27 Sugi, K., Inoue, M. and Morino, Y. (1989) Degradation of plasma bilirubin by a bilirubin oxidase derivative which has a relatively long half-life in the circulation. Biochim. Biophys. Acta **991**, 405–409
28 Iriyama, K., Yoshiura, M., Iwamoto, T. and Ozaki, Y. (1984) Simultaneous determination of uric and ascorbic acids in human serum by reversed-phase high-performance liquid chromatography with electrochemical detection. Anal. Biochem. **141**, 238–243
29 Umegaki, K., Inoue, K., Takeuchi, N. and Higuchi, M. (1994) Improved method for the analysis of ascorbic acid in plasma by high-performance liquid chromatography with electrochemical detection. J. Nutr. Sci. Vitaminol. (Tokyo) **40**, 73–79
30 Kashiba, M., Oka, J., Ichikawa, R., Kasahara, E., Inayama, T., Kageyama, A., Kageyama, H., Osaka, T., Umegaki, K., Matsumoto, A. et al. (2002) Impaired ascorbic acid metabolism in streptozotocin-induced diabetic rats. Free Radical Biol. Med. **33**, 1221–1230
31 Tietze, F. (1969) Enzymic method for quantitative determination of nanogram amounts of total and oxidized glutathione: applications to mammalian blood and other tissues. Anal. Biochem. **27**, 502–522
32 Ellman, G. L. (1959) Tissue sulfhydryl groups. Arch. Biochem. Biophys. **82**, 70–77
33 Wang, Y., Kashiba, M., Kasahara, E., Tsuchiya, M., Sato, E. F., Utsumi, K. and Inoue, M. (2001) Metabolic cooperation of ascorbic acid and glutathione in normal and vitamin C-deficient ODS rats. Physiol. Chem. Phys. Med. NMR **33**, 29–39
34 May, J. M., Qu, Z. C. and Cobb, C. E. (2004) Human erythrocyte recycling of ascorbic acid: relative contributions from the ascorbate free radical and dehydroascorbic acid. J. Biol. Chem. **279**, 14975–14982
35 Montel-Hagen, A., Kinet, S., Manel, N., Mongellaz, C., Prohaska, R., Battini, J. L., Delaunay, J., Sitbon, M. and Taylor, N. (2008) Erythrocyte Glut1 triggers dehydroascorbic acid uptake in mammals unable to synthesize vitamin C. Cell **132**, 1039–1048
36 May, J. M. (1998) Ascorbate function and metabolism in the human erythrocyte. Front. Biosci. **3**, d1–d10
37 VanDuijn, M. M., Tijssen, K., VanSteveninck, J., Van Den Broek, P. J. and Van Der Zee, J. (2000) Erythrocytes reduce extracellular ascorbate free radicals using intracellular ascorbate as an electron donor. J. Biol. Chem. **275**, 27720–27725
38 May, J. M., Qu, Z. and Cobb, C. E. (2000) Extracellular reduction of the ascorbate free radical by human erythrocytes. Biochem. Biophys. Res. Commun. **267**, 118–123
39 Su, D., May, J. M., Koury, M. J. and Asard, H. (2006) Human erythrocyte membranes contain a cytochrome b561 that may be involved in extracellular ascorbate recycling. J. Biol. Chem. **281**, 39852–39859
40 Will, J. C. and Byers, T. (1996) Does diabetes mellitus increase the requirement for vitamin C? Nutr. Rev. **54**, 193–202
41 Inoue, M. and Morino, Y. (1985) Direct evidence for the role of the membrane potential in glutathione transport by renal brush-border membranes. J. Biol. Chem. **260**, 326–331
42 Lee, J. H., Oh, C. S., Mun, G. H., Kim, J. H., Chung, Y. H., Hwang, Y. I., Shin, D. H. and Lee, W. J. (2006) Immunohistochemical localization of sodium-dependent L-ascorbic acid transporter 1 protein in rat kidney. Histochem. Cell Biol. **126**, 491–494
43 Bianchi, J. and Rose, R. C. (1985) Na^+-independent dehydro-L-ascorbic acid uptake in renal brush-border membrane vesicles. Biochim. Biophys. Acta **819**, 75–82
44 Boyer, S., Sharp, P. A., Debnam, E. S., Baldwin, S. A. and Srai, S. K. (1996) Streptozotocin diabetes and the expression of GLUT1 at the brush border and basolateral membranes of intestinal enterocytes. FEBS Lett. **396**, 218–222
45 Heilig, C. W., Brosius, 3rd, F. C. and Cunningham, C. (2006) Role for GLUT1 in diabetic glomerulosclerosis. Expert Rev. Mol. Med. **8**, 1–18
46 Linden, K. C., DeHaan, C. L., Zhang, Y., Glowacka, S., Cox, A. J., Kelly, D. J. and Rogers, S. (2006) Renal expression and localization of the facilitative glucose transporters GLUT1 and GLUT12 in animal models of hypertension and diabetic nephropathy. Am. J. Physiol. Renal Physiol. **290**, F205–F213
47 May, J. M., Cobb, C. E., Mendiratta, S., Hill, K. E. and Burk, R. F. (1998) Reduction of the ascorbyl free radical to ascorbate by thioredoxin reductase. J. Biol. Chem. **273**, 23039–23045
48 Hyun, D. H., Hunt, N. D., Emerson, S. S., Hernandez, J. O., Mattson, M. P. and de Cabo, R. (2007) Up-regulation of plasma membrane-associated redox activities in neuronal cells lacking functional mitochondria. J. Neurochem. **100**, 1364–1374
49 Samhan-Arias, A. K., Duarte, R. O., Martin-Romero, F. J., Moura, J. J. and Gutierrez-Merino, C. (2008) Reduction of ascorbate free radical by the plasma membrane of synaptic terminals from rat brain. Arch. Biochem. Biophys. **469**, 243–254

Received 19 February 2009/16 April 2009; accepted 23 April 2009
Published as BJ Immediate Publication 23 April 2009, doi:10.1042/BJ20090286

INTERNATIONAL JOURNAL OF GERIATRIC PSYCHIATRY
Int J Geriatr Psychiatry 2009; **24**: 1304–1310.
Published online 24 March 2009 in Wiley InterScience
(www.interscience.wiley.com) **DOI**: 10.1002/gps.2262

Assessment of the risk of postoperative delirium in elderly patients using E-PASS and the NEECHAM Confusion Scale

Hideyuki Hattori[1]*, Junichi Kamiya[2], Hiroshi Shimada[3], Hirotoshi Akiyama[3], Akihiro Yasui[4], Kojiro Kuroiwa[5], Koji Oda[6], Masahiko Ando[7], Takashi Kawamura[7], Atsushi Harada[8], Yuichi Kitagawa[9] and Shinji Fukata[9]

[1]*Department of Psychiatry, National Center for Geriatrics and Gerontology, 36-3 Gengo, Morioka-machi, Obu City, Aichi Prefecture, Japan*
[2]*Department of Surgery, Aichiken-Kouseiren-Toyota-Kousei Hospital, Ibohara 500-1, Jousui, Toyota city, Aichi, Japan*
[3]*Department of Gastroenterological Surgery, Yokohama City University Graduate School of Medicine, Yokohama, Japan*
[4]*Department of Surgery, Aichi-Saiseikai Hospital, Nagoya, Japan*
[5]*Department of Surgery, Tokyo Metropolitan Geriatric Hospital, 35-2 Sakaecho, Itabashi-ku, Tokyo, Japan*
[6]*Division of Surgical Oncology, Department of Surgery, Nagoya University Graduate School of Medicine, 65 Tsuruma-Cho, Showa-Ku, Nagoya, Japan*
[7]*Department of Preventive Services, Kyoto University School of Public Health, Kyoto University, Japan*
[8]*Department of Restorative Medicine, National Center for Geriatrics and Gerontology, 36-3 Gengo, Morioka-machi, Obu City, Aichi Prefecture, Japan*
[9]*Department of Surgery, National Center for Geriatrics and Gerontology, 36-3 Gengo, Morioka-machi, Obu City, Aichi Prefecture, Japan*

SUMMARY

Background The incidences of surgery-field disorders such as femur neck fracture and colorectal cancer in elderly persons have increased with the rapid aging of society. In such patients, postoperative delirium is also frequent. Patients should be generally assessed from the aspect of both physical and mental conditions in order to predict a high-delirium risk group. If so, delirium may be prevented more efficiently. In this study, we investigated whether the early detection of postoperative delirium in elderly patients is possible using a simple, useful behavior-assessing scale, the NEECHAM Confusion Scale, and a method for comprehensively evaluating elderly persons' stress related to surgery, E-PASS.

Methods The subjects were 160 patients aged more than 75 years who underwent surgery. Among them, three patients had vascular surgery-field disorders, 67 had orthopedic-field disorders, and 90 had digestive surgery-field disorders. To comprehensively evaluate surgery-related stress, E-PASS was employed. In addition, we assessed recognition, activities of daily living (ADL), and the quality of life (QOL). For delirium diagnosis and severity assessment, we used the NEECHAM Confusion Scale. The cut-off value of the NEECHAM score was established as 20 points, and patients showing values less than this after surgery were regarded as having postoperative delirium. Evaluation was performed until 10 days after surgery.

Results Postoperative delirium was noted in 54.7% of the subjects. There was a decrease in the NEECHAM score between the first and fourth postoperative days, but it gradually increased thereafter. Both uni- and multivariate analyses showed that postoperative delirium was associated with an advanced age (more than 80 years), low preoperative NEECHAM and MMSE scores, the preoperative QOL, and E-PASS. In groups showing an MMSE score of less than 25 or a preoperative NEECHAM score of less than 27, the incidence of postoperative delirium was 76%.

Conclusion The results suggest that E-PASS and the NEECHAM score facilitate assessment of the risk of postoperative delirium in elderly patients, contributing to early prevention/treatment. Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS—elderly; delirium; E-PASS; NEECHAM

*Correspondence to: H. Hattori, Department of Psychiatry, National Center for Geriatrics and Gerontology, 36-3 Gengo, Morioka-machi, Obu City, Aichi Prefecture, Japan. E-mail: hideyuki@ncgg.go.jp

Received 19 July 2008
Accepted 9 February 2009

INTRODUCTION

Delirium is characterized by the reduction of consciousness/recognition and disturbance in the sleep/awakening rhythm. As it develops suddenly and causes various psychiatric symptoms/behavioral abnormalities, its care is difficult in most patients. In elderly patients, it is known that mental/physical stress induces delirium (Johnson, 1990). A study reported that delirium was observed in 9.6% of elderly patients who received emergency treatment (Elie *et al.*, 2000). Etiological factors for delirium in elderly patients vary. In addition to delirium related to malignant tumors or infection, its onset as an adverse reaction to drugs must be considered. However, postoperative delirium is also frequent; it is observed in 51% of patients undergoing abdominal surgery and in 48–55% of those after surgery for femur neck fracture (Olin *et al.*, 2005; Santana Santos *et al.*, 2005; Golderberg *et al.*, 2006). In Japan, the incidences of surgery-field disorders such as femur neck fracture and colorectal cancer in elderly persons have increased with the rapid aging of society (Committee for Osteoporosis Treatment, 2004; Isobe *et al.*, 2007). Internationally, an advanced age is not considered to be a contraindication for surgery. Surgery has also been positively performed in patients aged more than 90 years (nonagenarian) (Blansfield *et al.*, 2004). However, there are many risks related to the postoperative management of elderly patients. Postoperative delirium also makes postoperative management difficult.

