Quality of life of residents with dementia in a group-living situation

An approach to creating small, homelike environments in traditional nursing homes in Japan

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Objectives Group living is an approach that can create small, homelike environments in traditional nursing homes in Japan. The aim of the present study was to examine quality of life (QOL) of residents with dementia in group-living situations.

Methods The group-living group consisted of facilities that formed residential units. Each unit had a common area and stable staff assignments. The control group consisted of facilities that did not form residential units. The quality of life instrument for Japanese elderly with dementia (QLDJ) scale was used to rate QOL by direct care workers of 616 residents with dementia from 173 facilities in the group-living group and 750 residents from 174 facilities in the control group. QOL was based on the following subscales: interacting with surroundings; expressing oneself; and experiencing minimal negative behavior.

Results Multilevel regression analyses demonstrated a significantly greater QOL with respect to interacting with surroundings, expressing oneself, and experiencing minimal negative behavior for residents with dementia in the group-living group compared to the control group, as measured by the QLDJ. The total QLDJ score was also significantly higher for the group-living group.

Conclusion The results suggest improved QOL of residents with dementia under group-living situations. Future studies should examine the effect of group-living on QOL of residents with dementia using a cohort design, following residents longitudinally from admission.

Key words: dementia, frail elderly, Japan, nursing homes, quality of life

I. Introduction

With the number of residents with dementia increasing in facilities for the elderly, the introduction of small, homelike environments in nursing homes has been proposed to promote normalization of daily life[1]. As there is no cure for dementia, care must focus on psychosocial aspects, including living conditions. Several studies have suggested that small, homelike environments, similar to green-houses in the United States[2], group living in Sweden[3], group-living homes in the Netherlands[4], and special care facilities in Canada[5], promote increased quality of life (QOL) of residents with dementia as compared with residents in traditional nursing homes.

Japan, with its rapidly aging population, is also addressing this demographic transformation. The Japanese national government introduced the public long-term care insurance (LTCI) system in April 2000. Under this system, special nursing homes are provided for people who are stable but require nursing care. Traditional special nursing homes were based on a medical model and usually had shared bedrooms for residents. In October 2008, most facilities (82.3% of the total of 6,015 special nursing homes) still had the traditional setting[6]. However, increased attention is currently being focused on group-living as an approach to providing small, homelike environments within traditional nursing homes in Japan. Group-living involves forming a residential unit[7], a fundamental living unit where frail elderly people can spend time alone in their own rooms in a small, homelike environment. Each residential unit provides a common area, such as a dining room, for interaction among residents, and has stable staff assignments. This emerging approach has been developed as a result of unit-type construction, a new model of special nursing homes with private rooms and residential units under the LTCI system[8]. Group-living increases the proportion of a resident's time spent in common areas and promotes interaction between staff and residents[9]. However, there has hitherto been no evaluation of

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QOL of residents with dementia in group-living situations compared to that of residents in traditional nursing homes. The aim of the present study was thus to examine QOL among residents with dementia in group-living situations.

