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Effects of a Fall-Prevention Program for Older Adults with Dementia Based on Person-Centered Care

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SUMMARY

Background: This study aimed to examine the effects of a fall-prevention program, focusing on the characteristics of falls among older adults with dementia, based on person-centered care.
Methods: Participants were divided into two groups: the intervention group (n = 60), which consisted of members who participated in a 3-month training program and the control group (n = 69), which consisted of members who received usual care. The study lasted 9 months, which included a training period (3 months), fall prevention practice period (3 months), and after the follow-up period (3 months).
Results: Compared to the control group, the Mini-State Examination scores of participants in the intervention group had significantly decreased at 3 months or 6 months since baseline. In the control group, the activities of daily living and different symptoms common in dementia had significantly worsened after the follow-up. Regarding fall rates, there was no significant difference between the intervention and control groups; however, in the intervention group, there were reductions in the training period with 13 members (21.7%), the practice period with eight members (13.3%), and the follow-up period with 10 members (16.7%), compared to the baseline with 16 members (26.7%).
Conclusion: These results suggest the effectiveness of the person-centered intervention program for older adults with dementia.

1. Introduction

In a "super-aged" society such as Japan, the number of older adults with dementia is continuously increasing with the ageing of the population. In 2012, there were 4,620,000 older adults with dementia in Japan, a prevalence of approximately one in seven elderly (15% prevalence). However, the 2018 Japanese White Paper on the Aging Society estimated that by 2025, this number will be one in five, indicating that treatment for older adults with dementia is becoming a crucial issue.[1] In particular, compared to older adults without dementia, fall rates after one year are significantly higher among those with dementia.[2] Falls among older adults with dementia are caused by complicated factors such as behavioral and psychological symptoms of dementia (BPSD), side effects of psychotropic medication, as well as living environment and healthcare status.[3]

Although research into fall-prevention interventions for older adults has reported on the efficacy of exercise for older adults[4] and of multifactorial interventions for institution-based older people requiring care,[5] there is a paucity of fall-prevention intervention research regarding older adults with dementia, and large numbers of falls are related to dangerous behavior due to worsening BPSD.[6] However, in terms of fall-prevention strategies for older adults with dementia, it has been suggested that specific fall-prevention strategies dealing with cognitive impairment and BPSD in older adults with dementia have not been adequately clarified.[7,8]

Studies have elucidated that the needs of older adults with dementia and the causes of the disorder, as well as the quality of their basic lifestyle and care, influence fall prevention.[9,10] In recent years, the collaboration between interprofessional fall prevention teams and healthcare providers, as well as fall-prevention intervention research regarding education and training to strengthen the system, has gained attention.[11–13] Additionally, it has been emphasized that high fall rate trends in long-term healthcare facilities are also due to factors such as the entry of older residents with relatively high levels of mobility compared to other care facilities.[14–16]

Person-centered care is reported to be effective in diminishing BPSD such as irritability.[17] In the current study, using person-centered care as the foundation, older adults with dementia are considered as people with their own will or intent, including lifestyle patterns and their own individual values amassed during their lifetime. It is thought that, "since older adults with dementia are unable to fulfill their own needs due to dementia induced communication impairment, dangerous behavior leading to falls occurs easily, and furthermore, when cognitive impairments such as attention and judgement impairments are also added, falls occur more readily."[9,10,18]

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Prior to the intervention, a "Nursing Quality Indicator" for preventing falls among older adults with dementia, which consists of items on fall prevention in older people with dementia based on the person-centered care theory,[9] was developed by the authors of the present study. The effects of a fall prevention program based on the person-centered care theory, which aims to provide care from the perspective of older people with dementia, by an interprofessional team have not been reported yet, and this study was the first to do so. The present study aimed to elucidate the effects of the fall-prevention program for older adults, especially those with dementia.

2. Materials and methods

Participants were older persons with dementia who were inpatients at five long-term care facilities in a regional urban center in Japan between May 2016 and January 2017. After receiving consent from these medical institutions, multi-bed, long-term healthcare facilities similar in scope, with patients similar in physical and mental status, were designated as the group 1 intervention facility (100 beds) and group 1 control facility (150 beds).

