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Priority approaches of occupational safety and health activities for preventing low back pain among caregivers

Kazuyuki Iwakiri | **Masaya Takahashi** | **Midori Sotoyama** | **Xinxin Liu** | **Shigeki Koda**

National Institute of Occupational Safety and Health, Kawasaki, Japan

Correspondence
Kazuyuki Iwakiri, National Institute of Occupational Safety and Health, Kawasaki, Japan.
Email: iwakiri@h.jniosh.johas.go.jp

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Abstract

Objectives: The incidence of occupational low back pain (LBP) is high among caregivers. The use of care equipment and training about care methods could prevent LBP among caregivers. However, in care facilities in Japan, these measures are not adequately employed. Moreover, the care facilities have faced issues regarding poor staffing in recent years. The present study investigated the relationship between LBP and occupational safety and health activities (OSHAs) for preventing LBP among caregivers and aimed to validate the priority approaches of OSHA.

Methods: This cross-sectional study was conducted in care facilities for the elderly in Japan. Questionnaires for administrators and caregivers were distributed to 1,000 facilities and 5,000 caregivers, respectively. Questionnaires completed by 612 facilities and 2,712 caregivers were analyzed.

Results: No direct association was observed between severe LBP and OSHA, but indirect association was done. A significant relationship was noted between severe LBP and the care methods. Direct factors causing severe LBP were lifting a resident using human power and taking an unsuitable posture. These care methods were associated with the following OSHAs: promoting the use of care equipment, training about care methods, and consultation regarding the use of care equipment and employing an appropriate care method with the person in charge.

Conclusions: These OSHAs decreased lifting a resident using human power and taking an unsuitable posture, which are the primary risk factors of LBP. Therefore, these OSHAs should be implemented as priority approaches to prevent LBP among caregivers in care facilities for the elderly.

KEYWORDS

care equipment, caregiver, low back pain, occupational safety and health activities

1 | INTRODUCTION

The incidence of occupational low back pain (LBP) is high among caregivers in care facilities.[1-4] Previous studies have reported that the primary risk factors of LBP among caregivers are handling a patient and taking awkward postures.[5,6] The use of care equipment, such as the lift for patient transfer, could prevent LBP and reduce back injuries among caregivers.[2,4,7-15] Adequate training about care methods could reduce the risk of LBP.[14,15] In addition, the ergonomic program comprising the use of care equipment and training about care methods can prevent LBP among caregivers.[4,12-15] However, in care facilities in Japan, care equipment are not adequately used,[20] and the training conducted to provide guidance about care methods for preventing LBP are insufficient.[20]

The main care facility for the elderly in Japan is called a special elderly nursing home. The care facility provides services for elderly individuals who require continual nursing care and face significant challenges for coping with the required activities of daily living. Moreover, it provides a home-like environment to help elderly individuals lead a life at ease. Although several care facilities have approximately 60-70 residents, there are certain large facilities with >100 residents. In such facilities, one caregiver is assigned to three residents. The needing care level (NCL) of a resident in Japan is divided into five levels—level 1 is low and level 5 is extremely high. The average NCL of residents in the special elderly nursing home has increased from 3.4 in 2000 to 3.9 in 2017.[21] An elderly individual who is categorized as NCL 3 or more exhibits a substantial impairment of activities of daily living and requires an almost full-scale nursing care. Furthermore, the number of residents with severe dementia has increased in recent years.[21] In addition, the care facilities face issues, such as poor staffing.[20,21] Caregivers in care facilities have physical and mental burden correlated to work and require useful measures for occupational safety and health.[20] However, in care facilities with such circumstances, effective occupational safety and health activities (OSHAs) for preventing LBP remain unclear.

The present study investigated the relationship between LBP and OSHA for preventing LBP and aimed to validate OSHA approaches for preventing LBP among caregivers in care facilities for the elderly.

