Table 1. Clinical characteristics of EOD patients and LOD patients

	EOD patients (n = 185; 27.7%)	LOD patients (n = 483; 72.3%)	p
Age at consultation, years	58.3 ± 11.0	77.9 ± 5.6	
Sex ratio (M:F)	94:91	188:295	0.007
Education[1], years	11.4 ± 2.8	9.5 ± 2.5	0.000
MMSE score at first consultation[2]	18.4 ± 7.8	18.4 ± 6.4	0.978
CDR at first consultation (0.5:1:2:3)[3]	50:50:53:12	108:167:148:34	0.326
Duration from onset to consultation, months	59.6 ± 70.8	35.7 ± 25.9	0.000

Those who could not undergo MMSE or CDR at their first consultation or whose caregivers' information on patients' education was inaccurate were excluded.
[1] n = 628.
[2] n = 637.
[3] n = 622.

cluding dementia with Lewy bodies (DLB) and fronto-temporal lobar degeneration (FTLD), are insufficient because pure cross-sectional or population studies are impractical for rare diseases [6]. Therefore, we aimed to clarify the frequency of EOD, rate of causes of dementia, and clinical characteristics of EOD in consecutive patients of our memory clinic.

Method

A total of 861 consecutive patients visiting the Higher Brain Function Clinic of the Department of Neuropsychiatry, Ehime University Hospital between January 1997 and September 2005 were examined. Of the 861 patients assessed, more than 80% resided in the Ehime prefecture, within a 100-km radius of the hospital, at their first consultation. The Ehime prefecture is a rural area of Japan with 1.5 million people, 21% of whom are over 65 years old. Our clinic is one of the few specialized clinics for demented people where we can evaluate patients with brain MRI and HMPAO-SPECT. More than 40% of all patients were referred from other doctors. Fifty percent of referrals were received from psychiatrists who are experts in demented patients to some degree, and the others were received from general physicians and geriatricians.

All patients were seen by senior neuropsychiatrists and underwent physical and neurological examinations. Thirty-three patients who came to our clinic only once or who could not undergo neuroimaging examination were excluded, as they could not complete enough evaluations for us to make a clear diagnosis. Patients were assessed with a comprehensive neuropsychological test battery, which included the Mini-Mental State Examination (MMSE) [7], Clinical Dementia Rating (CDR) [8], together with standard psychiatric evaluations to exclude major functional psychiatric disorders such as schizophrenia and mood disorders. All patients underwent brain MRI, except those with cardiac pacemakers who underwent brain CT instead. Almost all patients underwent HMPAO-SPECT except those who could not because of their be-

havioral symptoms. Patients were also assessed with screening blood tests including vitamin B_{12}, folic acid and thyroid function.

Dementia was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, 3rd edition revised [9]. Patients with AD satisfied probable AD criteria developed by the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association [10], and patients with vascular dementia (VaD) satisfied the criteria of the National Institute of Neurological Disorders and Stroke and the Association Internationale pour la Recherche et l'Enseignement en Neurosciences (NINDS-AIREN) [11]. DLB was defined according to the consensus guidelines for the clinical diagnosis of DLB [12]; FTLD was diagnosed according to the international consensus criteria [13]. Standard diagnostic criteria were also applied to dementia of other etiologies.

Information about onset of dementia was routinely and systematically queried from caregivers, and it was emphasized that 'onset' is the time when caregivers first noticed changes from the patients' premorbid state which should be substantive and not a long-standing character trait. One hundred and sixty patients were excluded as they did not fulfill the diagnostic criteria for dementia; 668 patients were included in this study. Among these nondemented patients, there were 31 patients with schizophrenia or delusional disorder, 19 patients with depression or anxiety disorder and 17 normal healthy subjects. The distribution of patients' diagnosis, differences in sex, educational level, severity of dementia according to CDR at the first visit, cognitive function according to MMSE at the first visit, and the duration from onset to consultation were compared between the EOD group (onset before the age of 65 years) and LOD group (onset after the age of 65 years). We examined the distribution of onset age and sex according to the causes of dementia in EOD patients. We also examined the changes in the proportion of subjects during the research period.

Data analyses were carried out using the SPSS-PC software package. Statistical differences between the EOD group and LOD group were assessed by the t test for age, education, duration from onset to consultation and MMSE score, and by the χ^2 test with post hoc Fisher's exact test for sex, CDR, distribution of diagnosis, and proportion of subjects. All examinations were conducted after obtaining informed consent from all subjects or their caregivers.

Frequency and Clinical Characteristics of Early-Onset Dementia

Fig. 1. Rate of causes of dementia in all patients, EOD patients and LOD patients. CBD = Corticobasal degeneration; PSP = progressive supranuclear palsy; alcohol = alcohol-related dementia; NPH = normal pressure hydrocephalus; others = dementia of other etiologies.
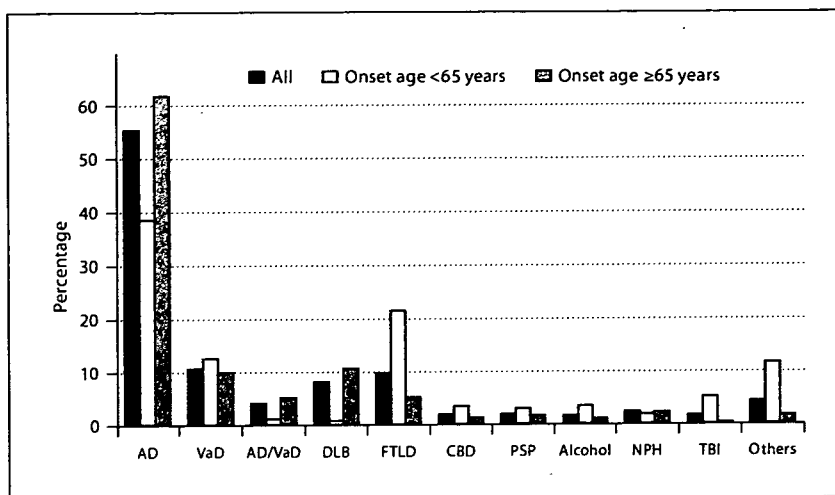
Result

Table 1 shows the clinical characteristics of the total 668 patients with dementia, comparing the EOD group and LOD group.

There were 185 EOD patients, 27.7% of all demented patients. In these EOD patients, mean age at consultation was 58.3 years and the sex ratio was almost equal (M:F = 94:91), meaning there were significantly fewer females than in the LOD group. Educational level was significantly higher than in LOD patients. There were no significant differences between the two groups in CDR and MMSE score at the first visit, but duration from disease onset to consultation was significantly longer in the EOD group compared to the LOD group.

