

Table 2 Functional fitness items in each group at pre- and postintervention

Item	Pre-intervention	Postintervention	Group × Time <i>F</i> -value	Interaction <i>P</i> -value
10-m walking time (s)				
CC group	16.2 ± 7.4	14.1 ± 4.4	0.01	0.91
SC group	18.6 ± 10.0	15.1 ± 6.2		
10-m walking step (<i>n</i>)				
CC group	27.5 ± 8.1	26.6 ± 7.2	1.08	0.30
SC group	31.6 ± 14.3	27.3 ± 9.9		
TUG (s)				
CC group	13.6 ± 5.2	13.7 ± 5.3	0.18	0.67
SC group	18.3 ± 9.4	14.8 ± 7.1		
Functional reach (cm)				
CC group	15.9 ± 9.3	16.1 ± 8.2	3.21	0.08
SC group	13.8 ± 7.5	14.0 ± 6.8		
One leg standing (s)				
CC group	6.0 ± 7.4	5.1 ± 5.7	2.56	0.12
SC group	3.2 ± 3.6	4.9 ± 6.1		
Performing time under simple course (s)				
CC group	15.9 ± 8.8	14.5 ± 4.0	0.28	0.60
SC group	17.2 ± 7.9	15.5 ± 5.9		
Performance time under complex course (s)				
CC group	132.6 ± 36.9	105.7 ± 18.7	5.63	0.02
SC group	152.0 ± 54.1	140.9 ± 53.8		
No. obstacles contacted under simple course (times)				
CC group	1.0 ± 1.1	0.3 ± 1.1 [†]	0.60	0.44
SC group	1.2 ± 1.4	0.2 ± 0.6 [†]		
No. obstacles contacted under complex course (times)				
CC group	1.9 ± 2.1	0.1 ± 0.4 [†]	5.62	0.02
SC group	1.7 ± 2.0	1.8 ± 2.8 [†]		

[†]As calculated by group comparison $P < 0.05$. Columns indicating pre- and postintervention values are expressed as mean (SD). CC, complex course obstacle negotiation exercise; SC, simple course obstacle negotiation exercise; TUG, timed up and go test.

Discussion

The SC exercise is an obstacle-avoidance program under simple task conditions. The CC exercise is an obstacle-avoidance program under complex task conditions, and is designed to address multiple domains, such as attention, short-term memory and balance, which when impaired have been shown to increase fall risk.²¹ The present results show that the CC program can improve the performance time of the CC test. This result is consistent with our previous study.¹⁰

In the CC program, the obstacles were organized to gradually increase the level of difficulty. Therefore, it is possible that the CC program improves the participants' performance by decreasing the number of obstacles contacted under the CC conditions. This result suggested that the obstacle-avoidance program, which increases attention demands for obstacles during

walking under complex task conditions, is useful for the improvement of obstacle-avoidance capability. Previous studies have shown that the obstacle-avoidance success rate was decreased by the presence of a secondary task.^{22,23} Furthermore, elderly individuals with a high risk for falls chose an early transfer of gaze strategy when challenged with an obstacle under dual-task conditions.¹³ The present study showed that our CC program could improve divided attention under complex task conditions.

The differences in fall and fall-related fracture rates between CC and SC groups were significant during the 12 months after the intervention. The improvement in the number of obstacles contacted and the performance time of the CC test became apparent in increased capacity in a real-life environment.

There were several limitations of the present study that warrant mention. First, the participants were

probably more motivated and showed greater interest in health and fall risk than the general population of older adults. Second, the information about the medications for osteoporosis was not included in the analysis. It is possible that such medications have an effect on the fracture incidence.

The results of this RCT suggest that the CC program is more effective in improving the number of obstacles contacted and the performance time of the CC test than the SC program. In addition, participants who received individualized obstacle-avoidance training under complex tasks combined with a traditional intervention showed a lower incidence rate of falls and fall-related fractures during the 12-month follow-up period. These results implicated the importance of population-based prevention programs to reduce falls and fall-related fractures in older adults (75 years and older). This is the first study to show that the obstacle-avoidance program, focusing on attention demands of obstacles during walking under complex task conditions, is useful in preventing falls and fall-related fractures in older adults. A larger study is needed to confirm the present results and to evaluate the most effective exercises for the prevention of falls and fall-related fractures.

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Disclosure statement

The authors declare no conflict of interest.

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COMMISSION REPORT

Toward the realization of a better aged society: Messages from gerontology and geriatrics

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1. Background: Recent medical advancements, and improvements in hygiene and food supply have led to Japan having the longest life expectancy in the world. Over the past 50 years, the percentage of the elderly population has increased fourfold from 5.7% in 1960 to 23.1% in 2010. This change has occurred at the fastest rate in the world. Compared with France, where the percentage of the elderly population has increased just twofold in the past 100 years, Japanese society is aging at an unprecedented rate. In addition, the percentage of the very elderly (aged 75 years and over), comprising more frail people, exceeded 10% of the nation's population in 2008. In such a situation, many elderly Japanese wish to spend their later years healthy, and wish to achieve great accomplishments in their lives. To achieve that, rather than considering an aging population as a negative social phenomenon, we should create a society where elderly people can enjoy a healthy, prosperous life through social participation and contribution.

Factors that hamper the elderly from leading a healthy life include various psychological and social problems occurring in older age, as well as a high incidence of diseases. Therefore, gerontology, which focuses on health promotion of the elderly by encompassing the study of social welfare, psychology, environment and social systems; and geriatrics, which focuses on health care of elderly people and carried out research, education and practices to promote health in the elderly, are becoming more important. Furthermore, along with a need for multidisciplinary care to support geriatric medicine, the development of a comprehensive education system for aged-care professionals is awaited. Thus, we should now recognize the importance of gerontology and geriatrics, and a reform of medical-care services should be made in order to cope with the coming aged society.