II. Methods

1. Overview of the study

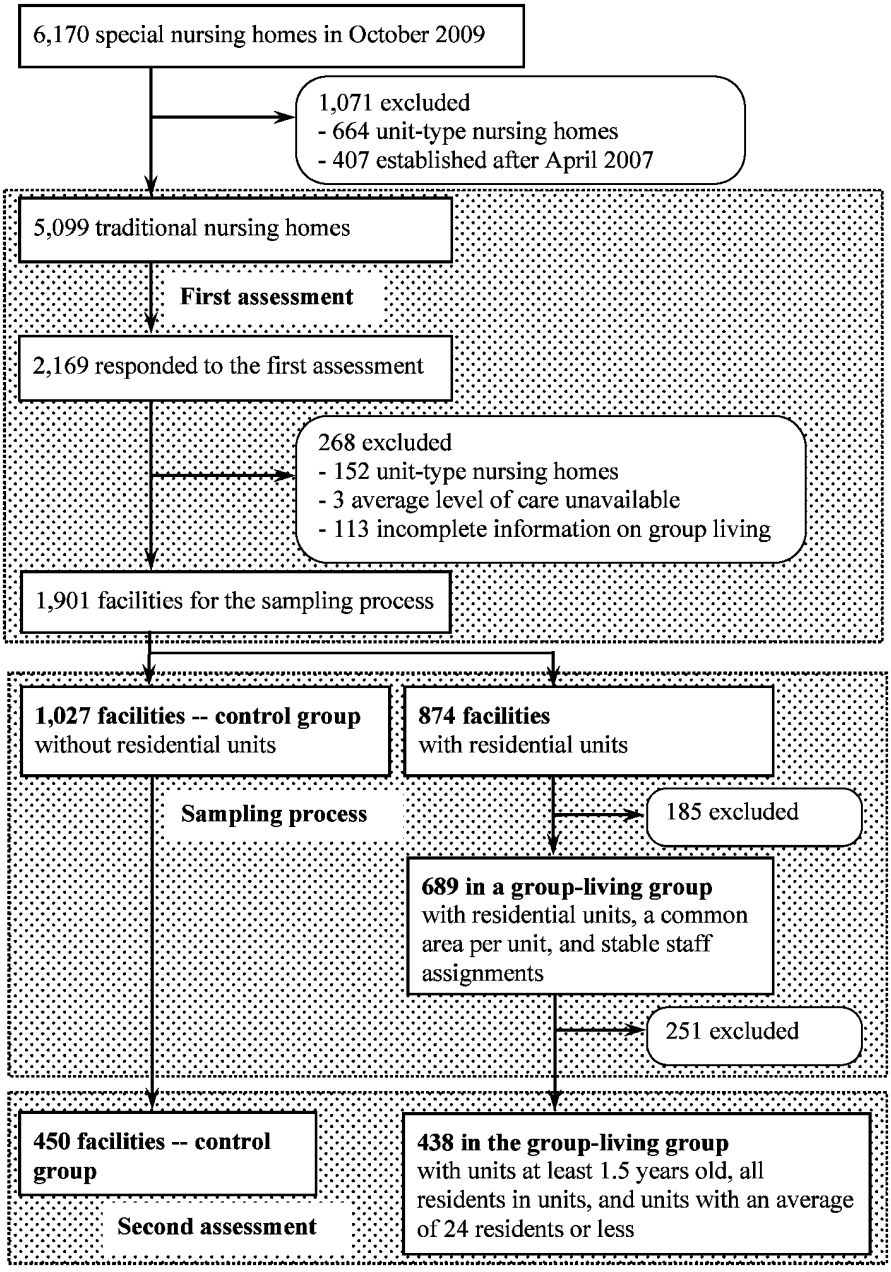
Because there is no formal definition of group-living under the LTCI system, the present study consisted of 3 phases: (1) first assessment; (2) sampling process; and (3) second assessment. Figure 1 shows an overview of the 3 phases of the study. The first assessment examined current group living conditions in traditional nursing homes for the elderly to establish a baseline for the second assessment. The second assessment evaluated QOL among residents with dementia in the sampled facilities. The sampling process was reviewed by an expert panel.

2. First assessment

1) Subjects

Subject facilities consisted of 5,099 traditional special nursing homes in Japan identified by the nationwide online database WAM-NET (Welfare and Medical Service Network System). In October 2009, there were a total of 6,170 such special nursing homes in Japan. We excluded 664 facilities (10.8%) because they were registered as unit-type nursing homes and 407 (6.6%) because they were established after April 2007. Each subject facility was asked to respond to a paper questionnaire.

Fig 1. Overview of 3 phases of the study



2) Measures

The questionnaire survey was administered during a 1-week period from 30 October to 6 November 2009. A paper questionnaire was mailed to each subject facility being assessed. The managing director at each facility filled out the questionnaire. Completed questionnaires were returned by fax.

Information collected from special nursing homes included whether they formed residential units and the characteristics of the facility. When the facility formed residential units in a traditional setting, the respondent was also asked the year the units were introduced, size of each unit, presence of a common area for each unit, and staff assignments. Facility characteristics included number of beds and average care level of residents based on LTCI criteria (1–5). The number of physicians, nursing staff, and other care workers at each facility was available from the WAM-NET database. The staffing ratio was calculated per 100 residents.