Figure 1 shows the rate of causes of dementia in all patients, EOD and LOD groups.

Among all demented patients, AD was the most frequent cause of dementia (55.4%), followed by VaD (10.5%), FTLD (9.4%) and DLB (8.1%). Among EOD patients, AD was also the most frequent cause of dementia (38.5%). FTLD was the second most common cause of dementia (21.4%), followed by VaD (12.6%) and traumatic brain injury (TBI) (4.9%), and there were only a few DLB patients (0.5%). There were statistically significant differences between the EOD and LOD groups in the frequency of AD (p = 0.000), DLB (p = 0.000), FTLD (p = 0.000), alcohol-related dementia (p = 0.031), and TBI (p = 0.000). Neurosyphilis, carbon monoxide intoxication and post-encephalitis were relatively common in EOD patients with other etiologies.

Table 2. Changes in the proportion of subjects during the research period

	Demented		Nondemented	Total
	EOD	LOD		
1997–1999	39	146	56	241
2000–2002	69	164	63	296
2003–2005 (Sept.)	77	173	74	324
Total	185	483	193	861

Among all EOD patients and early-onset AD patients, the number of patients increased as the onset age got older, and there were no large differences in sex distribution in any generation. Among early-onset VaD patients, the number of patients increased with increasing onset age, and there were more males. Among early-onset FTLD patients, the number of patients increased after the age of 45 years, but no constant tendency was found in the sex ratio.

The changes in the proportion of subjects during the three sequential research periods are summarized in table 2.

Although the number of subjects increased with the passage of time in all groups, there were no significant differences in the proportion between either demented subjects and nondemented subjects or EOD patients and LOD patients. Among the demented patients, the severity of dementia according to CDR at the first consultation did not differ during the research period.

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Discussion

This is a systematic study to reveal the clinical characteristics of EOD in consecutive patients over a period of 8 years at a memory clinic in Japan. It is worthy of notice that nearly 30% of the demented patients had an age of onset of less than 65 years.

Comparing with other studies in Japan, Miyanaga et al. [14] estimated that there are a total of 25,000 EOD patients (32 patients per 100,000 population) in Japan, only a few percent of more than 2 million demented patients. Yokota et al. [15] reported that only 34 patients (7.3%) had an age of onset of less than 65 years out of a total of 464 demented patients from their outpatients of psychiatric hospitals in Japan. Both studies showed a much fewer number of EOD patients than our study. Comparing with other countries, Harvey et al. [5] estimated that there are 54 EOD patients per 100,000 population in their epidemiological study in the UK, almost the same number as the one previously reported in Japan. An outpatient study in Denmark showed that a total of 314 patients per 1,000 demented patients were aged less than 60 years [4], an outpatient study in the USA reported that 29.3% of 948 demented patients were EOD patients [16], and a UK study showed that the proportion of EOD patients was 28.6% [17]. All these results are consistent with our result. An outpatient study in Brazil showed that 46.6% of all demented patients were EOD patients [18], a relatively high number compared to other studies. There may be more EOD patients in Japan than previously reported.

In our study, the sex ratio in the EOD group was almost equal, whereas there were more females in the LOD group. In fact, many epidemiological studies revealed that there were more female patients among the demented elderly [19–21], while there were more males among EOD patients [5, 14]. This may be because there are more male-related causes of dementia, such as VaD or alcohol-related dementia, in EOD groups. There is a possibility that the sex ratio of AD is affected by onset age, as some studies mentioned that there are more males in early-onset AD patients than in late-onset AD patients [3].

The education level was significantly higher in EOD groups. This may be due to changes in the educational system in Japan after World War II.

As there were no significant differences between the EOD and LOD groups in CDR and MMSE score at the first consultation, we performed this analysis with all causes of dementia together; however, cognitive function and severity of dementia could not be discussed for each cause of dementia. Therefore, further assessments are needed on cognitive function and psychiatric symptoms for all causes of dementia.

It is noteworthy that in EOD patients the duration from disease onset to consultation is longer than in LOD patients. Therefore, it seems that the progress of dementia in EOD patients is slow, even though the severity of dementia is equal between the two groups. However, in patients with AD, which is the major cause of dementia, early-onset groups are known to show a more rapid progression than late-onset groups [22, 23]. Therefore, we suppose that in EOD patients it takes longer to correctly diagnose the disease because early-onset patients are sometimes misdiagnosed as having psychiatric disorders such as schizophrenia or mood disorders. Furthermore, EOD groups consist of not only patients with neurodegenerative disorders or cerebrovascular diseases but also of patients with many heterogeneous causes of dementia, such as TBI or neurosyphilis. These pathologies sometimes require more time to be diagnosed by specialists in dementia. This misdiagnosis might have led to the under-recognition of EOD, and hence, to the underestimation of its prevalence. This issue is important from a socioeconomic point of view, and we need to inform people further about EOD.

There are also a few noteworthy findings in the classification of causes of dementia in our study. Among our patients, 12.6% of all EOD patients had VaD and there was no significant difference between that number and the number of LOD patients (9.7%). Although several epidemiological studies have reported that VaD was more common in patients aged less than 65 years compared with elderly patients [3, 18, 24], our result was not consistent with these findings. The distribution of the diagnoses of VaD is influenced by the specificity and sensitivity of the criteria used in each study, and the NINDS-AIREN criteria are known to be the strictest criteria, requesting onset of dementia within 3 months following a recognized stroke [25, 26]. This low prevalence of VaD in our study may be because we used the NINDS-AIREN criteria to diagnose VaD, and young patients may not have recognized their strokes. Furthermore, as our series of patients are outpatients of the neuropsychiatry department, there is a possibility that there might be few subjects with clear neurological symptoms due to cardiovascular disease.

Among our patients, DLB was the second most common cause of dementia (10.9%) in the LOD group while there were only a few DLB patients (0.5%) in the EOD group. Although there were little epidemiological data on clinically diagnosed DLB compared with research on au-

topsy patients, some investigations on EOD reported a low prevalence of DLB patients [4, 5, 27]. These findings suggest that the onset age of DLB seems to be considerably old.

Among our patients, FTLD was the second most common cause of dementia following AD among the EOD group (21.4%; AD/FTLD = 1.8:1) while it was relatively rare among the late-onset patients (4.9%; AD/FTLD = 12.5:1). Although this rate of FTLD in the EOD group is higher than in other studies in Japan [14, 15], it is not a surprising rate compared with those in other countries. Many studies in Western countries report that FTLD is the second most common cause of dementia following AD among early-onset patients [6, 28–30]. An epidemiological study in the UK showed that the rate of FTLD was 15.7% out of a total of 108 demented people aged <65 years, whereas the rate of AD was 25% (FTD/AD = 1:1.6) [29]. Although there are some familial and genetic cases among FTLD patients in Western countries and the pathoetiologic background of FTLD in Japan may be different from that in Western countries [28, 31], our results suggest that FTLD in Japan has been underestimated until now.