2.1. Ethical considerations

Family members proxying for the participants were given a written explanation of the study, and provided consent. Healthcare providers were given an explantation of the study in a pamphlet, and consent was obtained. Research ethics clearance was obtained from the Clinical Research Review Board of Hamamatsu University School of Medicine, the university with which the representative researcher is affiliated.

2.2. Healthcare provider fall-prevention program

2.1.1. Aim of the fall-prevention program

Based on person-centered care, the program, based on the Nursing Quality Indicator for preventing falls among older adults with dementia,[9] aimed to prevent falls by reducing dangerous behavior through analysis of the reasons for dangerous fall-related behaviors from the perspective of the individual, and to subsequently try to solve those issues.

2.1.2. Training (3 months: May–July 2016)

A one-hour fall-prevention program for healthcare providers was carried out each month (3 times in total), such as first month of the fall-prevention program, second month of the fall-prevention program using the "Nursing Quality Indicator for preventing falls among older adults with dementia", and third month: A specialist professional program of fall-prevention for older adults with dementia.

2.1.3. Practice (3 months: August–October 2016)

A nurse-led interprofessional fall-prevention team was formed, comprising care-workers, physiotherapists, and administrative staff. The practice included discussion with researchers of actual fall case studies for one hour per month, using fall-prevention care quality indicators. Care plans were created based on analysis of fall reasons from the perspective of older adults with dementia, and practical application of fall-prevention plans was implemented on each floor.

2.1.4. Follow-up (3.5 months: Nov 2016–Jan 2017)

The interprofessional collaboration fall-prevention team took the lead in promoting and addressing fall-prevention.

2.2. Evaluations

Participants in the intervention and control groups were surveyed on the same evaluative items listed below, a total of three times: at baseline, after the three-month intervention, and after a three-month follow-up (total of four times for fall records only).

2.2.1. Primary attributes

Age, gender, disease, dementia diagnosis, BPSD treatment medication, long-term care need certification, among others.

2.2.2. Record of falls

Date and time of fall, fall impact were investigated.

2.2.3. Mini-Mental State Examination (MMSE)

The MMSE is a cognitive function test and worsening cognitive function is indicated by extent of score lowering.[19]

2.2.4. Activities of daily living (Katz ADL)

The Katz ADL was used to evaluate a participant's feeding, bathing, transferring, etc. on a three-step scale, with points totaled.[20]

2.2.5. Gottfries-Brane-Steen Scale (GBS Scale)

The GBS scale is a 27-item assessment tool with four subscales that focus on level of dementia symptoms and qualitative differences.[21] Lower scores indicate better status.[22]

2.2.6. Subjective risk rating of specific tasks (SRRST)

In a subjective fall risk assessment scale completed by healthcare providers, and the total score was calculated.[22]

2.3. Statistical analysis

Intervention and control groups were compared using Dunnett's t-test at three time-points: baseline, after the three-month practice, and after the three-month follow-up, and an analysis of covariance (ANCOVA) using a general linear mixed effect model of the interaction between the group (intervention and control groups) and the three time-points was performed.

A chi-squared test was used to compare control group fall rates with the intervention group for baseline, the training period, practice period, and follow-up period.

Statistical analysis was conducted using IBM Statistical Package for Social Science Statistics 23.0 (IBM Corp., Armonk, NY, USA).

3. Results

The proportions of female participants in the control group (88.41%) and in the intervention group (76.67%) were much higher than those of male participants in both groups (Table 1). Regarding dementia types, the most common type was probability of dementia, which was a category II daily life independence level in the absence of a dementia diagnosis. The next most common type was Alzheimer's disease, found in seven persons in the control group (10.14%) and 10 persons in the intervention group (16.67%). Compared to the control group, there was a significantly higher number of participants with contracture in the intervention group (n = 40, 66.67%).

In the control group, compared to the baseline, ADL and the Gottfries-Brane-Steen different symptoms common in dementia

(GBS D) were significantly reduced after the follow-up (Table 2). Further, MMSE total scores had reduced significantly post practice and follow-up. In the intervention group, the MMSE total scores had reduced significantly after the follow-up, but no changes were found

Table 1
The baseline characteristics of participanst in intervention and in the control groups.