2 | METHODS

2.1 | Research design

This cross-sectional study was conducted in care facilities for the elderly in Japan. Overall, 5875 care facilities have been registered in the Japan Ministry of Health, Labor, and Welfare Publication System of Long-Term Care Service Information; moreover, the number of registered caregivers was 232 467 in November 2013. Among these, 1000 facilities located throughout Japan from Hokkaido to Okinawa (sampling rate: 17.0%) were selected via random sampling. Five caregivers who differed in terms of sex, age, and years of experience were selected per facility; overall 5000 individuals were selected (sampling rate: 2.2%). Anonymous self-administered questionnaires for a care facility and caregiver were developed and distributed to the facility administrators and caregivers, respectively.

2.2 | Questionnaires

The questionnaire provided to the administrators was used to collect basic information regarding the care facility (Table 1), OSHA (Table 4), and numbers and types of care equipment (Table 5). The questionnaire administered to caregivers was used to collect information regarding basic characteristics (Table 2), job stressors (Table 2), job dissatisfaction (Table 2), severity of LBP during the last year, OSHA (Table 3), the use of care equipment (Table 4), and care methods (Table 5). These OSHAs consisted of typical activities in care facilities in Japan. Although care methods are included in OSHA, in the present study, it was divided to distinguish the areas wherein the caregiver and administrator could improve. Information to link the questionnaires for a care facility and caregiver was not collected.

The severity of LBP was divided into four grades based on a scheme devised by Von Korff et al[22]: grade 0 (no LBP), grade 1 (LBP not interfering with work), grade 2 (LBP interfering

TABLE 1 Basic information of care facilities

n = 612	(% or mean ± SD)
Facility type (%)	
With several beds in a room	61.1
Unit care	22.1
Compound type	14.1
Work shift system (%)	
Day shift	4.7
Two shifts	29.6
Three shifts	27.8
Irregular three shifts and so on[a]	28.6
Caregivers (n)	46.4 ± 21.6
Residents in a care facility (n)	74.4 ± 28.4
Needing care level of residents (between 1 and 5)	3.9 ± 0.4
Retired care workers during the previous year (n)	5.5 ± 5.0
Absent care workers during the previous year (n)	

[a]Irregular three shifts include early morning shift, day shift, late morning shift, evening shift, and night shift.

TABLE 2 Basic characteristics of the caregivers

n = 2,712	(% or mean ± SD)
Sex (%)	
Male	36.5
Female	63.5
Age (year)	37.8 ± 10.7
Height (cm)	162.8 ± 8.4
Body mass index (BMI)	22.3 ± 3.6
Smoke (%)	
No smoking	63.0
Smoking	31.6
Qualification (multiple answers allowed; %)	
Certified caregiver	75.7
Caregiver	35.0
Care manager	14.8
Public health nurse or nurse	1.5
No qualification	5.0
Years of experience in total (%)	
<2 years	8.3
≥2 years, <10 years	50.1
≥10 years	41.3
Work shift system (%)	
Day shift	22.0
Two shifts	21.6
Three shifts	35.5
Irregular three shifts and so on	18.1
Total weekly working hours (%)	
<35 h	4.7
≥35 h, <40 h	29.7
≥40 h, <45 h	43.2
≥45 h	20.5
Job stressors	
Job demand (between 3 and 12)	9.5 ± 1.9
Job control (between 3 and 12)	7.6 ± 1.9
Worksite social support (between 6 and 24)	13.5 ± 3.6
Job dissatisfaction (%)	
Shortage of caregivers with task of transferring	44.8
Not provided sufficient time for performing transfer task	47.3
Shortage of caregivers with task of bathing	47.8
Not provided sufficient time for performing bathing task	63.4