Turning to the changes of the proportion of subjects during the three sequential research periods, there were no significant differences between either demented subjects and nondemented subjects or between EOD patients and LOD patients. This result suggests that the proportion of EOD and LOD patients was not affected by the recent trend of increased awareness of dementia, although the number of all patients increased. Moreover, the severity of dementia at the first consultation did not differ during the research period. This may suggest that early diagnosis and early referral are still not enough even today. Further information about dementia for families and for general physicians is required.

There are a few methodological issues that should be taken into consideration to fully appreciate our results. Firstly, this study is based on memory clinic patients in the department of neuropsychiatry of a university hospital, thus it is not a purely community-based epidemiological study. Referral bias may affect the proportion of each diagnosis in this study. Relatively common causes of dementia such as AD or VaD may be treated by general physicians, and physicians may refer patients with aphasia or motor neuron symptoms to other neurological referral centers. Younger patients may be threatened with loss of employment due to dementia, which may lead the family and the general physician to refer the patient to a specialist. Older patients may have less oppor-tunity of referral because of their age. This possible selection bias may affect the proportions of EOD and LOD patients. However, as we mentioned above, pure cross-sectional or population studies are impractical for rare diseases, and many epidemiological studies of dementia are intended for people over 65 years of age. Therefore, an assessment of a large number of consecutive patients at a memory clinic might be important. Furthermore, as our clinic is one of the few specialized clinics for demented people in our regional area where we can evaluate patients with MRI and HMPAO-SPECT, we believe our result is not inaccurate. Secondly, determining the age of onset and the duration of degenerative dementia is difficult. This study is based on the retrospective recall of caregivers, and it can be claimed that the informants' memories may have been inaccurate. Thirdly, in this study we clinically diagnosed AD, VaD, DLB, FTLD and other causes of dementia according to consensus diagnostic criteria. We did not perform pathological confirmations, so we cannot discuss the pathological background of our diagnoses. However, we routinely used the Neuropsychiatric Inventory [32] and Stereotypy Rating Inventory [33] for all patients in order to assess the psychiatric and behavioral symptoms of the patients. Moreover, we used a comprehensive frontal function assessment battery including motor series, conflicting instruction, digit span, word fluency test, trail making test, and the Stroop color-word test, for those in whom FTLD was suspected. As described previously, all patients underwent brain MRI and almost all patients underwent HMPAO-SPECT. All the patients with FTLD showed either frontal/temporal lobe atrophy on MRI, or frontal/temporal hypoperfusion on HMPAO-SPECT. Even when frontal system dysfunction was detected by neuropsychological tests in some patients with AD and VaD, they did not show frontal lobe atrophy on MRI or frontal hypoperfusion on HMPAO-SPECT. Therefore, we believe that our clinical diagnosis of the causes of dementia is the most accurate possible.

In conclusion, EOD patients are not rare, at least in memory clinics. There are many atypical causes of dementia among EOD patients such as FTLD or TBI, so clinicians have to take into consideration the specific clinical symptoms and histories of these diseases when examining such patients. Since in EOD patients the duration from their disease onset to consultation is longer, further information for the public and social support services for EOD patients are required.

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Comparison of behavioral and psychological symptoms in early-onset and late-onset Alzheimer's disease

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SUMMARY

Background When comparing with early-onset Alzheimer's disease (EO-AD) and late-onset Alzheimer's disease (LO-AD), some symptomatological differences in clinical features can be seen between them. Rapid progression, more severe language problems or visuospatial dysfunction occur more often in EO-AD patients. However, there have been very few reports about the differences in behavioral and psychological symptoms between these two groups.
Aim The aim of this study was to demonstrate the differences in behavioral symptoms between EO-AD and LO-AD groups.
Method Three hundred and seven consecutive outpatients with AD were put into an EO-AD group (46 patients) or a LO-AD group (261 patients). Comprehensive assessment batteries, including the Neuropsychiatric Inventory (NPI), were administered at the first medical assessment.
Results Significant differences were found between the EO-AD and LO-AD groups in terms of NPI total score (EO-AD: 10.3 ± 10.9, LO-AD: 17.8 ± 17.0, $p = 0.004$) and number of patients who experienced each NPI subscale score (delusion; EO-AD: 13.0%, LO-AD: 50.6%, $p < 0.001$). There were no differences in cognitive functions or dementia severity between two groups.
Conclusion In EO-AD, behavioral and psychological symptoms are relatively fewer than LO-AD at the first medical assessment. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS — early-onset; Alzheimer's disease; Neuropsychiatric Inventry (NPI); behavioral and psychological symptoms of dementia (BPSD); outpatients

INTRODUCTION

In recent years, reports based on large clinicopathologic studies have shown that the pathologies of Alzheimer's presenile dementia and senile dementia of Alzheimer type are not qualitatively different (Newton, 1948; Neumann and Cohn, 1953; Corsellis, 1962). However, when comparing their clinical symptoms in detail, several differences can be found (Chui *et al.*, 1985; Mayeux *et al.*, 1985). Some studies have reported that rapid progression (Jacobs *et al.*, 1994), language problems (Imamura *et al.*, 1998) or visuospatial dysfunction (Fujimori *et al.*, 1998) occur more often in early-onset Alzheimer's disease (EO-AD) patients.

There have been very few reports about the differences of behavioral and psychological symptoms of dementia (BPSD) between EO-AD and late-onset Alzheimer's disease (LO-AD) groups. Ferran *et al.* (1996) reported that in EO-AD patients, delusions,

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hallucinations and disinhibition were under 15%, however, they did not use standardized assessment instruments. Other studies lack standardized instruments for BPSD and operational criteria, too. Therefore, differences of BPSD between EO-AD and LO-AD groups are not clear at the present.

BPSD have been shown to be a major cause of anxiety and concern for caregivers (Deimling and Bass, 1986) and a frequent cause of admission to an institution (Steel et al., 1990; Haupt and Kurz, 1993). Because appropriate management of BPSD may lessen the burden of caregivers (Shigenobu et al., 2002) and may postpone admission to an institution, evaluation and management of BPSD are of considerable importance in practice (Ikeda and Tanabe, 2004). It is also important to assess BPSD of AD patients because of its differential diagnosis from depression, delusional disorders or dementia with Lewy Bodies (DLB) (Mckeith et al., 1996).

