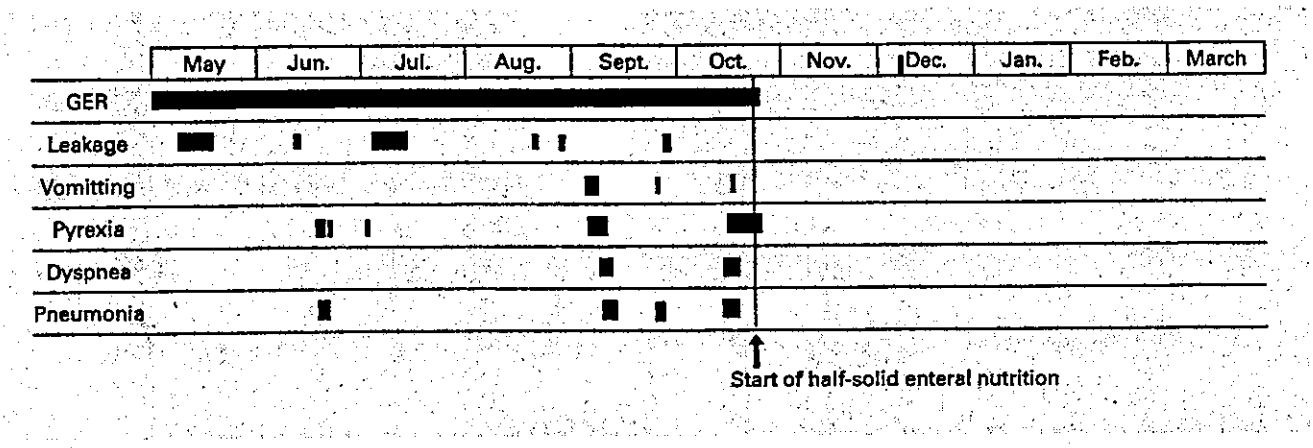

Fig. 1. Reduction of symptoms after half-solid enteral nutrition via PEG.

simply solidifying nutrients, the symptoms due to gastroesophageal reflux (GER) after PEG tube placement were relieved, and the leakage of nutrients from the PEG tube insertion site was alleviated.

Methods

An 85-year-old woman presented with regurgitation of enteral nutrients and recurrent respiratory infections after PEG placement. The patient suffered a cerebral infarction, and underwent PEG insertion on May 4, 2001, at a local hospital. After commencing PEG tube feeding, the following symptoms repeatedly occurred: regurgitation of the enteral feed; leakage of nutrients from the PEG tube insertion site; vomiting followed by pyrexia; dyspnea during the administration of nutrients, and pneumonia confirmed by chest X-ray. The patient often showed facial signs of discomfort during the feed administration. Liquid enteral nutrients were given in a sitting position at all times.

As the complications gradually became more frequent in occurrence, on October 21, 2001, we commenced giving her half-solid enteral nutrients which were prepared by mixing market-available enteral nutrients and agar powder. Half-solid nutrients were prepared by mixing 5 g agar powder with 500 ml liquid nutrients diluted with the same volume of water (1,000 ml total volume). The mixture was distributed into 50-ml syringes and kept in a refrigerator until it was administered via the PEG tubing. The mixture was not liquefied in the stomach due to body temperature. The administration of half-solid nutrients was made by injecting them into the stomach en bloc (injection time <5 min). The patient was not forced to remain in a sitting position during and after the administration.

Results

The symptoms, other than pyrexia, disappeared immediately after the administration of half-solid nutrients, and pyrexia vanished 2 weeks later. Also, the signs of discomfort during the feed administration were no longer noted. We followed the patient for up to 6 months after the start of the half-solid enteral nutrients, and observed no recurrence of the symptoms (fig. 1). At present (February 2004), the patient still remains in a stable condition and no longer suffers from the complications observed before the commencement of half-solid nutrients.

Discussion

PEG feeding is accompanied by unique complications, which occur over a long-term clinical course [1–3]. An increase in vomiting is one of the most common complications [4]. GER is clinically manifested by recurrent vomiting or aspiration. The mechanism by which GER increases in frequency has not yet been clarified.

Ogawa et al. [5, 6] suggested that since the stomach cannot move independent of the abdominal wall after the formation of a gastric fistula, enteral nutrients remain in the stomach longer, thereby increasing the chance of GER. Gastrin, a potent facilitator of peristaltic movement, may not be sufficiently induced by the distension of the stomach seen with slow infusion rates of liquid nutrients. Thus enhanced GER may eventually result. Since the nutrients can be administered in a short time by

our method (<5 min), the stomach wall is expected to be distended to a greater degree and thus stimulate peristaltic movement.

Another disadvantage of slow feed infusion is that patients are forced to remain in a sitting position for long periods while the nutrients are administered, which is unfavorable in terms of the prevention of decubitus ulcers, which are commonly found in patients with PEG feeding.

One of the late complications after PEG tube placement is leakage from the PEG tube insertion site. This is a difficult problem to cope with. There are two causes of leakage: inappropriate fixation of the bumper (including the so-called buried bumper syndrome [7]), and a decrease in the elasticity of the fistular opening, which develops over a long period after PEG placement [8]. The leakage resulting from a decrease in elasticity is intractable. Simply increasing the tube diameter cannot solve this problem [7, 9]. We found, however, that solidification of the enteral nutrients alleviated the leakage in the present case. This may simply be explained by the fact that the solidified nutrients could not be leaked out by the intragastric pressure through the narrow gap between the fistular pore and the tube.

So far, we have administered half-solid nutrients to 17 patients with PEG feeding and followed up the patients for 6 months. During the observation period, we confirmed significant reductions in the complications observed before the commencement of the half-solid nutrients (data not shown).

In conclusion, our experience indicates that the use of half-solid nutrients in PEG feeding and their rapid administration can substantially reduce the risk of GER and may eventually contribute to a reduction in complications as well as an improvement in the quality of life of the patients and their caregivers.

