattern in the case of NF6 (p<0.05) and higher for a three-shift pattern than a two-shift pattern and others (p<0.01).

The average number of complaints by overtime was the highest for 20 hours or longer and the lowest for less than 10 hours in the case of all characteristics. It was significantly higher for 20 hours or longer in comparison with less than 10 hours in the case of NF2-2, NF4, NF5-1 and NF5-2 (p<0.05) as well as NF1 and NF2-1,

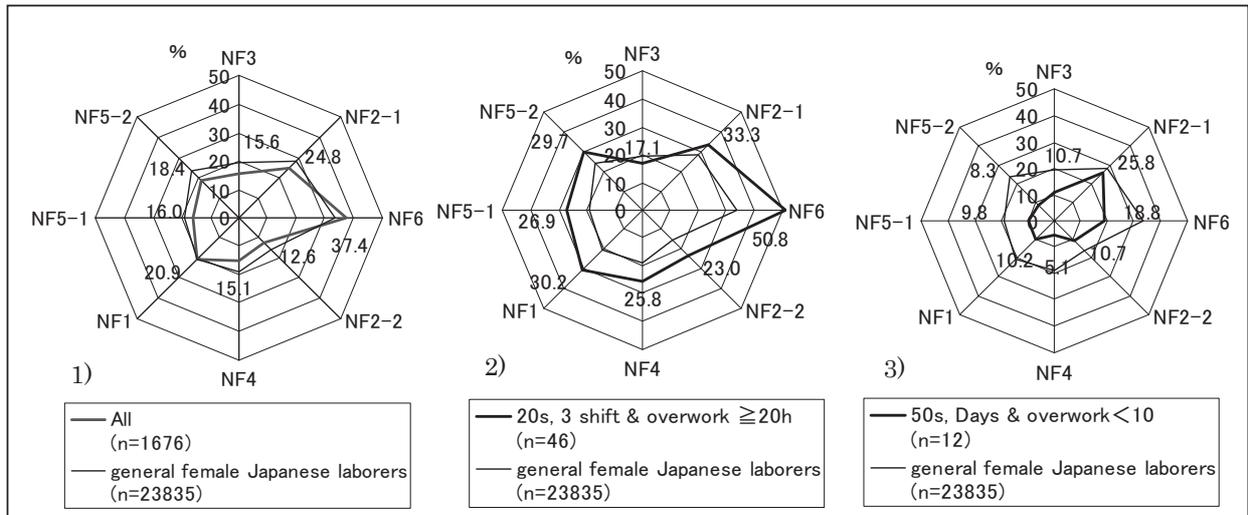


Fig 1. Comparison of CFSI. NF1; decreased vitality, NF2-1; general fatigue, NF2-2; physical disorders, NF3; irritability, NF4; decreased willingness to work, NF5-1; anxiety, NF5-2; depression, NF6; chronic fatigue symptoms. The radar chart diagramed in Figure.1 compares CFSI complaint rates between nurses targeted in this study (heavy line) with the results obtained by Kosugoh et al. from 23835 general female Japanese laborers (straight line). The right side (NF2-1, NF6, and NF2-2) of the radar chart shows the cluster displaying physical ailments, with the vertical line depicting the cluster reporting workplace environment dissatisfaction, while the left side (NF5-1, NF5-2, and NF1) shows the cluster displaying mental ailments.

it was significantly higher for 20 hours or longer in comparison with 10 hours to less than 20 hours and less than 10 hours ($p < 0.01$), as well as for 10 hours or longer to less than 20 hours in comparison with less than 10 hours ($p < 0.05$).

The average number of complaints by number of medical near-miss event reports for the past month was the highest for three times or more in the case of all characteristics and the lowest for no report. It was significantly higher for three times or more in comparison with no report in the case of NF1, NF2-1 and NF4 ($p < 0.05$) as well as in the case of NF2-2, NF3, NF5-1, NF5-2 and NF6 ($p < 0.01$). It was significantly higher for once or twice in comparison with no report in the case of NF1, NF2-1, NF2-2, NF5-1 and NF6 ($p < 0.05$). It was significantly higher for three times or more in comparison with once and twice in the case of NF5-1 ($p < 0.01$).