In this study we examined a large set of patients with EO-AD and LO-AD to evaluate BPSD using standardized assessment instrument (the Neuropsychiatric Inventory: NPI) (Cummings et al., 1994; Hirono et al., 1997) and attempted to clarify the differences of BPSD between the two groups.

METHOD

Subjects

Study participants were consecutive outpatients with a diagnosis of AD between January 1997 and September 2005. They were referred for evaluation to the Higher Brain Function Clinic, for outpatients of the University Hospital of Ehime University Graduate School of Medicine.

All patients underwent physical and neurological examinations, laboratory blood tests including vitamin B12, folic acid and thyroid function, brain MRI, and HMPAO-SPECT, and were assessed with a comprehensive neuropsychological test battery, including the Mini-Mental State Examination (MMSE) (Folstein et al., 1975), Alzheimer's Disease Assessment Scale—Cognitive Part (ADAS-cog) (Mohs et al., 1983; Homma et al., 1992) and Raven's Coloured Progressive Matrices (RCPM) (Raven, 1965). Dementia severity was assessed by Clinical Dementia Rating (CDR) (Hughes et al., 1982). BPSD were assessed by the NPI. The age at onset and the duration of the disease were ascertained through an interview with the primary caregiver. Age at onset was defined as the age of the first appearance of symptoms which interfere with social or occupational function-

ing, and the duration was defined as the amount of time between the onset and the first medical assessment. Patients who satisfied the NINCDS/ADRDA diagnostic criteria for probable AD (Mckhann et al., 1984) were put into the EO-AD group if they were under 65 years old, and into the LO-AD group if they were over 70 years old, at the time of their first assessment. We excluded patients aged between 65 and 70 years at the time of first medical assessment in order to reduce the likelihood of having patients older than 65 years with a disorder that had its onset before that age (Suribhatla et al., 2004), patients without a reliable caregiver, and patients who had a history of mental illness or substance misuse before onset of dementia. This study was conducted after obtaining informed consent from all subjects or their caregivers.

Assessment of BPSD

We assessed the presence of BPSD with a structured caregiver interview using the NPI. The NPI evaluates ten neuropsychiatric disturbances common in dementia: delusion, hallucination, agitation, dysphoria, anxiety, apathy, irritability, euphoria, disinhibition, and aberrant motor behavior. The severity and frequency of each neuropsychiatric symptom are rated on the basis of scripted questions that the patient's reliable caregiver is asked. A total NPI score is calculated, in addition to the scores for the individual symptom domains. The validity and reliability of the NPI have been proven both in Western countries and Japan (Cummings et al., 1994; Hirono et al., 1997).

Statistical analysis

All statistical analyses were carried out with Stat View, J 5.0.

To compare the differences of EO-AD and LO-AD, we used the Mann–Whitney U-tests for CDR, MMSE, ADAS-cog, RCPM, total NPI score and each NPI subscale score. We used the t-test for duration of disease and years of education. We used Fisher's exact test for sex and number of patients in each NPI subscale.

A significance level of 0.05 was set for all analyses.

RESULTS

Among the 370 patients who were diagnosed with AD, 27 patients were excluded because information from a reliable caregiver could not be attained. After we

excluded patients 65–70 years old at the time of first medical assessment, 307 patients remained. Of the 307 patients, 46 had EO-AD (24 males and 22 females; the mean age with SD at the time of first medical assessment was 55.3 years, SD 5.2) and 261 had LO-AD (80 males and 181 females, 75.3 years, SD 5.4). Significant differences were found between the EO-AD and LO-AD groups in terms of sex ratio ($p = 0.007$). The background of both groups is presented in Table 1. Significant differences were also found in years of education ($p < 0.001$) between the EO-AD and LO-AD groups. Duration of disease determined by informant-based interviews did not differ significantly ($p = 0.405$).

No significant differences were found between the two groups with CDR ($p = 0.445$), MMSE ($p = 0.231$), ADAS-cog ($p = 0.898$) and RCPM ($p = 0.064$). The mean total NPI score was significantly lower in the EO-AD group ($p = 0.004$). The number of patients who scored each NPI subscale is presented in Table 2. Significant differences were found between EO-AD and LO-AD groups in terms of delusion ($p < 0.001$), hallucination ($p = 0.002$), agitation ($p = 0.037$), disinhibition ($p = 0.039$) and aberrant motor behavior ($p = 0.034$). Each NPI subscale score is shown in Table 3. Significant differences were additionally found in the NPI

Table 2. Number of patients who scored on each NPI subscale

	EO-AD (N = 46)	LO-AD (N = 261)	p value
Delusion	13.0% (6)	50.6% (132)	<0.001*
Hallucination	4.3% (2)	22.6% (59)	0.002*
Agitaion	28.3% (13)	44.8% (117)	0.037*
Dysphoria	43.5% (20)	39.1% (102)	0.625
Anxiety	28.3% (13)	38.7% (101)	0.19
Euphoria	8.7% (4)	7.3% (19)	0.761
Apathy	56.5% (26)	64.4% (168)	0.323
Disinhibition	4.3% (2)	16.5% (43)	0.039*
Irritability	19.6% (9)	24.5% (64)	0.574
Aberrant motor behavior	26.1% (12)	43.7% (114)	0.034*

*Significant difference was found by the Fisher exact test ($p < 0.05$).

subscale scores of delusion ($p < 0.001$), hallucination ($p = 0.004$), agitation ($p = 0.009$), disinhibition ($p = 0.037$) and aberrant motor behavior ($p = 0.015$).

DISCUSSION

In this study, we examined a large series of patients in EO-AD and LO-AD groups for the evaluation of BPSD and attempted to clarify the differences between these groups. This is the first study which used standardized test batteries to evaluate and compared the BPSD of these two groups as far as we are aware.