3. Sampling process

A total of 2,169 facilities (42.6% of 5,099) responded to the first assessment. Among these, 152 facilities were excluded because they were found to be unit-type nursing homes, 3 because the average level of care was unavailable, and 113 because of incomplete information on group-living. The final sample set was comprised of the remaining 1,901 facilities (37.3% of 5,099). The 1,901 facilities had a lower ratio of care workers to residents than the 3,198 facilities that were excluded or did not respond ($t(5,097)=2.088$, $P=0.037$).

The control group comprised 1,027 facilities that did not have residential units in a traditional setting. Among the remaining 874 facilities, the group-living group was comprised of 689 facilities that had residential units, a common area per unit, and stable staff assignments. Among the 689 facilities in the group-living group, subject facilities for the second assessment consisted of 438 that had introduced residential units 1.5 years or more prior to the assessment and included all residents in residential units with an average of 24 residents or less, in order to assess stable care provision. Of the 1,027 facilities in the control group, subject facilities were the 450 that were sampled to ensure that the group-living group included an equal number of facilities in 8 regions (*Chiho kubun*).

4. Second assessment

1) Subjects

There were 888 subject facilities, 438 in the group-living group and 450 in the control group. Residents were randomly selected in each facility (1st, 3rd, 6th, 9th, and 12th in alphabetical order of family name) from among those aged 65 years or older who had a diagnosis of dementia and had lived for 1 year or more in a traditional setting. To provide similar representation across facilities, a maximum of 5 residents per facility were enrolled. A total of 1,842 questionnaires from 377 facilities, 197 in the group living group (45.0%) and 195 in the control group (43.3%), were collected. Among the 1,842 questionnaires, the following numbers of residents were excluded: 17 who were not dependent at the time the questionnaire was completed, 106 who had lived in the facility less than 1 year, and 353 because of incomplete information. The final sample consisted of the remaining 1,366 residents (74.2% of 1,842) from 347 facilities: 616 residents with dementia from 173 facilities in the group-living group and 750 from 174 facilities in the control group. The final sample had a higher proportion of women ($\chi^2(1)=6.174$, $P=0.015$), longer duration of stay ($t(1,808)=7.161$, $P<0.001$), higher physical dependence ($Z=4.042$, $P<0.001$), and more severe level of dementia ($Z=2.978$, $P=0.003$) than the residents who were excluded. The 347 facilities had a lower ratio of care workers to residents than the 541 facilities that were excluded or did not respond ($t(887)=2.333$, $P=0.020$).

2) Measurements

The questionnaire survey was administered during a 4-week period from 14 December 2009 to 8 January 2010. A set of paper questionnaires was mailed to each subject facility. Completed questionnaires were also collected by mail. Each facility was asked to distribute the questionnaires to direct care workers who read the instructions and rated the questions independently after informed consent was obtained. Direct care workers explained the aim of the study to residents with dementia. The set of questionnaires had an introductory section explaining the purpose of the study, the voluntary nature of participation, and an assurance of anonymity for residents and respondent staff members.

The resident questionnaire collected information on age, gender, duration of stay, level of physical dependence, level of dementia on admission and at the time the questionnaire was completed (at assessment) according to LTCI standards, and QOL. QOL was assessed using the quality of life instrument for Japanese elderly with dementia (QLDJ), developed from an English-language QOL instrument, the Alzheimer Disease Health-Related Quality of Life (ADRQL) scale employed in the United States[10]. The QLDJ has 24 items categorized in a 3-dimensional instrument: interaction with surroundings, self-expression, and experiencing minimum negative behaviors. Each subscale ranges from 0 to 100. The total QLDJ is calculated as an average of the 3 subscales and has demonstrated a high reliability and validity[11]. Level of physical dependence ranged from 1 to 5: 1=independent; 2=independent in daily life; 3=homebound; 4=bedbound; and 5=completely bedbound. Level of dementia ranged from 1 to 6: 1=independent; 2=independent in daily life; 3=independent with supervision; 4=requiring personal care; 5=usually requiring per-

sonal care; and 6＝usually requiring medical care. Under the LTCI system, both level of physical dependence and level of dementia were assessed on a regular basis.

5. Ethical considerations

Participating facilities were not required to sign consent forms; their returning the questionnaire implied consent. To preserve respondent anonymity, identification numbers were assigned to facilities and the questionnaires did not seek information about the background of individual respondent staff members. The study was approved by the Institutional Review Board of the Institute for Health Economics and Policy, Japan (H21-006, approval for the second assessment on 16 November 2009).