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CORRESPONDENCE

Survival rate after percutaneous endoscopic gastrostomy in a long-term care hospital

Dear Sir,

We previously reported the mortality after percutaneous endoscopic gastrostomy (PEG) in a general hospital.[1] The results showed a higher survival rate (30-day survival rate: 92.5%, 1-year survival rate: 64.0%, 2-year survival rate: 55.5%, mean age±SD at PEG: 75.7±14.1 years) than the results in other studies.[2]

In this study we surveyed the survival rate of 93 consecutive patients older than 65 years (mean age: 80.3±7.4 years) who received PEG by reviewing their charts in a long-term care hospital. Because the hospital has an affiliated nursing home, home-visit nursing and day care centers for the frail elderly, we could track the record of survival in 84.9% of the post-PEG patients at the time of survey. The primary diagnoses whose symptoms required the patients to receive PEG were: cerebrovascular disease (61.3%), Alzheimer's dementia and/or vascular dementia (15.1%) and brain injury (4.3%). Most patients were severely disabled, showing a mean of 5.5±1.2/6 on the score of Cognitive Performance Scale[3] (only one patient showed intact cognitive performance) and a mean of 0.8±3.0/20 on Barthel Index.[4]

Fig. 1 shows the Kaplan–Meier's survival curve after PEG. The survival rate was 88.9% at 30 days, 59.1% at 1 year and 52.0% at 2 years. The mean fully observed survival period was 382.3±485.2 days. Age was a significant predictor for the survival period ($\beta = -18.7$, $P = 0.008$). The relative risks of serum total protein <6.0, white blood count >12,000, and coexisting decubitus at the time of PEG for the death at 1 year after PEG was 1.33 (95% CI; 0.77–2.28, $P = 0.263$), 1.79 (95% CI; 1.10–2.93, $P = 0.080$) and 1.29 (95% CI; 0.78–2.13, $P = 0.228$), respectively.

The 30-days, 1-year and 2-year survival rates of post-PEG patients in a long-term care hospital were lower than those in a general hospital. According to the 2002 annual report released by the Ministry of Health, Welfare and Labor of the government, the mean length of patients' hospital stay was 22.2 days in general hospitals, and 179.1 days in long-term care hospitals in Japan. By the current political pressure of shortening the length of stay in acute hospitals, the number of patients receiving PEG in long-term care hospitals has been constantly increasing. As shown in the results, the patients in long-term care hospitals usually have severe functional disabilities relative to those in acute hospitals. Under the circumstances, it is crucial to build up evidences regarding the post-PEG prognosis in long-term care hospitals.

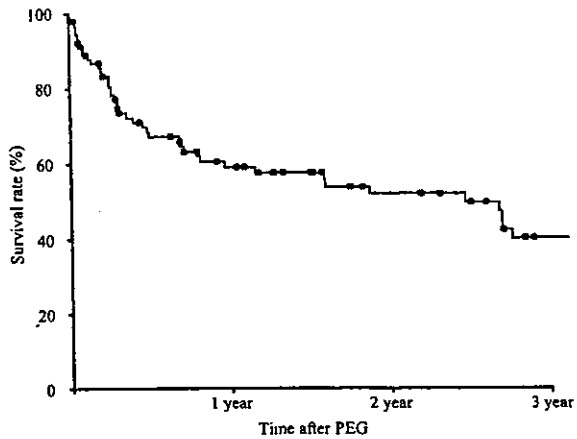

Figure 1 Kaplan–Meier survival curve after PEG. (●) Censored (dead) cases; PEG, percutaneous endoscopic gastrostomy.

In summary, the results indicate lower survival rates for post-PEG patients in a long-term care hospital than those in a general hospital. We believe that the present findings add some insights to the application of PEG in the long-term care.

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The Relationship Between Functional Disability and Depressive Mood in Japanese Older Adult Inpatients

Joji Onishi, MD, Hiroyuki Umegaki, MD, PhD, Yusuke Suzuki, MD, PhD, Katsuhiko Uemura, MA, Masafumi Kuzuya, MD, PhD, and Akihisa Iguchi, MD, PhD

ABSTRACT

Depression is commonly found in older adult patients and is often associated with handicaps. The authors administered the Comprehensive Geriatric Assessment (CGA), including basic activities of daily living (BADL), instrumental activities of daily living (IADL), Mini-Mental State Examination (MMSE), Geriatric Depression Scale (GDS)-15, and a socioenvironmental questionnaire to 198 patients who were admitted to Nagoya University Hospital, to examine the relationship between depressive mood and various physical and socioenvironmental outcomes. The overall GDS-15 score was correlated with the BADL and IADL. The factor analysis extracted 4 factors from the GDS-15 subscales. The factors labeled "loss of morale and hope" and "memory loss and reduction of social activity" were highly correlated with both ADLs, social variables, and the MMSE score. The results reveal that factor analysis of GDS-15 will help in understanding the etiology of depressive mood, thereby contributing to better therapeutic approaches. (*J Geriatr Psychiatry Neurol* 2004; 17:93-98)

Keywords: depressive mood; Geriatric Depression Scale; Comprehensive Geriatric Assessment; factor analysis

Depression is one of the most insidious problems faced by older adults, and its incidence is increasing with the growth of an aging population. Koenig and Blazer reported that the prevalence of major depression was about 1% among community-dwelling older adults and that less severe depressive disorder was present in over 25%.[1] Moreover, they reported that the rate of major depressive disorder in older adult hospitalized patients with illness was more than 10 times greater than that of the unhospitalized aging population. Depression is not only psychologically traumatic but also quite costly[2] because it is related to psychosomatic symptoms resulting in a higher frequency of examination and prescription of drugs. Furthermore, depression also decreases the morale of older people and increases the risk of being housebound. Although it is very important to adequately diagnose and treat depression in its early stage, it often remains unrecognized or untreated.[3] One of the main reasons for this is that depressive symptoms often resemble those of the aging process itself, such as progressive cognitive deterioration or physical disabilities.[4]

The Geriatric Depression Scale (GDS) is a self-administered questionnaire with 30 items[5] and is recommended by the Royal College of Physicians and British Geriatrics Society as a valid screening method for depression in older adults.[6] A short form of the GDS (GDS-15) was developed later[7] and was translated into Japanese.[8] The validity and reliability of the GDS-15 have been confirmed in both community and hospital settings.[9-11] Several studies have subjected the GDS-15 data to a factor analysis, which is a statistical technique to analyze interrelationships within a set of variables, resulting in the construction of a few hypothetical variables. To our knowledge, however, there has been only 1 study involving factor analysis of the Japanese version of the GDS-15, reported by Schreiner et al in poststroke patients.[12] In addition, there have been few studies demonstrating the relationship between GDS-15 factor loading and disabilities in the older population.

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The GDS-15 is included as one of the components in the Comprehensive Geriatric Assessment (CGA), a tool developed in the late 1980s[13,14] to assess not only medical conditions but also overall functional status with respect to physical, psychological, and social problems of the older adults.

Although it is well known that depressive mood is often associated with functional disabilities, the mechanism by which the disabilities cause depressive mood in the older adults remains unclear. We hypothesized that some variables associated with functional disability may be associated with depressive mood. Therefore, we investigated the relationship between depressive mood and physical health and socioenvironmental variables in older adult inpatients. In addition, we attempted to clarify the structure of depression by performing a factor analysis of the GDS-15.

