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Original Article

Relationships of job demand, job control, and social support on intention to leave and depressive symptoms in Japanese nurses

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Abstract: This study aims to elucidate the relationships among the factors of the demand-control-support model (DCS) on the intention to leave a hospital job and depressive symptoms. Participants included 1,063 nurses. Job demand, job control, and support from supervisors were found to be significantly related to both the intention to leave and depressive symptoms. Based on the odds ratios per 1 SD change in the DCS factors, low support from supervisors was found to be most related to the intention to leave, and low job control was found to be most related to depressive symptoms. In models that did not include "job demand" as an independent variable, 60-h working weeks were found to have a significantly higher odds ratio for depressive symptoms. Support from supervisors is more important in preventing intention to leave and depressive symptoms among nurses than is support from co-workers. Improving job control and avoiding long working hours may be important to prevent depressive symptoms.

Key words: Nurses, Job demand, Job control, Social support, Intention to leave, Depressive symptoms

Introduction

The shortage of nurses is a global problem[1)], and rural and remote areas face more difficulty in recruiting and retaining nurses than the urban areas[2)]. According to a survey from the Japanese Nursing Association, the turnover rate of fulltime nurses was 11.0%[3)], intention to leave is significantly related to low work ability, and actual turnover leads to nurse shortages, affecting the safety and equity of patient care[4)]. Nurses are usually affected by psychological stress and have a higher prevalence of depressive symptoms than the general population[5, 6)]. Nurses with depressive symptoms have higher presenteeism, which is significantly associated with a higher number of patient falls, a higher number of medication errors, and lower quality-of-care scores[7)].

The demand-control-support (DCS) model[8)] is a major job-stress model that is widely used in the field of occupational health. The model has two dimensions, job demand and job control, with social support being included as a third dimension[9)], and many studies report a negative relationship of high demand, low control, and low social support with psychological wellbeing[10–14)].

Because all DCS factors are mutually related, the analysis included all DCS factors simultaneously to adjust for mutual confounding. However, among nurses, few studies have reported the relationship of DCS factors on the intention to leave using multivariate analyses in which

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all DCS factors were included. A Taiwanese study of 373 hospital clinical nurses reported that high job strain (high job demand and low job control) and low social support were significantly related to an intention to leave[15]. In a European study of 17,524 registered female nurses, the Pearson's coefficients for social support from a direct superior and intention to leave were found to be higher than those for social support from close colleagues and intention to leave, but the analyses did not include job demand or control[16]. In another paper of the same European study, it was reported that job demand were included in the multiple regression analyses, but social support was not divided into supervisor support and co-worker support, though demand, control, and social support were introduced simultaneously in the models[17]. Thus, there has not yet been any study of intention to leave among nurses in which demand, control, supervisor support, and co-worker support are simultaneously introduced to adjust for mutual confounding.

Estimates using the General Health Questionnaire, high job demand, low job control, and low social support were also found to be associated with mental distress in 372 Lithuanian nurses, though social support was not divided into supervisor support and co-worker support[18]. For 1,592 Chinese nurses, support from supervisors was found to be significantly related to depressive symptoms, but support from co-workers and job demand were not selected in the stepwise multivariate model[6]. Therefore, the final model was not adjusted for support from co-workers or job demand. Moreover, among Japanese psychiatric nurses[19] and Japanese acute-hospital nurses[20], support from supervisors also was found to be significant, but support from co-workers was not. However, the former study was restricted to psychiatric nurses and had a relatively small number of participants (n=238), and the latter one did not adjust for socioeconomic variables such as income, job rank, or working hours; further, the nurses of the latter study were restricted to large urban hospitals. Thus, to our knowledge, the DCS factors most related to intention to leave and depressive symptoms in nurses has not been fully investigated when all factors, job demand, job control, social support from supervisors, and social support from co-workers are considered as independent variables in the model. "Social support" in workplaces has often been viewed as a combined factor of social support from supervisors and support from co-workers. However, because social support from supervisors and co-workers may have different effects on the intention to leave and depressive symptoms among nurses[6, 18], each effect should be evaluated separately.

