

Relationship between mental health of Japanese residents and the quality of medical service

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[ORIGINAL ARTICLE] Relationship between mental health of Japanese residents and the quality of medical service

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Key Words

1. quality of health care
2. medical residency
3. medical errors
4. mental health
5. burnout

We performed this study to clarify the relationship between the mental health of residents and the quality of their medical services in Japan. At 45 Japanese designated resident training hospitals in Japan, a longitudinal study was conducted to 910 first-year residents who started postgraduate clinical training in 2003 or 2004 before training and 2 and 9 months after training had started. The study revealed that the residents who committed serious clinical errors showed a lack of interest in the patients' conditions and disregard of the patients' psychological or social aspects, which lead to deterioration of the quality of medical services. At the surveys after 2 and 9 months, significant correlations were observed between the degree of mental health and quality of medical services. Moreover, between 2 and 9 months after training had started, the degrees of depression and burnout showed significant negative correlations with the quality of medical services, indicating that exacerbation of mental health was related to deterioration of the quality of medical services. These results suggest there is a possibility that the protection of residents' mental health by appropriate labor management has a major impact to the quality of their medical services.

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Introduction

In Japan, the overworking of residents was recognized as a social issue after the death of a resident due to acute myocardial infarction in 1998.¹⁾ Moreover a resident who developed psychiatric disorder due to overworking and committed suicide were designated as an industrial accident in recent years.²⁾ The overworking of residents may not only damage resident's own health, but also worsen the quality of clinical service they provide. It is reported that overworking causes lower work performance in the work shift which includes night work.³⁾

In the United States, a patient died due to a medication error by an overworked resident at Cornell University Hospital, New York in 1984. The court concluded that there was no fault in either the hospital or

the resident but that the system which demanded overworking of the physician was to blame.⁴⁾ In response, New York State established a law to restrict the working hours of residents (Bell Regulation) in 1989, and residents began to work under regulations demanding strict observance of 80 hours work week and prohibition of working through more than 24 hours.⁵⁻⁷⁾ Thereafter, in July, 2003, all residents in the United States were obligated to observe the 80-hour work week.⁸⁾ Similarly, in the EU, the working hours of residents are restricted from the viewpoints of securing the safety of medical services and improving the residents' QOL.⁹⁾ Thus, it is becoming clear that overworking exerts serious effects on the mental and physical health of residents and causes deterioration of the quality of medical services provided to the patients.¹⁰⁻¹³⁾

It has been researched that mental health deterioration of residents cause subjective lower work performance,¹⁴⁾ but only few research focused on the relationship between residents' mental health worsening and the frequency of clinical accidents or the quality of medical services they provided. We started this study by setting up the questionnaire subjects about the quality of medical service in order to investigate the relationship between residents' mental health and the quality of medical service they provided.

Subjects and Methods

Subjects and study design

The study was performed in 910 first-year residents who started postgraduate clinical training at 45 hospitals which had residency training programs in 2003 (N=342) and 2004 (N=568). A self-administered questionnaire was sent through each facility and returned by mail. The questionnaire was answered before (The first survey), 2 months after (The second survey), and 9 months after the beginning of the training (The third survey). The second survey was answered by 690 (recovery rate of 75.8%), and the third survey was answered by 550 (recovery rate of 60.4%).

The response of residents which had no defect in the answers were analyzed (628 residents in 2003, 463 residents in 2004). The attribute of the subjects was male-female ratio of 409:281 (M:F), age=26.0±2.84 (Ave.±S.D.) on the second survey and male-female ratio of 296:254 (M:F), age=25.9±2.85 (Ave.±S.D.) on the third survey.

In this study, we examined the reliability and validity of medical quality score and analyzed the relationship between mental health (depression and burnout) and the quality of medical service.