6. Data analysis

Facility characteristics were compared between the group-living group and the control group at the second assessment. The χ^2 test was used for categorical variables and the *t* test or Mann-Whitney's U test for continuous variables.

Resident characteristics and QOL were compared between the 2 groups. Change in physical dependence and level of dementia were tested using repeated-measures ANOVA with interaction between the groups (group-living or control) and time points (at admission and at assessment). The between-group effect size was calculated with Cohen's d for the QLDJ subscales and the total QLDJ. Effect size is low if the value of d varies around 0.20, medium if d varies around 0.50, and large if d varies at more than 0.80[12].

Multivariate analyses were performed using QOL at assessment as the dependent variable and group (group-living or control) as the independent variables. Because data were taken from residents nested in a facility, multilevel linear regression analyses were tested using linear mixed models with a variance component structure and restricted maximum likelihood. The models included random effects for facility to account for within-facility correlations. To investigate clustering within facilities, we used a null model not containing any explanatory variables but partitioning the total variance for each independent score in the entire sample into a variance that occurs between facilities and a variance that occurs between individuals. Internal conversion coefficients (ICCs) were calculated as the proportion of variance of the between-facility variance over the total variance[13]. Then, the null model was expanded to include the group as an independent variable. If there were variables significantly different between the 2 groups, these were also entered as covariates. All statistical analyses were conducted using SPSS for Windows, version 18.0 (SPSS Japan, Tokyo, Japan). The significance level was set at 0.05 (2-tailed).

III. Results

1. Facility characteristics of the 2 groups

Table 1 shows the facility characteristics for the group-living and control groups. The group-living group had a significantly greater number of beds and a higher ratio of care workers to residents compared to the control group (Table 1).

2. Resident characteristics and QOL of the 1,366 residents in the 2 groups

Table 2 presents resident characteristics and QOL of the 1,366 residents. The group-living group showed significantly greater physical dependence at admission and lower dependence at assessment than the control group. Deterioration of physical dependence and dementia from admission to assessment were significantly smaller among residents in the group-living group than in the control group. The QLDJ subscales and the total QLDJ were significantly greater in the group-living group. The effect size was low, around 0.20 (Table 2).

3. Multilevel regression analysis of QOL of the 1,366 residents

Following multilevel modeling, we treated physical dependence at assessment as a fixed effect and the number of beds and ratio of care workers to residents as random effects of level 2. Table 3 shows results of multilevel regression analyses of the QLDJ subscales, interaction with surroundings and self-expression. In the null model, between-group variance explained 13.1% of the variation in the QLDJ subscale interaction with surroundings and 11.5% of self-expression. Expanded models revealed that QLDJ subscale scores

Table 1 Facility characteristics of the group-living and control groups

Variables	Total N＝347	Group-living N＝173	Control N＝174	Test statistic	*P*
	Mean (SD)	Mean (SD)	Mean (SD)		
Number of beds	77.99(24.21)	80.65(23.69)	75.34(24.50)	t(345)＝2.051	0.041
Average care level (1-5)	3.93(0.28)	3.95(0.25)	3.90(0.31)	t(327.332)＝1.673	0.095
Physicians per 100 residents	2.26(1.66)	2.12(1.28)	2.41(1.96)	t(345)＝1.636	0.103
Nursing staff per 100 residents	5.65(3.82)	5.75(4.05)	5.55(3.58)	t(345)＝0.472	0.637
Care working staff per 100 residents	37.59(9.35)	39.77(10.66)	35.43(7.23)	t(302.528)＝4.430	＜0.001

Definition of group-living: forming residential units, with a common area per unit, and stable staff assignments.