Therefore, it is important to clarify the factors of the DCS model that influence the intention to leave and depressive symptoms among nurses. To our knowledge, there has been no study that investigates which DCS model factor is most closely related to both intention to leave and depressive symptoms in Japanese nurses, with adequate adjustment for confounders such as income, job rank, and working hours. Moreover, since job demand may include the "working hours" factor, a model that does not include "job demand" as an independent variable should also be analyzed. The aims of this study were to elucidate the impact of relationships among the DCS factors of job demand, job control, social support from supervisors, and social support from co-workers on the intention to leave and depressive symptoms, and to determine which of these factors was most closely related to the outcomes observed in local city hospital nurses.

Subjects and Methods

Participants

In November 2012, anonymous self-administered pen-and-paper questionnaires were distributed to all nurses (n=1,180) at four hospitals (one university hospital in Asahikawa City; two regional-center hospitals in Furano City and in Rumoi City, and one rehabilitation hospital in Asahikawa City) in the northern part of Hokkaido, the northernmost of the four main islands of Japan. In total, 1,063 nurses responded (response rate: 90.1%). This study was approved by the Institutional Ethical Board for Epidemiological Studies at the Asahikawa Medical University.

Demographics and work-related factors

The questionnaire gathered the following demographic information: gender, age (ranges: –29, 30–39, 40–49, 50+ yr old), marital status (married, not married), education (nursing school, university or more), annual income (ranges:–399, 400–599, 600+ million yen), job type (such as outpatient, inpatient, other: operating department, and dialysis center), job rank (such as chief or sub-chief), and working hours (−39, 40–49, 50–59, 60+ h/wk). The recall period for working hours was the preceding month.

Job stress and social support

The Brief Job Stress Questionnaire (BJSQ)[21], based on the DCS model[8], was used to evaluate two job stress dimensions (job demand and job control) and social support from supervisors, co-workers, and family/friends.

The BJSQ has been widely used in Japan for practical occupational health evaluation and occupational health research[22–25]. The job demand portion comprised three factors: (1) You have to do an enormous amount of work, (2) You cannot complete all your work in the allotted time, and (3) You have to work very hard. In addition, there were three factors on job control: (1) You can work at your own pace, (2) You can decide the order in which you do your work and the way you do it, and (3) You can provide your opinions on the work strategy of your workplace. The responses were scored on a 4-point Likert-type scale (1=agree; 2=somewhat agree; 3=somewhat disagree; and 4=disagree)[22]. To evaluate job demand and job control, the reversed total score for the job-demand questions and the total score for the job-control questions were used. Then, higher scores denoted higher job demand or control[24, 25].

Social support from supervisors, co-workers, and family/friends was also evaluated using three factors: (1) You can often communicate with supervisors/co-workers, (2) You can strongly rely on supervisors/co-workers when you have problems, and (3) Your supervisors/co-workers are prepared to spend their time on your personal problems. The responses to these items were scored on a 4-point Likert-type scale (1=agree; 2=somewhat agree; 3=somewhat disagree; and 4=disagree). To evaluate social support from supervisors and co-workers, the reversed total score was calculated for each of the three questions with higher scores denoting higher social support[24, 25]. Support from family/friends was found to have a buffering effect on depressive symptoms, and this significant relation has been previously reported for Japanese acute-care-hospital nurses[20]. Therefore, support from family/friends were used as a confounder. Cronbach's alpha coefficients for the BSJQ subscales—job demand, job control, and social support from supervisors, from co-workers, and from family/friends, were 0.76, 0.72, 0.82, 0.81, and 0.86, respectively.

Intention to leave

The outcome "intention to leave the hospital" was measured using the query "Do you want to continue working at this hospital?" with four response choices: "want to continue," "neutral," "want to transfer another hospital if possible," and "want to transfer another hospital right away." The latter two responses were defined as "intention to leave" positive.