with work), and grade 3 (LBP interfering with work and leading to sick leave). Of these, grades 0 and 1 are defined as non-severe LBP, whereas grades 2 and 3 are defined as severe LBP. Questions regarding job stressors were developed based on job demand, job control, and worksite social support items of the brief job stress questionnaire.[23] Job demand consisted of "I have an extremely large amount of work to do", "I can't complete work in the required time", and "I have to work as hard as I can". Job control consisted of "I can work at my own pace", "I can choose how and in what order to do my work", and "I can reflect my opinions on workplace policy". Worksite social support consisted of "How freely can you talk with superiors or co-workers?", "How reliable are superiors or co-workers when you are troubled?", and "How well will superiors or co-workers listen to you when you ask for advice on personal matters?". These items were measured using a four-point scale. Job demand and job control summarized three items into one, and it ranged from 3 (low stressor) to 12 (high stressor). Worksite social support summarized six items into one, and it ranged from 6 (low stressor) to 24 (high stressor). Questions regarding job dissatisfaction were developed with regard to the dissatisfaction owing to lack of personnel and that associated with the working time during transfer or bathing task, as shown in the bottom of Table 2. These questions were measured using a two-point scale: shortage and not shortage. Questions regarding the use of care equipment and care methods were developed with regard to the use of care equipment, lifting a resident using human power, and taking an unsuitable posture in transfer and bathing tasks, as shown in Table 5. These questions were measured using a five-point scale: always performed, often performed, sometimes performed, almost never performed, and completely never performed; these questions were dichotomized in the analysis.

2.3 | Procedure

All questionnaires were distributed to the administrators in the care facilities by mail from January 2014. The administrators were instructed to distribute the questionnaire to the five caregivers. The completed questionnaires were collected from each individual by mail by March 2014.

The administrators and caregivers were informed regarding the study plan, and personal information provided in writing was protected; written consent was obtained from the participants. This study conforms to the principles of Declaration of Helsinki and was approved by the ethics board of the National Institute of Occupational Safety and Health of Japan (registration ID: H2522).

2.4 | Statistical analysis

The questionnaires from administrators who failed to provide data regarding the numbers of caregivers and residents in the care facility were excluded from the analysis. The questionnaire from caregivers who failed to provide information regarding sex and age were excluded from the analysis. The association between severe LBP and

TABLE 3 Occupational safety and health activities in care facilities and the participation rate of caregivers

	Implementation rate in care facilities (%) n = 612	Participation rate of caregivers (%) n = 2,712
Medical checkup	99.3	97.9
Medical examination of low back pain	54.9	44.0
Setting-up of a health committee	80.1	—
Assessment on methods to prevent back pain by the health committee	65.7	—
Workplace round of inspection	74.8	—
Appointment with an industrial physician	75.5	—
Appointment with a health supervisor	87.1	—
Promoting the use of care equipment	67.2	49.9
Training about care methods	90.2	60.0
Training for using care equipment	48.0	36.9
Establish an appropriate care method for each resident	94.9	88.1
Use of the manual for care methods	86.3	65.3
Test about care methods and use of care equipment	5.1	4.4
Regular evaluation regarding care methods and use of care equipment	29.6	11.7
Promoting the discussion of improving care methods among colleagues	88.4	91.1
Consultation on appropriate care methods and use of care equipment with the person in charge	53.8	69.5

TABLE 4 Introduction rate and average number of care equipment in care facilities

n = 612	Introduction rate of care equipment (%)	Average number of care equipment per 100 residents（Min–Max）
Mobile hoist	18.0	2.1 (0.5-10.9)
Rail guide hoist in a bedroom	3.3	5.7 (0.7-12.2)
Rail guide hoist in a bathroom	9.5	2.0 (0.5-10.8)
Stationary hoist in a bedroom	2.1	3.9 (0.7-20.6)
Stationary hoist in a bathroom	37.3	2.5 (0.4-11.1)
Assistance equipment for standing	1.8	2.7 (0.4-14.7)
Sliding board	40.0	3.2 (0.4-25.9)
Sliding sheet	29.1	5.3 (0.6-58.8)
Modular wheelchair	42.5	14.3 (0.4-133.3)
Powered adjustable bed	87.4	73.5 (0.8-122.8)

OSHA or care methods as well as that between care methods and OSHA was analyzed using logistic regression analysis. Odds ratio (OR) and 95% confidence interval (95% CI) were calculated for Crude, Model 1, and Model 2. Model 1 included sex, age group, and smoking. Model 2 included sex, age group, smoking, job demand, job control, and worksite social support. The Statistical Package for the Social Sciences software (IBM SPSS version 22) was used for statistical analysis and the significance level was ≤5%.