Items	Control group		Intavention group		χ^2 test
	n	%	n	%	p value
Gender					0.077
Male	8	11.59	14	23.33	
Female	61	88.41	46	76.67	
Total	69	100.00	60	100.00	
Type of dementia					0.869
Alzheimer disease	7	10.14	10	16.67	
Vascular dementia	2	2.90	1	1.67	
Dementia with Lewy bodies	0	0.00	1	1.67	
High probability of dementia*	60	86.96	48	80.00	
Total	69	100.00	60	100.00	
Daily life independent level of older people with dementia					0.298
II (BPSD related trubble and require some supports)	31	44.93	18	30.00	
III (BPSD and require support)	36	52.17	40	66.67	
IV (Serious BPSD and always require supports)	2	2.90	2	3.33	
Total	69	100.00	60	100.00	
Daily life independence level of Bedridden elderly					0.067
A (Semi-bedridden)	22	31.88	8	13.33	
B (Bedridden)	43	62.32	51	85.00	
C (Always bedridden)	4	5.80	1	1.67	
BPSD therapeutic drug					0.052
Yes	38	55.07	43	71.67	
No	31	44.93	17	28.33	
Total	69	100.00	60	100.00	
Joint contractures					0.000
Yes	19	27.54	40	66.67	
No	50	72.46	20	33.33	
Total	69	100.00	60	100.00	
Locomotorium paralysis					0.734
Yes	59	85.51	50	83.33	
No	10	14.49	10	16.67	
Total	69	100.00	60	100.00	
Aphasia					0.109
Yes	67	97.10	53	88.33	
No	2	2.90	7	11.67	
Total	69	100.00	60	100.00	

* Category II daily life independence level (high probability of dementia) in the absence of a dementia diagnosis.

Table 2
Comparison of the evaluation between intervention and control groups.

Assessments	Group	Base Line		After fall prevention practice (after three months)			After follow-up period (after six months)			Interaction**	
		Means	S.D	Means	S.D	p value*	Means	S.D	p value*	F value	p value
Activities of daily living (Katz ADL)	Control group	10.93	3.84	11.45	4.15	0.671	12.54	4.22	0.040	0.319	0.727
	Intavention group	11.52	3.30	11.78	3.28	0.876	12.38	3.66	0.282		
Subjective risk rating of specific tasks (SRRST)	Control group	4.61	2.00	4.55	2.08	0.981	4.10	2.24	0.272	0.518	0.596
	Intavention group	2.97	2.29	2.88	2.13	0.968	2.92	2.08	0.988		
Mini-Mental State Examination (MMSE)	Control group	20.42	9.04	16.13	9.09	0.015	14.97	9.98	0.002	0.466	0.628
	Intavention group	17.98	7.87	15.15	8.61	0.110	14.62	8.24	0.049		
Gottfries-Brane-Steen Scale (GBS Scale)											
A Motor fuction	Control group	15.70	10.75	16.09	11.02	0.970	17.49	11.79	0.541	0.103	0.902
	Intavention group	15.28	8.63	15.22	8.77	0.999	15.93	9.15	0.889		
B Intellectual	Control group	29.06	21.38	30.07	22.02	0.948	31.64	22.71	0.715	0.034	0.966
	Intavention group	22.83	15.16	24.00	16.01	0.888	24.40	16.23	0.809		
C Emotional function	Control group	6.75	5.52	6.94	5.62	0.972	7.65	5.87	0.549	0.271	0.763
	Intavention group	6.45	4.70	6.45	4.37	1.000	6.45	4.38	1.000		
D Different symtoms common in dementia	Control group	13.13	8.21	13.35	8.25	0.989	21.48	13.43	0.000	21.528	0.000
	Intavention group	7.17	4.07	7.52	4.66	0.926	9.01	8.15	0.088		

* Dunnett's t-test three times: at baseline, after the 3-month practice, and after the 3-month follow-up.
** Analysis of covariance (ANCOVA) using the general linear mixed effect model.
Assignment condition (intervention VS. control) and time (base Line, after three months, after six months).

for the other items. In the ANCOVA, GBS D also had a significant interaction of group (intervention and control groups) and time.

The fall rates in the intervention group decreased from 16 persons at baseline (26.7%) to 8 persons during the practice period (13.3%) (Table 3). Regarding the impact level, the intervention group at baseline was the most common, with 10 persons having no injury (47.6%); however, no medical treatment which was beyond that vital sign changes and need for tests level was changes from 17 persons during the training period (85.0%), to 6 during the follow-up period (46.2%).