Depressive symptoms

Depressive symptoms were assessed using the Japanese version of the Center for Epidemiologic Studies for Depression scale (CES-D)[26, 27]. A CES-D scale score ≥16 is a widely used cutoff point for the general population[26, 27]. However, a high percentage of participants in this study (46.7%) were found to be above the CES-D positive cutoff score of ≥16. A recent study on Japanese workers recommended that the optimal cutoff score be ≥19[28], and a further study of Japanese nurses used this ≥19 cutoff[19]. Therefore, in this study, the depressive symptoms positive was defined as a CES-D score ≥19 (31.6%), to allow for the identification of mild mental health problems. The Cronbach's alpha coefficient for the CES-D was 0.88.

Statistical analysis

Employing multivariate logistic regression analyses, adjusting odds ratios for the demographics, work-related factors, job demand, job control, social support from supervisors, social support from co-workers, and social support from family/friends for intention to leave and depressive symptoms were analyzed. Since "working hours per week" may be an intermediate variable for "job demand," we analyzed another model that did not include "job demand" as an independent variable. Standardized scores for job demand, job control, social support from supervisors, social support from co-workers, and social support from family/friends were included in the model.

Though this study focused on the risk of each DCS factor, not job strain (combination of demand and control), job strain has been used widely. Therefore, the job strain categories of low demand and high control, high demand and high control, low demans and low control, and high demans and low control were also introduced in the models in the place of scores for job demand and control. The job-strain variable was constructed after demand and control were dichotomized.

Of the participants, 15.3% had missing data for one or more of the variables. On the basis of the "missing at random" (MAR) assumption, we used multiple imputations (20 imputed datasets). The variables included in the imputation model were as follows: hospital, age, sex, education, marital status, income, job type, job rank, working hours, whether working in shifts, job demand, job control, social support from supervisors, social support from co-workers, social support from family/friends, intention to leave, and all 20 separate CES-D item scores. After the imputation was completed, the total CES-D score was calculated and a depressive-symptoms positive (≥19) was established for

those participants with one or more missing values in the CES-D 20-item scores. The odds ratios were calculated both for the multiple imputation analyses and the complete case analyses.

P values<0.05 were considered statistically significant. All calculations were conducted using IBM SPSS Statistics 23.0 for Windows (SPSS Inc., Chicago, IL, USA).

Results

Table 1 shows demographic and work-related factors, along with each score for the BJSQ factors, intention to leave, CES-D scores, and positive depressive symptoms score (CES-D ≥19). Of the participants, 16.2% of the participants had an intention to leave, and 31.6% showed a positive depressive-symptoms score.

Table 2 shows the adjusted odds ratio for each variable for the intention to leave. In the multiple imputation models, age, education, job demand, job control and support from supervisors were found to be significantly related to the intention to leave. However, support from co-workers did not have any statistical significance. Complete data results showed a similar pattern.

Table 3 shows the adjusted odds ratio for each depressive-symptoms variable. In multiple imputation models, job demand, job control, support from supervisors and support from family/friends were found to be significantly related to depressive symptoms. However, support from co-workers did not have any statistical significance. The complete data result showed a similar pattern.

In the models not including "job demand" as the independent variable, job control and support from supervisors were found to be significantly related to an intention to leave, and job control, support from supervisors, and support from family/friends were found to be significantly related to depressive symptoms. Furthermore, ≥60 h/wk working hours had a significantly higher odds ratio for depressive symptoms in the multiple imputation model, though the relationship was marginal in the complete data set.

We also introduced the variable "job strain" in the models instead of the scores of demand and control, and high demand and high control, low demand and low control, and high demand and low control (reference: low demand and high control) had significant higher odds ratios for intention to leave and depressive symptoms.

