The Effect of Job Strain on Psychological Morbidity and Quality of Life in Military Hospital Nurses in Taiwan: A Follow-up Study

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Abstract: This study investigated changes in job strain in female nurses serving in a military hospital system being restructured and the effect of these changes on psychological morbidity and quality of life (QOL). Questionnaire surveys were sent twice to 618 nurses working in three military hospitals in southern Taiwan at the beginning and at follow up a half year later. A Job Content Questionnaire was used to divide subjects into high and low strain groups. The General Health Questionnaire and the WHO QOL Questionnaire were used to assess psychological morbidity and QOL. Four hundred eighteen nurses completed the study. Initially, the high strain group had a greater prevalence of psychological morbidity and lower QOL than the low strain group. At follow up, high strain group did not have a greater prevalence of psychological morbidity, though significant differences in QOL remained. Job control and social support directly affected the QOL (B=0.42, p<0.001; B=0.41, p=0.038, respectively) and the psychological demand affected directly on psychological morbidity (B=0.12, p<0.001). Job control and psychological demand are different aspects in job strain to impact the psychological morbidity and QOL in nurses working in military hospitals in Taiwan.

Key words: Control, Demand, Psychological morbidity, GHQ, JCQ, WHOQOL-BREF

Introduction

The two dimensional model of job stress, proposed by Karasek[1, 2], takes into consideration the psychological demands facing people in the work situation and the amount of job control they have. The combination of high level psychological demand and a low level of decision-making latitude have been found to adversely affect physical health, mental health and quality of life (QOL) by many studies. Most of these studies have been cross sectional[3–7]; few have been longitudinal[8–10].

Military hospitals can be especially stressful work environments. In Taiwan, health care workers in these hospitals are asked to intervene in disasters and crisis situations such as the SARS epidemic in February 2003. At that time, military hospitals were asked to handle the overflow of SARS cases[11]. Recently, the government in Taiwan decided to reduce the number of military general hospitals from nineteen to nine facilities and rank the hospitals by accreditation level[4]. These changes and other current

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issues that affect job security in these environments have influenced stress levels and quality of life in the health care workers there.

One previous study investigated the relationship between job stress and psychological status of workers serving in organization being restructured, and found an association between low decision attitude and poor mental health[7] but no other aspects of health to independent domain of job control or psychological demand. What has not been studied is the impact of changes in job demand and control on QOL and psychological morbidity over time. Even a follow up study, different outcome from job control versus psychological demand in four domains of QOL was found by study of Nasermoadelli but did not analyze the role of social support[5]. This study used the Chinese version of the Job Content Questionnaire (JCQ) to examine the relationship between job strain and quality of life and psychological morbidity in 618 female nurses working in three military hospitals in southern Taiwan over a six-month period occurring between 1 November 2005 and 1 July 2006.

Subjects and Methods

In November 2005, we administered a battery of questionnaires to all health workers in two hospitals slated to be downsized in Pingdong and Penghu and one hospital going through the accreditation process in Kaohsiung, Taiwan. The study follows the guidelines outlined in the Helsinki declaration and the design was approved by the institutional review board of Taiwan Armed Forces Kaohsiung General Hospital. The potential subjects were delivered a description of this study, an informed consent form and a structured questionnaire, which had items collecting personal characteristic data, as well as the questions from three well-accepted instruments which included the Chinese Job Content Questionnaire (C-JCQ), the WHO Quality of Life Questionnaire (WHOQOL-BREF), and the General Health Questionnaire (GHQ). The questionnaire was collected the day after it was distributed. Subjects were enrolled into this study if they signed the informed consent form. We used the C-JCQ to divide the nurses into either a high or low strain group. To follow up, we sent the same surveys to those that responded the first time in July 2006.

Participants

Because we were interested in the changes in these measures over time, we chose to analyze only the ques-

tionnaire data supplied from nurses, a more homogenous group, rather than all healthcare workers. Fifty-seven of the 60 nurses in the Pingdong facility, 88 of the 90 in the Penghu facility, and 273 of the 460 in the Kaohsiung facility filled out questionnaires, with response rates of 95%, 97.8%, and 59.4%, respectively. After excluding five male nurses to avoid confounding gender characteristics and excluding those with missing data, we were left with a total of 418 of the 610 nurses in three hospitals and response rate of 68.5%. The Pingdong and Penghu Facilities were facing downsizing and the Kaohsiung Hospital, a regional teaching center, was facing the stressful accreditation process.