4. Discussion

This study aimed to elucidate the influence of physical and psychological functioning on older adults, as well as the efficacy of this program for fall-prevention. The MMSE scores of the participants, consisting of older adults with dementia, were significantly reduced after the practice period and follow-up for the control group, and after the follow-up for the intervention group. ADL and the GBS scale scores were significantly reduced post follow-up for the control group; however, there were no significant changes in the intervention group. Shimada et al. reported significant improvements for GBS intelligence function, emotional function, and psychological status when fall-prevention is implemented by a separately appointed fall-prevention manager, although no significant fall improvement was noted.[23] This research considers that through fall-prevention training for healthcare providers in long-term care facilities, healthcare providers were effective in supporting the physical and psychological functioning of older adults with dementia by carrying out fall-prevention care, which responds to the needs of older adults with dementia based on person-centered care.

A significant difference regarding fall rates was not found between the intervention group and the control group, however in the intervention group there were reductions in the training period with 13 members (21.7%), the practice period with eight members (13.3%), and the follow-up period with 10 members (16.7%), compared to the baseline of 16 members (26.7%). Conventional fall-prevention measures for older adults with dementia have involved physical restraint and mobility restriction. However, these do not merely threaten the dignity of older adults; significant increases in falls have been reported post-release from physical restraint.[24]

In contrast to conventional fall-prevention measures, the current study conducted training involving: motivating the healthcare providers to participate in the research (first month), fall-prevention care methods utilizing fall-prevention care quality indicators (second month), and practical fall-prevention care, which responds to the needs of older persons with dementia and fall risks of older adults with dementia (third month). The Colon-Emeric Program was referenced, since it was to be an interprofessional team.[13]

The fall-prevention program content involves increasing fall-prevention knowledge of the interprofessional team, fall-prevention related problem-solving ability, improved healthcare provider confidence, and gains in cooperative capability. Given that the current training is based on person-centered care, it emphasized that: older with dementia are individuals with their own will, lifestyle habits and values garnered over a lifetime; the inability to fulfill one's own needs due to communication impairments and so forth makes dangerous, fall-related behavior more likely; and behaviors requiring attention and decision-making abilities are difficult due to cognitive impairment. Furthermore, the training emphasized to healthcare providers that analysis of the reasons behind dangerous fall-related behavior from that person's perspective and reducing dan-

Table 3
Fall, fall impact and type of fallimg.

Control group: n = 69, Intervention group: n = 60

Items	Baseline perod (Febraury to April)							Training period (May to July)							Practice period (August to October)							Follow-up period(Novenber to January)						
	Control group		Intavention group		Total		χ^2 test	Control group		Intavention group		Total		χ^2 test	Control group		Intavention group		Total		χ^2 test	Control group		Intavention group		Total		χ^2 test
	n	%	n	%	n	%		n	%	n	%	n	%		n	%	n	%	n	%		n	%	n	%	n	%	
Fall																												
Yes	18	26.1	16	26.7	34	26.4	1.000	22	31.9	13	21.7	35	27.1	0.235	15	21.7	8	13.3	23	17.8	0.254	15	21.7	10	16.7	25	19.4	0.510
No	51	73.9	44	73.3	95	73.6		47	68.1	47	78.3	94	72.9		54	78.3	52	86.7	106	82.2		54	78.3	50	83.3	104	80.6	
Total	69	100.0	60	100.0	129	100.0		69	100.0	60	100.0	129	100.0		69	100.0	60	100.0	129	100.0		69	100.0	60	100.0	129	100.0	
Fall impact																												
No injury	0	0.0	10	47.6	10	23.3	0.001	0	0.0	0	0.0	0	0.0	0.000	0	0.0	1	7.7	1	3.1	0.001	0	0.0	2	15.4	2	6.7	0.001
No medical treatment	19	86.4	7	33.3	26	60.5		0	0.0	17	85.0	17	37.0		0	0.0	7	53.8	7	21.9		0	0.0	6	46.2	6	20.0	
Medical treatment	3	13.6	3	14.3	6	14.0		23	88.5	2	10.0	25	54.3		16	84.2	4	30.8	20	62.5		12	70.6	5	38.5	17	56.7	
Permanent sequela	0	0.0	1	4.8	1	2.3		3	11.5	1	5.0	4	8.7		3	15.8	1	7.7	4	12.5		5	29.4	0	0.0	5	16.7	
Total	22	100.0	21	100.0	43	100.0		26	100.0	20	100.0	46	100.0		19	100.0	13	100.0	32	100.0		17	100.0	13	100.0	30	100.0	

gerous behavior by working to solve those issues would lead to fall-prevention.