Population aging is a global phenomenon. The actions being taken by Japan, the world's most aged society, have been closely watched by the rest of the world. Japan's aged society has been posing not only medical, nursing and welfare problems, but also complex problems closely associated with economy, industry and culture. Therefore, to solve these

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Proposal from The Subcommittee for Aging, The Science Council of Japan

problems, a macroscopic integration and cooperation among industries, education institutions, administration and community through an interdisciplinary approach including medical science, nursing science, nursing care, study of social welfare, social science, engineering, psychology, economics, religion and ethics should be made. Regarding the promotion of gerontology, the “**Committee for Establishing a Scientific Community for Sustainable Aged Society**” of the Science Council of Japan also prepared a proposal and this was announced on 20 April 2011.

2. Current situation and problems

(1) Promotion of social participation and contribution of elderly people

In Japan, the overall labor force rate is expected to decrease in the near future as a result of the low birth rate and high life expectancy. In contrast, many elderly people, particularly the young-old, have sufficient physical strength to fulfil their job duties and make a social contribution. For these people, a social structure where elderly people can work should be developed through re-educating the elderly and providing various job types. Promotion of social participation and contribution of the elderly is expected to cause a substantial increase in the labor force. Furthermore, it is also expected to contribute to not only the upturn of national economic activity through an increase in total consumption, but also a decrease in the number of elderly people who are likely to be in need of care. Therefore, in order for elderly people to be engaged in various social activities, strategies for developing a social structure for re-education, various employment statuses and employment opportunities should be prepared. However, as the total number of jobs is fixed, consideration should also be given to young workers.

(2) Fostering medical specialists for aging

Older people often suffer from many diseases, together with geriatric syndromes with multiple etiologies. Signs and symptoms vary according to each individual, and are often atypical; therefore, the patients visit different hospitals and receive many screening tests and prescriptions at the same time. To solve this problem, an effective screening system carried out by a primary-care doctor, and privacy-preserving medical data sharing among hospitals and clinics are needed. In a geriatric clinical setting, health-care professionals should be aware of the physical traits of older people who often develop not only dementia, but also geriatric syndromes, such as depression, falls and urinary incontinence, so that a holistic approach with consideration of nursing care is required. However, the existing Japanese medical education system is not prepared for medical professionals enabled to respond to the aforementioned requirements. Thus, the fostering of medical professionals who can provide comprehensive care – especially for the oldest-old – such as geriatric specialists and medical professionals who understand the principles of elderly care, is urgently needed.

(3) Diagnosis of elderly-specific diseases and reform of medical-care services

In Japan, the diagnostic system for elderly-specific diseases, including dementia, and reform of medical care services are markedly delayed. The current status concerning diagnosis, care and nursing should be investigated to collect academic data. In order to accumulate evidence for providing safe elderly care and nursing, the promotion of clinical research and a marked expansion of geriatric medical centers with high-level medical services are eagerly awaited.

(4) Promotion of home-based care and multidisciplinary care

To reduce the length of stay in acute hospitals, to reduce the physical burden of health-care professionals working at acute hospitals and to meet the demand of older people who prefer to remain in their own homes, further promotion of home-based care is needed. In addition, “multidisciplinary care” is increasingly needed to meet various demands in the medical care and welfare of the elderly. It is considered important to share countermeasures against the problems of disease prevention, medicine, care and welfare among health-care professionals in medicine, care and welfare, and cooperate by making the best use of health-care professionals’ specialties.

3. Contents of the proposal

The subcommittee for aging, thus, provided the following proposal:

- 1 Development and promotion of systems that enable elderly people to participate socially and make a contribution using an interdisciplinary approach among the various areas,

- including nursing science, nursing care, study of social welfare, social science, psychology, economics, religion and ethics, as well as medical sciences;
- 2 Promotion of gerontology, reform and enhancement of geriatrics in undergraduate, postgraduate and lifelong education;
 - 3 Building geriatric medical centers in each area, and accumulating large-scale evidence of geriatric diseases and geriatrics; and
 - 4 Structural development and promotion of home-based care and multidisciplinary care.
- Through implementation of the above measures, Japan is expected to function as a successful example for the rest of the world. *Geriatr Gerontol Int* 2012; 12: 16–22.

Keywords: education, elderly, geriatrics, gerontology, multidisciplinary approach.

1. Preface

Over the past 50 years, the percentage of elderly people in the population of Japan has increased fourfold from 5.7% in 1960 to 23.1% in 2010. Japanese society is aging at an unprecedented rate. According to the National Institute of Population and Social Security Research, the percentage the elderly population is estimated to continue increasing, reaching 26.0% in 2015 and further increasing rapidly. After 2020, the percentage of elderly people in the population is expected to stabilize; however, as a result of a decrease in the total population, the percentage will further increase to 40.5%, peaking in 2055. Japan will face a super-aged society, in which 40% of the population will be over 65 years-of-age. Unless appropriate countermeasures are taken, such as a rapid improvement in clinical skills and knowledge among physicians involved in geriatrics, marked advances in the prevention of lifestyle-related diseases, prevention of geriatric syndromes including dementia, and marked expansion of home-based care or local-care, we cannot avoid a situation where many frail elderly people have to live with no support. However, many issues remain; that is, a marked reduction of long-term care facilities, a reduction in length of hospital stay in acute hospitals and a delay in expanding home-based care system, and whether thanatology reflects a social change. We should also consider social issues, such as ageism, caregiver burnout, dignified death and the appropriateness of placing gastrostomy tubes in elderly patients with dementia. To provide dignified care, particularly for older people, appropriate care should be carried out in not only the terminal phase, but also during the last few years before death.

However, despite the challenge, little is known about gerontology and geriatrics in Japan, and they are not fully used in clinical settings or education. To solve this problem, a macroscopic integration and cooperation are needed, using an interdisciplinary approach involving medical science, nursing science, nursing care, study of social welfare, social science, engineering, jurisprudence, economics, psychology and ethics. Furthermore, along with the reform and enhancement of geriatrics in

undergraduate and postgraduate education, fostering specialists who can practice geriatrics is needed. Also, for non-geriatricians or general practitioners who currently and prospectively provide care in clinical settings, an educational system should be prepared to deepen their understanding of geriatric medicine.