3 | RESULTS

The questionnaires completed by the administrators were collected from 615 facilities (response rate: 61.5%), and those

TABLE 5 Association between severe LBP and care methods examined using the logistic regression models

	Severe LBP (%) n = 940	Non-severe LBP (%) n = 1,578	Crude			Model 1[a]			Model 2[b]		
			OR	95% CI	*p*	OR	95% CI	*p*	OR	95% CI	*p*
Sex											
Male	33.0	38.5	1.00								
Female	67.0	61.5	1.27	1.07-1.51	0.006						
Age											
<30 years	23.5	26.7	1.00								
≥30 years, <40 years	33.5	36.9	1.03	0.84-1.28	0.762						
≥40 years, <50 years	23.2	20.7	1.27	1.01-1.61	0.045						
≥50 years	19.8	15.7	1.44	1.12-1.85	0.004						
Smoke											
No smoking	57.7	65.7	1.00		0.006						
Smoking	38.0	28.6	1.51	1.27-1.80	<0.001						
General care work											
Assistance with multiple persons per resident											
Performed	81.3	85.3	1.00			1.00			1.00		
Not performed	17.8	13.6	1.37	1.10-1.71	0.005	1.37	1.09-1.73	0.007	1.31	1.03-1.67	0.028
Combination of work in different work postures and movements											
Performed	54.4	66.2	1.00			1.00			1.00		
Not performed	43.7	31.9	1.67	1.41-1.97	<0.001	1.64	1.38-1.95	<0.001	1.38	1.14-1.66	0.001
Transfer											
Use of a hoist											
Always, often, or sometimes	8.7	11.7	1.00			1.00			1.00		
Completely or almost never	78.3	73.8	1.42	1.08-1.87	0.013	1.45	1.09-1.93	0.012	1.34	0.99-1.81	0.058
Use of a sliding board or a sliding sheet											
Always, often, or sometimes	23.8	25.5	1.00			1.00			1.00		
Completely or almost never	66.9	63.0	1.14	0.94-1.38	0.193	1.15	0.94-1.41	0.168	1.08	0.88-1.33	0.451
Adjustment of the height and back support section of beds											
Always, often, or sometimes	79.0	82.1	1.00			1.00			1.00		
Completely or almost never	18.5	15.2	1.27	1.02-1.57	0.032	1.25	1.00-1.56	0.055	1.16	0.91-1.47	0.225

(Continues)

TABLE 5 (Continued)

	Severe LBP (%) n = 940	Non-severe LBP (%) n = 1,578	Crude			Model 1[a]			Model 2[b]		
			OR	95% CI	*p*	OR	95% CI	*p*	OR	95% CI	*p*
Lifting a resident using human power											
Completely or almost never	0.6	3.4	1.00			1.00			1.00		
Always, often, or sometimes	97.7	95.0	5.41	2.32-12.63	<0.001	5.07	2.15-11.95	<0.001	4.23	1.76-10.12	0.001
Taking an unsuitable posture											
Completely or almost never	3.5	11.0	1.00			1.00			1.00		
Always, often, or sometimes	95.3	87.7	3.41	2.33-5.00	<0.001	3.19	2.16-4.72	<0.001	2.56	1.71-3.84	<0.001
Bathing											
Use of a hoist											
Always, often, or sometimes	35.0	40.4	1.00			1.00			1.00		
Completely or almost never	52.9	48.0	1.27	1.07-1.51	0.007	1.29	1.08-1.55	0.006	1.28	1.06-1.54	0.011
Lifting a resident using human power											
Completely or almost never	2.9	7.0	1.00			1.00			1.00		
Always, often, or sometimes	94.6	90.1	2.55	1.66-3.91	<0.001	2.37	1.52-3.69	<0.001	2.16	1.35-3.44	0.001
Taking an unsuitable posture											
Completely or almost never	3.3	12.4	1.00			1.00			1.00		
Always, often, or sometimes	94.6	85.4	4.15	2.81-6.12	<0.001	3.96	2.66-5.90	<0.001	3.47	2.29-5.25	<0.001

95% CI: 95% confidence interval; OR: odds ratio.