Table 1. Participant characteristics (N=1,063)

Age	
–29	391 (36.8)
30–39	304 (28.6)
40–49	207 (19.5)
50+	160 (15.4)
Unknown	1 (0.1)
Sex	
Women	992 (93.3)
Men	65 (6.1)
Unknown	6 (0.6)
Education	
Nursing school	895 (84.2)
University or more	166 (15.6)
Unknown	2 (0.2)
Marital status	
Not married	895 (84.2)
Married	166 (15.6)
Unknown	2 (0.2)
Income	
–399	559 (52.6)
400–599	407 (38.3)
600+	69 (6.5)
Unknown	28 (2.6)
Job type	
Outpatient	185 (17.4)
Inpatient	739 (69.5)
Other	139 (13.1)
Job rank	
Chief or sub chief	132 (12.4)
Staff	920 (86.5)
Unknown	11 (1.0)
Working hours	
–39	279 (26.2)
40–49	433 (40.7)
50–59	210 (19.8)
60+	126 (11.9)
Unknown	15 (1.4)
Shift or not	
Daytime work	306 (28.8)
Night shift	757 (71.2)
Job demand (N=1,043)	9.2 ± 1.9
Job control (N=1,039)	7.3 ± 1.9
Support from supervisors (N=1,040)	7.4 ± 2.1
Support from co-workers (N=1,039)	8.3 ± 2.0
Support from family/friends (N=1,045)	10.1 ± 1.9
Intention to leave (N=1,050)	172 (16.2)
CEC-D score (N=979)	17.1 ± 9.7
CEC-D ≥19 (N=979)	336 (31.6)

Variables are presented as number (percent) or mean ± SD

Table 2. Adjusted odd ratios for the intention to leave

	Multiple imputation (N=1,063)			Complete data (N=962)		
	OR	95% CI	*p* value	OR	95% CI	*p* value
Age						
–29	7.62	2.56 to 22.68	**<0.001**	5.21	1.71 to 15.85	**0.004**
30–39	6.61	2.44 to 17.93	**<0.001**	4.05	1.47 to 11.16	**0.007**
40–49	3.71	1.34 to 10.29	**0.012**	2.60	0.92 to 7.36	0.071
50+	1.00			1.00		
Male (vs. female)	0.87	0.41 to 1.84	0.709	0.92	0.43 to 1.96	0.821
University or more	0.50	0.29 to 0.88	**0.016**	0.48	0.27 to 0.85	**0.012**
Married	0.82	0.52 to 1.28	0.380	0.80	0.50 to 1.28	0.350
Income						
–399	2.65	0.76 to 9.24	0.127	4.01	0.81 to 19.83	0.088
400–599	2.15	0.65 to 7.17	0.211	3.04	0.64 to 14.44	0.161
600+	1.00			1.00		
Job type						
Outpatient	1.00			1.00		
Inpatient	2.32	1.01 to 5.30	0.047	2.09	0.88 to 4.94	0.094
Other	2.46	1.01 to 6.00	0.048	2.09	0.83 to 5.26	0.118
Staff (vs. chief or sub chief)	1.12	0.52 to 2.41	0.771	0.99	0.45 to 2.18	0.976
Working hours (per wk)						
–39	1.00			1.00		
40–49	1.28	0.74 to 2.22	0.370	1.40	0.78 to 2.51	0.262
50–59	1.49	0.81 to 2.74	0.198	1.67	0.88 to 3.19	0.119
60+	0.98	0.49 to 1.98	0.954	1.18	0.56 to 2.49	0.667
Night shift	1.31	0.67 to 2.57	0.432	1.23	0.60 to 2.49	0.574
Job demand (per 1SD)	1.53	1.21 to 1.92	**<0.001**	1.53	1.21 to 1.94	**<0.001**
Job control (per 1SD)	0.73	0.59 to 0.89	**0.003**	0.75	0.60 to 0.94	**0.010**
Support from supervisors (per 1SD)	0.59	0.46 to 0.76	**<0.001**	0.58	0.44 to 0.75	**<0.001**
Support from co-workers (per 1SD)	0.83	0.66 to 1.05	0.124	0.84	0.66 to 1.07	0.167
Support from family/friends (per 1SD)	1.05	0.86 to 1.28	0.641	1.10	0.89 to 1.36	0.388

Above all variables, smoking, drinking, and hospitals were introduced in the models

Discussion

The purpose of this study was to elucidate the impact of relationships among DCS factors and to determine which DCS factor was most strongly related to the outcomes for local city hospital nurses. We found significant relationships between job demand, job control and support from supervisors on both the intention to leave and depressive symptoms. Based on the odds ratios per 1 SD change, support from supervisors was determined to be most related to the intention to leave, and job control was most related to depressive symptoms.