METHODS

Subjects

Among 355 consecutive patients aged 65 and older (mean age ± SD: 77.3 ± 6.8) who were admitted to Nagoya University Hospital between July 1998 and August 2001, patients who were admitted to nongeriatric wards were not included due to the absence of experienced CGA assessment team in the wards. Also, patients with communication impairments due to problems such as severe dementia or consciousness disturbance and patients under intensive care were not included in the study. If a patient was admitted more than once during the study period, only the data from the first admission was used for this analysis. As a result, 198 older adult patients in total were included in the study.

Measurements

The CGA was administered within a week after admission. The CGA included height; weight; Body Mass Index (BMI); blood pressure; basic activities of daily living (BADL), which were measured with the Barthel Index[15]; instrumental activities of daily living (IADL) using Lawton's scale[16]; Mini-Mental State Examination (MMSE)[17]; GDS-15; hearing ability and vision; communicative competence; and living environment including socioeconomic status. We scored IADL by 5 items (IADL-5), excluding food preparation, housekeeping, and laundry items from the Lawton's scale because the study samples included male patients, who did not normally perform these activities. The low scores of BADL and IADL-5 indicate greater functional disability. The GDS-15 is scored so that higher scores indicate a greater degree of depressive mood. The recent research clarified that the sensitivity of the GDS-15 was 97.3% and the specificity was 95.9% for screening major and minor depression when the cut-off score was set at 6/6+ in the Japanese geriatric population.[18] Socioenvironmental status was assessed by Ozawa's scale,[19] which includes items on economic, marital, family status, and the relationship between the patient and his or her family. The GDS-15 was self-administered by the patient. The attending nurse collected all other information by interview and/or assessment.

Statistical Analysis

Correlation coefficients were calculated by Pearson's method for parametric data and Spearman's for nonparametric data. We used the chi-square test with Yates correction and Fisher's exact test for categorical comparisons of the data. Differences in the means of continuous measurements between genders were tested using the Student's t test. In addition, after nonparametric data in the CGA were categorized into 2 groups (subjects with and those without a problem with respect to each parameter measured), the means of the continuous measurements between the groups were also compared by Student's t test. The internal consistency of the GDS-15 was calculated with Cronbach's alpha. Principal component analysis for the GDS-15 was performed with an eigenvalue of 1.0 or more as the extraction criterion, and factors were identified after Varimax rotation. The factor score, which shows the power of a factor's contribution, was calculated by regression method, which cumulated factor loadings of all items of GDS-15. In the present study, a higher score indicates a greater contribution of the factor to depressive mood. Differences in continuous variables among the disease groups were determined by 1-way analysis of variance (ANOVA). Tukey's test was used for multiple comparisons when homoskedasticity was assumed by Levene's method, and Dunnet's test was performed when homoskedasticity was not assumed. Multiple regression analysis, using the equation-building method with the variables of significant measures detected in the univariate analysis, was conducted to identify the variables contributing to GDS-15 scores. Values of $P < .05$ were considered to indicate statistical significance; all tests were 2-tailed. All statistical analyses were performed on a personal computer with the statistical package SPSS for Windows (Version 11.0 SPSS, Chicago).

RESULTS

Table 1 reports CGA variables for all patients, according to their diagnostic category. The mean GDS-15 score of all patients was 5.9 ± 3.8 SD, and 39.3% of the patients had scores above 6. The homoskedasticities were assumed in age, systolic blood pressure, BADL, IADL-5, and GDS-15, but not in BMI or MMSE. Significant intergroup differences were observed on the BADL and IADL-5, but not in BMI, MMSE, or GDS-15. The BADL score in patients with diabetes mellitus was higher than that in patients with collagen disease ($P = .005$), and the IADL-5 score in patients with diabetes mellitus was higher than that in patients

Table 1. Mean Values ± Standard Deviation of Comprehensive Geriatric Assessment (CGA) Variables by Admitting Diagnosis

Admitting Diagnosis	*n (%)*	*Age*	*BMI (kg/m²)*	*sBP (mm Hg)*	*BADL*	*IADL-5*	*MMSE*	*GDS-15*	*GDS > 6*
Neurological disease	40 (20%)	76.5 ± 6.6	20.9 ± 3.9	128.5 ± 23.7	16.9 ± 4.1	4.0 ± 1.3	24.9 ± 4.5	6.3 ± 37	42%
Cardiovascular disease	36 (18%)	77.7 ± 8.4	23.5 ± 3.8	132.8 ± 20.0	18.0 ± 3.7	4.0 ± 1.3	26.0 ± 4.3	5.7 ± 4.0	38%
Diabetes mellitus	34 (17%)	74.2 ± 5.3	23.5 ± 3.1	138.3 ± 19.4	19.0 ± 3.0*	4.5 ± 0.9*	26.6 ± 3.5	4.6 ± 3.5	27%
Psychological disease	20 (10%)	78.5 ± 6.5	20.0 ± 3.4	138.5 ± 22.3	17.9 ± 3.0*	3.1 ± 1.9*	22.4 ± 4.9	7.6 ± 3.8	15%
Gastroenterological disease	14 (7%)	78.9 ± 6.8	21.1 ± 4.8	132.3 ± 14.1	18.2 ± 3.2*	4.2 ± 0.9	25.9 ± 3.8	5.9 ± 4.7	64%
Collagen disease	12 (6%)	77.7 ± 5.1	21.6 ± 4.0	133.5 ± 20.6	14.2 ± 6.5*	3.3 ± 1.7	23.7 ± 4.7	5.4 ± 2.7	17%
Infectional disease	11 (6%)	83.1 ± 4.7	19.9 ± 3.0	122.0 ± 15.7	19.5 ± 0.8	4.8 ± 0.4	27.3 ± 2.8	2.8 ± 1.8	0%
Others	31 (16%)	78.0 ± 7.6	20.7 ± 3.5	142.4 ± 29.0	18.0 ± 3.9	4.3 ± 1.1	26.1 ± 4.1	6.3 ± 4.0	43%
Total	198 (100%)	77.3 ± 6.8	21.9 ± 3.8	133.9 ± 21.7	17.8 ± 3.8	4.1 ± 1.3	25.5 ± 4.3	5.9 ± 3.8	39%

Note: BMI = body mass index, sBP = systolic blood pressure, BADL = basic activities of daily living, IADL = instrumental activities of daily living, MMSE = Mini-Mental State Examination, GDS = Geriatric Depression Scale.

*$P < .05$.