Instruments

Personal data included name, gender, age, job category, educational level, marital status, smoking history, alcohol-drinking history, history of hypnotic drug use, and life events in the recent six months. The definition of life events included the death of a relative, economic stress, marital or divorce event, sentinel events, and malpractice problems with legal implications. Our survey instruments were the Chinese version of the General Health Questionnaire (GHQ), the Taiwan brief version of the WHO Quality of Life Questionnaire (WHOQOL-BREF) and Chinese version of the Job Content Questionnaire (C-JCQ).

The Chinese version of the General Health Questionnaire-12 (GHQ-12) is a self-administered instrument used to assess psychiatric morbidity and minor psychiatric disorder in the Chinese community derived from the General Health Questionnaire, though it does include some additional culturally relevant items into a primary item pool. Developers of this instrument used discriminative function analysis to select a subset of twelve items from this pool of questions, creating the GHQ-12. A simple scoring method of 0-0-1-1 representing "not at all," "about as usual," "more than usual," and "strong feeling" is generally used to quantify responses to the GHQ. Psychopathology was first assigned a global score to identify potential cases and non-cases, which are then categorized using an optimum cutoff point (the best compromise between high sensitivity and a low false-positive rate), based on Receiver Operating Characteristic curves. Cases were defined by a score of three or more points out of twelve possible points, and non-cases less than three. The Chinese version of the GHQ has been reported to be consistent and have a Cronbach's alpha of 0.79[12].

The WHOQOL-BREF is a 28-item tool mostly derived from the 100-item WHO-designed to Quality of Life (QOL)

Table 1. Demographic data of female nurses categorized in to low job strain and high job strain groups by the C-JCL

	Low strain	High strain	t/z	p value
N	268	90		
Age	33.3	30.8	2.5	0.013*
Height (cm)	158.98	158.87		
Weight (kg)	56.03	56.4		
Education level (yr)	14.4	14.4	−0.16	0.87
Leader	24	2	2.14	0.033*
Marriage				
Single	97	40	−1.449	0.147
Married	112	31		
Divorced	9	2		
Other				
Alcohol use	3	1	−0.02	0.984
Smoking	1	2	−1.66	0.098
Hypnotic drug use	4	1	−0.02	0.987
Life events	19	8	−0.54	0.591

*: $p<0.05$. High strain: low control combined with high demand. Low strain: defined as not in high strain group.

survey and translated into Chinese. Based on multi-geographical, multi-background, and cross-cultural research, WHO developed this survey to evaluate quality of life around the world. The 28-item WHOQOL-BREF also contains two items not directly derived from the WHOQOL. These two items were created to better match local culture. The WHOQOL-BREF covers subject's perception of his or her physical, mental, social and environmental well-being for the past two weeks. The minimum to maximum scores for each domain are 7 to 35 the physical domain, 6 to 30 for the psychological, 3 to 15 for social and 8 to 40 for the environmental domains. The higher the QOL score, the better the quality of life. Based on evaluations performed by Yao *et al.*[13], the reliability between WHOQOL-BREF and the original measure ranges from 0.70 to 0.80 (Cronbach's alpha between 0.70 and 0.77). That study also found that, with regard to its content validity, the Pearson correlation coefficients ranged between 0.53 and 0.78. The criteria-related validity for global QOL was 60% and the construct validity, based on principal factor analysis, had 73% variance. They concluded that the WHOQOL-BREF had good-to-excellent psychometric properties and that it performed well in preliminary tests of validity[13].

The Chinese Version of the Job Content Questionnaire (C-JCQ), which uses 22 items of the original JCQ, has been studied in Taiwan. The Cronbach's alpha coefficients for its job control, superior support, and coworker support scales were all above 0.80. However, for psychological demand, it was 0.55. Nevertheless, the C-JCQ has been found to be a reliable and valid tool for assessing psychosocial work conditions among Taiwanese workers[14]. The answers the items in that tool were coded 1 to 4, and average scores of subscales were weighted and calculated. Briefly, job control is the sum of two subscales: skill discretion, measured by six items with total score ranging from 12 to 48, and decision-making authority, measured by three items with total scores ranging from 12 to 48. The psychological demands scale is measured by five items with total scores ranging from 12 to 48; higher the value, the higher the strain. The work-related social support scale is the sum of two subscales: support from supervisors and support from co-workers, both measured by four items with total score of 8 to 32. Job strain was defined as the combination of low/high job demand and job control[14].