When delirium develops, intensive drug therapy is required, causing adverse reactions; therefore, treatment is difficult in many elderly patients. A study indicated that this contributed to an increase in the mortality rate (McCusker *et al.*, 2002), cognitive hypofunction, and prolongation of the admission period (McCusker *et al.*, 2003). Delirium prevention is needed. However, its early detection is difficult in many cases. If a high-risk group can be predicted, delirium may be prevented more efficiently. Concerning the risk of postoperative delirium in elderly patients, previous studies have reported various factors. According to a systematic review conducted by Dasgupta *et al.*, risk factors for postoperative delirium include age, gender, cognitive dysfunction, mental state, previous treatment with antipsychotic agents, complications, an increase in the serum blood urea nitrogen (BUN) level, admission to a nursing home, and the reduction of activities of daily living (ADL) (Dasgupta and Dumbrell, 2006). Another study reported that risk factors for femur neck fracture, which is frequent in elderly persons, included age and cognitive hypofunction (Bitsch *et al.*, 2004). The level of risk is wide-ranging, and it is difficult to evaluate the risk before and after surgery, when various physical situations must be controlled. Therefore, a quantitative index that facilitates the pre-/intraoperative assessment of patients' physical/mental risks and evaluation of the presence or absence and severity of postoperative delirium should be employed.

In this study, we investigated whether a high-risk group in which postoperative delirium frequently develops can be selected among elderly persons using the NEECHAM Confusion Scale, which facilitates the simple, accurate diagnosis/evaluation of patients' delirium conditions, and the Estimation of Physiologic Ability and Surgical Stress (E-PASS), in which pre-/intraoperative risks can be comprehensively evaluated.

SUBJECTS AND METHODS

The subjects were 160 patients who underwent surgery between April 1, 2005 and March 31, 2008 in hospitals for which collaborative investigators worked. Among them, three patients were with vascular surgery-field disorders, 67 were with orthopedic-field disorders, and 90 were with digestive surgery-field disorders. The sites of hospitals in which evaluation was performed, hospital bed capacity, annual number of surgical procedures, and standard delirium management are shown in Table 1.

Table 1. Profiles of partipating hospitals

	Location	No of inpatients	No of surgery per year	Delirium protocol
National Center for Geriatrics and Gerontology	Aichi	300	620	Conventional therapy at onset
Aichi-Saiseikai Hospital	Aichi	324	201	Conventional therapy at onset
Tokyo Metropolitan Geriatric Hospital	Tokyo	887	617	Conventional therapy at onset
Yokoham a City University Graduate School of Medicine	Kanagawa	623	1093	Conventional therapy at onset

Int J Geriatr Psychiatry 2009; **24**: 1304–1310.
DOI: 10.1002/gps

REGISTRATION/EXCLUSION CRITERIA

We registered patients aged more than 75 years who were admitted to hospitals participating in this study, and for whom abdominal surgery-field, vascular surgery-field, and orthopedic-field surgical procedures were indicated. Only patients from whom written informed consent could be obtained 3–5 days before surgery were enrolled. We excluded those who underwent emergency surgery. In addition, those with severe dementia and those in whom psychiatric symptoms/behavioral abnormalities before surgery required treatment were excluded. For evaluation, written informed consent regarding the purpose of this study and the protection of personal information was obtained from the subjects and their families. Prior to this study, the protocol was approved by the ethics review board of each hospital.

EVALUATION ITEMS

In this study, the E-PASS items were examined to assess surgery-related physical risks. E-PASS was calculated as described in Appendix. As preoperative ADL and the quality of life (QOL) in elderly patients undergoing surgery may influence their postoperative mental state, we also evaluated these two parameters. For ADL evaluation, we employed the Barthel Index. To evaluate the QOL, we used SF-8 and EQ-5D, which can be simply conducted via an inquiry. Furthermore, the patient's preoperative condition can be accurately assessed by classifying the QOL into inferior items such as the physical component summary (PCS) and mental component summary (MCS) and expressing them as numerical data (Fukuhara and Suzukamo, 2004; Brooks R with the EuroQol Group, 1996). In addition, we evaluated age, gender, cognitive function (Mini-Mental State Examination (MMSE)), preoperative urinary incontinence, the number of catheters inserted after surgery, and agents (antipsychotic agents, hypotensive agents, and others). We also assessed anti-Parkinson agents, which may cause hallucination. The preoperative baseline data on inferior mental items in all patients are shown in Tables 2 and 3. Surgeons evaluated risk factors and the presence or absence of delirium 3–5 days before surgery, as well as surgery-related risk factors after surgery. Establishing the cut-off value of the NEECHAM score as 20 points according to the literature, patients showing values less than this after surgery were regarded as having postoperative delirium (Neelon *et al.*, 1996). In our subjects, prophylactic therapy with antipsychotic agents was not performed.

Table 2. Baseline data

Demographic analysis	Value
Surgery	
Gastrointestinal	90 (56.2%)
Orthopedics	67 (41.8%)
Vascular	3 (2.0%)
Anesthesia	
General	132 (82.5%)
Lumbar	27 (16.8%)
Local	1 (0.7%)

$N = 160$; Male/Female ratio = 68:92; Age (SD) = 81.1 (6.3)

When marked symptoms of delirium made management difficult, standard delirium treatment was administered. Nurses evaluated patients' 24-h conditions using the NEECHAM Confusion Scale every day until 10 days after surgery.

We statistically examined the association with the above risk factors. For statistical analysis, we performed univariate and multivariate analyses. For the former analysis, we prepared a univariate division table involving the NEECHAM score and risk factors, and employed the logistic regression for continuous variables and the chi-square test for categorical variables. For the latter analysis, we used a logistic model in which the presence or absence of postoperative delirium was regarded as a result variable. We regarded six factors, age, gender, department, anesthesia, MMSE, and the preoperative NEECHAM

Table 3. Baseline data

Preoperative status and surgical stress	Average	SD
MMSE	22.2	8.0
NEECHAM score	26.1	5.5
Activity of daily living (Barthel Index)	76.6	33.1
QOL (PCS)	41.3	13.3
QOL (MCS)	45.6	9.8
Hemoglobin (g/dL)	12.1	2.0
Hematocrit (%)	33.6	5.9
Albumin (g/dL)	3.6	0.5
Na mEq/L	140.2	4.1
K mEq/L	4.1	0.4
Cl (mEq/L)	103.8	4.1
BUN (mg/dL)	17.1	7.7
Creatinin (mg/dL)	0.7	0.3
Glucose (mg/dL)	120.9	48.6
Creactive protein (mg/dL)	1.7	2.9
Electrocardiogram QTc (ms)	425.7	37.1
Ultrasonic cardiogram Ejection Fraction (%)	68.1	7.7
Preoperative SpO_2 (%)	96.1	2.7
Number of catheters (post-operation)	4.2	2.0
PRS	0.58	0.26
Surgical stress score (SSS)	0.15	0.53
CRS	0.36	0.54

score, as covariance in a basic model. Initially, we performed a logistic analysis using these six factors. Subsequently, in order to find additional risk factors, we sequentially inserted and removed variables such as the Barthel Index, QOL, concomitant psychiatric/nervous disorders, and E-PASS score to the logistic model, and evaluated whether these variables were independently associated with the development of postoperative delirium after adjustment for the six basic factors.

RESULTS

Eighty-seven patients (54.7%) were regarded as having delirium based on a NEECHAM score of less than 20 within 10 days after surgery. When examining changes in the median score in all registered patients, there was a decrease in the NEECHAM score between the first and fourth postoperative days, but it gradually increased thereafter (Figure 1). We investigated risk factors per variate, regarding a postoperative NEECHAM score of 20 points as the cut-off value. Postoperative delirium was associated with an advanced age (more than 80 years), reduction of the preoperative ADL (low Barthel Index value), a preoperative NEECHAM score of 27 or lower, an MMSE score of 25 or lower, the presence of concomitant psychiatric disease, urinary incontinence, a history of excitation/hyperactivity, the preoperative risk score (PRS) and comprehensive risk score (CRS)(E-PASS scores), the number of inserted catheters, and PCS on preoperative QOL assessment (SF-8). There were no significant differences related to the other factors such as gender, departments (abdominal surgery, orthopedics), concomitant physical disorders, hematology, or physiological test parameters (Table 4).

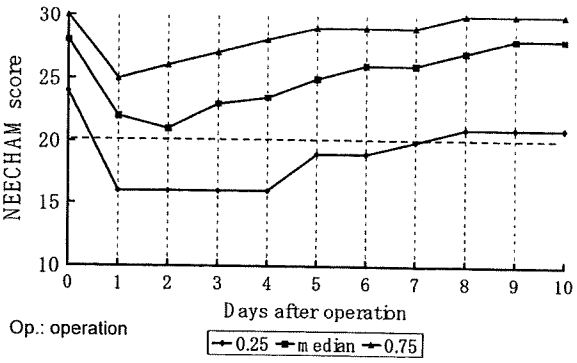

Figure 1. Changes in the NEECHAM score before and after surgery. The score before surgery is expressed as that on Day 0. The upper line indicates the 75 percentile, the middle line the median, and the lower line the 25 percentile. The dotted line represents the cut-off value of the NEECHAM score at which delirium was evaluated as present.