Table 2. Principal Components (Varimax) Factor Analysis of the Geriatric Depression Scale-15

Items	*Factor 1 Unhappiness*	*Factor 2 Apathy and Anxiety*	*Factor 3 Loss of Hope and Morale*	*Factor 4 Memory Loss and Reduction of Social Activity*
1. Satisfied	***0.708***	0.270	0.061	−0.266
2. Dropped activities	0.058	***0.646***	0.350	−0.020
3. Emptiness	0.299	***0.621***	−0.134	0.179
4. Often bored	0.151	***0.675***	0.140	0.233
5. In good spirits	***0.627***	0.216	0.129	0.216
6. Afraid something bad will happen	0.336	***0.572***	0.163	−0.100
7. Feels happy	***0.769***	0.027	0.128	0.101
8. Often feels helpless	−0.186	***0.536***	0.493	0.013
9. Prefers to stay in	0.009	0.095	0.385	***0.445***
10. More problems with memory than most	0.082	0.074	0.043	***0.805***
11. Wonderful to be alive	***0.553***	0.077	0.458	0.033
12. Feels worthless	0.348	0.108	***0.605***	0.242
13. Full of energy	0.061	0.063	***0.753***	0.002
14. Feels situation is hopeless	0.270	0.235	***0.679***	0.090
15. Most people better off than self	***0.487***	0.396	0.013	0.368
Explained variance	2.4	2.2	2.2	1.2
Cumulative percentage of variance explained	16.6	31.5	46.3	54.8

Note: The factor score was calculated by regression method, which cumulated factor loadings of all items of GDS-15. Loadings in italic bold indicate those selected to define the factor.

with psychological disease ($P = .009$). The patients with psychological disease showed the highest mean score of GDS-15, (7.6 ± 3.8 SD). No significant intersex difference was observed in all parameters examined. Antidepressants had been administered to 7.2% of all patients, and to 9.0% of the patients with a GDS-15 score greater than 6.

The internal consistency of GDS-15 was found to be satisfactory, Cronbach's alpha being .83. Factor analysis of GDS-15 extracted 4 factors, whose loading values are shown in Table 2. The cumulative percentage of variance explained was 57.3%. Factor 1 represented "unhappiness," which included the items satisfied, in good spirits, feels happy, wonderful to be alive, and most people better off than self. Factor 2, "apathy and anxiety," was made up of the items, dropped activities, emptiness, often bored, afraid something bad will happen, and often feels helpless. Factor 3, "loss of hope and morale," included the items feels worthless, full of energy, and feels situation is hopeless. Finally, factor 4, "memory loss and reduction of social activity," included the items prefers to stay in and more problems with memory than most.

Table 3. Correlation Between Geriatric Depression Scale-15, Extracted Factors, and Parametric Data

Measure	*GDS-15*	*Factor 1 Unhappiness*	*Factor 2 Apathy and Anxiety*	*Factor 3 Loss of Hope and Morale*	*Factor 4 Memory Loss and Reduction of Social Activity*
Age	0.123	−0.001	−0.108	0.250**	0.166*
BMI	−0.141	0.006	−0.135	−0.121	−0.036
sBP	−0.038	−0.260	−0.040	−0.009	−0.101
BADL	−0.168*	−0.033	−0.044	−0.191*	−0.055
IADL-5	−0.201**	−0.076	0.023	−0.235**	−0.066
MMSE	−0.151*	−0.034	0.050	−0.167*	−0.214**

Note: Pearson's rho used for correlations. BMI = body mass index, sBP = systolic blood pressure, BADL = basic activities of daily living, IADL = instrumental activities of daily living, MMSE = Mini-Mental State Examination.

*$P < .05$. **$P < .01$.

Pearson's coefficients of continuous variables are shown in Table 3. The total GDS-15 score had a significant negative correlation with IADL-5 ($r = -.201$, $P = .005$), BADL ($r = -.168$, $P = .021$), and MMSE ($r = -.151$, $P = .034$). However, there was no significant relationship between the GDS-15 score and age, BMI, or systolic blood pressure.

The score of factor 3 (loss of hope and morale) correlated positively with age and negatively with IADL-5, BADL, and MMSE scores, whereas factor 4 (memory loss and reduction of social activity) showed a significant positive correlation with age and a significant negative correlation with MMSE score. However, there was no significant relationship between the scores of factor 1

Table 4. Relationship of Nonparametric Data in Comprehensive Geriatric Assessment With the Geriatric Depression Scale-15 and Extracted Factors

Measurement	*Percent With Problem*	*Spearman's ρ With GDS-15*	*t Test for Mean Score GDS-15*	*Factor 1 Unhappiness*	*Factor 2 Apathy and Anxiety*	*Factor 3 Loss of Hope and Morale*	*Factor 4 Memory Loss and Reduction of Social Activity*
Gender (male/female)	—	—	NS	NS	NS	−0.22/0.17**	NS
BADL (with/without problem)							
Grooming	7.1%	—	NS	NS	NS	0.75/−0.08**	NS
Feeding	8.1%	−0.087	NS	NS	NS	NS	NS
Bowel continence	12.2%	−0.062	NS	NS	NS	NS	NS
Using toilet	14.2%	−0.122	NS	NS	NS	NS	NS
Ambulation	16.8%	−0.102	NS	NS	NS	0.31/−0.09*	NS
Chair/bed transfer	16.8%	−0.142	7.1/5.6*	NS	NS	NS	NS
Dressing	17.8%	−0.122	NS	NS	NS	NS	NS
Bladder control	19.8%	−0.097	NS	NS	NS	NS	NS
Bathing	25.0%	—	6.9/5.5*	NS	NS	0.27/−0.12*	NS
Using staircase	29.9%	−0.271*	7.4/5.2**	NS	NS	0.33/−0.17**	NS
IADL(with/without problem)							
Going outside	10.4%	—	NS	NS	−0.41/0.10*	NS	NS
Using telephone	11.4%	—	NS	NS	NS	NS	NS
Managing money	20.3%	—	NS	NS	NS	NS	NS
Medication	37.1%	—	NS	NS	−0.14/0.15*	NS	NS
Shopping	39.4%	—	NS	NS	NS	0.21/−0.15*	NS
Physical (with/without problem)							
Seeing	23.1%	−0.141	NS	NS	NS	NS	NS
Hearing	23.0%	−0.091	NS	NS	NS	NS	NS
Communication	7.0%	−0.152*	8.2/5.7*	NS	NS	NS	0.51/−0.48*
Social							
Economic status (dependent/ independent)	—	−0.163*	NS	NS	NS	NS	NS
Marital status (with/without spouse)	—	−0.148*	NS	NS	NS	0.20/−0.21**	NS
Familial status (alone/not alone)	—	−0.136	7.2/5.6*	0.50/−0.08*	NS	NS	NS
Family relation (with/without interaction)	—	−0.220*	NS	NS	NS	0.71/−0.03*	NS

Note: NS = not significant. t-test for mean score compared between 2 groups with or without problem for each item.

*$P < .05$. **$P < .01$. Dashes indicate not calculated because the items have less than 3 alternatives

(unhappiness) or factor 2 (apathy and anxiety) and other CGA variables.