The chi-square test and student *t*-test were used to examine the differences in the demographic variables and the generalized estimating equation analysis was used to assess the relative factors to outcome measures among the causal relationship. A *p*-value <0.05 was considered significant. All statistical operations were performed on SPSS 15.0 for Windows software package (SPSS, Chicago, IL).

Results

In total, we collected 418 questionnaires from 610 nurses in three hospitals, a response rate of 68.5. After the first survey and after excluding male nurses and incomplete questionnaires, we used the C-JCQ to divide nurses into a low strain group and high strain group (Table 1). The low strain group consisted of 268 cases with a mean

Table 2.   Analysis of JCQ domain scores, general health questionnaire, and WHOQOL-BREF domain scores by low and high job strain

		Low Strain		High Strain		*t*	*p* value
		Mean	SE	Mean	SE		
C-JCQ	Psychological Demand	32.55	0.26	36.81	0.37	−8.55	0.000
	Job control	65.06	0.57	54.67	0.76	16.67	0.000
	Skill discretion	32.92	0.30	29.33	0.39	10.01	0.000
	Decision-making authority	32.14	0.42	25.33	0.52	15.87	0.000
	Social Support	24.27	0.28	22.44	0.43	5.82	0.000
	Coworker support	12.35	0.12	11.78	0.28	2.69	0.007
	Supervisor support	11.92	0.21	10.67	0.35	6.18	0.000
CHQ	1st total score	1.82	0.15	2.67	0.36	−2.68	0.008
	2nd total score	2.28	0.19	2.34	0.36	−0.16	0.872
WHOQOL-BREF	Base line						
	Physical	31.82	0.25	29.53	0.55	4.23	0.000
	Psychological	19.56	0.20	17.73	0.43	4.34	0.000
	Social	14.06	0.13	13.00	0.22	4.11	0.000
	Environmental	30.40	0.28	27.67	0.60	4.636	0.000
	Followed up						
	Physical	31.34	0.31	30.11	0.48	2.04	0.042
	Psychological	19.55	0.24	18.36	0.39	2.59	0.010
	Social	13.80	0.15	13.02	0.24	2.70	0.007
	Environmental	29.91	0.31	28.68	0.53	1.99	0.048

N1: baseline, N2: followed up case number, SE: standard error. Job control= Skill discretion+ Decision-making authority, Social Support= Coworker support + supervisor support.

age of 33.3 yr old; the high strain group consisted of 90 cases with a mean age 30.8. The low strain group was on average 2.5 yr older than high strain group (p=0.013). A greater percentage of nurses in the low strain group held leadership positions than in the high (p=0.033). There were no other significant demographic differences between the two groups (p>0.05).

Between the first and second survey, twenty-seven (6.5%) nurses dropped out of the study because they resigned from their positions. The average age of those who dropped out was 28.5 yr old, significantly younger than those who remained (p=0.005). There were no other significant demographic or assessment tool differences between those remaining in the study and those who resigned (data not shown).

For the second interview a half year later, we collected 286 questionnaires. In total, 72 nurses did not participate in the second interview, including the 27 mentioned above who resigned and 45 who declined to continue in the study, making a response rate of 79.9%. The additional 45 who declined to continue brought the mean age of the of the drop outs down to 26.5 yr old (p=0.003). These 72 nurses had a lower mean educational level (14.2 yr;

p=0.002) and lower mean social domain quality of life score (p=0.006) than those remaining in the study (N=286). No other demographic data differences were found between the two groups (p>0.05). With regard to the results on the key measures of this study, those who dropped out had a lower social quality of life score (WHO-QOL-BREF) and lower coworker support (C-JCQ) than those who remained (13.55 vs. 13.98, respectively; p<0.001 and 11.94 vs. 12.12, respectively; p=0.03). No other significant differences were noted between the two groups.