2. Current situation and measures

(1) Social contribution of the elderly and the medical economy

As a result of the low birth rate, the percentage of the total labor force (aged 20–64 years) is expected to decrease in Japan. Elderly people are usually divided into two groups based on age: 65–84 years (young-old) and 75 years and older (old-old). Although many elderly people, particularly the young-old, have sufficient physical strength to fulfil their job duties and a make social contribution through productive activity, they are not fully utilized. The promotion of social participation and the contribution of the elderly is expected to contribute to creating purpose in their lives, as well as an increase of a substantive productive population, financial stability and self-sustainability for the elderly, and an upturn of national economic activity through an increase of total consumption. Therefore, for elderly people to be engaged in various social activities, strategies for developing a social structure for re-education, volunteer activity, various employment statuses and employment opportunities should be prepared using an interdisciplinary approach involving study of social welfare, social science and economics. However, as the total number of jobs is fixed, consideration should also be given to young workers.

Life expectancy in Japan is the highest in the world. Japan also has the highest healthy life expectancy. In 2008, USA health expenditures accounted for 16% of the nation's gross domestic product (GDP), twice the Japanese rate. Compared with other countries, Japanese health expenditures as a percentage of GDP accounted for two-thirds of that of France and Germany, suggesting that we have the most cost-effective health-care

systems. In addition, the annual cost of health care has been approximately 670 000 yen per elderly person for the past 10 years. However, the aging of the population is expected to impact on future spending growth. Sasaki compared life-long medical costs between the longevity and non-longevity groups, and found that longevity decreases medical costs and has positive economic impacts.¹ Thus, it is important to enhance preventive medicine to achieve longevity, make continuous efforts for cost-effective medicine and improve satisfaction with the health-care systems. Discussion of geriatric medicine should be made after disclosing the aforementioned facts to the public.

Problems in geriatric medicine are closely linked to social structures, including care, welfare and dwelling surrounding the health-care system. To reveal and solve problems regarding the elderly and an aged society, the promotion of gerontology using an interdisciplinary approach is increasingly needed.

Regarding employment opportunities for older workers and future directions of medicine, care and welfare, discussion should be made among specialists from various health-care specialties. The Japan Geriatrics Society and the Japan Gerontological Society, as a core organization, should expand their activities to achieve a "society where elderly people can enjoy their lives" with the cooperation of the National Center for Geriatrics and Gerontology, Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology, the Institute of Gerontology the University of Tokyo, and J. F. Oberlin University.

(2) *The current state of geriatric medicine and its direction*

Geriatric disorders have several features.

First, diseases occur as a result of a decline in organ systems associated with aging. Therefore, even if a disease is not so severe, a patient might have been developing an unexpectedly marked decline in organ systems. In addition, homeostatic function with aging, biophylaxis capacity and nutritional absorption capacity often decrease, and symptoms become chronic and refractory.

In terms of clinical symptomatology, older people often complicate many diseases together with a geriatric syndrome with multiple etiologies. Signs and symptoms vary according to each individual, and are often atypical. Response to drugs is different in elderly compared with non-elderly people.

Older people are more likely to develop multiple diseases, and visit different hospitals and receive many screening tests and prescriptions at the same time;² thus, total expenditures on the elderly become inevitably high, which has been said to cause financial collapse of the Japanese health insurance system. However, regarding this issue, we should focus on the medical

cost required for a single disease between elderly and non-elderly people, and we should be aware that restricting the increasing financial burden on patients to receive screenings or prescriptions for each disease would be ageism for elderly people and uncontroversial. However, unnecessary duplication of the screening given at each hospital should be avoided. To achieve this, an effective screening system carried out by primary-care physicians, and privacy-preserving medical data sharing of test results and medication among hospitals and clinics are needed. Regarding medications, the Japan Geriatrics Society has prepared the "Guidelines for medical treatment and its safety in the elderly" as an outcome of the sponsored research in Japan Foundation on Aging and Health.³ The guideline explained standard medical treatments mainly for the elderly by giving examples of low priority, such as making an easy prescription or non-evidence-based prescription to prevent deterioration of chronic disease. In either retrospective fee-for-service or a prospective payment system (fixed amount), physicians should provide the same level of prescription to each patient. To carry out effective screening for the elderly or evidence-based medical treatment, a constructive research system should be developed separately from health-care reform in terms of medical economy. The Japanese government has decided to abolish the existing medical insurance system for those aged 75 years and older; however, the following principles stated in the existing medical insurance system should be included in the next system for the elderly: (i) elderly disease prevention; (ii) comprehensive geriatric assessment; and (iii) incentives to promote discharge planning.

Older people often develop functional disorders associated with chronic disease or aging. Functional disorders not only jeopardize the independence of people and pose social disadvantage, but also lead to secondary disease. This often makes elderly people fully dependent, resulting in lower quality of life. Therefore, in the treatment of geriatric disorders, priority should be given to functional outcomes, as well as life expectancy and the prognosis of organ systems. In addition, because a psychological change associated with an environmental change often leads to a deterioration of symptoms in elderly people, treatment policy and discharge planning should be prepared with a holistic consideration of the patient using the comprehensive geriatric assessment (CGA). In geriatric medicine, it is important not only to protect organ systems, but also to maintain physical function to prevent assisted living.

To maintain independent living, a person needs to have sustained function, including daily life functions, cognitive function, emotion and sociality (family, friends, job). CGA is used to determine the aforementioned functional status both comprehensively and systematically. The results of CGA give us a clue of what kind of

support can help maintain independent living or assisted living with minimum care for elderly people. However, CGA is not a popular tool. Therefore, we should examine ways of increasing the awareness of CGA to promote its use for the improvement of geriatric medicine.

End-of-life care for elderly patients is an extremely important issue in geriatric medicine; however, very few elderly people in Japan have made advance directives to show their wishes about their health care during the end-of-life period. In geriatrics, there are so many issues to discuss, including confirmation of patient's wishes, the need of a health-care representative, and the relationship between the patient and their physician. Therefore, we should investigate the awareness of end-of-life care for elderly patients among health-care professionals, including physicians and nurses, people involved in care, patients, and their families, to discuss future direction of care. Regarding end-of-life care in elderly people, "Attitudes toward end-of-life care in elderly patients",⁴ which was announced in 2000 by the ethics committee of the Japan Geriatrics Society and is currently under revision, and a proposal prepared by the end-of-life care research group,⁵ should be referred.