Table 2 Personal characteristics and quality of life among 1,366 residents in the group-living and control groups

Variables	Total residents N=1,366	Group-living N=616	Control N=750	Test statistics	*P*	Effect size (d)
	Mean(SD) or%	Mean(SD) or%	Mean(SD) or%			
Age, year	86.56(7.43)	86.64(7.48)	86.50(7.39)	t(1,364)=0.364	0.716	
Gender, female	83.2	81.5	83.4	$\chi^2(1)=0.462$	0.539	
Duration of stay, year	4.79(3.66)	4.61(3.49)	4.93(3.78)	t(1,364)=1.600	0.110	
Physical dependence (1-5)				F(1,1364)†=22.729	<0.001	
At admission	3.49(0.88)	3.54(0.88)	3.45(0.87)	Z=2.312	0.021	
At assessment	3.88(0.84)	3.82(0.84)	3.93(0.83)	Z=2.244	0.025	
Level of dementia (1-6)				F(1,1364)†=10.632	0.001	
At admission	3.73(0.96)	3.76(1.01)	3.71(0.92)	Z=0.862	0.389	
At assessment	4.15(0.87)	4.10(0.91)	4.19(0.84)	Z=1.844	0.065	
QOL						
Interacting with surroundings	51.84(25.21)	55.63(25.05)	48.74(24.94)	t(1,364)=5.073	<0.001	0.276
Expressing oneself	38.16(26.19)	41.89(26.93)	35.09(25.18)	t(1,364)=4.815	<0.001	0.261
Experiencing minimum negative behaviors	73.72(20.33)	75.21(19.60)	72.49(20.85)	t(1,339.448)=2.482	0.013	0.135
Total QLDJ	54.57(16.30)	57.58(16.47)	52.10(15.75)	t(1288.947)=6.232	<0.001	0.340

† Repeated-measures ANOVA, time point × group.
QOL, quality of life; QLDJ, quality of life instrument for Japanese elderly with dementia

Table 3 Multilevel regression of QLDJ interaction with surroundings and self expression among 1,366 residents in the group-living and control groups

Model Level	Independent variables	Interaction with surroundings				Self expression			
		Null model		Expanded model		Null model		Expanded model	
		Estimate	*P*	Estimate	*P*	Estimate	*P*	Estimate	*P*
Level 1 (resident)	*Fixed effect*								
	Intercept	52.05	<0.001	41.17	<0.001	38.36	<0.001	26.36	<0.001
	Group-living			6.32	<0.001			6.26	<0.001
	Physical dependence at assessment (reference=5: completely bedbound)								
	1: independent			13.44	0.023			22.66	<0.001
	2: independent in daily life			14.34	0.003			17.80	<0.001
	3: homebound			11.25	<0.001			13.71	<0.001
	4: bedbound			9.55	<0.001			10.19	<0.001
	Random effect								
	Residual	552.22	<0.001	536.74	<0.001	607.52	<0.001	578.03	<0.001
Level 2 (facility)	Intercept	83.20	<0.001	68.44	<0.001	79.25	<0.001	70.06	0.026
	Number of beds			0.00				0.00	
	Care working staff per 100 residents			0.00				0.001	0.964
ICC		0.131		0.113		0.115		0.108	
Fitness of model	−2 log likelihood	12657.998		12575.734		12770.989		12672.784	
	Akaike's Information criterion (AIC)	12661.998		12583.734		12774.989		12680.784	
	Schwarz's Bayesian criterion (BIC)	12672.436		12604.595		12785.427		12701.645	

QLDJ, quality of life instrument for Japanese elderly with dementia

for interaction with surroundings and self-expression were significantly greater among residents in the group-living group and in residents with lower physical dependence at assessment. Between-group variance explained 11.3% of the interaction with surroundings and 10.8% of self-expression (Table 3).

Table 4 summarizes results of multilevel regression analyses of the QLDJ subscale for experiencing minimum negative behavior and for total QLDJ. In the null model, between-group variance explained 10.2%

Table 4 Multilevel regression of experiencing minimum negative behavior and total QLDJ among 1,366 residents in the group-living and control groups

Level	Independent variables	Experiencing minimum negative behaviors				Total QLDJ			
		Null model		Expanded model		Null model		Expanded model	
		Estimate	*P*	Estimate	*P*	Estimate	*P*	Estimate	*P*
Level 1 (resident)	*Fixed effect*								
	Intercept	73.69	<0.001	75.75	<0.001	54.70	<0.001	47.75	<0.001
	Group-living			2.71	0.032			5.06	<0.001
	Physical dependence at assessment (reference=5: completely bedbound)								
	1: independent			−2.28	0.638			11.31	0.003
	2: independent in daily life			−2.66	0.511			9.74	0.002
	3: homebound			−4.52	0.004			6.83	<0.001
	4: bedbound			−4.26	0.002			5.16	<0.001
	Random effect								
	Residual	371.14	<0.001	370.81	<0.001	233.58	<0.001	226.80	<0.001
Level 2 (facility)	Intercept	42.17	<0.001	30.47	0.322	32.34	<0.001	21.28	0.096
	Number of beds			0.0005	0.868			0.00	
	Care working staff per 100 residents			0.003	0.838			0.003	0.724
ICC		0.102		0.076		0.122		0.086	
Fitness of model	−2 log likelihood	12083.187		12051.607		11473.157		11389.570	
	Akaike's Information criterion (AIC)	12087.187		12059.607		11477.157		11397.570	
	Schwarz's Bayesian criterion (BIC)	12097.625		12080.468		11487.594		11418.431	