Comparing scores of the high and low strain group over the two phases, the first survey found a greater prevalence of psychological morbidity and lower QOL in the high strain group than the low strain group (GHQ, p=0.008; WHOQOL-BREF, all four domains p<0.001). The second survey, administered six months later, found the GHQ scores of the high strain group to have lost significance (p=0.872) while all four QOL domain scores remained significantly low (p-value range, p=0.007 to p=0.048) (Table 2).

Job strain and psychological morbidity

As seen in Table 3, in our GEE analysis of the relative factors for the dependent variable of total score of

Table 3. The Generalized Estimating Equation analysis with relative factors to the total score of GHQ

Parameter	B	SE	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald χ^2	df	Sig.
(Intercept)	−0.897	1.9235	−4.667	2.873	0.218	1	0.641
[hospital=0]	−0.697	0.2953	−1.276	−0.118	5.574	1	0.018
[hospital=1]	0[a]	.	.	.	.	.	.
Job control	0.023	0.0226	−0.021	0.068	1.082	1	0.298
Psychological demand	0.117	0.0285	0.061	0.173	16.715	1	<0.001
Coworker support	−0.177	0.1053	−0.384	0.029	2.830	1	0.092
[Time=1]	1.803	0.4458	0.929	2.677	16.359	1	<0.001
[Time=2]	0[a]	.	.	.	.	.	.
[life=1]	−1.914	0.5595	−3.01	−0.817	11.696	1	0.001
[life=2]	0[a]	.	.	.	.	.	.
(Scale)	5.884						

Dependent Variable: total score of GHQ. Model: (Intercept), hospital, Job control, Psychological demand, Coworker support, Time. a. Set to zero because this parameter is redundant; hospital=0 means a regional teaching hospital, =1 means two downsizing hospitals; life=1 means no life event, =2 means had life event.

Table 4. Generalized Estimating Equation analysis to the relative factors for the score of WHOQOL-BREF

Parameter	B	SE	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald χ^2	df	Sig.
(Intercept)	53.808	7.5910	38.930	68.687	50.246	1	<0.001
age	0.317	0.0479	0.223	0.411	43.761	1	<0.001
[hospital=0]	−1.779	0.8410	−3.427	−0.131	4.474	1	0.034
[hospital=1]	0[a]	.	.	.	.	.	.
GHQ	−1.625	0.1940	−2.005	−1.245	70.155	1	<0.001
Job control	0.418	0.0615	0.297	0.538	46.216	1	<0.001
Psychological demand	−0.111	0.1000	−0.307	0.085	1.239	1	0.266
WRSS	0.407	0.1959	0.022	0.791	4.305	1	0.038
[Time=1]	−11.207	3.3807	−17.833	−4.581	10.989	1	0.001
[Time=2]	0[a]	.	.	.	.	.	.
(Scale)	101.396						

Dependent Variable: Total score of WHOQOL. Model: Intercept, age, hospital, GHQ, Job control, Psychological demand, WRSS, Time. a. Set to zero because this parameter is redundant, hospital=0 means regional teaching center, =1 means two downsizing hospitals; WRSS: work related social support.

GHQ, we entered the participants' personal data included age, whether they were leaders or not, educational level, marital status, smoking history, alcohol-drinking history, history of hypnotic drug use, and life events and the work characteristics such as job control, psychological demand, supervisor support and coworker support and downsizing hospital or not, layoff or not by backward stepwise regression. We found the regional teaching hospital in Kaohsiung to have lower total score of GHQ 0.697 than two downsizing hospitals (95%CI −1.276 to −0.118, p=0.018). With regard to the effect of different domains of the C-JCQ, the higher the psychological demand score, the higher the GHQ 0.117 (95%CI 0.061 to 0.173, p<0.001),

though job control and work related social support did not have a significant effect on GHQ (p=0.257, 0.120 respectively). Before downsizing and accreditation, the GHQ got higher 1.864 than half year later (95%CI 0.771 to 2.956, p=0.001). The life event increased the GHQ 1.922 (95%CI −3.021 to −0.823, p=0.001).