Contents of questionnaires

- The first survey (before the beginning of training)
Age, gender, The Center for Epidemiologic Studies Depression Scale I (CES-D) in Japanese (*1)
- The 2nd and 3rd survey (2 and 9 months after the beginning of the training)
CES-D in Japanese, The Maslach Burnout Inventory-General Survey (MBI-GS) in Japanese (*2), questions concerning the quality of medical services, whether they had committed medical accidents

*1: The degree of depression was evaluated using a Japanese version of the Center for Epidemiologic

Studies Depression Scale (CES-D). The degree of depression is judged to be higher as the score increases. This scale is used for the screening of depression, with a cut-off point of 15/16.¹⁵⁾ The reliability coefficient (Cronbach's α) for this scale was 0.84.¹⁶⁾

*2: Japanese research version of the MBI-GS was used for the evaluation of burnout. The MBI-GS has 3 subscales, i.e. "Exhaustion" (fatigue due to work), "Cynicism" (loss of enthusiasm or interest in work and psychological detachment and indifference toward work), and "Professional efficacy" (confidence and sense of worth in work). In a burnout state, the scores of "Exhaustion" and "Cynicism" increase, and the score of "Professional efficacy" decreases.^{17,18)} The reliability coefficient (Cronbach's α) for these scales were 0.91 (exhaustion), 0.86 (cynicism) and 0.86 (professional efficacy).¹⁸⁾

(Evaluation of the quality of medical services)

The quality of medical services was evaluated according to the answers by a 4-point frequency scale of 5 questions, the superficial validity of which had been established by the specialists in medical accidents, occupational health, and psychiatry.

Specifically, we asked the subjects to answer 5 questions as follows: Owing to busyness and fatigue, (1) whether they had failed to perform examinations or treatments that should have been performed, (2) whether they had failed to deal adequately with the patients' questions and anxiety, (3) whether they had committed, or had been about to commit, normally unthinkable medical accidents, (4) whether they had neglected to consider the patients' psychological or social aspects, and (5) whether they had lost interest in the patients' conditions according to a 4-point scale of "very frequently", "fairly frequently", "occasionally", and "never". The answers were scored 0 to 3, respectively, and the total score of the answers to the 5 questions was defined as the "medical quality score (MQS)" (range 0-15). A higher score is considered to indicate a higher quality of medical services, and a lower possibility of medical errors.

Statistical Analysis

Concerning the validity of the questionnaire about the quality of medical care, the internal validity of the question items was evaluated by principal component analysis. The scores of various question items concerning the quality of medical care were compared between those who answered that they had "made serious

Table1. The average and standard deviation of each items

Items (Owing to busyness and fatigue,)	second survey (n=628)		third survey (n=463)	
	Ave.	S.D.	Ave.	S.D.
1)whether they had failed to perform examinations or treatments that should have been performed	2.39	0.68	2.33	0.64
2)whether they had failed to deal adequately with the patients' questions and anxiety	2.12	0.71	2.08	0.67
3)whether they had committed, or had been about to commit, normally unthinkable medical accidents	2.57	0.65	2.57	0.63
4)whether they had neglected to consider the patients' psychological or social aspects	2.16	0.77	2.10	0.68
5)whether they had lost interest in the patients' conditions	2.25	0.77	2.17	0.78

Table2. Factor loading matrix of the Medical Quality Score

Factor	Items	Factor loading (second survey)	Factor loading (third survey)
medical quality	1)whether they had failed to perform examinations or treatments that should have been performed	0.609	0.671
	2)whether they had failed to deal adequately with the patients' questions and anxiety	0.789	0.813
	3)whether they had committed, or had been about to commit, normally unthinkable medical accidents	0.546	0.501
	4)whether they had neglected to consider the patients' psychological or social aspects	0.781	0.780
	5)whether they had lost interest in the patients' conditions	0.722	0.724

clinical errors within 1 month” and those who did not by the t-test. Also, concerning the relationships of the MQS score with depression and burnout, two-variable correlation analysis was performed, and Pearson’s correlation coefficients were calculated. Statistical analyses were performed using the SPSS 11.0J for Windows.

Ethical considerations

Before the beginning of the study, we sufficiently explained orally that the study was designed for the

establishment of a safe and high-quality training system and we distributed a document which included the explanation at the same time. We also stated clearly that the information would be completely concealed from the instructors or training managers and that it would be handled in a manner that would inhibit identification of individuals. In addition, we also stated that this study would include subjects participating of their own free will, and that the subjects would sustain no disadvantage if they would refuse to participate or drop out during the study.