QLDJ, quality of life instrument for Japanese elderly with dementia

of the variation in the QLDJ subscale experiencing minimum negative behavior and 12.2% in the total QLDJ score. The expanded models revealed that the total QLDJ score was significantly greater among residents in the group-living group and in residents with a lower physical dependence at assessment. Residents in the group-living group also had a significantly higher QLDJ score for experiencing minimum negative behavior. The QLDJ score for experiencing minimum negative behavior was significantly greater among residents with a middle grade of physical dependence. Between-group variance explained 7.6% of experiencing minimum negative behavior and 8.6% of the total QLDJ score (Table 4).

IV. Discussion

The present study defined group-living as residing in a facility with residential units, a common area per unit, and stable staff assignments. Residents with dementia in group-living facilities had a better QOL (interacting with surroundings, expressing oneself, experiencing minimum negative behavior, and total QOL). A significant component of group-living may be frequent personal contact between staff and residents, as suggested earlier[9], which can lead to more tailored care based on improved understanding of the resident's needs. Group-living allows for more frequent observation of residents compared to the control facilities; consequently, it could result in more accurate evaluation of QOL using the QLDJ scale.

Physical dependence at assessment was significantly associated with a decreased QLDJ (interaction with surroundings, self-expression, and total QLDJ), consistent with previous studies[14]. In contrast, the QLDJ score for experiencing minimum negative behavior was lowest in the middle grade of physical dependence. Since physical dependence and group-living were correlated, frequently observed behavior in those with less physical dependence could have been confounded by the impact of group living. Future studies should examine the longitudinal variation of QOL in group living and the relationship between QOL and physical dependence.

The group-living group also had a larger number of beds and higher ratio of care workers to residents. The combination of residential units and stable staff assignments helps improve person-centered care; however, it increases staffing needs[15]. A greater number of beds in group-living facilities may be required by the high staffing ratio to strengthen the management base. At present, there is no backup for staffing needs for group-living facilities in Japan, so policy efforts should support the implementation of group-living in traditional nursing homes.

While adjusting these covariates, the multilevel model confirmed that residents' QOL was in part in-

fluenced by the facility in which they lived. One explanation is that the type of care in each facility contributed to the enhancement of QOL of residents with dementia as well as those in group living situations. Another explanation is that these facility differences reflected different staff attitudes about dementia within facilities[16]. In addition, staff ratings of QOL may differ from resident ratings[17]. Therefore, resident ratings of QOL in group-living situations should be examined in the future.

The present study had several limitations. First, there may have been sample bias because residents included in the analyses had some characteristics that were significantly different from those who were excluded. Facilities included in analyses also had a lower ratio of caregivers to residents compared to those that were excluded. In addition, the cross-sectional design could not control for the effect of baseline QOL, although length of stay did not differ between the 2 groups. Among long-term care residents with dementia, a decline has been observed in QOL ratings over time[18]. Furthermore, we used level of dementia according to LTCI standards; cognitive function tests such as MMSE and HDS-R were not performed. Finally, the group-living facilities seemed to have more residents than other small, homelike facilities in western countries with 5 to 15 residents per home or unit[1]. Group-living situations should be studied further to determine the most appropriate size of unit.

In spite of these limitations, the present study suggests that residents with dementia have improved QOL in group-living situations that create small, homelike environments in traditional nursing homes. Future studies should examine the effect of group living on QOL of residents with dementia using a cohort design, following residents longitudinally from admission.

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Conflicts of interest

The authors have no conflicts of interest that are directly relevant to the content of this manuscript.

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