Significant differences were found between the EO-AD and LO-AD groups in terms of NPI total score. In the EO-AD group, BPSD were relatively few. Significant differences were also found between the two groups in the NPI subscale scores, such as delusion. Delusions are common BPSD in AD (Wragg

Table 1. Comparison of characteristics between EO-AD and LO-AD patients

	EO-AD (N = 46)	LO-AD (N = 261)	p value
Age at onset (y)	55.3 ± 5.2	75.3 ± 5.4	
Age at examination (y)	58.8 ± 5.0	78.5 ± 5.1	
Duration of illness (y)	3.5 ± 2.0	3.2 ± 2.4	0.405
Sex (M/F)	24/22	80/181	0.007*
Education (y)	11.8 ± 2.7	9.5 ± 2.3	<0.001**
CDR (0.5/1/2/3)	16/15/9/6	66/97/82/16	0.445
MMSE	17.4 ± 7.6	19.0 ± 6.0	0.231
ADAS-cog	18.7 ± 12.1[a]	17.9 ± 10.4[b]	0.898
RCPM	17.9 ± 10.7[c]	21.5 ± 7.6[d]	0.064
total NPI score	10.3 ± 10.9	17.8 ± 17.0	0.004***

mean ± SD or N.
*Significant difference was found by the Fisher exact test ($p < 0.05$);
**Significant difference was found by the t-test ($p < 0.05$);
***Significant difference was found by the Mann–Whitney U-test ($p < 0.05$).
CDR = Clinical Dementia Rating; MMSE = Mini-Mental State Examination; ADAS-cog = Alzheimer's Disease Assessment Scale-cognitive part; RCPM = Raven's Coloured Progressive Matrices; NPI = Neuropsychiatric Inventory.
[a]N = 39.
[b]N = 222.
[c]N = 41.
[d]N = 204.

Table 3. Scores of NPI subscale

	EO-AD (N = 46)	LO-AD (N = 261)	p value
Delusion	0.50 ± 1.59	2.99 ± 3.97	<0.001*
Hallucination	0.15 ± 0.73	1.13 ± 2.72	0.004*
Agitaion	0.57 ± 1.13	1.81 ± 2.88	0.009*
Dysphoria	1.87 ± 2.83	1.30 ± 2.30	0.302
Anxiety	1.20 ± 2.37	1.72 ± 2.80	0.200
Euphoria	0.20 ± 0.75	0.19 ± 0.76	0.755
Apathy	3.17 ± 3.80	3.53 ± 3.62	0.399
Disinhibition	0.33 ± 1.81	0.77 ± 2.22	0.037*
Irritability	0.89 ± 2.06	1.46 ± 3.02	0.369
Aberrant motor behavior	1.41 ± 2.66	2.94 ± 4.09	0.015*

*Significant difference was found by the Mann–Whitney U-test ($p < 0.05$).

Table 4. Number of patients who experience delusions

	EO-AD patients	LO-AD patients	Total
Male			
With delusion	1	30	31
Without delusion	23	50	73
Total	24	80	104
Female			
With delusion	5	102	107
Without delusion	17	79	96
Total	22	181	203

Significant differences were found between the EO-AD and LO-AD groups, regardless of sex (in male, $p = 0.002$; in female, $p = 0.003$. by the Fisher exact test).

and Jeste, 1989; Migliorelli *et al.*, 1995). However, the mechanism for delusions in AD patients is not well understood. Some studies which did not use an age limit reported that being female is linked to delusions in AD (Hirono *et al.*, 1998; Launer *et al.*, 1999; Ikeda *et al.*, 2003). Therefore, there is a possibility that our results were strongly influenced by sex ratio. We thus sorted females and males and recompared separately (Table 4). Delusions were significantly lower in the EO-AD group, regardless of sex.

Hallucination was significantly lower in EO-AD group. The mechanism of hallucinations in AD patients, like that of delusions, is not well understood. There is a possibility that DLB patients who often hallucinated may have been misdiagnosed with AD, although patients with parkinsonism, fluctuation and deterioration of blood flow in the occipital lobe were excluded as a precaution (Mori *et al.*, 2006). Similar to AD patients, DLB patients show memory disturbance and disorientation, and there are more DLB patients amongst the elderly (Yokota *et al.*, 2005). Therefore, some DLB patients might be diagnosed as LO-AD.

Ropacki and Jeste (2005) reviewed 55 studies published between 1990–2003 that reported that older age was correlated with psychotic symptoms in 12 of 25 studies and was not associated with psychosis in the remaining 13 investigations. Further studies are needed on this issue.

Agitation, disinhibition and aberrant motor behavior were significantly lower in EO-AD group. This may be due to the low frequency of hallucination and delusions (Ballard and Oyebode, 1995).

We could not sufficiently explain the reason why the prevalence of these BPSD in EO-AD is lower than that of LO-AD in this study. A possible explanation for our findings is that age itself, biological, psychosocial

or environmental factors may affect BPSD. It is especially important to evaluate BPSD for diagnosis and care in LO-AD patients.

Although BPSD were low in the EO-AD group, dysphoria (43.5%) and apathy (56.5%) occurred with relatively high frequency. Therefore, it is important to introduce a day-care service and plan for keeping daily activities of EO-AD patients similar to LO-AD patients. In examining a young patient with memory disturbance and depression, clinicians should carefully consider the diagnosis of dementing disorders, depression (pseudo-dementia), or complicated versions of both.

No significant differences were found in the duration of disease, CDR, MMSE, ADAS-cog and RCPM. Therefore, levels of cognitive function and severity of dementia were almost the same in the two groups. The education level was significantly higher in EO-AD group. This difference seems to be influenced by the changing of the Japanese education system after World War.

Ropacki and Jeste (2005) reviewed studies that reported the risk factors associated with psychosis of AD and reported that education level showed a weak or inconsistent relationship with psychosis. As Hirono *et al.* (1998) also reported that education level is not related to behavioral and psychological symptoms, this difference of education level might not effect our results.

In general, there are more female AD patients (Launer *et al.*, 1999). In this study as a whole, there was also female predominance. However, looking at the EO-AD group only, no significant difference was found in terms of sex ratio. Some community based surveys about early-onset dementias did not show a difference in sex ratio (Newens *et al.*, 1993), whereas others showed female predominance in EO-AD (Kokmen *et al.*, 1988). Further studies are needed to examine this sex ratio in the future.

Previous PET studies show the differences of regional cerebral glucose metabolism between EO-AD and LO-AD groups. Sakamoto *et al.* (2002) reported that EO-AD group had more severe hypometabolism in the bilateral parietal and posterior cingulated cortices and precuneus region than the LO-AD groups. Yasuno *et al.* (1998) reported that EO-AD patients showed significant hypometabolism in the left dorsal frontal, left lateral temporal, bilateral inferior parietal and left retrosplenial areas compared to the LO-AD patients. There is a possibility that these results are associated with the differences of BPSD between two groups. Further studies with strictly controlled experimental designs are needed to reveal

the regions responsible for psychotics (Fukuhara *et al.*, 2001).

In this study, there are some methodological issues. Firstly, there is a possibility that results were affected by the peculiarity of an university hospital (population bias by institution). Secondly, age at onset was ascertained by an interview with the primary caregiver and then patients are classified into EO-AD and LO-AD groups in many studies. However, in some cases, caregivers' memories may have been inaccurate (Oppenheim, 1994), making it difficult to obtain an accurate medical history. Therefore, in this study, we decide to classify subjects by age at first assessment. This method can strictly identify EO-AD patients, whereas there is possibility that a few EO-AD patients may be put into the LO-AD group.