Table3. The score of each MQS's items depending on medical accident (the second survey)

Items	medical accident	n	Ave.	S.D.	p
1)whether they had failed to perform examinations or treatments that should have been performed	no	599	2.40	0.68	0.06
	yes	29	2.17	0.60	
2)whether they had failed to deal adequately with the patients' questions and anxiety	no	599	2.14	0.70	>0.01 **
	yes	29	1.69	0.81	
3)whether they had committed, or had been about to commit, normally unthinkable medical accidents	no	599	2.61	0.62	>0.01 **
	yes	29	1.83	0.85	
4)whether they had neglected to consider the patients' psychological or social aspects	no	599	2.19	0.75	>0.01 **
	yes	29	1.59	0.91	
5)whether they had lost interest in the patients' conditions	no	599	2.27	0.75	0.014 *
	yes	29	1.79	0.98	

notes 1; Statistical significance; *p<0.05, **p<0.01

Table4. The score of each MQS's items depending on medical accident (the third survey)

Items	medical accident	n	Ave.	S.D.	p
1)whether they had failed to perform examinations or treatments that should have been performed	no	432	2.35	0.65	0.01 *
	yes	31	2.06	0.57	
2)whether they had failed to deal adequately with the patients' questions and anxiety	no	432	2.09	0.67	0.04 *
	yes	31	1.84	0.69	
3)whether they had committed, or had been about to commit, normally unthinkable medical accidents	no	432	2.60	0.60	>0.01 **
	yes	31	2.16	0.86	
4)whether they had neglected to consider the patients' psychological or social aspects	no	432	2.13	0.67	>0.01 **
	yes	31	1.71	0.74	
5)whether they had lost interest in the patients' conditions	no	432	2.20	0.75	>0.01 **
	yes	31	1.65	0.91	

notes 1; Statistical significance; *p<0.05, **p<0.01

Results

1) The reliability and validity of medical quality score (MQS)

Table 1 shows the means and standard deviations of the scores concerning 5 question items, which superficial validity has been established by specialists. Concerning these 5 questions, factor analysis (principal factor method) was performed in the 2nd and 3rd surveys. As a result, when the number of factors was 1, the sum of variance

was 58.2% (2nd survey) and 59.2% (3rd survey), and interpretation was easiest. The factor loading exceeded 0.5 in all question items on both surveys (Table 2). When the total score of all question items was used as a scale, Cronbach's coefficient α was 0.82 on both the 2nd and 3rd surveys.

Next, the scores of various questions concerning the quality of medical services were compared between those who answered that they "made serious clinical errors

Table.5 The attribution and the average score of the CES-D scale and MBI-GS scale

	Number of subjects examined (Male : Female)	Age		Medical Quality Score		CES-D		MBI (Exhaustion)		MBI (Professional efficacy)		MBI (Cynicism)	
		Ave.	S.D.	Ave.	S.D.	Ave.	S.D.	Ave.	S.D.	Ave.	S.D.	Ave.	S.D.
the second survey	518 (M 339 : F 179)	26.1	2.95	11.8	2.56	13.1	8.77	17.2	6.86	18.2	7.79	9.46	7.39
the third survey	363 (M 234 : F 129)	25.9	2.90	11.5	2.52	12.4	8.22	16.6	6.86	17.3	7.32	10.7	7.48

Table.6 Correlations of Medical Quality Score with the CES-D scale and the MBI-GS scale

	CES-D		MBI (Exhaustion)		MBI (Professional efficacy)		MBI (Cynicism)	
MQS(second survey)	-0.42	***	-0.37	***	0.20	***	-0.45	***
MQS (third survey)	-0.34	***	-0.40	***	0.10		-0.46	***

notes 1; Statistical significance; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

within 1 month” and those who did not. As a result, on the 2nd survey, significant differences were noted in all items except 1) “I did not perform the examinations or treatment that I should have performed” (Table 3). On the 3rd survey, significant differences were noted in all questions (Table 4).