A logistic analysis with six basic model factors showed the association of age (a 1-year increase elevated the risk of postoperative delirium 1.2-fold), gender (males: 3.9-fold), and MMSE (a 1-point decrease elevated the risk 1.2-fold) with the development of postoperative delirium. The above logistic analysis was additionally performed by dividing the subjects with respect to age (younger than 80 years, 80 years or older), MMSE (less than 25 points, 25 points or higher), and the preoperative NEECHAM score (less than 27 points, 27 points or higher). In patients aged more than 80 years, the risk of postoperative delirium was 3.1 times higher than that in those aged younger than 80 years. In those with an MMSE score of less than 25 points, it was 4.0 times higher than that in those with an MMSE score of 25 or higher. In those with a preoperative NEECHAM score

Table 4. Statistically significant factors associated with low NEECHAM score

	Coefficient	Chi-square value	*p*-Value
Age, >80		44.3	<0.01
Barthel Index, <65/65–95/100		12.9	<0.01
NEECHAM, <27		40.1	<0.01
MMSE, <25		40.8	<0.01
Concomitant psychiatric disease, yes/no		5.5	0.02
Urinary incontinence, yes/no		19.5	<0.01
History of excitement, yes/no		9.1	0.01
Numver of catheters (post-operation), continuous	0.23		<0.01
PRS, continuous	2.65		<0.01
CRS, continuous	1.76		<0.01
QOL (PCS), continuous	−0.03		0.04

Int J Geriatr Psychiatry 2009; **24**: 1304–1310.
DOI: 10.1002/gps

Table 5. Multivariate analysis for basic six models

	Odds ratio (95% CI)	*p*-Value
Age, >80	3.14 (1.35–7.26)	<0.01
Male	2.86 (1.09–7.47)	<0.01
Type of surgery, orthopediatrics	0.70 (0.24–2.07)	0.52
Type of anesthesia, general	1.11 (0.26–4.71)	0.89
Preoperative MMSE, <25	3.96 (1.52–10.39)	<0.01
Preoperative NEECHAM, <27	5.33 (1.84–15.31)	<0.01

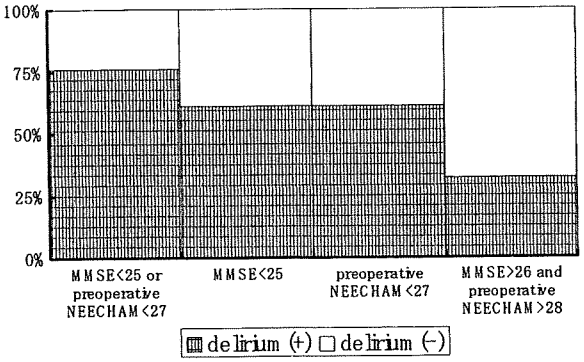

Figure 2. Close association between the MMSE/preoperative NEECHAM scores and the development of delirium.

of less than 27 points, it was 5.3 times higher than that in those with a NEECHAM score of 27 or higher (Table 5). In groups with an MMSE score of less than 25 points or a preoperative NEECHAM score of less than 27 points, the incidence of postoperative delirium was 76% (Figure 2).

When examining factors associated with the development of postoperative delirium, a QOL parameter, PCS of SF-8, was associated with its development after correction with six basic factors ($p = 0.04$). There was no association with other QOL parameters such as MCS of SF-8 or EQ5D. The global E-PASS score (CRS, $p = 0.09$) was weakly associated. Among the factors comprising CRS, surgical invasiveness (surgical stress score: SSS) was associated with the development of postoperative delirium ($p = 0.09$). When classifying the SSS into three categories, the risk of postoperative delirium in the highly invasive surgery group was significantly higher than that in the less invasive surgery group ($p = 0.03$). On the other hand, another factor comprising the CRS, the preoperative physical status, was not associated. The other factors for which an association was noted on univariate analysis were not associated with postoperative delirium after correction with the six basic factors by multivariate analysis.

DISCUSSION

In this study, we employed the NEECHAM Confusion Scale for delirium diagnosis and severity assessment (Neelon *et al.*, 1996). The NEECHAM score is useful for evaluating postoperative delirium in elderly inpatients (Schuurmans *et al.*, 2003), and is available for medical staff (Matsushita *et al.*, 2004); three categories, cognitive information processing, behavior, and physiological control, are assessed. The most unfavorable condition during a 24-h period is regarded as the day's condition. The full score is 30 points, and the severity increases with a decrease in the score. Patients showing a NEECHAM score of 28 points or higher are regarded as having no problems, those showing scores ranging from 21 to 27 points as having mild delirium, and those showing a NEECHAM score of 20 points or lower as having severe delirium. Furthermore, the NEECHAM Confusion Scale has high internal consistency, and is reliable between examiners. It is correlated with the DSM-IV criteria (Immers *et al.*, 2005). Therefore, it is available for delirium diagnosis and monitoring.

E-PASS, which was employed to evaluate surgical-related risks, was developed by Haga *et al.* (1999) as a parameter for predicting the incidence of postoperative complications. Several studies have reported its usefulness in various surgical fields (Tang *et al.*, 2007; Yamashita *et al.*, 2006; Oka *et al.*, 2005). E-PASS consists of three items: PRS, SSS, and CRS. PRS is calculated using a specific formula based on the performance status (PS) (Furue, 1986) and American Society of Anesthesiologists (ASA) physiological status classification (American Society of Anesthesiologists Task Force, 1996), which are used to evaluate anesthesia, the preoperative state, surgical invasiveness, the duration of surgery, volume of intraoperative blood loss, and blood pressure changes, in addition to an index regarding the presence or absence of preoperative concomitant disorders. The SSS is calculated based on the body weight, operation time, and width of the surgical field. The CRS is a parameter for comprehensively evaluating the PRS and SSS (refer to Appendix). For the evaluation of postoperative delirium in elderly patients, preoperative physical (malnutrition, etc.) and mental (cognitive hypofunction) fragility must be considered. In clinical practice, complex evaluation is difficult, and data interpretation is complex. In this study, combination of the NEECHAM Confusion Scale and E-PASS facilitated evaluation; it was simple to interpret results expressed as numerical data.

We serially examined postoperative psychiatric symptoms/behavioral abnormalities using the NEECHAM Confusion Scale. Delirium or a delirium-like state persisted until 3–4 days after surgery, and then subsided. Previous studies indicated that the incidence of postoperative delirium increased with age; the incidences were 12% in patients aged more than 65 years and 35% in those aged more than 80 years (Knill, 1990; Hirsch, 1995). Amemiya *et al.* (2007) reported that, among patients aged more than 75 years who underwent elective surgery for gastric/colorectal cancer, the incidence of postoperative delirium in those aged more than 80 years was 1.3 times higher than that in those aged younger than 80 years. As indicated for an age-related increase in the incidence of dementia, the fragility of the central nervous system may be an important risk factor for the onset of delirium. A study reported that postoperative delirium became severe after 12–24 h (Olympio, 1991). This tendency is also observed in patients with delirium after alcohol cessation (Victor and Wolfe, 1973). Furthermore, the results of uni- and multivariate analyses suggested that the preoperative MMSE and NEECHAM scores influence the postoperative NEECHAM score. The incidence of postoperative delirium was approximately 80% in patients showing a preoperative MMSE score of 25 points or lower or a NEECHAM score of 27 points or lower. Thus, the NEECHAM Confusion Scale may be useful for evaluating the risk of postoperative delirium, the postoperative state, and treatment response.

In this study, significant risk factors for postoperative delirium included an advanced age, the presence of preoperative cognitive hypofunction, and ADL reduction. However, the presence of hematological abnormalities, such as anemia, a decrease in the serum albumin level, and an increase in the serum BUN level, was not a significant risk factor. Furthermore, differences in fields such as abdominal surgery and orthopedics were also not associated with the onset of delirium. On the other hand, univariate analysis showed that CRS involving surgical invasiveness was associated with its onset, suggesting that surgical invasiveness influences the development of postoperative delirium in elderly patients. Previous studies have reported the association of postoperative delirium with the type of anesthetics (Parikh and Chung, 1995) and volume of intraoperative blood loss (Marcantonio *et al.*, 1998; Böhner *et al.*, 2003). However, surgery-related stress may complexly act; it is important to comprehensively evaluate various associated factors. E-PASS, which we employed in this study, involves almost all factors that may contribute to surgery-related risks. This procedure should be introduced to evaluate such risks.

KEY POINTS

- Postoperative delirium was associated with an advanced age (more than 80 years), low preoperative NEECHAM and MMSE scores, the preoperative QOL, and E-PASS.
- An MMSE score of less than 25 or a preoperative NEECHAM score of less than 27, the incidence of postoperative delirium was 76%.
- E-PASS and the NEECHAM score facilitate assessment of the risk of postoperative delirium in elderly patients, contributing to early prevention/treatment.

Thus, many studies have investigated the risk of postoperative delirium. However, it is important to comprehensively evaluate its risk in individual patients. This is much more important in elderly patients. However, complex procedures are difficult on bedside evaluation. Furthermore, the accuracy of numerical data is required so that the results of evaluation may be reflected by prevention/treatment. The NEECHAM Confusion Scale and E-PASS, which we used in this study, are useful for evaluating the risk of postoperative delirium in elderly patients and initiating prevention/treatment.

ACKNOWLEDGEMENTS

This work was supported by the Research Grant for Longevity Sciences (17C-3) from the Ministry of Health, Labour and Welfare, Japan.

REFERENCES

Amemiya T, Oda K, Ando M, *et al.* 2007. Activities of daily living and quality of life of elderly patients after elective surgery for gastric and colorectal cancers. *Ann Surg* **246**(2): 222–228.

American Society of Anesthesiologists Task Force 1996. Practice guidelines for sedation and analgesia by non-anesthesiologists—a report by the American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-anesthesiologists. *Anesthesiology* **84**: 459–471.

Bitsch M, Foss N, Kristensen B, Kehlet H. 2004. Pathogenesis of and management strategies for postoperative delirium after hip fracture: a review. *Acta Orthop Scand* **75**(4): 378–389.

Blansfield JA, Clark SC, Hofmann MT, Morris JB. 2004. Alimentary tract surgery in the nonagenarian: elective vs. emergent operations. *J Gastrointest Surg* **8**(5): 539–542.

Böhner H, Hummel TC, Habel U, *et al.* 2003. Predicting delirium after vascular surgery: a model based on pre- and intraoperative data. *Ann Surg* **238**(1): 149–156.