5. Chronic fatigue symptoms

Figure 1-1) is indicating the response pattern

of complaint rates in the CFSI in regards to the overall participants ($n = 1676$) in this survey. The response to each characteristic was below basic pattern values except for NF6. Figure 1-2) is indicating the response pattern of the average complaint rate in the CFSI for participants ($n = 46$) who are in their 20s and work on a three-shift pattern and whose average overtime is 20 hours or longer per month, as they had a significantly high average number of complaints in the case of NF6 (chronic fatigue symptoms). The response was far above basic pattern values for all characteristics except NF3 (irritability). Figure 1-3) is showing the response pattern of the average complaint rate in the CFSI for participants ($n = 12$) who are in their 50s and work a day shift only and whose average overtime is less than 10 hours per month. The response was far below basic pattern values for all characteristics.

Discussion

1. Association between each age group and fatigue

Characteristics of CFSI for the 20s include a significantly higher average number of complaints than the other age groups for all characteristics, including not only characteristics indicating physical overloads such as NF2-1 (general fatigue) and NF6 (chronic fatigue symptoms) but also NF5-1 (anxiety) and NF5-2 (depression) indicating mental overloads as well as NF3 (irritability) indicating dissatisfaction to workplace. This is consistent with the report on reality shock experienced by new nurses as reported by Mizuta¹⁵⁾, raising pains unexpectedly experienced by new nurses such as pain relating to nursing techniques, pain relating to relationships at workplace, pain relating to working arrangements, etc. This is also true considering the fact that as age groups go up, the average number of complaints relating to NF5-1 (anxiety) and NF5-2 (depression) indicating mental overloads as well as NF3 (irritability) indicating dissatisfaction to workplace decreases. The average number of complaints relating to NF2-1 (general fatigue) is significantly high for the 40s and 50s. Characteristics for older workers include weakened basic physical fitness and contraction with chronic illness. It has also been reported that their home environment becomes complicated and it is not possible to have good rest at home^{4,16)}. We consider from this survey that mental support is important to alleviate chronic fatigue for the 20s and physical support is important to alleviate chronic fatigue for the 40s and older including adjustment of workload and working hours⁴⁾.

2. Association between working hours (time to leave work and overtime) and fatigue

The average number of complaints in the CFSI is significantly higher when the time to

leave work is irregular and overtime is longer in the same way. 572 (34.1%) participants work overtime for less than 10 hours per month, which is approximately the same result as the survey by the Japanese Nursing Association. Calculating from the fact that the average time to leave work is 20.4 ± 1.6 , subjects with almost 12 working hours for a day shift are assumed to be the average. There is a report on the association between working hours and medical errors, e.g., the risk of medical errors is doubled in the case of consecutively working for 12.5 hours or longer in comparison with 8-hour work¹²⁾, and the risk of medical errors increases in the case of working for 40 hours or longer per week¹⁷⁾. According to this survey, 874 (52.1%) participants reported no medical near-miss per month, and half of the subjects reported some kind of medical near-miss. Since the average number of complaints in the CFSI was significantly higher in the case of three times or more per month in comparison with no report per month for all characteristics, fatigue is related to medical errors, similar to previous studies. It has been reported that fatigue accumulated for a long time has a strong influence on health, including irreversibility as well as no response to compensatory action^{18,19)}; therefore it is necessary to adjust workload to reduce overtime and avoid being saddled with chronic fatigue.