2) The relationship between mental health and the quality of medical service

To evaluate the relationship between the quality of medical services and mental health, the subjects who were considered to be depressed (CES-D ≥ 16 at the 1st survey) before the beginning of the study were excluded from the analysis. Those who made serious clinical errors within 1 month were also excluded, because their mental health may have been temporarily exacerbated. Table 5 shows attributes and the scores of MQS, CES-D, and MBI-GS on the 2nd and 3rd surveys.

Cross-sectionally, Pearson's correlation coefficient between the MQS and CES-D, MBI (Exhaustion), or MBI (Cynicism) was -0.34 to -0.46, indicating a relatively close negative correlation (Table 6).

The attributes of the 335 residents who answered the questionnaires in both the 2nd and 3rd surveys were:

Age 26.0 ± 3.09 years (Ave. \pm SD) and male-female ratio of 218:117 (M:F). Longitudinally, Pearson's correlation coefficient r between the MQS and CES-D, MBI (exhaustion), or MBI (cynicism) in the 2nd and 3rd surveys were -0.25 to -0.31, indicating a significant correlation (Table 7)

Discussion

1) The reliability and validity of medical quality score (MQS)

In this study, to investigate the quality of medical services provided by residents, question items were determined not simply whether medical errors have occurred, but after sufficient and repeated evaluation of high-risk conditions for medical errors, by instructors of postgraduate clinical training, experts of occupational health, and mental health experts. The question items, the superficial validity of which had been guaranteed by these experts, were confirmed to converse on 1 factor by principal component analysis on the 2nd and 3rd surveys. Cronbach's coefficient α of the scale derived by summing up the scores of all items was 0.82 on both surveys, indicating internal cohesion as a scale.

Table.7 Correlations of the change of the MQS with the change of the CES-D scale and the MBI-GS scale

	CES-D(3)– CESD-(2)	MBI-E(3)– MBI-E(2)	MBI-P(3)– MBI-P(2)	MBI-C(3)– MBI-C(2)
MQS(3)– MQS(2)	-0.27 ***	-0.31 ***	0.13 *	-0.25 ***

notes 1; Statistical significance; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

notes 2;

MQS(2) : Medical Quality Score (the second survey)

MQS(3) : Medical Quality Score (the third survey)

CES-D(2) : the CES-D score(the second survey)

CES-D(3) : the CES-D score(the third survey)

MBI-E(2) : the MBI-GS Exhaustion score(the second survey)

MBI-E(3) : the MBI-GS Exhaustion score(the third survey)

MBI-P(2) : the MBI-GS Professional efficacy score(the second survey)

MBI-P(3) : the MBI-GS Professional efficacy score(the third survey)

MBI-C(2) : the MBI-GS Cynicism score(the second survey)

MBI-C(3) : the MBI-GS Cynicism score(the third survey)

Also, as the score was significantly lower in most items of those who answered that they had made serious clinical errors. To a certain extent, the score is considered to reflect the quality of medical care that was actually provided to the patients. More interestingly, those who committed clinical errors failed to take the patients' psychological or social aspects into consideration, or did not pay sufficient attention to the patients' doubts or worries. It is reasonable to interpret that these results suggest clinical errors do not occur simply by chance but that its occurrence is closely related to the conditions of the residents themselves. From these observations, the questions used in the surveys of this study are considered to be usable for questionnaire surveys in multi-center investigations to examine the quality of medical services provided by residents, although problems such as the number of questions is small and that the questionnaire is answered by the residents themselves remain.