Brooks R with the EuroQol Group. 1996. EuroQol: the current state of play. *Health Policy* **37**: 53–72.
Committee for Osteoporosis Treatment of The Japanese Orthopaedic Association. 2004. Nationwide survey of hip fractures in Japan. *J Orthop Sci* **9**(1): 1–5.
Dasgupta M, Dumbrell AC. 2006. Preoperative risk assessment for delirium after noncardiac surgery: a systematic review. *J Am Geriatr Soc* **54**(10): 1578–1589.
Elie M, Rousseau F, Cole M, *et al.* 2000. Prevalence and detection of delirium in elderly emergency department patients. *CMAJ* **163**(8): 977–981.
Fukuhara S, Suzukamo Y. 2004. Manual of the SF-8 Japanese version, Institute for Health Outcomes and Process Evaluation Research, Kyoto.
Furue H. 1986. Criteria for the direct effect of chemothrapy against solid cancer by Japanese Society for Cancer Therapy (in Japanese). *Nippon Gann Tiryou Gakkai Zasshi (J Jpn Soc Cancer Ther)* **21**: 931–942.
Golderberg G, Kiselev P, Bharathan T, *et al.* 2006. Predicting postoperative delirium in elderly patients undergoing surgery for hip fracture. *Psychogeriatrics* **6**: 43–48.
Haga Y, Ikei S, Ogawa M. 1999. Estimation of physiologic ability and surgical stress (E-PASS) as a new prediction scoring system for postoperative morbidity and mortality following elective gastrointestinal surgery. *Surg Today* **29**: 219–225.
Hirsch CH. 1995. When your patient needs surgery: weighing risks versus benefits. *Geriatrics* **50**(1): 26–31.
Immers HE, Schuurmans MJ, van de Bijl JJ. 2005. Recognition of delirium in ICU patients: a diagnostic study of the NEECHAM Confusion Scale in ICU patients. *BMC Nurs* **4**: 7.
Isobe H, Takasu N, Mizutani M, Kimura W. 2007. Management of colorectal cancer in elderly patients over 80 years old. *Nippon Ronen Igakkai Zasshi* **44**(5): 599–605. (in Japanese).
Johnson JC. 1990. Delirium in the elderly. *Emerg Med Clin North Am* **8**(2): 255–265.
Knill RL. 1990. Clinical research in anaesthesia. Past accomplishments and a future horizon. *Anaesthesia* **45**(4): 271–272.
Marcantonio ER, Goldman L, Orav EJ, Cook EF, Lee TH. 1998. The association of intraoperative factors with the development of postoperative delirium. *Am J Med* **105**(5): 380–384.
Matsushita T, Matsushima E, Maruyama M. 2004. Early detection of postoperative delirium and confusion in a surgical ward using the NEECHAM Confusion Scale. *Gen Hosp Psychiatry* **26**(2): 158–163.
McCusker J, Cole M, Abrahamowicz M, Primeau F, Belzile E. 2002. Delirium predicts 12-month mortality. *Arch Intern Med* **162**(4): 457–463.
McCusker J, Cole M, Dendukuri N, Han L, Belzile E. 2003. The course of delirium in older medical inpatients: a prospective study. *J Gen Intern Med* **18**(9): 696–704.
Neelon VJ, Champagne MT, Carlson JR, Funk SG. 1996. The NEECHAM Confusion Scale: construction, validation, and clinical testing. *Nurs Res* **45**(6): 324–330.
Oka Y, Nishijima J, Oku K, *et al.* 2005. Usefulness of an estimation of physiologic ability and surgical stress (E-PASS) scoring system to predict the incidence of postoperative complications in gastrointestinal surgery. *World J Surg* **29**(8): 1029–1033.
Olin K, Eriksdotter-Jonhagen M, Jansson A, *et al.* 2005. Postoperative delirium in elderly patients after major abdominal surgery. *Br J Surg* **92**(12): 1559–1564.
Olympio MA. 1991. Postanesthetic delirium: historical perspectives. *J Clin Anesth* **3**(1): 60–63.
Parikh SS, Chung F. 1995. Postoperative delirium in the elderly. *Anesth Analg* **80**(6): 1223–1232.
Santana SF, Wahlund LO, Varli F, Tadeu VI, Eriksdotter JM. 2005. Incidence, clinical features and subtypes of delirium in elderly patients treated for hip fractures. *Dement Geriatr Cogn Disord* **20**(4): 231–237.
Schuurmans MJ, Deschamps PI, Markham SW, Shortridge-Baggett LM, Duursma SA. 2003. The measurement of delirium: review of scales. *Res Theory Nurs Pract* **17**(3): 207–224.
Tang T, Walsh SR, Fanshawe TR, *et al.* 2007. Estimation of physiologic ability and surgical stress (E-PASS) as a predictor of immediate outcome after elective abdominal aortic aneurysm surgery. *Am J Surg* **194**(2): 176–182.
Victor M, Wolfe SM. 1973. Causation and treatment of the alcohol withdrawal syndrome. In *Alcoholism*, Brome PG, Fox R (eds.) Academic Press: New York; 137–149.
Yamashita S, Haga Y, Nemoto E, *et al.* 2006. Comparison of surgical outcome using the prediction scoring system of E-PASS for thoracic surgery. *Jpn J Thorac Cardiovasc Surg* **54**(9): 391–395.

APPENDIX

Equations for E-PASS scores: PRS, surgical stress score (SSS), and CRS (Haga *et al.*, 1999).

(1) $PRS = -0.0686 + 0.00345 \times 1 + 0.323 \times 2 + 0.205 \times 3 + 0.153 \times 4 + 0.148 \times 5 + 0.0666 \times 6$

X1, age; X2, presence (1) or absence (0) of severe heart disease; X3, prsence (1) or absence (0) of severe pulmonary disease; X4, presenc (1) or absence (0) of diabetes mellitus; X5, PS index (0–4); X6, ASA physiological status classification (1–5). Severe heart disease was defined as heart failure of New York Heart Association Class III or IV, or severe arrhythmia requiring mechanical support. Severe pulmonary disease was defined as any condition with a% VC of less than 60% and/or a FEV1.0% of less than 50%. PS index was based on the definition by Japanese Society for Cancer Therapy (VC, vital capacity; FEV, forced expiratory volume).

(2) $SSS = -0.342 + 0.0139 \times 1 + 0.0392 \times 2 + 0.352 \times 3$

X1, blood loss/body weight (g/kg); X2, operation time (h); X3, extent of skin incision (0: minor incisions for laparoscopic or thoracoscopic surgery (including scope-assisted surgery); 1: laparotomy or thoracotomy alone; 2: both laparotomy and thoracotomy.

(3) $CRS = -0.328 + 0.936(PRS) + 0.976(SSS)$

Archives of Gerontology and Geriatrics 49 (2009) 278–283

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger

Can an individualized and comprehensive care strategy improve urinary incontinence (UI) among nursing home residents?

Yukiko Tanaka [a,b,c,*], Kumiko Nagata [d], Tomoe Tanaka [c], Koichi Kuwano [c], Hidetoshi Endo [e], Tetsuya Otani [a], Minato Nakazawa [a], Hiroshi Koyama [a]

[a] Department of Public Health, Gunma University Graduate School of Medicine, 3-39-15 Showa, Maebashi 371-8511, Japan
[b] Department of Internal Medicine, Uchida Hospital, 345-1 Kuyahara, Numata 378-0005, Japan
[c] Nonprofit Organization Silver Age Institute, 1-12-5 Hamamatsucho, Minato 105-0013, Japan
[d] Research Division, Tokyo Dementia Care Research and Training Center, 1-12-1 Takaidonishi, Suginami 168-0071, Japan
[e] Department of Comprehensive Geriatric Medicine, National Hospital for Geriatric Medicine, National Center for Geriatrics and Gerontology, 36-3 Morioka, Obu 474-8511, Japan

ARTICLE INFO

Article history:
Received 6 June 2008
Received in revised form 18 October 2008
Accepted 21 October 2008
Available online 17 December 2008

Keywords:
Urinary incontinence
Individualized care
Intervention study

ABSTRACT

Urinary incontinence (UI) is one of the most common and distressing conditions among nursing home residents. Although scheduled care is usually provided for them, incontinence care should be individualized regarding going to the toilet, changing diapers, and taking food and water. We have developed an individualized and comprehensive care strategy to address the problem. We conducted an intervention study that involved training chiefs of staffs, who in turn trained other staffs, and encouraging residents. A total of 153 elderly subjects selected from 1290 residents in 17 nursing homes were eligible to receive our individualized and comprehensive care. The goals of the care strategy were (i) to complete meal intake; (ii) to take fluids up to 1500 ml/day; (iii) to urinate in a toilet; (iv) to spend over 6 h out of bed; and (v) to reduce time spent in wet diapers. We explained the aims of our strategy to the chiefs of staff of each nursing home and instructed them to encourage residents to take an active part in our individualized and comprehensive care strategy for 12 weeks. For 3 days before and after that period, we assessed the changes in fluid volume intake, time spent in wet diapers, size of diaper pads, and urination habits. The result was that fluid volume intake significantly increased ($p < 0.001$) while time spent in wet diapers decreased ($p < 0.001$). The number of residents wearing diapers decreased as did the size of pads during the day ($p = 0.0017$). The proportion of residents using diapers at night was reduced and those using toilets at night increased ($p = 0.007$). This study suggests that such an individualized and comprehensive care strategy can offer a measurable improvement in UI care.

1. Introduction

Urinary incontinence (UI) is one of the most common and distressing conditions affecting nursing home residents and their caregivers on staff (Ouslander et al., 1982, 1993; Ouslander and Fowler, 1985; Mizoguchi et al., 1995; Toba et al., 1996; Schnelle et al., 1998; Fader et al., 2003). It has an adverse impact on physical health, psychosocial status, and the costs of health care (Ouslander et al., 1982, 1993; Ouslander and Fowler, 1985). Ouslander et al. (1982) examined the characteristics of residents with UI in nursing home settings, and indicated that improved care will provide a better quality of life for these patients as the staff's knowledge of incontinence increases.

Several studies have suggested that individualized incontinence care was able to reduce the rate of UI among nursing home residents (Gotoh et al., 2001; Mori, 2001; Ouslander et al., 2001; Toba, 2002; Fader et al., 2003). In fact, some clinical trials have demonstrated that prompted voiding, a typical individualized incontinence care method, and other similar behavioral interventions can significantly reduce the frequency and volume of UI among nursing home residents (Ouslander et al., 1993; Schnelle et al., 1998; Mori, 2001; Fader et al., 2003). However, most such residents still receive inadequately individualized or scheduled toileting assistance (Ouslander and Fowler, 1985; Mori, 2001; Toba, 2002; Fader et al., 2003; Schnelle et al., 2004). In addition, there has been much debate on what kind of individualized care

* Corresponding author at: Department of Internal Medicine, Uchida Hospital, 345-1 Kuyahara, Numata 378-0005, Japan. Tel.: +81 27 823 1231; fax: +81 27 824 5315.
E-mail address: y-tanaka@kyujinkai.com (Y. Tanaka).

0167-4943/$ – see front matter © 2008 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.archger.2008.10.006

could best address UI problems. Some previous studies have reported that inconsistency in applying care principles caused nursing home care variations each night during the study observation period (Ouslander and Fowler, 1985; Schnelle et al., 1998, 2004, 2006).