Of the participants, 16.2% were found to have intention to leave. A recent study of Japanese nurses conducted in Tokyo reported that 29.6% had an intention to leave the workplace within the following year.[29] In other Japanese studies on small-to medium-sized private hospital nurses, 16.7% answered "negligible" to the query regarding the intention to stay[30]. In a European study of 23,159 surgical and medical unit nurses, 33% had an intention to leave the hospital workplace[31]. It is difficult to directly compare the prevalence of the intention to leave, since the methods used to measure an intention to leave have not been standardized. However, because the prevalence of the intention to leave in our study was not high, the hospitals in our study did not seemed to be atypical workplaces.

Of the participants, 31.6% were found to have depressive symptoms (CES-D ≥19). In a recent Japanese survey on 24,896 individuals, 25.6% of males aged 20–59 yr and 29.5% of females aged 20–59 yr were found to have depressive symptoms (CES-D ≥16)[32]. A recent study on Japanese workers recommended that the optimal cutoff score be ≥19, with the prevalence of positive depressive symptoms at 9.5%[28]. In a study of Japanese psychiatric

Table 3. Adjusted odd ratios for depressive symptoms

	Multiple imputation (N=1,063)			Complete data (N=904)		
	OR	95% CI	*p* value	OR	95% CI	*p* value
Age						
–29	1.61	0.87 to 2.99	0.133	1.97	0.94 to 4.11	0.072
30–39	1.33	0.79 to 2.23	0.284	1.56	0.83 to 2.92	0.170
40–49	1.15	0.69 to 1.93	0.596	1.10	0.59 to 2.07	0.765
50+	1.00					1.00
Male (vs. female)	1.23	0.68 to 2.20	0.496	1.16	0.63 to 2.14	0.636
University or more (vs. nursing school)	0.89	0.58 to 1.37	0.593	0.93	0.59 to 1.46	0.750
Married	0.76	0.54 to 1.07	0.112	0.75	0.52 to 1.09	0.128
Income						
–399	2.00	0.96 to 4.16	0.063	1.62	0.70 to 3.71	0.258
400–599	1.61	0.81 to 3.18	0.173	1.30	0.60 to 2.83	0.509
600+	1.00					1.00
Job type						
Outpatient	1.00					1.00
Inpatient	1.34	0.78 to 2.33	0.291	1.61	0.86 to 3.05	0.140
Other	1.22	0.68 to 2.19	0.504	1.35	0.70 to 2.63	0.375
Staff (vs. chief or sub chief)	0.70	0.42 to 1.16	0.161	0.79	0.45 to 1.40	0.420
Working hours (per wk)						
–39	1.00					1.00
40–49	1.21	0.81 to 1.79	0.354	1.40	0.90 to 2.18	0.135
50–59	1.27	0.79 to 2.02	0.325	1.38	0.82 to 2.33	0.225
60+	1.57	0.92 to 2.66	0.095	1.69	0.94 to 3.03	0.080
Night shift	1.25	0.77 to 2.04	0.362	1.12	0.64 to 1.95	0.692
Job demand (per 1SD)	1.39	1.17 to 1.66	**<0.001**	1.40	1.16 to 1.70	**0.001**
Job control (per 1SD)	0.63	0.53 to 0.74	**<0.001**	0.58	0.48 to 0.70	**<0.001**
Support from supervisors (per 1SD)	0.81	0.67 to 0.97	**0.024**	0.79	0.64 to 0.97	**0.024**
Support from co-workers (per 1SD)	0.87	0.73 to 1.05	0.149	0.86	0.71 to 1.06	0.154
Support from family/friends (per 1SD)	0.67	0.57 to 0.78	**<0.001**	0.63	0.53 to 0.76	**<0.001**

Above all variables, smoking, drinking, and hospitals were introduced in the models

nurses, however, 36.4% of males and 37.2% of females were found to have depressive symptoms with a ≥19 cutoff[19]. In a Chinese nursing study using a ≥16 cutoff, 61.7% were found to have depressive symptoms[6], and in a Korean study using a ≥21 cutoff, 37.7% nurses were found to have positive depressive symptoms[33]. The reason for the higher depressive symptom prevalence among nurses was speculated to be the different levels of occupational stress in the nursing profession compared to other occupations[19]. In our study, however, participants were not found to have a high depressive-symptom prevalence. The reason for such a prevalence of intention to leave and depressive symptoms may be that mental health needs seemed to be acknowledged in the participating hospitals.