The patients were divided into 2 groups depending on their score for CGA variables. Then we compared the difference between the GDS-15 factor scores and these 2 groups using Student's *t* test. The correlations of nonparametric data with the score of GDS-15 and the extracted factors are shown in Table 4. The GDS-15 score had a significant negative correlation with BADL (using staircase), communicative ability, economic and marital status, and family relationship. Patients having problems in using the staircase, bathing, chair/bed transfer, and communication showed a significantly higher GDS-15 score than the patients without these problems ($P < .001$, $P = .041$, $P = .034$, $P = .028$, respectively). Also, patients living alone showed a significantly higher GDS-15 score than those not living alone ($P = .043$). The statistical analysis revealed that the score of factor 3 (loss of hope and morale) was significantly higher among women ($P = .007$). Factor 3 had a much stronger relationship with some variables of BADL and IADL-5, such as grooming, using staircase, ambulation, bathing, and shopping, than it did with other factors. On the other hand, factor 2 (apathy and anxiety) was inversely correlated with going outside and managing medication.

Multiple regression analysis was performed to predict the score of GDS-15 with significant variables, which were using stairs, bathing, communicative ability, economic status, marital status, familial status, and the total score of MMSE. This analysis elicited a model with an adjusted R^2 of .144 ($P < .001$) (Table 5).

DISCUSSION

The mean GDS-15 score in this study was 5.9, which was higher than those in previous studies. In a recent study of 1343 Japanese community-dwelling older adults, the mean GDS-15 score was 2.0 and 23.7% scored 6 or higher.[20] Meanwhile, Patrick et al reported that the mean score of hospitalized patients in their geriatric rehabilitation unit was 3.8 ± 2.8 SD.[21] The higher GDS-15 scores obtained in this study may imply that worsening medical conditions resulting in admission to the hospital relate to increased depressive symptoms. In particular, the neurological disease group showed the highest mean GDS-15 score, which is in line with findings in previous studies that depression

Table 5. Coefficients of Regression Model for Geriatric Depression Scale-15

Variable	ß	Standardized ß	T	P Value
Using stairs	−2.48	−0.48	−4.27	< .001
Bathing	2.59	0.29	2.44	< .001
Communicative ability	−0.57	−0.04	−0.558	.016
Economic status	−0.48	−0.07	−0.917	.577
Marital status	−0.34	−0.09	−1.25	.360
Familial status	−1.02	−0.17	−2.17	.211
MMSE	−0.04	−0.04	−0.55	.584

Note: MMSE = Mini-Mental State Examination. GDS-15 = −2.48 × (Using stairs) + 2.59 × (Bathing) − 0.57 × (Communication) − 0.48 × (Economic status) − 0.34 × (Marital status) − 1.02 × (Family status) − 0.04 × MMSE. Total adjusted $R^2 = 0.144$, $P < .001$.

frequently occurs after stroke.[10,22,23] In the present study, antidepressants were administered to only 9.0% of the patients who had a GDS-15 score of greater than 6, which supports claims that depression is overlooked by clinicians, or is not treated adequately.[4]

The results of this study are consistent with previous findings that physical disabilities relate to depressive symptoms.[24-27] In the present study, the GDS-15 score was negatively correlated with the BADL and IADL. Three BADL items in particular, using staircase, chair/bed transfer, and bathing, had strong negative correlations with the GDS-15 score. These results indicate that loss of lower body strength and impaired mobility may affect patient's mood. A possible explanation for the difference is that depressive mood may be associated with impaired abilities to maintain normality in life such as immobility, rather than the severity of disabilities.

We also found a weak but significantly negative correlation between the GDS-15 and MMSE scores. The findings of previous studies regarding the relationship between depression and the severity of dementia are varying, which may be attributable to differences in study design.[28] Although many investigators have reported a decrease in the frequency of depression in advanced dementia,[29,30] no such association was found in this study probably because the cognitive impairment of the patients in this study was rather mild with mean MMSE score of 25.5 ± 4.3 SD, and no patients with advanced dementia were included.

Liu et al reported that being female, older, and without spouse were related to depressive symptoms among Chinese older adults.[31] Our results did not demonstrate a significant relationship between the GDS-15 score and either gender or age, but a higher GDS-15 score was significantly related with economic dependence, absence of spouse, and poor family relationship particularly with "living alone."

Thus far, many researchers have reported on the factor analysis of GDS-15, but the relationship between the factors extracted and the physical, psychological, and socioenvironmental status of the older adults has not been extensively investigated. We found that factor 3, "loss of morale and hope," was highly related with BADL and IADL. Meanwhile, factor 4, "memory loss and reduction of social activity," was related with age and MMSE, although factor 1 (unhappiness) and factor 2 (apathy and anxiety) were not correlated with any of those parameters examined, which means they may be normal aspects of disabled state and hospitalization. Some investigators have reported that sense of loss or environmental change can induce depression in the aged.[32,33]

GDS-15 is often included in CGA, which is a useful tool to comprehensively assess older adult patients. The meta-analysis conducted by Stuck et al demonstrated that CGA was effective in improving mortality and in reducing hospitalization.[34] However, there have been few studies using CGA results to identify specific clinical strategies for patient care. The present study demonstrates that factor analysis of GDS-15 helps health care staffs establish better therapeutic strategies for depressive mood of older patients. For example, the present findings suggest that intervention to assist in coping with the functional impairment may decrease depressive symptoms in subjects suffering from them. However, pharmacological interventions may be more appropriate for nondisabled patients.

In conclusion, we carried out a structural analysis of the GDS-15 in older adult inpatients and extracted 4 factors related with functional disabilities. Factor 3, "loss of morale and hope," and factor 4, "memory loss and reduction of social activity," were highly related with ADL, social variables, and cognitive impairment. In addition, the results suggest that factor analysis will allow improved assessment and medical support of older adult inpatients. Thus, we believe that the results have indicated an extended utility of the GDS-15 not only as a simple screening method for depressive mood but also as a tool for better therapeutic approaches.