The current training not only focused on fall occurrence rates and how the likelihood of falls would be reduced if the values and needs of older adults with dementia were met, allowing them to live a peaceful life, but also is considered to have perpetuated the notion among healthcare providers that improved quality of life, achieved through meeting the individual needs of each older person with dementia cooperating in the intervention program, is linked to fall-prevention.

According to Colon-Emeric and colleagues, individual care is effective against falls for nursing home residents.[13] Chenoweth et al. compared person-centered care (PCC), a group using a person-centered care evaluative system called dementia-care mapping (DCM), and regular care groups at intervention and follow-up.[24] PCC and DCM groups saw significant reductions on the Cohen-Mansfield Agitation Inventory evaluation of BPSD, and significant increases in falls were indicated for the PCC group. Here, in training alone, fall increase was not linked to individual care, suggesting that reflective care is linked with individual care, which becomes a fall-preventative. In the current study, it is thought that person-centered care was perpetuated, then analysis by the interprofessional cooperative fall-prevention team informed individual care, which brought about a reduction in falls.

With respect to impact levels, 90% of the control group had level 3 (requiring treatment and processing) and 4 (permanent sequela) falls. In comparison, in the intervention group, 80% of the falls were level 1 (no injury) and 2 (vital sign changes and tests required). The clearly lower impact levels of the falls in the intervention group compared to the control group, the continuation of these trends at follow-up, and that worsening from these falls was reduced, could be effects of the fall-prevention program. Moreover, when fall types were considered, the number of "details unknown" falls during the practice and follow-up period was zero, and the fall types were adequately ascertained.

Although ADL and GBS D, which are the indexes of BPSD, significantly worsened in the control group, ADL and BPSD, ADL and GBS were maintained in intervention. These results might be due to the influence of understanding the fall risk along with older persons with dementia, and comprehending the behavioral risks and needs of older individuals through the person-centered care-based fall-prevention intervention. Multiple older adults with dementia with a high fall risk and staff shortages make long-term care health facilities a difficult environment for fall-prevention. However, by focusing on fall-prevention intervention based on person-centered care, individual behaviors of older adults can be predicted, and the level of danger of the fall related to these behaviors is removed prior to the fall; thus, it is possible to create effective fall-prevention measures.

In the current study program, person-centered care-based fall-prevention for older adults with dementia reduced falls, although not significantly. In addition, there were some benefits such as harmonious maintenance of ADL and psychological symptoms. While the study involved clinical comparative research with control and intervention groups, the fall-prevention intervention participants were from long-term care facilities within one corporation; thus, joint comparative research between various institutions in the future is needed.

5. Limitations

The present study had a small sample size, and the characteristics of the participants in the intervention and control groups differed. There were significant differences in older people with contracture between the intervention and control groups. It is necessary to use a larger sample size without selection bias to clarify the effects of this program. We intend to clarify the effects in future studies.