[a]Adjusted for sex, age group, and smoking using logistic regression analyses.

[b]Adjusted for sex, age group, smoking, job demand, job control, and worksite social support using logistic regression analyses.

TABLE 6 Association between care method and occupational safety and health activities examined using logistic regression models

	Model 2[a] with "Refraining from lifting a resident using human power" as a dependent variable						Model 2[a] with "Refraining from taking an unsuitable posture" as a dependent variable					
	Transfer			Bathing			Transfer			Bathing		
Independent variables	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***
Promoting the use of care equipment												
Not received	1.00			1.00			1.00			1.00		
Received	2.12	1.15-3.92	0.016	1.63	1.11-2.39	0.013	1.19	0.87-1.62	0.278	1.20	0.90-1.62	0.217
Training about care methods												
Not received	1.00			1.00			1.00			1.00		
Received	2.02	1.03-3.98	0.041	1.64	1.07-2.50	0.023	1.43	1.02-2.01	0.036	1.35	0.98-1.85	0.066
Consultation on appropriate care methods and use of care equipment with the person in charge												
No consultation	1.00			1.00			1.00			1.00		
Consultation	1.57	0.78-3.18	0.206	0.97	0.64-1.47	0.895	1.18	0.82-1.69	0.373	1.44	1.01-2.07	0.044
Number of training about care methods												
Once a year	1.00			1.00			1.00			1.00		
Twice to thrice a year	1.82	0.94-3.54	0.078	1.26	0.79-2.01	0.335	0.89	0.60-1.32	0.553	0.81	0.55-1.19	0.279
Four–eleven times a year	0.43	0.06-3.33	0.0421	0.73	0.28-1.91	0.516	0.63	0.29-1.37	0.239	0.72	0.36-1.47	0.373
At least once a month	4.40	1.16-16.74	0.030	2.56	0.83-7.96	0.104	1.59	0.57-4.42	0.375	1.10	0.36-3.33	0.868

95% CI: 95% confidence interval; OR: odds ratio.

[a]Adjusted for sex, age group, smoking, job demand, job control, and worksite social support using logistic regression analyses.

completed by caregivers were collected from 2751 individuals (response rate: 55.0%). Among these, 612 facilities and 2712 caregivers (1723 females and 989 males) were included in the analysis. Results of the questionnaire completed by the administrators are presented in Table 1, Table 3 (Implementation rate in care facilities), and Table 4. Results of the questionnaire completed by caregivers are presented in Table 2, Table 3 (Participation rate of caregivers), Table 5, and Table 6.

3.1 | Basic information of care facilities and caregivers

Table 1 provides the basic information of care facilities. The number of caregivers (mean ± standard deviation) was 46.4 ± 21.6, and the number of residents was 74.4 ± 28.4 in the care facilities. The average NCL of the residents was 3.9 ± 0.4 in care facilities. The retired and absent caregivers during the previous year were 5.5 ± 5.0 and 0.9 ± 1.3, respectively.

Table 2 shows the basic characteristics of the caregivers. Mean age of the caregivers was 37.8 ± 10.7 (18-75) years, and the rate of smoking was 31.6%. The total weekly working hours were the largest number at 40-45 hours, and it accounted for 43.2% of all caregivers. Job demand was slightly higher than the median, and job control was almost equal to the median, and worksite social support was slightly lower than the median. Job dissatisfaction regarding the lack of personnel and working time had a high percentage in terms of transfer and bathing tasks. Height, body mass index, qualification, years of experience, and work shift system of caregivers are presented in Table 2.