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Effect of long-term care insurance on communication/recording tasks for in-home nursing care services

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Abstract

The purpose of this research was to clarify the possible changes brought about by the introduction of the long-term care insurance system in terms of number of communication/recording tasks, related nursing services in use, and when and where these tasks were performed. By examining the detailed content of communication/recording tasks, this study also sought to explore the advantages of introducing information technology (IT) systems in nursing service settings. The study was designed before-and-after study in two sessions, February 2000 and August 2000, namely before and after the introduction of Japan's long-term care insurance system. Participants were clients using the institution's in-home nursing services and all staff in a medical institution located in the Mikawa region of Aichi Prefecture, Japan. Following measurements were performed: (1) nursing service in use, (2) type of job, (3) date and time, (4) from whom, (5) to whom, (6) communication tool and (7) content, related to a particular communication. Communication/recording tasks were frequently performed around the starting and closing time of services. Following the adoption of the new system, these tasks tended to occur mostly around the starting time of services. As for the staff, the involvement of the professional carers increased. Regarding content of communication/recording, reports, confirmation and instruction increased. In conclusion, the use of IT driven devices is recommended

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to streamline the performance of communication/recording tasks as well as to ease the rush of these tasks thereby improving the quality of nursing services.
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Keywords: Long-term care insurance; Communication/recording task; Nursing service setting; In-home nursing care service; Information technology (IT)

1. Introduction

The aging of society is a phenomenon affecting many developed countries today (Itouji, 1996; Adachi, 1998; Hattori et al., 2000; David et al., 2001; Esping-Andersen, 2001; Robert, 2002), and the need to establish nursing care systems that adequately meet the increasing related demands is thus evermore pressing (Adachi, 1998; Hilary, 2001).

In April 2000, Japan introduced a social insurance system for elderly care based on the principle of Socialization of Elderly Care (Masuda et al., 2001; Matsuda, 2002), whereby the burden of the care for the elderly is shared by society as well as the family (Hattori et al., 2000; Hilary, 2001). Prior to the introduction of the system, some had predicted a shortage in nursing service provision (Ueda et al., 1994; Hashimoto, 1996; Itouji, 1996). A quantitative increase in nursing service demand was reported after the adoption of the system (Miyatake, 2001), and the shortage of services seems to have intensified.

Moreover, under this insurance system, the professional carers are faced with the additional task of administrating the service provision. In order to provide a greater range of services, more precise planning is needed, and care plans must be carefully implemented and evaluated. Additional exchanges of information or communication/recording tasks among the professional carer are also required. Such tasks include face-to-face conversations, record entries, telephone calls, facsimiles, voicemail, and others. With the increasing demand for nursing services covered by the insurance, the associated communication/recording tasks may lower the quality of nursing services.

With the rapid advance of information technology (IT) in recent years, the trend can be found in medical sectors as in many other industries toward improving operational efficiency of services with the help of IT driven management systems (Laerum et al., 2001; Stamouli and Mantas, 2001). These systems allow for efficient processing of electronic medical charts, order entry, administration of materials and laboratory results, etc. In nursing settings also, carers can resort to IT systems to reduce their communication/recording workload, thereby spending more time and energy providing nursing services.

The purpose of this research is to clarify the possible changes induced by the introduction of Japan's new insurance system in terms of number of communication/recording tasks, related nursing services in use, and when and where these tasks occurred. Furthermore, during the periods of time when significant increases in the number of communication/recording tasks were observed, the detailed content of communication/recording was examined to explore the possibility of introducing IT systems to improve the efficiency of the nursing service settings.

2. Methods

2.1. Subject and sessions of research

The subject of this research is a medical institution located in the Mikawa region of Aichi Prefecture, Japan. The institution consists of a clinic with a rehabilitation facility (Clinic), a geriatric intermediate care facility (GICF) (providing a certain amount of medical care), an In-home nursing support center, a helper's station, and a visiting care station, providing nursing services such as visiting medical care, visiting rehabilitation, rehabilitation for outpatients, visiting nutrition guidance, and short-stay services.

The research was conducted in two sessions in February 2000 and August 2000, namely before and after the nationwide introduction of the elderly care insurance system. At each session, all the communication/recording tasks that occurred in relation to nursing service provisions during a continuous 48 h were recorded.

Given the fact that no significant variation in terms of number of users on workdays was shown in a preliminary research, Tuesdays and Wednesdays were selected for both the February and August sessions.

2.2. Content of research

A fill-out-type questionnaire was designed and used for the research (see Fig. 1). The items to fill out were: (1) nursing service in use, (2) type of job, (3) date and time, (4) from whom/what, (5) to whom/what, (6) communication tools and (7) content. The entry was performed by the staff carrying out each particular communication task. A preliminary meeting was held for orientation and instruction as well as to identify any problems with the procedure. The management of the forms was conducted by off-duty staff trained in advance. They were stationed at each facility and their duty was to check and collect the forms as appropriate.

2.2.1. Category of nursing services in use

Utilized in-home nursing services in relation to specific communication tasks were categorized as follows: daycare service at clinic, daycare service at GICF, short-stay service at GICF, in-home helper service, visiting nursing, visiting nutrition guidance, visiting rehabilitation, visiting medication, and others.

2.2.2. Job type

The job types of the staff involved in communication tasks were categorized as follows: physician, nurse, pharmacist, radiological technologist, physical therapist (PT), occupational therapist (OT), trainer, professional carer, consultant, secretary, nutritionist, cook, driver, and others.

2.2.3. Date and time

The specific dates and times when communication tasks occurred were recorded.

2.2.4. From whom/what and to whom/what

When a communication event occurred, the names of the persons involved were recorded in the columns 'From' and/or 'To whom'. When information was referenced and/or recorded

Nursing service in use	Daycare at Clinic	Daycare at Center	Short-stay at Center	Helper	Visiting care	Visiting nutrition guidance	Visiting rehabilitation
User's name	Mr./Ms.			Home visit	Others ( )		
Entered by:				Medical Doctor	Nurse	Pharmacist	Radiological Technologist
Type of Job	PT	OT	Trainer	Nursing staff	Consultant	Office worker	
	Nutritionist	Cook	Driver	Others			
Date/hour of occurrence	Date: day, dd/mm/yy Hour: hh/mm am./pm.						
From whom	Family	User	Staff		Others ( )		
From what	Form/Notes/Voicemail/Others ( )						
To whom	Family	User	Staff		Others ( )		
To what	Form/Notes/Voicemail/Others ( )						
Communication tool	Message	Face-to-face conversation	Voicemail	Notes	Wiseman barcode		Wiseman keyboard
	Extension	Outside line	Facsimile	Entry in charts	Others ( )		
Brief content	Instruction (prescription)		Info	Report	Consultation	Record	Confirmation

Fig. 1. Questionnaire on communication tasks.

in some medium such as recording forms, the type of medium was entered in the column 'To what' and/or 'From what'. Entries in the 'From/To whom' column indicate the involvement of some person categorized as family, user, staff or others. Entries in the 'From/To what' column indicate the involvement of some recording medium categorized as forms, notes, voicemail or others. Forms are any recording medium of paper such as medical records. Notes represent Notes®, a groupware of Lotus. Groupware is any type of software designed for groups and for communication, combining various software for supporting collaboration among a group of people with functions such as email, document management and schedule management.

2.2.5. Communication tools/media

The communication tools/media used in communication/recording tasks were categorized as follows: message, face-to-face conversation, voicemail, Notes, Wiseman Barcode, Wiseman Keyboard, extension call, outside line call, facsimile, medical record entries, references to other forms, and others.