2) The relationship between the quality of medical service and mental health

The cross-sectional investigation in this study showed the strong relationship between residents' depression or burnout and qualitative deterioration of medical service they provided. At the same time, the longitudinal investigation in this study also showed higher degree in depression or burnout in residents resulted in qualitative deterioration of medical service they provided. These results confirmed the strong relationship between residents' mental health and the quality of medical service

they provided, which might be consistent with previous study which reported residents' mental health deterioration caused their lower clinical performance.¹⁴⁾

In Japan, the Ministry of Health, Labour and Welfare recognized residents as workers in 2001 and decided to apply the Labor Standards Act to them as well.²⁾ Though new effective measures have been examined for the labor management of residents after the establishment of the new postgraduate clinical training system in 2004, it is reported that residents are forced to work much longer than 40 hours a week even now, which is the legal working hour stipulated by the Labor Standards Act.¹⁹⁾

In shift work including night shifts, prolonged working hours have been reported to cause a loss in performance.³⁾ In a study of American residents, also, an increase in working hours is closely related to a decrease in sleep time. A decrease in sleep time and continuous work over 24h has been shown to induce a lack of attention.¹¹⁾ There are also many studies which concluded residents' overworking is main factor of their mental health deterioration.^{10,19)} These findings and the result of our study also suggest residents' mental health deterioration brought mainly by overworking has much to do with lower quality of medical services they provide, which may result in the increase of the number of the medical accidents such as medication mistakes or misdiagnosis.

In the Japanese criteria for the recognition of

medical accidents such as medication mistakes or misdiagnosis.

In the Japanese criteria for the recognition of industrial accidents, working hour is considered as the most important factor in the accumulation of fatigue.²⁰⁾ An adequate labor administration of the residents including the restriction of their working time is considered to be necessary in order to improve residents' mental health and quality of medical service they provide. Concerning the effects of restriction of working hours on the health of residents, there are some reports of decreases in perceived stress and symptoms²¹⁾ or increase in sleep time and decreases in the frequency of lack of attention.¹¹⁾ Thus it can be said that an adequate labor administration of residents might reduce the number of medical accidents. Furthermore, many study reported a state which residents cannot secure adequate sleep time and become exhausted markedly affects medical education.^{13,22,23)} This result also suggests that improvement of residents' overworking and mental health not only reduce the number of medical accidents but also bring sufficient clinical training education, which may result in improvement of medical service quality in Japan.

However, residents have been forced to overwork for many years, partly because considerable time and efforts are necessary for them to acquire special skills of medical practice. In the United States, the quality of training has been evaluated after working hours were restricted to 80 hours a week in July, 2003. There are reports that the restriction of working hours did not affect the results of training,⁷⁾ that the time spent in the operation room did not change,²⁴⁾ and that the time spent on outpatient treatment or ward rounds did not decrease,²⁵⁾ indicating that the quality of training can be maintained sufficiently even after the restriction of working hours. On the other hand, there are reports that it was impossible to reduce working hours without reducing the time for education,²⁶⁾ that the number of operations that residents experience decreased,²⁷⁾ and that most of the time reduced by the restriction of working hours was spent for non-educational purposes,²⁸⁾ suggesting that a decrease in working hours leads to deterioration of the quality of training. Therefore, to improve the quality of medical services, it is necessary to prepare a training program and conduct labor management by not only focusing on the residents' mental health, but with comprehensive consideration of how to provide sound medical education.

Finally, the limitation of this study was that as all

surveys were performed by a questionnaire answered by the subjects, whether there was a serious clinical error depended on their subjective judgment. Also, as depression and burnout were evaluated by the subjects themselves, individual subjective factors are considered to have affected the results. These are limitations of a questionnaire survey at multiple facilities. The evaluation of the relationship with actual medical accidents that occurred at small number of facilities and their cohesion with objective indices based on stress markers is necessary for the future. Furthermore, from the viewpoint of the relationship between the protection of health by appropriate labor management and the quality of medical services, it is considered necessary to evaluate of the relationship of the quality of medical services with physiologic indices obtained by health screening rather than by mental health parameters alone.

In addition, in the newly adopted super-rotation system, residents change departments every few months. Therefore, it was difficult to obtain accurate information and eliminate factors of the content of training such as the period of affiliation to a particular department, which was considered to affect mental health and the occurrence of clinical errors.

In conclusion, this study revealed a relationship between the residents' mental health and the quality of their medical services in early postgraduate training in Japan. In early postgraduate training, the quality of medical services may be improved by searching for an appropriate style of labor management to ensure the residents' mental health as well as providing solid medical education.

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