3.2 | Severe LBP among caregivers

Within the last year, the rates of grade 0-LBP, grade 1-LBP, grade 2-LBP, and grade 3-LBP were 26.7%, 31.5%, 28.2%, and 6.5%, respectively. Among caregivers, the rate of non-severe LBP was 58.2% (n = 1,578) and that of severe LBP was 34.7% (n = 940).

3.3 | OSHA in care facilities and participation rate of caregivers

Table 3 presents the OSHA in care facilities and the participation rate of caregivers. Approximately 99.3% of care facilities conducted medical checkup, and 97.9% of caregivers underwent this checkup. The health committee, industrial physician, and health supervisor, who addressed the health problem of caregivers, were assigned in approximately 80% of care facilities. However, a few care facilities conducted the training about the use of care equipment, the test, and regular evaluation regarding the use of care methods and equipment; few caregivers attended such training. Regarding the use of care equipment, 67.2% of care facilities implemented this use, and 49.9% of caregivers used care equipment. With regard to guidance about care methods, 90.2% of care facilities implemented such training. However, only 60.0% of caregivers attended such training. Regarding consultation with a person in charge for the use of care equipment and employing an appropriate care method, 53.8% of care facilities conducted such an approach, and 69.5% of caregivers communicated with the staff.

3.4 | Introduction rate and number of care equipment in care facilities

Table 4 presents the introduction rate and average number of care equipment in the care facilities. The introduction rate of mobile hoist was 18.0%, and that of stationary hoist in a bathroom was 37.3%. However, that of other hoists was <10.0%. Mean number of these hoists per 100 residents was approximately 2-6 units. The introduction rate of sliding board was 40.0%, and that of sliding sheet was 29.1%. The number of sliding boards and sliding sheets per 100 residents was approximately 3-5. The introduction rate of powered adjustable bed was 87.4%. The number of bed per 100 residents was 73.5.

3.5 | Association between severe LBP with OSHA or care methods

Effect of OSHA on the prevention of LBP among caregivers was not noted using logistic regression analysis. However, a significant relationship was noted between severe LBP and each care method, as shown in Table 5. In an odds ratio (OR) of ≥2.00 in Model 2, lifting a resident using human power while transferring (OR: 4.23; 95% CI: 1.76-10.12), taking an unsuitable posture while bathing (OR: 3.47; 95% CI: 2.29-5.25), taking an unsuitable posture while transferring (OR: 2.56; 95% CI: 1.71-3.84), and lifting a resident using human power while bathing (OR: 2.16; 95% CI: 1.35-3.44) were associated with severe LBP. In an OR of <2.00 in Model 2, not performing a combination of work in different work postures and movements (OR: 1.38; 95% CI: 1.14-1.66), lack of assistance owing to the lack of multiple individuals assigned per resident (OR: 1.31; 95% CI: 1.03-1.67), and lack of using hoist while bathing (OR: 1.28; 95% CI: 1.06-1.54) were associated with severe LBP.

3.6 | Association between care methods and OSHA

The association between care methods with an OR of ≥2.00 in Model 2 and OSHA was examined using logistic regression analysis. Logistic regression analysis was conducted with each care method as a dependent variable and OSHA as an independent variable. Table 6 presents the association between care method and OSHA via logistic regression models. “Refraining from lifting a resident using human

power for transferring or bathing" was associated with promoting the use of care equipment (transfer: OR: 2.12, 95% CI: 1.15-3.92; bathing: OR: 1.63, 95% CI: 1.11-2.39) and training about care methods (transfer: OR: 2.02, 95% CI: 1.03-3.98; bathing: OR: 1.64, 95% CI: 1.07-2.50). "Refraining from taking an unsuitable posture during transfer" was associated with training about care methods (transfer: OR: 1.43, 95% CI: 1.02-2.10). "Refraining from taking an unsuitable posture during bathing" was associated with consultation regarding appropriate use of care equipment and employing an appropriate care method with the person in charge (bathing: OR: 1.44, 95% CI: 1.01-2.07).

Moreover, the association between these care methods and the number of training about care methods was examined using logistic regression analysis. In terms of transfer, the caregivers who participated in monthly trainings about care methods refrained from lifting residents using human power compared with those who participated in a training just once a year (OR: 4.40; 95% CI: 1.16-16.7), as shown in Table 6.