In this study, we used standardized test batteries to evaluate BPSD and compared between EO-AD and LO-AD groups. It became clear that significant differences were found between these two groups in terms of BPSD, especially delusions and hallucinations, although the levels of cognitive function and severity of dementia are not different. In the EO-AD group, prevalence of BPSD is relatively lower compared with the LO-AD group. Several functional imaging studies and our results show the possibility of the existence of biological subtypes of AD.

To confirm our assumption, further community based surveys with generally low bias and imaging studies with strictly controlled experimental designs are needed.

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Regular Article

Residential program for long-term hospitalized persons with mental illness in Japan: Randomized controlled trial

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Abstract   Research on the merits of long-term group residences is inconclusive. The purpose of the present paper was to investigate the effects of supported group residence on the symptoms, social function, quality of life, general health quality, and the medical/psychiatric cost in Japan of a large number of psychiatric beds and long average length of stay. Patients were assessed every 6 months for 2 years using Positive and Negative Syndrome Scale, Katz Adjustment Scale, World Health Organization Quality of Life (WHO-QOL) and General Health Questionnaire 12-item version. Patients discharged to the supported group residence (SGR) significantly improved with regard to positive symptoms, the level of socially expected activities and free-time activities. The QOL physical domain of the inpatients was significantly more deteriorated compared to the SGR group. The total psychiatric/medical cost of the SGR group was approximately one-third that of the inpatient group, while the cost of the SGR to treat physical comorbidity was much higher. The present findings indicate that SGR has advantages for mental and social function but not for physical health. A major limitation of the present study was the high mean age (>60 years) of the subjects who had been hospitalized for a long period (mean, 24 years).

Key words   community care, medical cost, randomized controlled trial, schizophrenia, supported group residence.

INTRODUCTION

In most Western countries for several decades there has been a policy of deinstitutionalization involving discharge of patients from psychiatric hospitals into the community. This social movement has generated much related research. Earlier community care studies mainly focused on the rate of psychiatric bed use, the rate of service use in psychiatric hospitals, or changes

of symptoms,[1] and found that community care has lowered the rate of re-hospitalization[2] and improved clinical symptoms.[3] In addition, some studies showed that community care could be provided at a lower cost.[4,5] The patients' or relatives' satisfaction with treatment was another area of interest, and it was shown that they much preferred community care to traditional hospital care.[6,7] More recently, studies have been refined, further showing the predominance of community care in cost-effective studies[8,9] and the quality of life (QOL) of patients and relatives.[10] Studies of educational intervention have also enforced the flow from hospital to community life.[11,12] Although research findings on community care have not been numerous in Asia compared to the West, there were some studies

modeled on the Western approaches in community care. Shu *et al.* found that total QOL in patients receiving home care programs was higher than those receiving half-way house services,[13] while Chan *et al.* showed that community-based treatment settings had a positive impact on objective QOL.[14] In other studies using psychosocial interventions, long-term hospitalized patients were successfully discharged through the Community Re-Entry Program,[15,16] or family interventions could prevent patients from having to undergo re-hospitalization.[17,18] Japan has just begun to reduce the number of psychiatric beds and to try to transfer long-term hospitalized patients into community settings. The Japanese psychiatric care delivery system has been characterized as having many beds, many closed wards, a long average length of stay, and poor community resources.[19,20]

After 1994, however, the number of beds has been gradually decreasing with more programs of psychiatric rehabilitation introduced for the inpatients,[21] which aroused interest regarding the effects of housing services on chronic patients.

The purpose of the present study was to investigate the effects of a supported group residence (SGR) on symptoms, social function, quality of life, and the general health quality of long-term hospitalized patients, and to compare the psychiatric/medical cost between hospital and residential care. Such studies would be significant not only in examining deinstitutionalization in an Asian country, but also in the understanding of relevant community care in general.

METHODS

Subjects

The patients who had been hospitalized in Tosa hospital, a private psychiatric hospital with 229 beds, for ≥1 year were selected and included in the present study. They had to be between 30 and 80 years old, without serious symptoms, such as being dangerous to oneself or others, persistently troubling others or showing bizarre behavior, and not requiring regular nursing. The subject selection criterion was patients with schizophrenic disorders including epileptic psychoses. Patients with personality or depressive disorders were excluded. There were 30 patients who met this standard. After the purpose of the present study was explained and the consent form was presented, 28 patients agreed and signed the form (16 male, 12 female). They were randomly allocated into a group moving to the SGR ($n = 14$) or a group continuing in hospital ($n = 14$).

Because the number of rooms for men and women differed in the residence, random distribution was per-

formed according to sex. Consequently, in the SGR group, there were 10 men and four women, while six men and eight women continued in the hospital. The diagnosis of patients was DSM-IV schizophrenia in 27 and epileptic psychoses in one patient who belonged to the hospital group. The DSM-IV diagnosis of the patient with epileptic psychoses was psychotic disorder due to epilepsy.

Program

There are several housing programs for persons with severe mental illness in Japan. Starting in 2000, Fukushi-home B (Japanese name of SGR)is a facility for people with psychiatric symptoms such as avolition or bizarre behavior, and/or those who need some daily support due to aging. The Fukushi-home B system was established for patients with volitional disorder or mild deviant behavior who often have difficulty living in group homes, or who require assistance due to aging. There are no special rules for the provision of meals. In the facility in the present study, meals were provided at patients' request. The institution standard is to maintain >23.3 m^2 per occupant, to equip the consultation room, cooking room, manager's office and other key rooms, to appoint one manager, one or more physicians, three guides, including one psychiatric social worker (Seishin-hoken-fukushishi), to have a capacity of approximately 20, to provide programs, such as helping the patients acquire daily life skills such as cleaning or washing, and give advice on interpersonal relationships.

Before the SGR patients moved to the facility, all patients, including the comparative group, received training to acquire some basic skills, such as taking medication, money management, or personal self-care. The programs for the SGR group consisted of volunteer work, such as cleaning the neighboring park, which might help to promote good relationships with the local residents, tea meetings/birthday parties at the SGR to strengthen friendships, and attending day care programs at Tosa Hospital three times a week. Because the staff working hours were only during the day, the patients were instructed to use a direct phone line to the Tosa Hospital in the case of an emergency at night.

When their psychiatric symptoms resurged after moving to the SGR they were usually readmitted to Tosa Hospital, but for physical illness they visited another hospital. The patients of the hospital group attended the occupational therapy department three times a week and the day care department once a week. We followed them for 2 years. The SGR of this case is in the town outside the site of the hospital.