Job strain and quality of life

As seen in Table 4, in our GEE analysis of the relative factors for the dependent variable of total score of WHOQOL-BREF, the older worker, the higher QOL score with 0.317 when increase one year in age (95%CI 0.223 to 0.411, p<0.001). We also found the workers in regional teaching hospital in Kaohsiung to score 1.779 points lower on QOL

than those working the two hospitals that were downsizing (81.2 ± 12.3 vs. 82.5 ± 12.0 and 82.6 ± 12.6; 95%CI −3.43 to −0.43, *p*=0.034). We found that a one-point increase in GHQ score occurred with a 1.625 decrease in QOL (95%CI −2.005 to −1.245, *p*<0.001). Similarly, a one-point increase in C-JCQ job control and C-JCQ higher work related social support occurred with a 0.418 and 0.407 point increase in QOL (95%CI 0.297 to 0.538, *p*<0.001 and 95%CI 0.022 to 0.791, *p*=0.038, respectively). A one-point increase in C-JCQ psychological demand occurred with a 0.111 decrease in QOL (95%CI −0.307 to 0.085, *p*=0.266). In general, we found QOL scores to be 11.207 lower on the first survey than on the follow up survey (95%CI −17.833 to −4.581, *p*=0.001).

Analyzing the relationship between C-JCQ and GHQ, we found C-JCQ psychological demand to affect total GHQ score (B=0.085, 95%CI 0.025 to 0.145, *p*=0.005). GHQ was not affected significantly by C-JCQ job control, work related social support and skill discretion and decision-making authority, coworker support and supervisor support (subscales of job control and work related social support, table not shown). We also tested the relationship personal data and C-JCQ subscales and the social domain score of QOL, and found the higher psychological demand and coworker support, the greater the social QOL score 0.09, 0.375 respectively (*p*<0.001) (table not shown).

Discussion

In this study, we wanted to find out how job strain (demand, control, social support) would affect psychological morbidity and quality of life. We found that increased job strain adversely affected quality of life and increased psychological demand which led to adverse changes in psychological morbidity. Our first administration of this survey found significant differences in psychological morbidity and quality of life between the high strain and low strain groups. Six months later, the two groups were not found to have any significant difference in psychological morbidity (*p*=0.872). Job control and social support enhanced the QOL; but high psychological demand worsened psychological morbidity then influenced QOL indirectly.

However, significant group differences remained in four QOL domains, suggesting the possibility of a moderator or mediating effect between the job content and psychological morbidity and their effect on quality of life. While job control and social support appeared to affect quality of life directly, psychological demand appeared to first affect psychological morbidity which in turn affected quality of life, though further studies using moderation analysis are needed to confirm the relationship among these variables, subscales and outcomes. In a previous eight-year three-phase follow-up study of the influence of job strain on psychological morbidity in 3,413 female civil service workers, the Whitehall II study tried to make predictions regarding future changes in psychological morbidity based on baseline measures of job strain, but did not follow up job strain along with psychological morbidity during later stages of the study[8]. In a meta-analysis led by the same author[15], job strain (high demands and low decision latitude) were reported to be risk factors of psychological morbidity. They provided robust consistent evidence of this relationship. However, although they were able to predict future psychological morbidity, they were not studying the subscales of job strain. Predictions based on one baseline estimate of job strain may not be accurate because they fail to take into account changes in perceptions of that factor over time. We found the secular changes in perceptions of job strain to be significantly associated with psychological morbidity in our study population of nurses working in a changing work environment. The reason might be due to not only the official reimbursement strategy from Ministry of Defense but also the social reform from hospital accreditation.

We also found psychological morbidity to mediate the effect of psychological demand on QOL. In the systemic review of Eller on work-related psychosocial factors to the development of ischemic heart disease that not control but demand fully explained the association of heart disease[16]. In the result of Nasermoadelli, psychological demand did not associate with QOL[5]. Job control and psychological demand are different aspects in job strain to impact the psychological morbidity and QOL. This indicates that in the future study, we have to accumulate more evidences from the different domains of job content questionnaire on the different health-related outcome measurements.