3. Association between alternative work schedule and fatigue

Occurrence of medical errors is low in the case of a three-shift pattern; therefore it is safe and helps effective job performance²⁰⁻²²⁾. However, hospitals are increasingly adopting a two-shift pattern due to the reasons to reduce labor costs and expenses, reduce the number of night shifts, and ensure uninterrupted holidays. In regards to the working structure for the subjects, 605 (36.1%) participants worked on a

three-shift pattern, i.e., approximately the same number as 604 (36.0%) participants who worked on a two-shift pattern. In comparison with 37.3% for a three-shift pattern and 28.5% for a two-shift pattern at the time of survey conducted by the Japanese Nursing Association²⁾, the proportion of the two-shift pattern was higher. As mentioned in the above, working hours are longer in the case of a two-shift pattern than a three-shift pattern, causing drowsiness, fatigue, and low attentiveness which will lead to medical errors¹¹⁾. On the other hand, benefits were also reported including spending time with family and friends, participating in social activities, and taking longer free hours²³⁾. Similarly, the average number of complaints about chronic fatigue by nurses on a three-shift pattern is high for all characteristics in comparison with nurses on a two-shift pattern, and the response pattern in the CFSI is far above the basic pattern in this survey; therefore it is assumed that short intervals between shifts will lead to arrival of the next shift before full recovery from fatigue while with the two-shift pattern, the next shift begins after full recovery from fatigue. Also in the case that the lunch break is less than 60 minutes, effectiveness to plan a power nap has been reported even in the case of day shift since the average number of complaints in the CFSI is significantly high and drowsiness during work, fatigue and low attentiveness will also be prevented. Based on the above, organizational attention seems to be necessary to ensure break hours even for day shifts in addition to in-between shifts and night shifts²⁴⁾. Furthermore, it is also important for workers to take care of each other and consciously ensure break hours to recover from fatigue while working for long hours for the purpose of preventing chronic fatigue.

4. Factors with less association with chronic fatigue

The average number of complaints in

the CFSI had no significant difference for all characteristics in this survey when reviewed by managerial position which was a factor with less association with chronic fatigue. Regarding the presence of a pre-school child, it was higher for NF6 (chronic fatigue symptoms) in the group with a pre-school child than the group without a pre-school child, but there was no significant difference. However, the average number of complaints was significantly higher for the group without a pre-school child than the group with a pre-school child in regards to other characteristics. As to the presence of a family member requiring nursing care, the average number of complaints was significantly higher for NF2-1 (general fatigue) in the case of subjects with a family member requiring nursing care. Although physical fatigue was high, there was no significant difference in the case of NF6. There is a report that when time allocation to work and childcare is well adjusted, depression or feeling of fatigue is unlikely to appear and workplace turns into a place for refreshment; therefore work is considered as a release from childcare or nursing care, leading to alleviation of fatigue, etc²⁵⁾. However, there is a report that lack of sleep and fatigue from childcare or nursing care influences work²⁶⁾; therefore it is important to adjust work by giving importance to information on the living environment.

Physical and mental health is important to provide nursing care. It was clarified from the response pattern in the CFSI that chronic fatigue accumulates in a completely different manner depending on age group and working status. Fatigue from work has a physical, mental and social impact. It is necessary to adjust the environment in an organization or society including working structure by paying attention to characteristics of individual fatigue.

Conclusion

Based on the results of this survey as well as the response pattern in the CFSI, it was found that nurses are not able to fully recover from fatigue and chronic fatigue is likely to accumulate when the following conditions are relevant: they are in their 20s, they work under the working environment with overtime (the time to leave work is irregular) for 20 hours or longer on average per month, or they work on a three-shift pattern.