In this study, support from supervisors was found to have a significant relation with both intention to leave and depressive symptoms, but support from co-workers had no significant relation. In the Chinese nursing study, support from supervisors was found to be significantly related to depressive symptoms, but support from co-workers was not selected in the stepwise multivariate model[6]. Moreover, two Japanese studies have reported that support from supervisors was found to be significant, whereas support from co-workers was not[19, 20]. A meta-analysis has reported that low social support had a significantly higher odds ratio for common mental disorders[14]. However, the protective effect varied depending on the social support type and the worker characteristics[34]. In an European nurses' study, the Pearson's coefficients for social support from a direct superior and intention to leave were found to be higher than for social support from close colleagues and intention to leave[16]. A study of Malaysian nurses reported that support from a supervisor was positively related to work engagement, but support from co-workers was found

to have no effect on work engagement[35]. Support from supervisors plays a significant role in the development of occupational competence and growth potential[36, 37]. In a nursing setting, supervisors with good leadership skills may have effects on job satisfaction and good patient outcomes, and supervisors have an important role in staff education[38]. Furthermore, support from supervisors can lead to a resourceful work environment, which would improve the staff member's willingness to apply greater effort to the work tasks[35]. Those mechanisms could explain why support from supervisors had protective effects on intention to leave and depressive symptoms in our study. Therefore, increased attention should be paid to supervisor social support to prevent nursing turnover and improve mental health.

Job control was consistently related to both the intention to leave and depressive symptoms, and was found to be most related to depressive symptoms based on a 1-SD change in the DCS factors. The meta-analysis reported that low job control had a significantly higher odds ratio for common mental disorders[14]. Moreover, significant results were also found in the previously highlighted Japanese nursing studies[19, 20] and the Chinese nursing study[6]. Job control is related to job satisfaction, commitment, involvement, performance, and motivation[39]. To prevent medical errors and accidents, paperwork has been increasing, and strict adherence to the manual has recently been required. Thus, nurses' job control has been decreasing, but nurses should have more latitude in their jobs, for their mental health. To increase job control, team-oriented organizational structures are preferable, as compared with traditional hierarchical nursing structures[40]. Because the existence of a double line of command (nursing department and physicians) among nurses may reduce job control[41], a good nurse-physician relationship may improve job control among nurses[42].

Job demand was also found to be consistently related to both the intention to leave and depressive symptoms. Meta-analysis reported that high job demand had a significantly higher odds ratio for common mental disorders[14]. The Chinese nursing study had a significant result in univariate analysis, but not in multivariate analysis[6]. However, among Japanese psychiatric nurses[19] and Japanese acute-hospital nurses[20], job demand was significantly related to depressive symptoms. The European study reported that job demand was mostly related to intention to leave in the multiple regression analyses[17]. Thus, the reason for a non-significant result in the Chinese study is unknown, but the other study indicated that job demand is as significant a factor for mental health as in other occupations. Nurses have been confronting increasing burdens, such as rapidly expanding knowledge base and patient expectations. However, increasing nurse staff is difficult because of the shortage of nurses and staff cost restriction. According to the survey of Japanese Nursing Association, unpaid overtime work has existed, and sometimes long hours are necessary to hand off their patients, and nurses have a great many educational duties and meetings[43]. Thus, we need to reduce uncompensated overtime, time to hand off their patient, too many educational duties, and long hours of meetings. Moreover, if these measures cannot be applied soon, countermeasures to low job control and low social support may be practical.