(3) Fostering health-care professionals involved in geriatric medicine

Despite the growth of the elderly population, physicians with special geriatric training are not expected to increase under the present system of medical education. In order to solve the problem of care for the growing elderly population, the educational system should be restructured to provide an understanding of geriatric medicine for non-geriatricians, general practitioners and physicians working at care facilities that provide care for elderly patients. This might be an effective and practical approach for fostering physicians taking care of the elderly. To provide sufficient geriatric knowledge to general practitioners and non-geriatricians, the education program should include basic geriatrics contents to retain quality of geriatric care, which would be required even for non-geriatricians. The Japan Geriatrics Society has published *Clinical Handbook for Active Aging and Geriatric Care* for physicians, which aims to provide basic knowledge of elderly-specific symptoms, assessment, treatment and care. It is expected that using this handbook for students, residents, practitioners and non-geriatricians might contribute to the expansion of geriatric medicine. In the USA, in order to deal with a shortage of geriatric specialists, medical students are required to receive a minimum geriatrics education.⁶

(4) Promotion of geriatric disease clinical research

In Japan, a system for making diagnosis and providing treatment and care for patients with elderly diseases,

including dementia, has not been fully developed. In elderly care, it is important to make an accurate diagnosis and collect clinical evidence to reflect diagnosis and evidence in clinical settings. To accumulate evidence of geriatric medicine and nursing, the promotion of clinical research and a marked expansion of geriatric medical centers with high-level medical services are eagerly awaited.

Currently, there are just two geriatric medical centers in Tokyo and Nagoya. Therefore, the number of centers should be increased and should be placed in each district (Hokkaido, Tohoku, Hokuriku, Kanto, Koshinetsu, Tokai, Kinki, Chugoku, Shikoku and Kyushu). The National Center for Geriatrics and Gerontology, as a core facility, is required to examine the efficacy of geriatrics-related activities and consistency with countermeasures, supervise multicenter studies and clinical research projects, and strive to enhance geriatric medicine through the standardization of geriatric medicine and care, and preparation of medical guidelines. In this process, each center, as a platform of geriatric medicine, should accumulate clinical data, and is also required to function as a facility to educate non-geriatricians.

The Japan Geriatrics Society has been carrying out clinical research on the treatment of hyperlipemia involving the elderly aged 75 years and over. An establishment of a support system for such clinical research and an accumulation of evidence on the efficacy of nutrition and exercise are also considered important.

(5) Promotion of home-based care and multidisciplinary care

Based on the demand of older people who prefer to remain at home, and a government policy that aims to shorten the length of hospital stay and the number of beds to decrease the growing burden of health-care expenditure, the promotion of home-based care has been provided. However, the medical structure of home-based care has not been fully devised, requiring further development of a medical and nursing structure where older people can receive continuing treatment and care, including rehabilitation, within the local community, while not being too dependent on the hospital stay, or not being forced to choose home-based care. Enhancement of home-based care might contribute to reducing the burden on physicians and nurses at acute hospitals, and might also compensate for other care services, such as emergency care and obstetrics.

One of the concerns of home-based care among physicians, patients and their families is the difficulty with hospital admissions in the event of sudden illness or deterioration. To solve this problem, the National Center for Geriatrics and Gerontology has established a "Home-based care unit". Preregistration from both a general practitioner and the patient is necessary for

admission to this unit, with the intention to continue home-based care. The patient can be admitted any time by referral of a general practitioner. The outcome of this program is eagerly awaited.

In home-based care settings, a group of professionals from diverse disciplines mutually cooperate to provide care for a patient. For such a multidisciplinary approach, it is important to choose appropriate professionals according to the condition and disease stage of the elderly patient. However, this multidisciplinary approach involves some problems. One is the legislative "gap" between health-care providers registered under the Medical and Dental Practitioners Acts and the Act on Public Health Nurses, Midwives and Nurses, and nursing care providers registered under the Long-Term Care Insurance. The other is the discrepancy in the principle between health-care and nursing-care providers. To solve these problems, it is essential to examine them along with the legislative issues, and promote home-based care, particularly at universities offering courses in geriatrics and local community hospitals where there are accumulating results of a multidisciplinary approach to caring for elderly patients, to further promote the cooperation between medical-care and social-welfare services.

3. Proposals

We make the following proposals as countermeasures against various issues in geriatrics:

(1) Development and promotion of a system that enables elderly people to participate socially and make a contribution using an interdisciplinary approach among the various areas, including nursing science, nursing care, study of social welfare, social science, engineering, psychology, economics, religion and ethics, as well as medical sciences.

Promotion of social participation and contribution of the elderly, while considering the total number of jobs and young workers, is expected to contribute to creating purpose in their lives, and reduce the growing number of older people who become frail or in need of care. It is also expected to bring about an increase in a substantial productive population, financial stability and self-sustainability for the elderly, and an upturn of the national economic activity through an increase of total consumption.

(2) Promotion of gerontology, reform, and enhancement of gerontology and geriatrics in undergraduate, postgraduate and lifelong education.

To solve problems associated with elderly people or an aged society, gerontological and geriatric research and education should be enhanced. By fostering medical professionals who understand the physical and mental traits of older adults, and those who can provide a

holistic approach with consideration to organic integration with nursing care, provision of reliable care and nursing services is expected.

(3) Build geriatric medical centers in each area, and accumulate large-scale evidence of geriatric diseases and geriatrics.

For system reform of diagnosis, treatment and nursing care, evidence should be accumulated through large-scale clinical studies.

(4) Structural development and promotion of home-based care and multidisciplinary medicine and care.

Promotion of home-based care and multidisciplinary medicine and care, particularly at universities offering courses in gerontology and local community hospitals where there are accumulating results of a multidisciplinary approach to care for elderly patients, can be expected to help reduce the burden of physicians and nurses, and meet the demand of older people.