Regarding the contents that the caregiver consulted with the person in charge (multiple answers allowed), the rates of using methods for transfer, bathing, toilet support, walking support, diaper changing, and care equipment was 48.0%, 39.4%, 38.9%, 35.7%, 34.2%, and 22.1%, respectively.

4 | DISCUSSION

The present study aimed to validate the effect of OSHA on the prevention of LBP among caregivers in care facilities of the elderly. Within the last year, 34.7% of caregivers experienced severe LBP. OSHA did not lead directly to prevent severe LBP among caregivers, but served to prevent it indirectly. The specific activities of OSHA improved care methods among caregivers and the improvement of care methods led to prevent severe LBP.

Although association was not observed between severe LBP and OSHA, a significant relationship was noted between severe LBP and care methods. Lifting a resident using human power and taking an unsuitable posture were associated with severe LBP. Previous studies have reported that handling a patient/resident and taking an unsuitable posture were the primary risk factors of LBP among caregivers.[5,6] Handling a resident and taking an unsuitable posture were associated with OSHA for preventing LBP in the present study. The caregivers who received training about care methods refrained from lifting a resident using human power and refrained from taking an unsuitable posture compared with those who did not receive such training. Moreover, the caregivers who were advised to use care equipment refrained from lifting a resident using human power compared with those who were not. Previous studies have reported that the ergonomic program consisting of the use of care equipment and training about care methods prevented or alleviated LBP among caregivers.[4,12-15] Training about care methods contribute to the initiation of appropriate care methods wherein a caregiver does not lift the resident and does not take an unsuitable posture.[14,15] In addition, the use of care equipment, such as the mechanical lift, suppresses lifting a resident using human power.[2,4,7,8] Hence, training about care methods and promoting the use of care equipment are useful in preventing LBP among caregivers.

Caregivers who consulted regarding the use of care equipment and employing an appropriate care method with a person in charge refrained from taking an unsuitable posture compared with those who did not. In the ergonomics program, ergonomic experts or educated colleagues have provided instructions to caregivers.[4,12-15] However, the relationship between consultation with the person in charge and LBP had not been reported in previous studies. In addition, caregivers who received the training at least once a month refrained from lifting a resident using human power compared with those who received it only once a year. The resident's physical condition varies every day, and the care method must be accordingly adapted. It is likely that caregivers are required to learn the care method appropriate for the resident's physical condition during the training and adjust the care method by consulting with the person in charge. Therefore, we believe that consultation with a person in charge of regarding the use of care equipment and employing an appropriate care method is a useful approach of OSHA for preventing LBP among caregivers.

This study has certain limitations. Only five caregivers per care facility were sampled, and the result might have been affected by sampling bias. In addition, results will differ depending on the use of care equipment and the degree of the residents' NCL in the sampled care facilities. We have not investigated the actual content of the training about care methods. The content might have influenced the effort in preventing LBP among caregivers. Further studies must be conducted that would consider these points.

In conclusion, the promotion of using care equipment, training about care methods, and consultation regarding the use of care equipment and employing an appropriate care method with the person in charge decreases incidences of lifting a resident using human power and taking an unsuitable posture, which are the primary risk factors of LBP. Therefore, these OSHAs should be implemented as the priority approach in preventing LBP among caregivers in care facilities for elderly individuals.

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DISCLOSURE

Approval of the research protocol: The Research Ethics Committee of JNIOSH reviewed and approved the present study. *Informed consent:* All the study participants provided informed consent before completing the questionnaire. *Registry and the registration no. of the study/trial:* N/A. *Animal Studies:* N/A. *Conflict of Interest:* N/A.

AUTHOR CONTRIBUTIONS

KI and SK conceived the ideas. KI and MS collected the data. KI and MT analyzed the data. KI, MS, and XL led the writing.

ORCID

Kazuyuki Iwakiri https://orcid.org/0000-0002-1912-3807

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