Past studies of the effect of job strain on health have used various tools, including self-rated estimate of health rated 1 to 8[17] and self rated health with five possible answers[18] as well as a single physical condition such as coronary artery disease[16, 19] to measure health outcomes. Others have used tools measuring depression or mental health[4, 7, 8], psychosomatic symptoms[20], and general health[6, 21]. No study has used tools that measure health comprehensively, taking into account biological, psychological, social and environmental aspects of health. The WHOQOL subdivides quality of life into not only

physical and psychological domains, but also into social and environmental domains. Several studies report that the environment plays an important role in workplace and industrial health[5, 22, 23]. This was found in the present study using WHOQOL-BREF and JCQ.

The social domain in the WHOQOL-BREF evaluates issues related to personal relationships, sexual activity, practical social support, and feeling of being respected and accepted. Adverse social relationships and job characteristics have been associated with ill health[24], and some studies have found that social support may act as a buffer and protect against the development of depression or anxiety in environments with poor working conditions[7, 25]. The current study found a significant association between WHOQOL-BREF job control (include skill discretion and decision-making authority) and work related social support but psychological demand. This result confirmed the supervisor support, apart from work related social support, associated with employee` health outcome[26]. The reason of less educated younger worker who dropped out at the second survey which might be due to lower work-related support and the lower social domain QoL was found too. Their dropping out might have led to a healthy worker effect. Future studies might consider revising the definition of job strain from Karasek's control-demand theory by adding the attenuating power of social support for the future study.

The GHQ is used worldwide and considered an appropriate measurement of mental health outcomes[7, 8, 27–30]. Women have been reported by several epidemiological studies to have a higher prevalence of psychological morbidity[7, 27, 28, 31, 32]. In this study, we found higher prevalence of psychological morbidity in nurses in high strain jobs at baseline and in nurses working in job with greater psychological demand at follow up. Three longitudinal reports have found a causal relationship between job strain and the psychological morbidity, two using JCQ only at baseline[8, 10] and one using it at both baseline and follow up[9]. The results of the latter study might have been biased, as 25% of the nurses in that sample were unemployed. The reason our results may have differed from theirs is that our definition of job strain involved combing low/high job control and psychological demand. Dividing these two scales may have decreased the sensitivity of continuous data. Another reason may be that our study population were health care workers facing downsizing or facing a stringent accreditation process, which are special job characteristics not covered specifically by other studies. Still another reason may that seventy-two of the younger

workers in our study were lost follow up. These younger workers had lower educational levels and may have had less job control than those who remained. Therefore, the second survey may have been biased by the healthy worker effect, which could have led to underestimations of the relationship of job control and social support to psychological morbidity.

Although age has not been associated with psychological morbidity[33], our study found the younger nurses in our study to have poorer QOL scores. We also found that the nurses serving in hospitals that were downsizing had higher psychological morbidity but higher QOL than those serving in the regional teaching center. At the beginning of this study, we found a relationship between psychological morbidity and QOL, which could serve as an indicator of the need for early coaching and guidance for the younger nurses.

This study has several limitations. First, after subdividing the sample by changes in perceived job strain, the sample size was small. This reduced the statistical power of our results. Second, our study population was female nurses working in hospitals, which are work environments previously been reported to have high job strain and a higher prevalence of psychological morbidity[6, 11, 21, 34–38]. Therefore, our results may not be generalized to the whole population. Third, because health care workers are reported to have a high turnover rate[9], the nurses left working may be healthier than the whole sample if all had remained on the job. This possible healthy worker effect may lead to an underestimation of the relationship between job strain and psychological morbidity. Fourth, since health outcome and job strain were measured by self-reported questionnaire, response bias cannot be avoided. This kind of information bias could lead to an overestimation, though based on our findings with regard to psychological demand and those of two other studies, response bias does not significantly change the association between job strain and health outcome[7, 8]. Fifth, prediction is not causality and just because two time-points have been measured, this does not mean that there is a causal trend.

In conclusion, this study found that increases in job strain adversely affected changes in psychological morbidity and poorer quality of life in nurses working in military hospitals being downsized and hospitals being evaluated for accreditation. Job control and social support enhanced the QOL; high demand worsened psychological morbidity then mediated QOL indirectly. We have to accumulate more evidences from the different domains of job content questionnaire on the different health-related outcome mea-

surements. Therefore, nurses working in health care systems under transition might benefit from continued follow up and educational programs introducing them to stress coping strategies. This might help reduce psychological morbidity and improve quality of life in this vulnerable population.

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