Wiseman Barcode® and Wiseman Keyboard® represent the utilization of the nursing information management system of Wiseman®, making use of barcodes and keyboards, respectively, for data entry. Wiseman Barcode® barcodes date, treatment, person-in-charge of treatment, and vital signs, and then reads them via a reader device. Wiseman Keyboard® utilizes a keyboard for data input.

2.2.6. Content

The content of communication/recording was categorized as follows: instruction (prescription), information, report, consultation, record, confirmation and others. Information means an unofficial communication which does not require reporting or recording.

2.3. Analysis

The changes between the two sessions of research were analyzed in terms of number of users, number of occurrences of communication/recording tasks, and category of service in use in relation to communication/recording tasks that occurred. To eliminate the influence on the number of communication/recording tasks induced by the change in total number of users, the data of the same users (153) was analyzed in both sessions.

Further, for these 153 users, a detailed analysis was conducted for a period of time where a significant change in the number of occurrences of tasks was found.

Data analysis was performed by Statview 5.0. For testing statically significant differences, the chi-square test was utilized with $P < 0.05$ as criteria.

3. Results

3.1. Total number of users and number of occurrences of communication/recording tasks

Table 1 shows the total number of users and the number of occurrences of communication/recording tasks. The total number of users was 400 in February and 442 in the August

Table 1
Number of occurrences of communication/recording tasks

	February	August	P
Overall			
Total number of users	400	442	
Occurrences of tasks	2811	4235	<0.001
153 subjects			
Total number of users	232	249	
Occurrences of tasks	1883	2244	0.300

Note: A chi square test was conducted between February and August sessions on the total number of users divided by the number of occurrences of the task.

session and the number of occurrences of communication tasks was 2811 and 4235, respectively. The increase in the number of occurrences of communication tasks was statistically greater than the increase in the number of total users ($P < 0.001$).

In the analysis of the 153 users whose data was obtained in both sessions, no statistical difference was found in the total number of utilized services, nor in the increase in the number of occurrences of tasks in comparison with the increase in the number of times at which they utilized these services.

3.2. Category of services

Table 2 shows the type of utilized in-home nursing service in relation to a particular communication/recording task. In both sessions, more than 80% of all utilized services belonged to one of the three most popular categories, i.e., daycare at clinic, daycare at GICF and short-stay at GICF. In August, both daycare at clinic and daycare at GICF were more often used ($P = 0.002$, <0.001) while short-stay at center was less often used ($P < 0.001$) than in February (Table 3).

Table 2
Number of occurrences of in-home nursing service by category

Service category	February ($N = 1883$)	August ($N = 2244$)	P
Daycare at clinic	340	493	0.002
Daycare at GICF	781	1071	<0.001
Short-stay at GICF	558	390	<0.001
In-home helper	102	107	0.381
Visiting care	86	95	0.656
Visiting rehabilitation	8	11	0.938
Home visit	2	2	0.999
Others	2	7	0.282
Unknown	4	68	<0.001

Note: A chi square test was conducted between February and August sessions. GICF: geriatric intermediate care facility.

Table 3
Number of occurrences of in-home nursing service by place

Place	February ($N = 1883$)	August ($N = 2244$)	P
Clinic	302	464	<0.001
GICF	1263	1434	0.036
At home	143	67	<0.001
Others	172	192	0.550
Unknown	3	87	<0.001

Note: A chi square test was conducted between February and August sessions. GICF: geriatric intermediate care facility.

3.3. Time of occurrence

Fig. 2 indicates the time of occurrence of communication/recording tasks. Peaks were found in the 8:00–12:00 and 14:00–18:00 periods. Also, the number of occurrences was on the rise between February and August in the 8:00–9:00 and 10:00–11:00 periods.

3.4. Detailed analysis of 8:00–9:00 and 10:00–11:00 time periods

Regarding the communication/recording tasks that occurred in the 8:00–9:00 and 10:00–11:00 time periods, when an increase in tasks was observed, was further analysis was

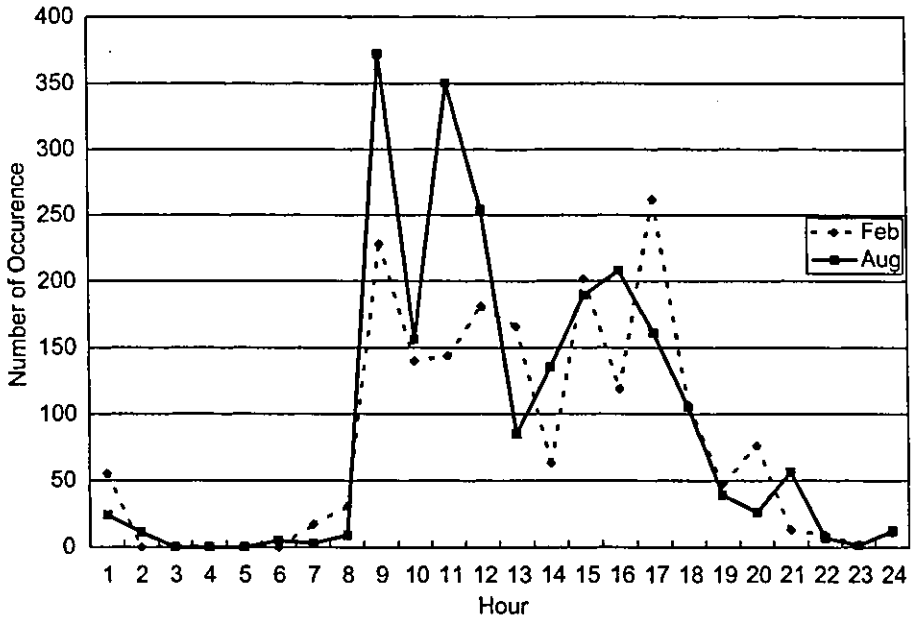

Fig. 2. Time of occurrence of communication/recording tasks. The number of occurrences was on the rise between February and August in the 8:00–9:00 and 10:00–11:00 time periods.

Table 4
Number of occurrences of communication/recording tasks by involved staff's job type

Job type	8:00–9:00		P	10:00–11:00		P
	February ($N = 228$)	August ($N = 372$)		February ($N = 144$)	August ($N = 350$)	
Physician	3	0	–	0	5	–
Nurse	75	68	<0.001	42	40	<0.001
Pharmacist	0	0	–	0	4	–
Radiological technologist	1	0	–	2	0	–
PT	3	4	0.999	2	5	0.999
OT	0	0	–	0	7	–
Trainer	0	0	–	0	0	–
Professional carer	99	266	<0.001	49	187	<0.001
Consultant	11	7	0.071	20	20	0.004
Secretary	12	12	0.307	9	54	0.009
Nutritionist	0	7	–	14	1	<0.001
Cook	0	0	–	0	1	–
Driver	5	2	0.150	4	18	0.359
Others	19	0	–	2	1	0.425
Unknown	0	6	–	0	7	–

Note: A chi square test was conducted between February and August sessions. (–) Indicates that the test could not be conducted. PT: physical therapist; OT: occupational therapist.

conducted to determine the possible changes in job types of the staff involved, communication routes, tools or media in use and contents of communication/recording.