Comparing of four DCS factors, support from supervisors was determined to be the most related to the intention to leave, and job control was most related to depressive symptoms. In the European study, support from a direct superior was more related to intention to leave compared with support from close colleagues, though the analyses did not include job demand and control[16]. Among Japanese psychiatric nurses, support from supervisors was most related to depressive symptoms[19], and among Japanese acute-hospital nurses, qualitative work load was mostly related to depressive symptoms[20]. The former study was restricted to psychiatric nurses and had a relatively small number of participants. The later one, restricted to large urban hospitals, did not adjust for socioeconomic variables such as income, job rank, and working hours, though the Chinese study reported a significant relation of job rank and education to depressive symptoms, and speculated on the influence of salary[6]. The strengths of our study are that the results were adjusted for job rank, education, and income, and are that participants were not restricted to specific specialties. As previously mentioned, support from supervisors has a significant role in the development of occupational competence and growth potential[36, 37]. The importance of the nursing practice environment has been reported, and the subscale "nurse manager ability, leadership, and support of nurses" was the most related to intention to stay among Japanese nurses[29]. Thus, supervisor may be the most influential factor for nurses who work in practical environment and need to study continuously. That may be the reason for the strongest relationship of support from supervisors.

Since working hours may be an intermediate variable for "job demand," the model that did not include "job demand" as an independent variable was analyzed. In the model, ≥60 h/wk of working hours (vs. ≤39 h/wk) was

found to have a significantly higher odds ratio for depressive symptoms in the multiple imputation models. A recent systematic review concluded that long working hours were a significant risk factor for depressive symptoms[44], and the Chinese study on nurses also reported that long working hours were significantly related to depressive symptoms, which was estimated using the Zung Self-Rating Depression Scale (SDS)[45]. Thus, because long working hours affect mental health and 31.6% of the participants worked 50 h per week or more, measures to reduce working hours should be considered, as previously mentioned.

Many previous studies reported a job strain effect on psychological wellbeing among various populations[11, 13], and job strain had a significantly higher odds ratio for intention to leave and depressive symptoms in the present study. Thus, job strain results were compatible with those of previous studies. In the present study, high demand and low control had an odd ratio of 3.2 for intention to leave and an odds ratio of 4.3 for depressive symptoms. Thus, because job strain was also significant indicator, a combination of reducing job demand and increasing job control may be a more effective countermeasure to prevent intention to leave and depressive symptoms among nurses, especially with high job strain.

This study had several limitations. First, since this study was cross-sectional, we were unable to infer cause–effect relationships. The necessity of longitudinal studies has been emphasized, and the possible reciprocity between DCS and wellbeing was reported[11, 13]. However, because there has been no study to clarify which DCS factor is most related to both intention to leave and depressive symptoms among Japanese nurses, we believe that this study can lead to effective countermeasures. Second, while the response rate was relatively high, there might have been a tendency by nurses with greater job stress not to participate, which may have attenuated the significance of the results. Third, the participants were restricted to four local city hospitals. However, the rates for the intention to leave and the depressive symptoms were relatively compatible with similar recent studies, so we believe our results can be largely generalized to other nurses in other hospitals. Fourth, the lack of a significant result for social support from co-workers could have been due to the inadequate sample size, but the larger sample-sized Japanese study also did not have a significant result of support of co-workers on depressive symptoms[20]. Fifth, we used the four-response-choice questions to measure "intention to leave." As previously mentioned, the standard method to measure "intention to leave" has not been established. Finally, because this study used a questionnaire that measured exposures and outcomes simultaneously, a common method bias may exist. However, we believe that the comparison of four DCS factors is possible, though the odds may be overestimated.

Conclusion

Our study of nurses suggested that job demand, job control and support from supervisors related to both the intention to leave and depressive symptoms. Support from supervisors was found to be most related to the intention to leave, and job control was found to be most related to depressive symptoms. In terms of social support, support from supervisors was found to be more important to a nurse's intention to stay and to mental health compared to support from co-workers. Improving job control and avoiding long working hours may be important to prevent depressive symptoms.

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