Through implementation of the aforementioned measures, Japan is expected to function as a successful model for the rest of the world.

4. Summary

The phenomenon of an aging population is often considered within a negative spectrum; however, elderly people in need of care only account for 13% of the total elderly population, and this is not being expected to further increase. We should rather focus on the fact of an increasing number of "healthy elderly individuals with rich experience and knowledge", which would not become a negative factor in the future. The restructuring of these healthy elderly resources for social development is believed to bring a permanent bright future, and it is expected that medical-care and social-welfare services will make a significant contribution within this framework. The realization of healthy longevity in society is possible; however, we should be aware that it is only possible by the integration of geriatric medicine and social welfare.

To cope with the problems that come with a rapidly aging society as the world-leading model, the development of elderly-friendly medical devices and nursing-care equipment to avoid a labor shortage is considered essential. Taking the lead in the development of medical equipment for elderly people enables us to provide other countries with aging populations with a model for success, and is also expected to contribute to the creation of new employment and an increase in export as one of the main industrial products in Japan.

The task given to the country with the longest healthy life expectancy is to try to achieve the highest level of elderly satisfaction. As a result of a community change, "roles" and "presence with respect" of the elderly have become weakened, and a medical- and nursing-care "burden" for the younger population has been casting

a dark shadow over the society. As the baby boomer generation ages into elderly status, new roles, including a future health-care workforce and volunteer activities, and community satisfaction should be rebuilt. Gerontology and geriatrics ought to take the lead in showing a practical approach to the industry and the administration to create new images of the elderly.

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Disclosure statement

The authors declare no conflict of interest.

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ORIGINAL ARTICLE: EPIDEMIOLOGY,
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Comparison of the psychosocial quality of life in hemodialysis patients between the elderly and non-elderly using a visual analogue scale: The importance of appetite and depressive mood

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Aim: The number of hemodialysis (HD) patients is increasing along with their mean age in Japan. The assessment of their psychosocial status and quality of life (QOL) is therefore becoming more and more important along with laboratory data or comorbidities.

Methods: We examined the psychosocial status of 211 HD patients (72 elderly and 139 non-elderly) and compared the difference between elderly and non-elderly patients using a visual analogue scale (VAS). We then examined how QOL affected mortality rate in 3-year prospective follow up. We assessed 10 items of QOL: health condition, appetite, sleep, mood, memory, family relationships, friendship, economical status, life satisfaction in daily life, and happiness with qualified self-evaluating questionnaires along with laboratory data and comorbidities. Furthermore, we investigated the correlation between the scores of mood and geriatric depression scale (GDS)-15.

Results: There was no difference in VAS scores between elderly and non-elderly patients. Lower VAS scores for appetite and mood correlated with higher mortality in HD patients, especially in the non-elderly. VAS scores for mood correlated with GDS-15 in HD patients.

Conclusions: More attention should be paid to appetite and the diagnosis and therapy of depressive mood to improve the prognosis of HD patients, especially for the non-elderly. *Geriatr Gerontol Int* 2012; 12: 65–71.

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Introduction

With the advance of dialysis technology, the number of dialysis patients along with the proportion of older patients is increasing in Japan. According to the annual statistical survey by the Japanese Society for Dialysis Therapy from the end of 2003 to 2009, the mean age of the whole dialysis population rose from 61.5 to 65.8 years old, much older than in 1985 (50.3 years old).

In the years 2003 and 2009, there were about 220 000 and 290 000 dialysis patients in Japan, respectively. It is likely that these dialysis patients live with more mental stress, including anxiety from comorbidities, conflict with their family and social restrictions.¹ It is reported that mental and physical health-related quality of life (QOL) in hemodialysis (HD) patients is lower than that in the general population,² and that depression is one of the most important predictors of patients' prognosis,³ which is one of the main QOL factors used to evaluate patients with end-stage renal disease (ESRD).⁴ Therefore, we should pay more attention to QOL and the psychological problems of dialysis patients in addition to medical factors. In terms of QOL, assessment of HD patients' self-evaluation for psychosocial status (subjective QOL) is very important. Although there are some reports on psychosocial QOL in HD patients, few studies have addressed the comparison between elderly and non-elderly patients.⁵

The aim of this study, therefore, was to evaluate psychosocial QOL of HD patients and to compare it between the elderly and non-elderly. Furthermore, we investigate how QOL affects the mortality of HD patients in a 3-year prospective follow up.

Patients and methods

This study was performed at Taigenkai Hospital and Kita-Eijinkai Hospital, located in Japan from 2000–2003. All HD outpatients in the dialysis units (231 patients) of these two hospitals were given questionnaires. Patients 65-years-old or older were defined as "elderly", those under 65-years-old as "non-elderly". On the basis of this definition, the HD population consisted of 83 elderly and 148 non-elderly patients. This study was approved by the Ethical Committee of Kita-Eijinkai Hospital and Taigenkai Hospital and conforms to the provisions of the Declaration of Helsinki. Written informed consent for the study was obtained from each patient. Participants were given a brief explanation of the questionnaire by a medical technician or the attending physician and were asked to complete the questionnaire.

QOL assessment of subjects was carried out using a visual analogue scale (VAS). VAS is frequently used as a subjective scale of pain in the field of anesthesiology. Each VAS questionnaire ended with a summing-up graph in the form of a 100 mm bar, graded with

subjectively the worst condition on the left and best one on the right. The participant was asked to mark on the 100 mm bar how they evaluated their condition. We defined the distance (mm) from the left to the marked position as the score of VAS (0–100), with high scores indicating high QOL.⁶ We assessed 10 QOL items: health condition; appetite; sleep; mood; memory; family relationships; friendship; economical status; life satisfaction in daily life; and happiness, as described by Matsubayashi *et al.*⁶ The VAS (10 items of QOL) has been validated for use in the Japanese population.⁷ Demographic data including age, gender, and duration of HD therapy, laboratory data, which included cardiothoracic ratio (CTR), plasma level of blood urea nitrogen (BUN), hemoglobin (Hb), albumin (Alb), and comorbidities including blood access trouble, ischemic heart disease, diabetes mellitus, infectious diseases, bone fracture, cerebrovascular disease were simultaneously collected. After patients rested in the supine position for at least 5 min, systolic blood pressure was measured twice by medical staff at the bedside and the average of those was calculated. Patients were examined at the beginning of their first HD session of the week, as is done in routine medical care.