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References

1. Cabinet Office, Government of Japan. *Current State and Trends on the Elderly and their Environment*. Tokyo, Japan: Cabinet Office, Government of Japan; 2017. Available at https://www8.cao.go.jp/kourei/english/annualreport/2017/2017pdf_e.html. Accessed June 27, 2019.
2. Louise MA, Clive GB, Elise NR, et al. Incidence and prediction of falls in dementia: A prospective study in older people. *PLoS ONE*. 2009;4(5):e5521.
3. Suzuki M, Soyano A, Yasuda M, et al. Trends in multifactor intervention research focused on fall prevention for elderly patients with dementia and issues in the nursing research. *Kango Kenkyu*. 2009;42(4):261–279.
4. Cheng P, Tan L, Ning P, et al. Comparative effectiveness of published interventions for elderly fall prevention: A systematic review and network meta-analysis. *Int J Environ Res Public Health*. 2018;15(3):E498.
5. Cameron ID, Dyer SM, Panagoda CE, et al. Interventions for preventing falls in older people in care facilities and hospitals. London, UK: Cochrane Library; 2018. Available at https://www.cochrane.org/CD005465/MUSKINJ_interventions-preventing-falls-older-people-carefacilities-and-hospitals. Accessed June 27, 2019.
6. Suzuki M, Kurata S, Yamamoto E, et al. Impact of fall-related behaviors as risk factors for falls among the elderly patients with dementia in a geriatric facility in Japan. *Am J Alzheimers Dis Other Demen*. 2012;27(6):439–446.
7. Kawano Y, Yamanaka K. Prospective study. RCT study from literatures reviews fall risk factor of elderly people with dementia and fall prevention intervention. *J Japan Soc Demen Care*. 2008;7(1):30–42.
8. Suzuki M, Kanamori M. Fall prevention among the elderly with dementia. *J Japan Soc Demen Care*. 2016;15(3):577–584.
9. Suzuki M, Maruoka N, Kato M, et al. Usability of nursing Quality Indicator for preventing falls among the elderly with dementia based on processes in clinical judgment: Comparison consideration of comparison between acute hospitals and long term care insurance facilities. *J Japan Gerontol Nurs*. 2014;19(1):43–52.
10. Suzuki M, Maruoka N, Kato M, et al. Evaluation of the compliance of nurses in long-term care health facilities with the items of the Nursing Quality Indicator aimed at preventing falls among the elderly. *Japan J Fall Preven.* 2015;2(1):9–18.
11. Colon-Emeric CS, McConnell E, Pinheiro SO, et al. CONNECT for better fall prevention in nursing homes: Results from a pilot intervention study. *J Am Geriatr Soc*. 2013;61(12):2150–2159.
12. Colón-Emeric CS, Corazzini K, McConnell ES, et al. Effect of promoting high-quality staff interactions on fall prevention in nursing homes: A cluster-randomized trial. *JAMA Intern Med*. 2017;177(11):1634–1641.
13. Colón-Emeric CS, Corazzini K, McConnell E, et al. Study of individualization and bias in nursing home fall prevention practices. *J Am Geriatr Soc*. 2017;65(4):815–821.
14. Kawano Y, Yamanaka K, Matsuda O, et al. A case study of falling situation and individuals factors for falls among nursing home residents with short term prospective design. *J Japan Soc Demen Care*. 2007;6(1):59–68.
15. Kawano Y, Yamanaka K. Analysis of the circumstances of falls among

elderly persons in residential care institutions. *Japan J Gerontol*. 2012; 34(1):3–15.
16. Shigemori K, Kusaka R, Ohgi S, et al. Relationship between the prevent falls and the dementia status in the elder people among long-term care facility. *J Japan Soc Demen Care*. 2006;5(1):21–26.
17. Livingston G, Sommerlad S, Orgeta V, et al. Dementia prevention, intervention, and care. *Lancet*. 2017;390(10113):2673–2734.
18. Maruoka N, Suzuki M, Mizutani N, et al. Structure and process of clinical judgments by dementia specialist nurses in fall prevention. Japanese Journal of Fall Prevention. *J Japan Gerontol Nurs*. 2018;5(1):65–79.
19. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". Apractical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12(3):189–198.
20. Reijneveld SA, Spijker J, Dijkshoorn H. Katz' ADL index assessed functional performance of Turkish, Moroccan, and Dutch elderly. *J Clin Epidemiol*. 2007:60(4):382–388.
21. Homma A, Niina R, Ishii T, et al. Reliability and validity of the Japanese version of the GBS scale. *Japan J Geriatr.* 1989;26(6):617–623.
22. Shimada H, Suzukawa M, Ishizaki T, et al. Relationship between subjective fall risk assessment and falls and fall-related fractures in frail elderly people. *BMC Geriatr.* 2011;11:40.
23. Shimada H, Suzuki T, Obuchi S, et al. Effects of introducing a risk manager for prevention of falls in a long-term care facility. *Japan J Geriatr.* 2004; 41(4):414–419.
24. Tinetti ME, Liu WL, Ginter SF. Mechanical restraint use and fall-related injuries among residents of skilled nursing facilities. *Ann Intern Med*. 1992;116(5):369–374.