Measurements

The Positive and Negative Syndrome Scale (PANSS)[22] was used to assess patient symptomatology.

The interrater agreement was excellent ($\kappa = 0.84$). To evaluate social function we used the Katz Adjustment Scale (KAS).[23] There are five evaluation domains in the KAS, and in the present study we used 16 social activity items and 22 leisure activity items and evaluated the actual activity and the degree of expectation separately, for 38 items in two domains, to give a total of 76 items. We asked the staff in the SGR and the hospital to substitute for the relatives in the family version. For assessment of the quality of life and general health condition of the patient, we administered World Health Organization Quality of Life (WHO-QOL)[24] and the General Health Questionnaire 12-item version (GHQ-12),[25] respectively. For GHQ score calculation we used (0-0-1-1) for the grading method.

We used PANSS, KAS, WHO-QOL and GHQ-12 every 6 months for 2 years. Concerning the blindness of the assessment, we ensured that the PANSS rating was made by a psychiatrist unaware of the group allocation.

The dosage of the prescribed antipsychotic(s) was converted into chlorpromazine equivalent based on the power value conversion table by the treatment resistance schizophrenia research group and the equivalent conversion table of an oral antipsychotic by the 2001 version Keio University Psychopharmacology Research Group.[26] We compared the dosage between baseline and at 2 years.

Regarding the cost, we initially planned to examine both psychiatric/medical treatment cost and living cost. We excluded the cost of living, however, because the expense of psychiatric/medical care was precisely and easily available, while calculation of the living cost was complicated and inaccurate. Further, compared to the psychiatric/medical cost, the living costs were limited to the purchasing of cigarettes or sweets in the present study. Patients' psychiatric/medical services were recorded continuously, and data were collected monthly to calculate psychiatric/medical treatment costs for 2 years.

Statistical analysis

The χ^2 test was used to compare the differences by gender, and Student's t-test was used to compare age, duration of hospitalization, and antipsychotic dose at baseline between the two groups. Repeated measure ANOVA (times × groups) was used to compare PANSS, KAS, WHO-QOL, and GHQ-12 scores and the dose of antipsychotic(s) between baseline and at 2 years. All statistical analysis was carried out using SPSS for Windows, version 12.0 (SPSS, MapInfo, Troy, NY, USA).

RESULTS

There were no significant differences in sex, age, and duration of hospitalization between the SGR and hospital groups (Table 1). During the follow-up period of 2 years, three out of 14 patients in the SGR group were readmitted to Tosa Hospital. The duration of re-hospitalization of the three patients was 4.9 months, 2.9 months and 0.5 months, respectively. For the three re-admitted patients in the SGR group, the hospitalization cost was added to the 'medical cost in Tosa Hospital' in the SGR group for analysis. Therefore, the actual hospitalization cost in each patient was added, and the living cost in Fukushi-home B was also added because they did not go through the cancellation procedure. Meanwhile, all patients in the hospital group continued hospitalization for 2 years.

Changes in psychiatric manifestations

Table 2 shows the mean value of the PANSS subscale scores at baseline and at 2 years. There was a significant

Table 1. Comparison of patients characteristics in SGR and hospital groups

	SGR group (n = 14)	Hospital group (n = 14)	Significance
Age	63.01 ± 7.95	61 ± 9.41	n.s.[t]
Duration of hospitalization (years)	24.23 ± 15.70	24.18 ± 16.73	n.s.[t]
Gender (%)			
Female	4 (29)	8 (57)	n.s.[‡]
Male	10 (71)	6 (43)	n.s.[‡]

[t] Student's t-test; [‡] χ^2 test
SGR, supported group residence.

Table 2. PANSS, KAS, WHO-QOL, and GHQ-12 scores (mean ± SD)

	SGR group		Hospital group		Analysis	
	Baseline	2 years	Baseline	2 years	*F*	*P*
PANSS						
Positive syndrome	17.7 ± 4.1	13.6 ± 4.7	18.5 ± 3.0	17.6 ± 3.2	6.43	0.02
Negative syndrome	24.4 ± 6.4	23.5 ± 6.1	27.6 ± 3.9	30.4 ± 4.2	3.54	0.07
General psychopathology	41.7 ± 7.1	42.1 ± 5.9	46.6 ± 4.4	49.9 ± 4.8	2.28	0.14
KAS						
S-LPSA	13.7 ± 2.1	24.9 ± 6.4	14.4 ± 1.9	17.7 ± 6.9	9.22	0.005
S-LSPSA	16.1 ± 3.5	26.1 ± 6.6	17.2 ± 3.0	21.6 ± 9.9	2.42	0.13
S-LPFA	25.4 ± 3.6	29.6 ± 6.4	24.0 ± 4.4	24.7 ± 4.2	2.9	0.1
S-LSFA	20.2 ± 5.7	22.9 ± 7.7	18.9 ± 5.7	18.8 ± 7.8	0.61	0.44
R-LPSA	13.4 ± 2.3	19.4 ± 4.1	12.1 ± 2.6	15.1 ± 4.2	3.8	0.06
R-LEPSA	14.9 ± 3.0	21.6 ± 3.6	14.6 ± 1.4	15.7 ± 6.6	6.28	0.02
R-LPFA	24.0 ± 4.0	28.1 ± 5.3	21.6 ± 3.0	19.9 ± 6.0	6.14	0.02
R-LSFA	27.7 ± 4.3	28.4 ± 4.0	24.9 ± 5.9	23.0 ± 8.9	0.6	0.45
WHO-QOL						
Physical	21.0 ± 4.9	21.4 ± 4.6	23.1 ± 4.0	19.8 ± 3.4	4.39	0.046
Psychological	16.6 ± 4.3	17.9 ± 4.8	17.9 ± 9.0	15.9 ± 3.6	3.3	0.08
Social	7.9 ± 2.4	8.4 ± 2.3	9.1 ± 2.2	10.0 ± 1.9	0.11	0.74
Environment	24.8 ± 3.9	24.1 ± 6.2	24.6 ± 5.0	23.0 ± 4.3	0.17	0.69
Life satisfaction	5.6 ± 1.5	5.9 ± 1.8	6.3 ± 1.3	5.8 ± 1.3	1.08	0.31
GHQ-12	2.6 ± 2.5	1.6 ± 2.4	2.5 ± 2.5	3.1 ± 2.6	0.64	0.43

GHQ-12, General Health Questionnaire 12-item version; KAS, Katz Adjustment Scale; PANSS, Positive and Negative Syndrome Scale; R-LEPSA, relative's rating of level of expectations for performance of social activities; R-LPFA, relative's rating of level of performance of free-time activities; R-LPSA, relative's rating of level of performance of socially expected activities; R-LSFA, relative's rating of level of satisfaction of free-time activities; SGR, supported group residence; S-LPSA, subject's rating of level of performance of socially expected activities; S-LSPSA, subject's rating of level of self-expectation for performance of social activities; S-LPFA, subject's rating of level of performance of free-time activities; S-LSFA, subject's rating of level of self-satisfaction of free-time activities; WHO-QOL, World Health Organization Quality of Life.

improvement in positive syndrome in the SGR group ($F = 6.43$, $P < 0.05$) and a trend toward aggravation of negative syndrome in the hospital group ($F = 3.54$, $P = 0.07$).