In Japan, scheduled incontinence care, called as "scheduled toileting," have become common in most nursing homes. The residents go to the toilet as a group and have to line up in front of it. Most residents are compelled to urinate and defecate on commode chairs or in diapers due to lack of toilets or of the care staff required to accompany them. A previous study reported that Japanese nursing home residents remained in wet diapers for an hour or more on average due to scheduled toileting (Toba et al., 1996). In addition to scheduled toileting, meals are also tightly scheduled. The residents usually take their meals together in large dining halls at strictly scheduled hours (usually 8:00, 12:00, and 18:00). Nursing home staffs provide physical assistance to those who cannot eat or drink without help. Because often only one staff is available to take care of many residents, the quality of physical assistance suffers. As for drinks, roasted green tea, Houji-cha, is usually delivered to the residents before each meal. Some nursing homes provide some snacks at 10:00 and 15:00. However, the variety of available beverages and snacks is limited. Additionally, most nursing home residents need some help from staff to maintain a sitting position due to their weak physical condition. However, such assistance is insufficient, leaving the residents bedridden in most nursing homes.

To significantly improve the knowledge of incontinence among nursing home residents and develop an individualized care strategy, Takahashi et al. (2004) surveyed UI problems in nursing homes in Fukushima Prefecture, Japan and conducted a preliminary intervention study. They measured residents' fluid intake volume, frequency of diaper changes, and time spent in wet diapers. As a result, they confirmed that residents' fluid intake was unstable and low, as other similar studies had reported (Ouslander and Fowler, 1985; Schnelle et al., 2004, 2006; Simmons and Schnelle, 2006). Consequently, they suggested that creative solutions were needed to comprehensively improve residents' quality of life across the board, including the issue of UI. Additionally, they obtained a preliminary result of an improvement in UI rates by educating nursing home caregivers about UI.

We hypothesized that an improvement of UI could best be achieved by a system of individualized and comprehensive care that focused on providing adequate fluids and meals, encouraging patients to use toilets and reducing the size of their diaper pads. This approach would differ significantly from the usual UI care in which diapers would be changed only at scheduled times. The aim of this study was to investigate whether such a strategy was in fact able to increase the intake of fluids and food, and to reduce the proportion of diaper users and the size of their diaper pads, thus leading to an enhanced quality of life.

2. Methods

2.1. Study setting

2.1.1. Nursing homes

The present study was conducted at 17 nursing homes: 9 welfare institutions for the elderly (Kaigo Rojin Fukushi Shisetsu); 6 health care facilities for the aged (Kaigo Rojin Hoken Shisetsu); 1 hospital; and 1 institution for dementia patients (Group Home).

2.1.2. Nursing home staffs

The ratio of nursing home residents to caretakers on staff was approximately 1.5 among nursing homes in this study. Since the corresponding ratio of the Japanese standard is 3.0, the nursing homes in this study were relatively adequate regarding care staffs.

2.2. Study subjects

A total of 153 elderly subjects selected from 1290 residents in 17 nursing homes were eligible to participate. Eligibility criteria were the ability (1) to maintain a sitting position, and (2) to express their wish to defecate. Of those subjects, 31 were ineligible to receive our individualized and comprehensive care, due to declining co-morbidity or to having been discharged from their facilities. Thus, we obtained complete data from 122 residents, with informed consent obtained from either the subject or his/her representative, that is, spouse, son, or daughter.

2.3. Education program for care staff

One care staff was selected from each nursing home as the head care staff who participated in a training program for the individualized and comprehensive care strategy and, after finishing the program, educated other care staffs in turn.

First, all chiefs on staff were informed of the current excretion status of all residents in their facility based on our investigation of the actual circumstances among all 1290 residents prior to launching the current study (unpublished data). Second, they were informed of the volume of current intakes of food and water, and the time spent in wet diapers among our 153 subjects. Our data indicated that both food and water intake volumes of residents were inadequate. Third, they learned the rationale for our hypothesis that UI problems among residents improved after participation in our care strategy. The protocol for that strategy can be summarized as follows: (1) to encourage complete meal intake; (2) to increase fluid intake up to 1500 ml/day; (3) to encourage urination in a toilet; (4) to encourage time spent out of bed to exceed 6 h; and (5) to reduce time spent in wet diapers (Table 1).

In addition to the above five goals, we asked care staffs to choose diapers with smaller pads to improve skin condition and lower costs. Larger wet pads have been shown to not only adversely affect larger areas of skin than smaller ones, but also to force nursing home residents and their families to bear both the higher cost and extra expense of disposal.

2.4. Details of our strategy

2.4.1. To encourage complete meal intake

Care staffs provided patients with strong physical assistance at meal times, and encouraged them to finish their meals if they appeared reluctant to do so. The care staffs recorded each resident's meal intake volume in check sheets to assess the rate of meals completely consumed.

2.4.2. To increase fluid intake up to 1500 ml/day

Care staffs delivered beverages other than before each meal, e.g., in the early morning, 10:00, 15:00, and before sleep. In addition to roasted green tea, Houji-cha, Japanese green tea which elderly residents preferred was delivered. Some care staffs were specially assigned to engage in tea delivery, as they were able to deliver tea anytime. Nursing homes prepared various kinds of beverages other than green tea including coffee, black tea, cocoa, milk, orange juice, apple juice, etc. If the residents preferred some beverages other than green tea, the staffs served them. Care staffs patiently assisted the residents in drinking the beverages and

Table 1
Concepts of each protocol for individualized and comprehensive care strategy.

Summary of protocol	Concept
(1) To encourage complete meal intake	Since nursing homes manage nutritional states of their residents, incomplete meal intakes lead to insufficient nutrition (Sugiyama, 2006). Malnutrition is associated with the risk of poor health status. If energy and protein are appropriately supplied to malnourished elderly persons, their physical functions are improved (Akner and Cederholm, 2001).
(2) To increase fluid intake up to 1500 ml/day	Adults usually require 2400 ml water a day: 1200 ml from fluids; 900 ml from solids; and 300 ml from oxidation in the body (Ono, 2000). Our goal for fluids was approximately from 1200 to 1500 ml.
(3) To encourage urination in a toilet	Ms. Tanaka, a co-author, hypothesized that sitting on a toilet facilitates evacuation aided by gravity. In fact, when one sits on the toilet to defecate, the anorectal angle becomes obtuse so as to allow easy defecation (Konishi and Kanazawa, 1989). In addition, nursing home residents probably experience a higher quality of life when using toilets rather than diapers.
(4) To encourage time spent out of bed to over 6 h	Ms. Tanaka also hypothesized that nursing home residents, rather than remaining in bed, retain better control of their blood pressure and sense of balance when out of bed, and using their autonomous nervous system and preserving their trunk muscular strength. Time spent out of bed can also sharpen their appetite.
(5) To reduce time spent in wet diapers	Urinary incontinence can lead to physical complications such as skin irritation and urinary tract infection (Ouslander et al., 1982; Ouslander and Fowler, 1985; Schnelle et al., 1998, 2004, 2006; Fader et al., 2003). To minimize skin irritation caused by wet diaper pads, minimum-sized pads that can fully absorb a one-time volume of urination are recommended.

encouraged them to finish as much of their drink as they could manage. If the residents seemed to feel tired, they drank a cup of tea from time to time. Water intake volume was also recorded in residents' check sheets.

2.4.3. To encourage urination in a toilet

Care staffs provided individual assistance for resident toileting in this study. They assessed whether residents could maintain their sitting position unaided or would need assistance, and provided encouragement to use the toilet or commode chair. They actually accompanied residents to the toilet, prompted them to void, and asked them to stay seated for at least 15 min as necessary when attempting to urinate or defecate.

2.4.4. To encourage time spent out of bed to over 6 h

Care staffs tried to elevate bedridden residents, and encouraged ambulatory residents to spend their time socializing with others in nursing home living rooms. The care staffs attempted to keep usually bedridden residents sitting up longer than before this study. Staff also urged the ambulatory residents to frequent the living rooms for a longer time than before, and they arranged for residents to spend quality time in those living rooms by, for example, playing music CDs and chatting with one another frequently.

2.4.5. To reduce time spent in wet diapers

Care staffs conscientiously checked out the condition of diapers every 2 h. They carefully recorded the condition of diapers (dry or wet) on the check sheets when residents wet their diapers, and furnished them with fresh ones as soon as possible. Hours spent in wet diapers were calculated by subtracting the total time spent in dry diapers from 24 h. In addition, the care staffs were trained to determine when they started to use smaller instead of larger pads by assessing the weight of absorbed urine and comparing them with dry ones.

2.5. Assessment

Twice before and after a 12-week exposure to our individualized and comprehensive care strategy, the residents were assessed by Care level (Grade 1–5; with Grade 5 denoting the most severe state), by Independency level of the elderly with dementia (Grade I, II, III, IV, and M; with Grade M denoting the most severe state), and by Independency level of the elderly (J1, J2, A1, A2, B1, B2, C1, C2; with C2 denoting the most dependent state) using the criteria of the Japanese Ministry of Health, Labor and Welfare.

2.6. Statistical analysis

We used a paired *t*-test to compare 3-day mean water intakes and hours spent in wet diapers before and after the 12-week intensive care strategy. The Wilcoxon signed rank sum test was used to compare the size of the diaper pad before and after the 12-week period. We ranked 24 combination patterns among pants, diapers, and pads from rank 1 denoting cloth pants without pads to rank 24 denoting cloth diapers with two large-size pads; two kinds of pants and two kinds of diapers (i.e., 4 choices) with or without pads [6 choices: none, small, medium, large, extra large (LL) size pads, and two large-size pads]. We used SPSS 12.0J for Windows (SPSS Japan Inc., Tokyo) for statistical analysis.

3. Results

The mean age of the 122 nursing home residents participating in this study was 85.2 years (81.2 among males and 85.9 among females). Females comprised 85.2% of the study subjects. Fifty-seven percent of all subjects were in care level Grade 4. As to the

Table 2
Characteristics of 122 nursing home residents participating in this study.

Factors	Categories *n* (%)
Sex	
Men	18 (14.8)
Women	104 (85.2)
Care level[a]	
No	1 (0.8)
Grade 1 (mild)	0 (0)
Grade 2	5 (4.1)
Grade 3	28 (23)
Grade 4	70 (57.4)
Grade 5 (severe)	18 (14.8)
Independence level of elderly with dementia[b]	
Grade I (mild)	2 (1.7)
Grade II	18 (14.9)
Grade III	59 (48.8)
Grade IV (severe)	42 (34.7)
Independence level of elderly[c]	
J1 (independent)	0 (0)
J2	0 (0)
A1	7 (5.8)
A2	15 (12.4)
B1	28 (23.1)
B2	52 (43)
C1	7 (5.8)
C2 (dependent)	12 (9.9)

[a] Judged by the extent of time required for care giving. Elderly persons requiring a longer time are ranked at a more severe level. This judgement is used for payment of the Long-term Care Insurance managed by the Japanese Government.