References

- 1) Japanese Nursing Association. Department of nursing statistics. 2012. Retrieved August 1, 2013, from <http://www.nurse.or.jp/home/publication/toukei/pdf/toukei01.pdf> (in Japanese).
- 2) Japanese Nursing Association. Immediate field survey on overtime work, night shift, alternate work schedule, etc. 2009. Retrieved August 1, 2013, from <http://www.nurse.or.jp/home/opinion/press/2009pdf/0424-2.pdf> (in Japanese).
- 3) The Ministry of Health, Labor and Welfare. Monthly labor statistics: statistical table for May 2013. 2013. Retrieved August 1, 2013, from <http://www.mhlw.go.jp/toukei/itiran/roudou/monthly/25/2505r/dl/pdf2505r.pdf> (in Japanese).
- 4) Keller SM. Effects of extended work shifts and shift work on patient safety, productivity, and employee health. *AAOHN J* 2009;57(12):497-504.
- 5) Barger LK, Ayas NT, Cade BE, Cronin JW, Rosner B, Speizer FE & Czeisler CA. Impact of extended-duration shifts on medical errors, adverse events, and attentional failures. *PLoS Med* 2006;3(12):e487:2440-8.
- 6) Montgomery VL. Effect of fatigue, workload, and environment on patient safety in the pediatric intensive care unit. *Pediatr Crit Care Med* 2007;8(2 Suppl):S11-6.
- 7) Brake DJ & Bates GP. Fatigue in industrial workers under thermal stress on extended shift lengths. *Occup Med (Lond)* 2001;51(7):456-63.
- 8) Barger LK, Cade BE, Ayas NT, Cronin JW, Rosner B, Speizer FE & Czeisler CA. Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med* 2005;352(2):125-34.
- 9) Scott LD, Hwang WT, Rogers AE, Nysse T, Dean GE & Dinges DF. The relationship between nurse work schedules, sleep duration, and drowsy driving. *Sleep* 2007;30(12):1801-7.
- 10) van der Hulst M. Long work hours and health. *Scand J Work Environ Health* 2003;29(3):171-88.
- 11) Knauth P. Extended work periods. *Ind Health* 2007;45(1):125-36.
- 12) Scott LD, Rogers AE, Hwang WT, Zhang Y. Effects of critical care nurses' work hours on vigilance and patients' safety. *Am J Crit Care* 2006;15:30-7.
- 13) Kosugo R & Fujii H. Harmony of labor and health. Kanagawa: The Institute for Science of Labor; 2002.p.43,49-63. (in Japanese)
- 14) Japanese Nursing Association. Project to promote work-Life balance for nurses. n.d. Retrieved August 1, 2013, from <http://www.nurse.or.jp/kakuho/pc/various/workshop/index.html> (in Japanese).
- 15) Mizuta M. Job adjustment among new graduate nurses - factors which influence reality shock and recovery -. *Journal of Japanese Society of Nursing Research* 2004;27(1):91-8. (in Japanese)
- 16) Letvak S. Health and safety of older nurses. *Nurs Outlook* 2005;53(2):66-72.
- 17) Rogers AE, Hwang WT, Scott LD, Aiken LH & Dinges DF. The working hours of hospital staff nurses and patient safety. *Health Aff (Millwood)* 2004;23(4):202-12.
- 18) Wadsworth EJ, Allen PH, Wellens BT, McNamara RL & Smith AP. Patterns of fatigue among seafarers during a tour of duty. *Am J Ind Med* 2006;49(10):836-44.
- 19) Raediker B, Janssen D, Schomann C & Nachreiner F. Extend working hours and health. *Chronobiol Int* 2006;23(6):1305-16.
- 20) Fitzpatrick JM, While AE & Roberts JD. Shift work and its impact upon nurse performance:

- Current knowledge and satisfaction in nursing. *J Adv Nurs* 1999;29(1):18-27.
- 21) Josten EJ, Ng-A-Tham JE & Thierry H. The effects of extended workdays on fatigue, health, performance and satisfaction in nursing. *J Adv Nurs* 2003;44(6):643-52.
- 22) Mitchell RJ & Williamson AM. Evaluation of an 8-hour versus a 12-hour shift roster on employees at a power station. *Appl Ergon* 2000;31(1):83-93.
- 23) Richardson A, Turnock C, Harris L, Finley A & Carson S. A study examining the impact of 12-hour shifts on critical care staff. *J Nurs Manag* 2007;15(8):838-46.
- 24) Scott LD, Hofmeister N, Rogness N & Rogers AE. An interventional approach for patient and nurse safety - A fatigue countermeasures feasibility study -. *Nurs Res* 2010;59(4):250-8.
- 25) Hasegawa Y. Adjustment of time allocation and daily emotional experience during the transition to the role of a working mother. *Shinrigaku Kenkyu* 2010;81(2):123-31 (in Japanese).
- 26) Scott LD, Hwang WT & Rogers AE. The impact of multiple care giving roles on fatigue, stress, and work performance among hospital staff nurses. *J Nurs Adm* 2006; 36(2):86-95.