Changes of social function

As presented in Table 2, the level of performance of the socially expected activities assessed by the subjects was more enhanced in the SGR group after 2 years ($F = 9.22$, $P < 0.01$). In addition, the level of both expectations for performance of social activities and performance of free-time activities assessed by the staff was also more enhanced in the SGR group ($F = 6.28$, $P < 0.05$, F = 6.14, $P < 0.05$, respectively) and level of performance of social activities assessed by the staff tended to increase in the SGR group ($F = 3.8, P < 0.06$).

Change of QOL

Table 2 also presents the change of QOL measured with WHO-QOL and shows that the score of the

hospital group significantly declined in the physical domain ($F = 4.39, P < 0.05$). No differences were found in other domains.

Changes to general health condition

There was no significant difference in the general health condition measured with GHQ-12 between the two groups (Table 2).

Comparison of dosage in antipsychotic

When the dose of antipsychotic(s) was compared at baseline, there was no difference between the two groups. The mean ± SD dose of the SGR group was 568.8 ± 292.42 mg, while that of hospital group was 508.2 ± 312.4 mg. After 2 years the doses in the SGR and the hospital group were 562.0 ± 294.7 mg and 439.8 ± 396.6 mg, respectively (no significant difference; $F = 4.24$, $P = 0.61$).

Table 3. Psychiatric/medical costs in the first and second years (mean ± SD)

	SGR group	Hospital group	Significance
Psychiatric/medical cost in Tosa Hospital			
First year	128 522 ± 10 435	414 866 ± 28 983	<0.000
Second year	124 883 ± 24 918	445 512 ± 100 771	<0.000
Medical cost excluding Tosa Hospital			
First year	14 074 ± 24 271	1 318 ± 4931	0.065
Second year	34 646 ± 37 215	2 480 ± 8059	0.004
Total	302 125 ± 66 149	864 177 ± 95 086	<0.000

Yen per person per month. SGR, supported group residence.

Comparison of psychiatric/medical cost

As is shown in Table 3, there was a significant difference in the psychiatric/medical cost in Tosa Hospital between the two groups. The expense of the hospital group was more than threefold greater than that of the SGR group. In contrast, the SGR group cost excluding Tosa Hospital was more than 10-fold higher than the hospital group.

DISCUSSION

The present study compared psychopathology, social function, QOL, general health condition, dose of pre-scribed antipsychotic(s) and psychiatric/medical cost for long-term hospitalized patients moving to SGR with those of the patients continuing hospitalization. The patients receiving care in the SGR improved in their positive symptoms, performance of socially expected activities, expectations for performance of social activities and the performance of free-time activities and QOL physical domain. The present results suggest that SGR is a suitable facility for aged persons with chronic and stable mental illness without serious physical complications.

The results of the improvement in positive symptoms do not agree with previous findings[4,6,27] and were contrary to expectation. Still, there may be some interpretations; first, there were a few reports that showed the improvement of psychotic symptoms through some psychosocial treatment[28] or social environmental treatment.[29] Patients in the present study had been hospitalized for an average of >24 years, and their psychopathology might have been greatly affected by the change of the therapeutic environment. Second, conducting a national survey on Japanese psychiatric hospitals based on the method of Wing and Brown,[30] Oshima et al. demonstrated that there was a weaker correlation between positive symptoms and the social environment of psychiatric hospitals in Japan.[31] Although their study was concerned with negative

symptoms, positive symptoms might also be related to the hospital environment given the severe and significant degree of ward restrictions and the understimulating social environment. Third, there were many staff members involved in the evaluation process, such that perfect blindness of evaluation could not be maintained.

The results of the improvement in social function among the SGR group agree with the previous findings.[32,33] The present findings suggest that the SGR patients had greater contact with the neighboring society than the patients in hospital, resulting in on-site training for development of interpersonal and occupational skills for the SGR patients. Further, the situation whereby the SGR patients were left without duty staff at night might promote their independence, leading to an increase of social function.[6]

In addition, it is easy to consider the possibility of assessment bias of the SGR staff, in that they wanted to see the patients living more actively at the residence.

The finding that the patients in hospital group had a poorer QOL physical domain is consistent with the previous report. For example, Anderson and Lewis showed that intermediate care facility patients reported higher QOL scores than state hospital patients.[34] That the SGR patients might have been spending their social and leisure time more actively than hospital patients may have led to the difference of the QOL physical domain. The inpatients, however, seemed to be more physically healthy by reasoning from the difference of medical cost. There may be some discrepancy between the subjective QOL and objective condition.[14]

The fact that the total psychiatric/medical cost was smaller in the SGR group is not contradictory to the previous studies.[4,5,8] However, it was noted that the medical cost, excluding Tosa Hospital, was much greater in the SGR group, suggesting that this group was much more vulnerable to physical complications. Those continuing hospitalization were regularly monitored by

nursing staff, and their physical complications were recognized early and treated. In the long run, the medical cost becomes much greater for the SGR group and their life expectancy might be shorter. The management of physical health in community institutions such as SGR is a challenge for community care.

The present study had some limitations. The first is the high mean age (>60 years) of the subjects who had been hospitalized for a long period (mean, 24 years). The second is that because many investigators were involved, independent assessment might not have been assured during the assessment stage. Third, the small number of subjects weakened the statistical power, leading to failure to find significant differences of negative symptoms or other related variables.

CONCLUSIONS

We investigated the effects of SGR on the symptoms, social function, QOL, general health quality, and the medical/psychiatric cost and showed that the patients receiving care in the supported group residence improved in their positive symptoms assessed with PANSS, performance of socially expected activities, expectations for performance of social activities and the performance of free-time activities assessed with KAS, and QOL physical domain assessed with WHO-QOL. The total psychiatric/medical cost of the SGR was approximately one-third of the inpatient group, while the cost of treating physical complications for the SGR group was much higher. The present findings suggest that SGR has advantages for mental and social function but not for physical health.

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