We followed these patients for 3 years prospectively. The end point for patients was the trial end or death from any cause. At first, we examined the survival analysis in elderly and non-elderly HD patients. We then investigated how QOL affects the mortality of HD patients. At the end of the 3-year observation period we also screened for depression using the geriatric depression scale (GDS)-15 with a self-assessed questionnaire (0 [good] – 15 [very depressed])⁸ and investigated the correlation between the scores of the GDS-15 and QOL item mood, which was also examined simultaneously.

Data were analyzed using JMP v. 6.0.0 (SAS Institute Inc., Cary, NC, USA). For patient age, duration of HD and laboratory data, means were analyzed using *t*-test. For patient gender and comorbidities, frequencies were analyzed using χ^2 for independence test. Medians of QOL scores were calculated and analyzed using Mann-Whitney *U*-test. According to the average score of each VAS from all patients, a survival rate curve was analyzed by Kaplan–Meier analysis followed by log–rank test. Correlation between each score of QOL and mortality rate was analyzed using multivariate Cox regression analysis corrected for age, gender, duration of HD therapy, laboratory data and comorbidities. Correlation between the scores of GDS-15 and mood was analyzed using univariate regression analysis. Statistical significance was considered to be a *P* value of <0.05.

Results

Questionnaires were given to 231 patients and the response rate was 100%. However, answers from 211

Table 1 Characteristics, laboratory data and comorbidities in hemodialysis (HD) patients

	Elderly patients (n = 72)	Non-elderly patients (n = 139)	P value
Age (years, means \pm S.D.)	71.8 \pm 5.6	52.4 \pm 9.3	<0.0001
Sex (male)	58.3%	64.7%	0.3613
Duration of HD (years, means \pm S.D.)	6.9 \pm 5.0	8.5 \pm 6.9	0.0696
SBP (mmHg, means \pm S.D.)	155 \pm 23	153 \pm 22	0.6046
CTR (% , means \pm S.D.)	50.2 \pm 4.9	48.0 \pm 5.0	0.0025
BUN (mmol/L, means \pm S.D.)	26.0 \pm 6.5	28.4 \pm 5.8	0.0073
Hb (g/L, means \pm S.D.)	87.8 \pm 14.4	94.7 \pm 15.6	0.0033
Alb (g/L, means \pm S.D.)	38.5 \pm 5.7	42.4 \pm 4.9	<0.0001
Blood access trouble	58.5%	57.6%	0.9175
IHD	28.6%	25.7%	0.7410
DM	53.1%	42.7%	0.2567
Infectious diseases	18.4%	5.7%	0.0549
Bone fracture	17.1%	23.8%	0.4111
CVD	13.3%	17.4%	0.5614

Patient characters were compared between elderly and non-elderly. Data are expressed as means \pm S.D. or incidence of each disease (%). Alb, albumin; BUN, blood urea nitrogen; CTR, cardiothoracic ratio; CVD, cerebrovascular disease; DM, diabetes mellitus; Hb, hemoglobin; IHD, ischemic heart disease; SBP, systolic blood pressure.

Table 2 Median of quality of life (QOL) scores in hemodialysis patients

Items of QOL	Elderly patients (n = 72)	Non-elderly patients (n = 139)	P value
Health condition	50	49	0.3047
Appetite	76.5	82	0.2415
Sleep	53	54	0.8906
Mood	62	60	0.6133
Memory	45	51	0.0948
Family relationships	91.5	89	0.1982
Friendship	88	80	0.3215
Economical status	70.5	51.5	0.0512
Satisfaction in daily life	68	57	0.0903
Happiness	71	67	0.4419

QOL scores were compared by Mann-Whitney *U*-test between elderly and non-elderly hemodialysis patients for each item of QOL. There was no significant difference between elderly and non-elderly hemodialysis patients.

patients (91.3%) were used for the analysis, because the rest were incomplete. Table 1 demonstrates patient characteristics, laboratory data, and comorbidities. The mean age of elderly and non-elderly HD patients was 71.8 \pm 5.6 and 52.4 \pm 9.3, respectively ($P < 0.0001$). There was no significant difference in the proportion of gender or the duration of HD between the two groups. For the 10 items of QOL, there was no significant difference in VAS scores between elderly and non-elderly HD patients (Table 2).

In the 3-year prospective follow up, the number of deceased patients was 44 and the mortality rate was 21.8%. We also investigated the correlation between VAS scores in the QOL items and survival rate by

univariate analysis according to the average score of each QOL. The Kaplan-Meier analysis according to the VAS score of each QOL item in elderly and non-elderly HD patients is shown in Table 3. We found that higher VAS scores of health condition, appetite, sleep, mood and satisfaction in daily life were associated with better survival in non-elderly patients, but not in elderly patients.

On the other hand, higher VAS scores in appetite, mood, friendship, and satisfaction in daily life were significantly associated with better survival in non-elderly HD patients according to multivariate Cox regression analysis adjusted for age, gender, and duration of HD therapy, clinical data including CTR, BUN, Hb, Alb

Table 3 Kaplan–Meier analysis by each item of quality of life (QOL) in hemodialysis patients in elderly and non-elderly

	Cut-off point	Elderly patients (<i>n</i> = 72) <i>P</i> value	Non-elderly patients (<i>n</i> = 139) <i>P</i> value
Health condition	50 ≤ vs 49 ⇒	0.4824	0.0138
Appetite	75 ≤ vs 74 ⇒	0.6832	0.0021
Sleep	59 ≤ vs 58 ⇒	0.8158	0.0059
Mood	62 ≤ vs 61 ⇒	0.8342	0.0047
Memory	53 ≤ vs 52 ⇒	0.7448	0.1317
Family relationships	78 ≤ vs 77 ⇒	0.4242	0.3575
Friendship	74 ≤ vs 73 ⇒	0.3438	0.5439
Economical status	54 ≤ vs 53 ⇒	0.5022	0.1990
Satisfaction in daily life	61 ≤ vs 60 ⇒	0.5047	0.0420
Happiness	66 ≤ vs 65 ⇒	0.7771	0.4040