[b] This classification aims to enable co-medical staffs to objectively and quickly determine the requirements of care giving for the elderly diagnosed with dementia by a physician so as to provide appropriate care.

[c] This classification served to spread the idea of being bedridden (Netakiri). The aim is for co-medical staffs to objectively and quickly determine the care giving requirements for the elderly with a disability in order to provide appropriate care.

Table 3
Difference in fluid intake and time spent in wet diapers before changing (wet time) before and after intervention by our comprehensive care strategy.

	Before	After	Difference, CI	p[a]
Fluid intake volume (ml/day)	881.1 ± 263.8	1146.4 ± 365.2	265.3 (213.5–317.2)	<0.001
Wet time (h/day)	13.9 ± 5.5	12.2 ± 5.9	−1.7 (−2.41 to −0.92)	<0.001

Note: Mean ± S.D. calculated from 3-day assessments were used to obtain difference before and after intervention.
[a] Paired *t*-test was used to evaluate difference before and after intervention.

independency level of the elderly, those categorized with dementia Grade III accounted for 48.8% of the study subjects, and those judged to be at the B1 to C2 independency level accounted for 81.8% (Table 2). The distribution of those three indices did not change after our 12-week intensive care strategy (data not shown).

The mean water intake volume of nursing home residents significantly increased after our intervention from 881.1 ± 263.8) (±S.D.) ml/day to 1146.4 ± 365.2 ml/day (mean difference of 265.3, 95% Confidence interval (CI) 213.5–317.2; $p < 0.001$) (Table 3). The mean time that residents spent before changing from wet diapers to fresh ones decreased from 13.9 ± 5.5 h to 12.2 ± 5.9 h/day (mean difference −1.7, CI = −2.41 to −0.92; $p < 0.001$).

After intervention, 34 residents (27.9%) improved their daytime UI care, 68 were unchanged, and 20 became worse ($p = 0.017$; Table 4). Among all residents, 17 who were wearing cloth pants with pads changed to smaller pads after the intervention. Two residents who had used training pants also changed to smaller pads. Five residents used no diapers or pads after the intervention as did as aged persons without dementia. No statistically significant improvement in nocturnal UI was observed.

The method of urination during daytime did not significantly change before and after intervention (14 residents improved, 5 worsened, and 103 were unchanged, Table 5). That method showed a statistically significant improvement during nighttime ($p = 0.007$; Table 6); 23 subjects (18.9%) improved, 8 worsened, and 91 were unchanged after the intervention; among those 23, 2 changed from using commode chairs to using toilets, while among residents who wore diapers, 10 changed to commode chairs and 8 to toilets.

4. Discussion

We confirmed that nursing home residents had a low volume of water intake (in average 881 ml/day), as other similar studies had

Table 4
Changing types of pants or diapers and the size of pads during daytime.

Before	After																							
	Cloth pants						Training pants						Diapers						Cloth diapers						
	None	S	M	L	LL	Two L	None	S	M	L	LL	Two L	None	S	M	L	LL	Two L	None	S	M	L	LL	Two L	Total
Cloth pants																									
None	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
S	1	9	6	10	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	20
M	1	6	26	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
L	0	2	6	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
LL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Two L	0	1	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Training pants																									
None	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
S	1	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
M	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
L	2	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
LL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Two L	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Diaper																									
None	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
M	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	4
LL	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Two L	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cloth diaper																									
None	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	6
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
LL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Two L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6	21	41	6	1	3	0	9	12	8	0	0	0	3	3	3	0	0	4	0	0	2	0	0	122

Note: Cloth pants are the most desirable and cloth diapers the least desirable option. Among similar types of pants or diapers, eliminating use of pads is the most desirable and use of two L pads is the least desirable option. "Two L" denotes using two large-size pads. A small-size pad can absorb less than 150 ml, a medium-size 150–449 ml, a large-size pad 450–999 ml, a LL-size pad 1000 ml or more.
Improved: 34 residents (under the diagonal).
Worsened: 20 residents (over the diagonal).
Unchanged: 68 residents (on the diagonal).

Table 5
Change in method of daytime urination.

	After				
	Toilet	Commode chair	Urinary chamber pot	Diaper	Total
Before					
Toilet	81	1	0	4	86
Commode chair	0	4	0	0	4
Urinary chamber pot	1	0	2	0	3
Diaper	7	4	2	16	29
Total	89	9	4	20	122

Improved: 14 residents (under the diagonal).
Worsened: 5 residents (over the diagonal).
Unchanged: 103 residents (on the diagonal).

Table 6
Change in method of nighttime urination.

	After					
	Toilet	Commode chair	Urinary chamber pot	Diaper	Cont. ind. catheter	Total
Before						
Toilet	7	1	0	3	0	11
Commode chair	2	8	1	1	0	12
Urinary chamber pot	0	0	0	1	0	1
Diaper	8	10	3	76	1	98
Total	17	19	4	81	1	122

Improved: 23 residents (under the diagonal).
Worsened: 8 residents (over the diagonal).
Unchanged: 91 residents (on the diagonal).

reported (Ouslander and Fowler, 1985; Schnelle et al., 2004, 2006; Simmons and Schnelle, 2006). Our study was the first in Japan to quantitatively clarify the level of water intake among nursing home residents. Following our individualized and comprehensive care strategy, we observed an increased volume of water intake and a reduction in the time residents wore wet diapers after urination. This strategy resulted in the following improvements in UI care: approximately a quarter of residents switched from diapers to pants or from larger to smaller pads during the day; and about one-fifth improved their method of urination from diapers to toilets at night.

Since we found that nursing home residents consumed insufficient water, we aimed to increase their water intake. However, an increase of water intake without any restriction may not necessarily improve UI care. A previous study has reported that many nursing homes advocated encouraging fluids to an "adequate level," often over 2000 ml/day in the United States (Ouslander and Fowler, 1985). An adequate fluid level and/or fluid restriction in the evening is usually encouraged for bladder training (Ouslander and Fowler, 1985). In other words, an adequate fluid intake reduces the risk of urinary tract infection and maintains normal bladder function. However, such adequate levels are often impractical and can worsen UI in patients with unstable bladders, though they may prove worthwhile for some patients with indwelling catheters (Ouslander and Fowler, 1985).

Although we tried to encourage a fluid intake volume of at least 1500 ml, the mean volume was only 1146.4 ml in the assessment conducted after the 12-week period. That volume proved insufficient, even when nursing home staff would deliberately increase residents' fluid intake; it would have been even lower, had the staff not tried to increase it. Previous studies have reported that medical records kept by nursing home staffs reflected an overestimate of residents' food and fluid intakes (Schnelle et al., 2004, 2006; Simmons and Schnelle, 2006). Prior to the introduction of our current strategy, nursing home staffs were not aware of the importance of accurately monitoring fluid volume, even though they encouraged residents to drink often. Moreover, staffs were seldom trained to accurately measure the volume of food intake. As a result, they were often slipshod in recording the volume, causing inaccurate estimations to be made. One reason for such inaccuracies may be the lack of an adequate staff who would carefully observe and record residents' intake volumes (Schnelle et al., 2004).

We observed a decrease in the amount of time residents were left unattended before their wet diapers were changed. Since UI can lead to physical complications such as skin irritation and urinary tract infection (Ouslander et al., 1982; Ouslander and Fowler, 1985; Schnelle et al., 1998, 2004, 2006; Fader et al., 2003), it is desirable that time spent in a wet diaper be kept to a minimum. According to a previous study using a micturition-monitoring device, the mean wet time was over 1 h for every UI episode if the nursing home staff failed to encourage prompt voiding (Toba et al., 1996). Another study showed that in most nursing homes the mean time spent in a wet diaper before changing was approximately 200 min (Schnelle et al., 1998).

As a result of our strategy, we observed improvements in incontinence care among one-fourth of residents such as changing from diapers to pants or from larger to smaller pads. Such improvements, however, occurred in daytime rather than at night, one possible reason being an insufficiency of nighttime nursing home staffs. In that situation, residents' pads were changed less often. To reduce the frequency of pad changing, staffs may have preferred larger pads but been unable to substitute them for smaller ones.

To improve the quality of care for nursing home residents, more and better educational programs on individualized care and the quality control of care are needed. Several studies have suggested that individualized incontinence care was able to improve UI (Gotoh et al., 2001; Mori, 2001; Ouslander et al., 2001; Toba, 2002; Fader et al., 2003; Takahashi et al., 2004). However, almost all nursing homes in our study had no prior strategy of individual incontinence care before this study, since the staffs were unaware that such care could improve a resident's incontinence. If, as in our study, nursing home staffs are educated and encouraged to practice intensive and individualized incontinence care including precise ongoing assessments of their residents' incontinence, some residents currently wearing diapers may no longer need them. In short, inappropriate care for the elderly who wear diapers may be simply due to a lack of sufficient education and training regarding UI. In addition, adequate management systems and auditing technologies are also needed (Schnelle et al., 2004). However, attempting to educate or motivate staffs to provide unrealistic levels of care may be even more ineffective and counterproductive (Schnelle et al., 2004).

Although a preintervention assessment showed that more residents wore diapers at night than in the day, only nighttime incontinence care had improved after the intervention period. One reason may be the unnecessary use of diapers for residents who had improved nighttime control. Although nursing home staffs should individualize nighttime incontinence care to minimize disrupting the sleep of other residents (Ouslander et al., 1993, 2001; Schnelle et al., 1998; Fader et al., 2003), they often indiscriminately used diapers with pads large enough to absorb an entire night's volume of urine. Nighttime staffs are often too few to conduct painstaking incontinence care such as prompt voiding (Gotoh et al., 2001; Fader et al., 2003).

There are several limitations to the current study. First, since this is not a randomized controlled trial, several unavoidable factors could have biased the results. One such factor is measurement bias.

Because some of the data were collected by those who actually performed the individualized and comprehensive care strategy, they might have overestimated the effect of their intervention. The second limitation is in the procedure for checking wetness. We defined diapers or pads as wet when trained staffs felt them to be heavier than identical dry diapers or pads. The third limitation concerns the necessity of working with diapers and pads made by different manufacturers, which could lead to variations in evaluating wetness depending on the brands of diapers or pads available. The fourth limitation is the difficulty of obtaining accurate information on the frequency of incontinent episodes and other medical information, e.g., present and past illness, and diagnosis by physician, from nursing staff or nursing home records. In the nursing home records we examined, there were no specific evaluations documented by urologists similar to those in other studies (Ouslander et al., 1982; Ouslander and Fowler, 1985; Mori et al., 1999; Gotoh et al., 2001; Toba, 2002; Okamura et al., 2003a,b).