Table 4 shows the job types of staff involved in communication/recording tasks that occurred in the 8:00–9:00 and 10:00–11:00 periods. From 8:00 to 9:00, more professional carers were involved in communication/recording tasks in August (71.5%) than in February (43.4%) ($P < 0.001$). A significant decrease in the number of nurses involved in communication/recording tasks was also observed between August and February ($P < 0.001$).

From 10:00 to 11:00, more professional carers carried out some kind of communication/recording task in August (53.4%) than in February (34.0%) ($P < 0.001$), while significantly less nurses and consultants were involved in communication/recording tasks ($P = 0.004$, <0.001).

Table 5 shows the communication routes in relation to the tasks that occurred at various time periods. In the 8:00–9:00 period, more staff-staff communication took place in August (54.3%) than in February (37.7%) ($P < 0.001$), while less staff's recording to forms was observed in August ($P < 0.001$). However, in the 10:00–11:00 period, the rate of staff-staff communication decreased in August ($P = 0.002$).

Table 6 shows the means by which communication was conducted at various time periods. In the 8:00–9:00 period, face-to-face conversations were most frequently seen in both sessions (79.8% in February, 71.2% in August). However, despite the increase in the number of occurrences of direct conversation, the rate of overall communication decreased ($P = 0.025$). Also, in the 10:00–11:00 period, a decreased rate of direct conversation was found ($P < 0.001$), and voicemail was more frequently used ($P = 0.019$). In this period, a prominent increase in the number of staff using forms was observed, jumping from 0 to 74 times.

Table 5
Number of occurrences of communication/recording tasks during the periods of 8:00–9:00 and 10:00–11:00 by communication route

Communication route	8:00–9:00		P	10:00–11:00		P
	February ($N = 228$)	August ($N = 372$)		February ($N = 144$)	August ($N = 350$)	
Staff ⇒ staff	86	202	<0.001	55	83	0.002
Staff ⇒ records	85	21	<0.001	45	134	0.169
Staff ⇒ others ('What')	19	28	0.841	8	16	0.817
Staff ⇒ user(s)	6	1	0.026	1	7	0.514
Records ⇒ staff	2	9	0.292	0	3	–
User(s) ⇒ staff	2	3	0.999	1	5	0.823
Family ⇒ staff	1	8	0.184	1	4	0.999
Records ⇒ records	1	1	0.999	1	8	0.406
Staff ⇒ family	1	0	–	0	3	–
Staff and/or records ⇒ staff	0	41	–	0	3	–
Staff and/or others ('What') ⇒ staff and/or others ('What')	0	19	–	0	1	–
Staff and/or records ⇒ staff and/or records	0	0	–	0	24	–
Others	22	36	0.999	30	54	0.186
Unknown	3	3	0.853	2	5	0.999

Note: A chi square test was conducted between February and August sessions. (–) Indicates that the test could not be conducted. 'What' refers to medium.

Table 6
Number of occurrences of communication/recording tasks during the periods of 8:00–9:00 and 10:00–11:00 by communication tool

Communication tool	8:00–9:00		P	10:00–11:00		P
	February ($N = 228$)	August ($N = 372$)		February ($N = 144$)	August ($N = 350$)	
Messages	3	3	0.853	3	14	0.429
Direct conversation	182	265	0.025	65	87	<0.001
Voicemails	1	1	0.999	2	25	0.019
Notes	0	0	–	0	0	–
Wiseman Barcode	6	0	–	18	10	<0.001
Wiseman Keyboard	6	3	0.150	4	24	0.117
Extension calls	3	1	0.311	9	0	–
Outside calls	7	10	0.984	1	16	0.061
Facsimiles	0	4	–	0	2	–
Record entries	7	0	–	15	0	–
Reference to forms	9	6	0.131	0	74	–
Others	4	44	<0.001	27	60	0.767
Unknown	0	35	–	0	38	–

Note: A chi square test was conducted between February and August sessions. (–) Indicates that the test could not be conducted.

Table 7
Number of occurrences of communication/recording tasks during the periods of 8:00–9:00 and 10:00–11:00 by content

Communication Tool	8:00–9:00		P	10:00–11:00		P
	February ($N = 228$)	August ($N = 372$)		February ($N = 144$)	August ($N = 350$)	
Instruction	0	1	–	1	17	0.048
Information	180	148	<0.001	58	42	<0.001
Reporting	6	30	0.011	17	17	0.010
Consultation	3	3	0.853	5	5	0.265
Recording	20	13	0.010	51	131	0.750
Confirmation	19	106	<0.001	11	25	0.998
Others	0	33	–	1	9	0.320
Unknown	0	38	–	0	104	–

Note: A chi square test was conducted between February and August sessions. (–) Indicates that the test could not be conducted.

Table 7 shows the breakdown of contents of communication that occurred in the various periods. In the 8:00–9:00 period, information decreased from 78.9 to 39.8% ($P < 0.001$), but more reporting and confirmation were observed ($P = 0.011$, <0.001). In the 10:00–11:00 period, information decreased again from 40.3 to 12.0% ($P < 0.001$) while instruction increased ($P = 0.048$). With respect to reporting, the rate in all communication tasks decreased significantly ($P = 0.010$).

4. Discussions

4.1. Background of the increase in total number of users and communication/recording tasks

This research reveals an increase in total number of users after the introduction of Japan's elderly care insurance system. Even before the implementation of the system, a quantitative increase both in number of users and provision of services (Wada, 1996) had been predicted. In fact, traditionally, the administration (Hattori et al., 2000) determined the nursing services to be provided to users (Hashimoto, 1996; Wada, 1996), but under the new system, users are able to chose the nursing services they wish to receive. The findings of this research seem to support this prediction.

On the other hand, although the overall rate of increase in the number of occurrences of communication/recording tasks was greater than that of users, the analysis of the 153 users who had already used some nursing services before the new system was launched did not reveal any significant increase in the number of occurrences of communication/recording tasks for such users. This suggests that the increase in communication/recording tasks for new users after the adoption of the system was reflected on the overall increase in the number of occurrences of communication tasks. In addition, the possible lack in necessary medical and/or nursing-related information on these new users may have lead to greater information exchange among staff.