Correlation between mortality and each item of QOL was analyzed by Kaplan–Meier analysis, followed by log–rank test. Cut off point (according to the average score of each QOL) is shown.

and comorbidities (appetite: relative risk [RR] = 0.931, $P = 0.0041$; mood RR = 0.938, $P = 0.0005$; friendship: RR = 0.949, $P = 0.0317$; satisfaction in daily life: RR = 0.967, $P = 0.0178$) (Table 4, right). Statistical significance was also found in family relationships (RR = 0.967; $P = 0.0009$) and friendship (RR 0.977; $P = 0.0180$) for all HD patients (Table 4, left), and appetite in elderly patients (RR = 1.048; $P = 0.0247$) (Table 4, center).

We then assessed the correlation between mood and GDS-15 in HD patients. There was an inverse correlation between VAS scores for mood and GDS-scores among all HD patients ($r = -0.585$, $P < 0.0001$), and when divided into elderly ($r = -0.603$, $P < 0.0001$) and non-elderly patients ($r = -0.610$, $P < 0.0001$).

Discussion

In this study we have shown that there is no difference between elderly and non-elderly HD patients in 10 psychosocial QOL items. However, better appetite, mood, and satisfaction in daily life were associated with better survival in non-elderly HD patients by Cox regression analysis and Kaplan–Meier analysis; no relationship was found between the scores of those QOL items and laboratory data/comorbidities (data not shown). These results indicate more attention should be paid to appetite, depressive mood, and satisfaction in daily life to improve the survival especially in non-elderly HD patients.

We found no significant difference in QOL between elderly and non-elderly HD patients. Few reports have addressed the relationship between age and QOL in HD patients. Tovbin *et al.* demonstrated that age is not associated with self-evaluated individualized QOL according to life domains including health, family, work/studies,

economic situation and leisure.⁵ Kutner *et al.* reported that prevalence of sleep disorders is not clearly associated with an increasing age of patients, and that elderly patients often report better psychosocial adjustment to dialysis than younger patients.⁹ Leinau *et al.* reported that the prevalence of depression is not restricted to older participants (≥ 60 years 31%; ≤ 60 years; 22%).¹⁰ These studies are consistent with our study showing no difference in QOL assessments between elderly and non-elderly HD patients.

Quite a number of studies have been reported in terms of QOL in HD patients. Most of the studies used the Kidney Disease Quality of Life (KDQOL) or Short Form 36 (SF-36) questionnaire and have reported that QOL of HD patients is markedly disturbed compared to that of the general population in both physical and mental components.² In Japan, a study using SF-36 reported that QOL scores of HD patients were lower than the national standard in all of eight scales, indicating disturbed physical and psychosocial QOL.¹¹ However, in the KDQOL and SF-36 questionnaires the participants need to answer as many as 36 questions, which might be time consuming and require them to be patient to some extent. Japanese people, especially the elderly, are not used to multiple choice questionnaires and may have some difficulties responding to 36 questions. Therefore, we used a VAS that can be completed quickly, because participants only have to put a mark on the 100 mm bar.¹² Inter-rater reliability ($r = 0.74$, $P < 0.05$) and test–retest reliability ($r = 0.82$, $P < 0.05$) of the VAS score has been already confirmed.⁶ For the VAS examination we assessed 10 items of QOL, and the rate of available answers was as high as 91.3% in HD patients. Previous studies have reported that VAS scores of health conditions in dialysis patients were 58.¹³ Although more tests might be needed to prove further

Table 4 Correlation between mortality and each visual assessment scale (VAS) score of quality of life (QOL) items in hemodialysis patients in total, elderly, and non-elderly patients

	Relative risk	Total patients (n = 211) 95% CI	P value	Relative risk	Elderly patients (n = 72) 95% CI	P value	Relative risk	Non-elderly patients (n = 139) 95% CI	P value
Health condition	0.983	(0.956–1.008)	0.1866	0.987	(0.932–1.048)	0.6430	0.982	(0.939–1.026)	0.4116
Appetite	1.004	(0.988–1.023)	0.6087	1.048	(1.006–1.103)	0.0247	0.931	(0.871–0.980)	0.0041
Sleep	0.993	(0.976–1.011)	0.4511	1.029	(0.973–1.093)	0.3112	0.975	(0.936–1.009)	0.1462
Mood	0.982	(0.963–1.000)	0.0516	1.013	(0.971–1.053)	0.5270	0.938	(0.895–0.973)	0.0005
Memory	0.986	(0.966–1.005)	0.1393	1.020	(0.965–1.071)	0.4506	0.974	(0.937–1.004)	0.0881
Family relationships	0.967	(0.948–0.986)	0.0009	1.006	(0.945–1.076)	0.8544	0.965	(0.918–1.006)	0.0979
Friendship	0.977	(0.958–0.996)	0.0180	0.994	(0.916–1.067)	0.8763	0.949	(0.898–0.996)	0.0317
Economical status	1.001	(0.985–1.016)	0.9219	0.993	(0.940–1.035)	0.7229	0.990	(0.964–1.014)	0.4187
Satisfaction in daily life	0.990	(0.974–1.005)	0.1762	1.015	(0.982–1.046)	0.3423	0.967	(0.936–0.994)	0.0178
Happiness	0.988	(0.967–1.008)	0.2371	1.013	(0.972–1.052)	0.5097	0.997	(0.950–1.042)	0.8848

Correlation between mortality and each item of VAS score of QOL was analyzed by multivariate Cox regression adjusted for age, gender, duration (years) of hemodialysis therapy, cardio-thoracic ratio (CTR), blood urea nitrogen (BUN), hemoglobin (Hb), albumin (Alb), and presence or absence of comorbidities including blood access trouble, ischemic heart disease (IHD), diabetes mellitus (DM), infectious diseases, bone fracture and cerebrovascular disease (CVD).

validation, our investigation is the first study to use VAS to assess psychosocial QOL in HD patients.