In conclusion, this study suggests that our individualized and comprehensive care strategy of educating nursing home staffs to encourage residents to raise their food and water intake levels and to reduce the time they spend in wet diapers may be useful in improving UI.

Conflict of interest

None.

Acknowledgments

For their invaluable help in this study, we are deeply indebted to all nursing home staff and residents, especially to Ms. Tomoko Otaguro who passed away before it could be completed.

References

Aimer, G., Cederholm, T., 2001. Treatment of protein-energy malnutrition in chronic nonmalignant disorders. Am. J. Clin. Nutr. 74, 6–24.

Fader, M., Clarke-O'Neill, S., Cook, D., Dean, G., Brooks, R., Cottenden, A., Malone-Lee, J., 2003. Management of night-time urinary incontinence in residential settings for older people: an investigation into the effects of different pad changing regimes on skin health. J. Clin. Nurs. 12, 374–386.

Gotoh, M., Yoshikawa, Y., Ono, Y., Ohshima, S., Kato, K., Kato, T., Kondo, A., Takeda, M., Ito, I., Iguchi, A., 2001. A fact-finding inquiry and future strategy on the management of voiding dysfunction in the institutionalized elderly at nursing homes: a questionnaire and interview survey. Nihon Shinkei Insei Boukou Gakkaishi 12, 207–222 (in Japanese).

Konishi, F., Kanazawa, K., 1989. Physiology of defecation. Geka 51, 119–124 (in Japanese).

Mizoguchi, T., Iijima, S., Niino, N., Orimo, H., 1995. Reliability and validity of a Japanese version of the cost of care index. Nippon Ronen Igakkai Zasshi 32, 403–409 (in Japanese).

Mori, S., 2001. Approach to the elderly with urinary incontinence. Nippon Ronen Igakkai Zasshi 38, 760–762 (in Japanese).

Mori, S., Kojima, M., Sakai, Y., Nakajima, K., 1999. Bladder dysfunction in dementia patients showing urinary incontinence: evaluation with cystometry and treatment with propiverine hydrochloride. Nippon Ronen Igakkai Zasshi 36, 489–494 (in Japanese).

Okamura, K., Nagahama, K., Usami, T., Nagata, H., Abe, T., Katsuno, S., Kawano, K., Sato, S., Harada, M., 2003a. Criteria for general practitioners to assess treatment efficacy for urination problems of the elderly. Nippon Ronen Igakkai Zasshi 40, 352–359 (in Japanese).

Okamura, K., Nagahama, K., Usami, T., Nagata, H., Abe, T., Katsuno, S., Kawano, K., Sato, S., Harada, M., 2003b. Initial assessment criteria for urination problems of the elderly: comparison of criteria for patients/caregivers/nurses, general practitioners, and urologists. Nippon Ronen Igakkai Zasshi 40, 360–367 (in Japanese).

Ono, T., 2000. Water intake. In: Hongo, T., Hiroshige, T. (Eds.), Standard Textbook of Physiology. 5th ed. Igakushoin, Tokyo, (in Japanese), pp. 418–420.

Ouslander, J.G., Fowler, E., 1985. Management of urinary incontinence in Veterans Administration nursing homes. J. Am. Geriatr. Soc. 33, 33–40.

Ouslander, J.G., Kane, R.L., Abrass, I.B., 1982. Urinary incontinence in elderly nursing home patients. J. Am. Med. Assoc. 248, 1194–1198.

Ouslander, J., Schnelle, J., Simmons, S., Bates-Jensen, B., Zeitlin, M., 1993. The dark side of incontinence: nighttime incontinence in nursing home residents. J. Am. Geriatr. Soc. 41, 371–376.

Ouslander, J.G., Al-Samarrai, N., Schnelle, J.F., 2001. Prompted voiding for nighttime incontinence in nursing homes: is it effective? J. Am. Geriatr. Soc. 49, 708–709.

Schnelle, J.F., Cruise, P.A., Alessi, C.A., Al-Samarrai, N., Ouslander, J.G., 1998. Individualizing nighttime incontinence care in nursing home residents. Nurs. Res. 47, 197–204.

Schnelle, J.F., Bates-Jensen, B.M., Chu, L., Simmons, S.F., 2004. Accuracy of nursing home medical record information about care-process delivery: implications for staff management and improvement. J. Am. Geriatr. Soc. 52, 1378–1383.

Schnelle, J.F., Ouslander, J.G., Simmons, S.F., 2006. Direct observations of nursing home care quality: does care change when observed? J. Am. Med. Dir. Assoc. 7, 541–544.

Simmons, S.F., Schnelle, J.F., 2006. A continuous quality improvement pilot study: impact on nutritional care quality. J. Am. Med. Dir. Assoc. 7, 480–485.

Sugiyama, M., 2006. The revolution of nutritional care and management in the revised long-term care insurance. Hoken Iryo Kagaku 55, 32–41 (in Japanese).

Takahashi, S., Tanaka, T., Kodaira, H., Ota, H., Kanazawa, Y., Sakata, T., Ikeda, K., Igarashi, N., Nitta, Y., Koizumi, S., 2004. Fukushima ken koureisha haisetsu jiritsu shien jigyou houkokusho: Fukushima Prefecture Social Health and Welfare Department, Social Welfare Division, Seniors Health Welfare Group (in Japanese), P12–P22.

Toba, K., 2002. Urinary incontinence in the elderly: functional assessment and therapy. Nippon Ronen Igakkai Zasshi 39, 606–609 (in Japanese).

Toba, K., Sudo, N., Nagano, K., Eto, M., Kozaki, K., Akishita, M., Hashimoto, M., Yumita, K., Hara, M., Fukushima, M., Orimo, H., Ouchi, Y., 1996. Use of a micturition-monitoring device in elderly inpatients. Nippon Ronen Igakkai Zasshi 33, 681–685 (in Japanese).

老年精神医学雑誌　第20巻第10号(2009.10)別冊

原著論文

認知症高齢者における行動観察評価スケール NOSGERの検討（第1報）

―― 信頼性の検討 ――

梅本充子・遠藤英俊・三浦久幸

[原著論文]

認知症高齢者における行動観察評価スケール NOSGERの検討（第1報）

―― 信頼性の検討 ――

梅本充子[*1]・遠藤英俊[*2]・三浦久幸[*2]

*1 名古屋女子大学，*2 国立長寿医療センター

抄録

認知症高齢者に対する行動観察評価NOSGER日本語版の信頼性の検討を行った．老人保健施設，グループホームに入所中の高齢者27人を対象に，看護師1人と介護福祉士1人による評価者間の信頼性の検討を行った．27人を分析対象に各30項目において一致率の指標であるκ指数，Spearman相関係数およびα係数を検討した．結果，感情の項目「機嫌がよさそうである」「むなしさを訴える」はいずれも低い一致率を示した．κ指数においては，上記項目のほかに「夜間は落ち着かない」に低い値が示されたものの，他の項目はκ指数0.296～0.686の範囲で中等度から相当高い値を示し，Spearman相関係数0.455～0.941，α係数0.606～0.969を示した．抽象性の高い項目に改善の余地があるものの各項目の一致率が高く，NOSGER日本語版の信頼性が示された．

Key words：行動観察評価スケール，NOSGER，信頼性，認知症高齢者

老年精神医学雑誌 20：1139-1148，2009

はじめに

認知症高齢者に対する評価は，中核症状としての認知機能障害を測定すると同時に，周辺症状を含んだ総合的な評価が求められている．医療機関のみならず，施設・在宅など介護に携わる人々にとって，認知症の状態を適切に把握することは，初期段階での早期発見や予防的介入，さらには患者の残存能力を生かしたリハビリへの介入など医療福祉が連携した介護プランの策定に重要かつ不可欠である．NOSGER（Nurses' Observation Scale for Geriatric Patient）[1,6]は，簡便であると同時に，日常生活行動から客観的評価が可能であり，医師など専門家以外でも測定可能な包括的尺度である．また本尺度は，世界の主要言語に翻訳され，信頼性も確認された汎用性の高い国際尺度であるが，これまでわが国では，ほとんど活用されていない．本研究では，認知症高齢者に対する行動観察評価NOSGERの信頼性の検討を行ったので報告する．

NOSGERは，アルツハイマー型認知症に対する新たな薬物療法の開発において，薬効を判定する行動観察評価尺度としてSpiegelら[5]により1991年に報告された．NOSGERの構築にあたっては，精神疾患患者の行動症状を評価する尺度NOSIE[2]と，老年精神疾患患者における評価尺度GEERI[4]の項目をできるかぎり多く取り入れた新しいスケールNOSGERとして考案された．信頼性については，Spiegelら[5]により，スイスとカナダにおいて，在宅や老人ホーム入所高齢者32人，在宅の認知症高齢者27人，ナーシングホーム入所の認知症高齢者28人という多施設共同研究が行われ（Brunner CH，1989；Brunner CH，Spiegel R，1990；Puxty，1988～1989，未発表）[3]，再テスト，評価者間テストによる検討がなされている．評価者間による信頼性の検討では，近親者および看護師間によるもので，再テスト法による

（受付日　2008年7月24日）

Mitsuko Umemoto, Hidetoshi Endo, Hisayuki Miura

*1 〒467-8610　愛知県名古屋市瑞穂区汐路町3-40

表1　NOSGER 質問用紙

Nurses' Observation Scale for Geriatric Patients（NOSGER Ⅱ）

教示：患者さんの最近2週間の行動様式を調査しますので，以下の30項目についてご自身の観察に基づいて，最も該当する欄を選んでください．

		常時	ほとんどつねに	しばしば	時々	まったくなし
1	ひげ剃りまたは化粧，整髪が一人でできる	1	2	3	4	5
2	好みのラジオ・テレビ番組を理解する	1	2	3	4	5
3	悲哀感を訴える	5	4	3	2	1
4	夜間は落ち着かない	5	4	3	2	1
5	周囲の出来事に関心を示す	1	2	3	4	5
6	自室をきれいに保とうとする	1	2	3	4	5
7	排便はコントロールできる	1	2	3	4	5
8	中断後も会話の内容を覚えている	1	2	3	4	5
9	簡単な買い物（新聞や食料）に出かける	1	2	3	4	5
10	むなしさを訴える	5	4	3	2	1
11	ひとつの趣味を続けている	1	2	3	4	5
12	会話中に同じことを何回も繰り返す	5	4	3	2	1
13	悲しげにまたは涙ぐんで見える	5	4	3	2	1
14	身なりが清潔できちんとしている	1	2	3	4	5
15	施設や自宅から逃げ出す	5	4	3	2	1
16	親友の名前を覚えている	1	2	3	4	5
17	身体的に可能な範囲で他人の手助けをする	1	2	3	4	5
18	不適切な装いで外出する	5	4	3	2	1
19	いつもの環境では，順応している	1	2	3	4	5
20	質問するとイライラして不機嫌そうになる	5	4	3	2	1
21	周囲の人と交流する	1	2	3	4	5
22	衣類などの品物の置き場所を覚えている	1	2	3	4	5
23	言葉または動作が攻撃的である	5	4	3	2	1
24	排尿はコントロールできる	1	2	3	4	5
25	機嫌がよさそうである	1	2	3	4	5
26	友人または家族との交流を続けている	1	2	3	4	5
27	ある人を別の人と勘違いする	5	4	3	2	1
28	催しごと（来客やパーディー）を楽しむ	1	2	3	4	5
29	家族または友人と親しげに会話を楽しむ	1	2	3	4	5
30	頑固で，指示や規則に従わない	5	4	3	2	1

下位尺度，＊逆点項目

①記憶：8，12*，16，22，27*

②道具を用いる日常行動：2，6，9，11，19

③セルフケア：1，7，14，18*，24

④感情：3*，10，13*，25，28

⑤社会的活動：5，17，21，26，29

⑥行動障害：4*，15*，20*，23*，30*

(Spiegel R, Brunner C, Ermini-Funfschilling D, Monsch A, et al.: A new behavioral assessment scale for geriatric out- and in-patient ; The NOSGER (Nurses' Observation Scale for Geriatric Patients). *J Am Geriatr Soc*, 39: 339-347, 1991，翻訳：新井〃による)

検討では看護師によって2，4，12週間後に繰り返し行われ，いずれも高い信頼性が得られている．NOSGERの下位尺度は記憶，道具を用いる日常行動，セルフケア，感情，社会的活動，行動障害の6つの下位尺度ごとに5項目を設定し，全体で30項目の包括的行動評価である．評価は，「常時」「ほとんどつねに」「しばしば」「時々」「まったくなし」の5段階からなる．評価点は総合点で示され，低得点は機能障害の程度が軽いことを示し，高得点になるほど障害が重いことを示す．

表2　研究参加者属性

N = 27

項目	カテゴリー	人数	%
性　別	男性	2	7.4
	女性	25	92.6
年　齢	70～79歳	6	22.2
	80～89	10	37.0
	90～96	11	40.7
診断名	アルツハイマー型認知症	10	37.0
	老人性認知症	10	37.0
	アルツハイマー・老人性混合型認知症	2	7.4
	血管性認知症	4	14.8
	老人性うつ病，老人性認知症	1	3.7
要介護度	要支援	0	0.0
	要介護1	5	18.5
	要介護2	6	22.2
	要介護3	7	25.9
	要介護4	8	29.6
	要介護5	1	3.7
CDR評価	CDR 0	1	3.7
	CDR 0.5	7	25.9
	CDR 1	8	29.6
	CDR 2	7	25.9
	CDR 3	4	14.8

Ⅰ．研究方法

1．研究参加者

愛知県T市，老人保健施設・グループホームに入所の高齢者，計27人を調査対象とした．

2．調査方法

実施期間は2004年8～9月であり，信頼性を検討するため評価者間のテストを行った．NOSGERの評定は，看護師，介護者（介護福祉士）それぞれ1人に依頼し，行動観察スケールNOSGER評価尺度（表1）を用いて測定した．その際，NOSGERの評価については，本来尺度の作成意図から検査者の判断で行うことを条件としており，具体的な指示は行わずに依頼した．NOSGERの評価尺度の翻訳版は，新井[1]による翻訳のものを使用した．

3．分析方法

統計解析ソフトはSPSS（11.5J）を使用した．

4．倫理的配慮

調査にあたっては，研究の趣旨と目的，回答は自由意思であること，また自由意思の判断がむずかしい認知症の場合は，家族に文書で説明し，同意が得られた場合に依頼をお願いした．

Ⅱ．結　果

1．研究参加者の属性

愛知県T市，グループホームに入所中17人，老人保健施設入所中10人の計27人であり，認知症と診断された高齢者に行った．性別は男性2人，女性25人，年齢平均85歳SD 6.5であった．要介護度は，平均2.7 SD 1.1であった．研究参加者の属性を表2に示す．診断名は，いずれも認知症であり，要介護度は要支援と要介護5が少なく，要介護1～4がほぼ均等の割合を示した．認知症重症度を示す評価としてClinical Dementia Rating（CDR）の得点分布を示した．健康（CDR 0）と重度（CDR 3）の割合が少なく軽度，中等度認知

表3　NOSGERの評価者間信頼性（30項目）

下位尺度		質問項目	
		原文	訳
①記憶	8	Remembers a point in conversation after interruption.	中断後も会話の内容を覚えている
	12	Repeats the same point in conversation over and over.	会話中に同じことを何回も繰り返す
	16	Remembers names of close friends.	親友の名前を覚えている
	22	Remembers where clothes and other things are placed.	衣類などの品物の置き場所を覚えている
	27	Confuses the identity of some people with others.	ある人を別の人と勘違いする
②道具を用いる日性行動	2	Follows favorite radio or TV programes.	好みのラジオ・テレビ番組を理解する
	6	Tries to keep his / her room tidy.	自室をきれいに保とうとする
	9	Goes shopping for small items (newspaper, groceries).	簡単な買い物（新聞や食料）に出かける
	11	Continues with some favourite hobby.	ひとつの趣味を続けている
	19	Is orientated when in usual surroundings.	いつもの環境では，順応している
③セルフケア	1	Shaves or puts on makeup, combs hair without help.	ひげ剃りまたは化粧，整髪が一人でできる
	7	Is able to control bowels.	排便はコントロールできる
	14	Clean and tidy inapperance.	身なりが清潔できちんとしている
	18	Goes out inappropriately dressed.	不適切な装いで外出する
	24	Is able to control bladder function (urine).	排尿はコントロールできる
④感情	3	Reports he / she feels sad.	悲哀感を訴える
	10	Reports feeling worthless.	むなしさを訴える
	13	Appears sad or tearful.	悲しげにまたは涙ぐんで見える
	25	Appears to be cheerful.	機嫌がよさそうである
	28	Enjoys certain events (visits, parties).	催しごと（来客やパーティ）を楽しむ
⑤社会的活動	5	Is interested in what is going on around him / her.	周囲の出来事に関心を示す
	17	Helps others as far as physically able.	身体的に可能な範囲で他人の手助けをする
	21	Makes contact with people around.	周囲の人と交流する
	26	Maintains contact with friends or family.	友人または家族との交流を続けている
	29	Appears friendly and positive in conversation with family members or friends.	家族または友人と親しげに会話を楽しむ
⑥行動障害	4	Is restleess during the night.	夜間は落ち着かない
	15	Runs away.	施設や自宅から逃げ出す
	20	When asked questions, seems quarrelsome and irritable.	質問するとイライラして不機嫌そうになる
	23	Is aggressive (verbally or physically).	言葉または動作が攻撃的である
	30	Behaves stubbornly, dose not follow instructions or rules.	頑固で，指示や規則に従わない

症の割合が約80%を示した．

2．評価者間による信頼性の検討

看護師1人と介護福祉士1人による評価者間の信頼性の検討を行った．27人を分析対象に一致率の指標であるκ指数，Spearman相関係数およびα係数を検討した．その結果を表3に示した．κ係数の解釈基準は，$\kappa \leq 0.20$であれば“わずかな”（slight），$0.20 < \kappa \leq 0.40$であれば“まずま

N = 27

得点〔平均値±SD〕		κ係数	Spearman 相関係数	Cronbach's α係数
看護者	介護者			
3.48±1.12	3.44±0.93	0.315	0.737	0.860
2.37±1.14	2.33±0.92	0.355	0.673	0.867
3.41±1.15	3.48±0.94	0.388	0.578	0.793
3.30±1.30	2.89±1.19	0.431	0.803	0.869
2.30±1.07	2.26±0.90	0.463	0.681	0.835
3.11±1.37	3.07±1.07	0.458	0.706	0.823
3.63±0.93	3.59±0.84	0.531	0.862	0.910
3.56±1.34	3.26±0.98	0.528	0.851	0.916
3.93±1.21	3.93±1.24	0.686	0.941	0.969
2.15±0.72	2.26±0.94	0.553	0.737	0.884
3.27±1.25	3.04±1.19	0.341	0.761	0.868
2.89±1.15	2.96±1.13	0.296	0.619	0.738
2.71±1.14	2.44±0.80	0.574	0.825	0.827
1.78±1.01	1.74±0.81	0.532	0.712	0.773
2.63±1.18	2.48±1.01	0.357	0.578	0.739
2.11±0.75	2.19±0.74	0.300	0.782	0.862
2.00±0.73	2.22±0.80	0.207	0.455	0.606
1.70±0.67	1.74±0.53	0.413	0.534	0.733
2.30±0.82	2.56±1.01	−0.128	0.075	0.150
2.41±0.69	2.63±0.74	0.597	0.749	0.829
3.48±0.64	3.22±0.75	0.558	0.827	0.879
3.85±1.03	3.67±0.78	0.540	0.749	0.878
3.00±0.83	2.85±0.77	0.455	0.684	0.835
2.92±0.78	2.88±0.64	0.460	0.771	0.857
2.74±0.71	2.70±0.61	0.550	0.721	0.806
1.93±1.00	1.85±0.72	0.270	0.834	0.901
1.33±0.62	1.56±0.89	0.677	0.923	0.755
1.78±0.58	1.85±0.66	0.365	0.475	0.624
1.96±0.76	2.07±0.83	0.410	0.681	0.836
2.07±0.96	2.22±0.80	0.393	0.458	0.685

ずの" (fair)，$0.40 < \kappa \leq 0.60$ であれば中等度の (moderate)，$0.60 < \kappa \leq 0.80$ であれば相当高い (substantial)，$0.80 < \kappa$ であれば"ほぼ完全な" (almost perfect) 一致を示すものとされる[9]．各項目の評価者間の一致率による最も低いκ係数は，項目「機嫌がよさそうである」−0.128であり，まずまずの一致を示す項目は，「むなしさを訴える」0.207，「夜間は落ち着かない」0.270であった．