Anemia is considered to be an important factor for QOL and survival. As reported in western countries, there was a recent report from Japan that lower mortality risk was associated with higher Hb levels and that lower Hb levels were associated with lower QOL scores.¹⁴ In contrast, the relationship between anemia and depression has been controversial.¹⁰ In this study we did not find any correlation between the Hb level and VAS score of any QOL items using multivariate regression analysis. It has been reported that diminished appetite is associated with a higher mortality rate from a viewpoint of malnutrition–inflammation complex syndrome (MICS).¹⁵ In this study, we analyzed data such as Alb (for nutritional status) and presence or absence of comorbidities such as infectious diseases (for inflammatory state). However, we did not find any relationship between comorbidities and Alb. These negative results might be ascribed to the small sample size in this study.

In terms of mood, a previous study found 10–35% prevalence of depression among ESRD patients.¹⁶ In this study, we assessed depressive mood by measuring the VAS score for mood. However, the score did not necessarily mean that the patients had depression. Therefore, we used GDS-15 in the third year of the prospective follow up, because it is validated for Japanese subjects¹⁷ and is a self-assessed questionnaire composed of 15 yes or no questions, requiring only a few minutes to complete and score.¹⁸ As expected, the score of mood and that of GDS-15 was inversely correlated by univariate regression analysis in HD patients in both elderly and non-elderly patients. This indicates that the VAS of mood could be used as a relative score to assess depression to some extent. The correlation coefficient (r) was about –0.6, which means there is some discrepancy between mood and GDS. One reason that explains this discrepancy is that feelings such as anxiety might have been included in mood in our study.¹⁹ The prevalence of depression (GDS scores 6 or more) was found to be 54.5% in our study. This relatively high prevalence of depression may be due to the screening method. In our study, little, if any, antidepressive agent was prescribed to patients with depressive mood. Therefore, a prospective study to test the effect of antidepressants on QOL in HD patients needs to be investigated.

It has been reported that the prevalence of depression is increasing with age in the general population.²⁰ However, according to a patient survey performed by the Ministry of Health, Labor and Welfare in Japan in 2005, patients with depression were distributed widely between the ages of 30 to 70. This could account for the lack of difference in mood between elderly and non-elderly HD patients.

To investigate whether poor QOL reflects a poor health condition, we assessed the relationship between health condition and QOL in elderly and non-elderly patients using regression analysis. In non-elderly patients there was a correlation between health condition and appetite, sleep and mood ($r = 0.28$; $P = 0.0008$, $r = 0.29$; $P = 0.0006$ and $r = 0.51$; $P < 0.0001$, respectively). However, the r value was relatively low ($r < 0.30$) except in relation to mood. In elderly patients, there was correlation between health condition and appetite, sleep and mood ($r = 0.41$; $P = 0.0004$, $r = 0.38$; $P = 0.0012$ and $r = 0.65$; $P < 0.0001$, respectively) and the r value was relatively high ($r > 0.30$). These results indicate that the QOL items appetite and sleep would be better markers of the health condition of elderly HD patients than non-elderly HD patients and that the QOL item mood would be a better marker of the health condition of both elderly and non-elderly HD patients. In contrast, we showed that better appetite and mood were associated with better survival in non-elderly HD patients. Furthermore, there was no relationship between the scores of these QOL items and laboratory data/comorbidities (data not shown). These data indicate the importance of QOL assessment in HD patients.

The relationship between depression and mortality rate is reported to be controversial.²¹ Husebye *et al.* reported that psychosocial variables are prognostically important for the survival of dialysis patients over the age of 70, but depression is not associated with mortality rate.²² Drayer *et al.* reported that depressed HD patients are younger and depression is associated with decreased QOL including sleep and increased mortality rate.²³ In terms of psychological factors, Kimmel *et al.* reported that there is an inverse relationship between the number of symptoms (pain, trouble with sleep, tiredness and shortness of breath) and QOL including psychological items and that no clinical parameter (duration of ESRD, serum Alb, Hb, Kt/V and Karnofsky Performance Status Scale) correlates with any measure of QOL.²⁴ Moreover, Leinau *et al.* demonstrated that non-ESRD-specific conditions such as fatigue, pain, and depression are as prevalent as ESRD-specific conditions (use of a catheter for access, Hb, intact parathyroid hormone, phosphorous, and Kt/V) and highlighted the importance of diagnosing and treating non-ESRD-specific conditions to improve the health and QOL of persons with ESRD.¹¹ As reported in these latter two literatures, QOL factors such as sleep disturbance, depression and so on should be paid as much attention as clinical parameters as suggested in the guidelines for ESRD.

We have highlighted the need for assessment of elderly HD patients using self-evaluation for psychosocial status (subjective QOL). In this study, however, a higher QOL score for appetite, sleep, mood and satisfaction in daily life was associated with better survival

by both of univariate analysis (Kaplan–Meier analysis; Table 3) and multivariate analysis (Cox regression analysis; Table 4), in non-elderly HD patients only. These negative results in elderly patients might be ascribed to the small sample size. Actually, among the laboratory data that showed differences between elderly and non-elderly patients (Table 1), higher levels of Alb were associated with better survival in elderly patients, but there was no relationship between Alb and the scores of any QOL item (data not shown).

In conclusion, there was no difference in 10 psychosocial QOL items between elderly and non-elderly HD patients. Paying attention to appetite and depressive mood may lead to the improvement of the mortality rate of HD patients, especially for the non-elderly.

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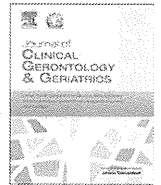
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Original article

Identifying cognitive dysfunction using the nurses' rapidly clinical judgment in elderly inpatients

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ABSTRACT

Background/Purpose: The aim of this study was to examine the relationship between nurses' clinical judgment on cognitive function by fall risk assessment and mini-mental state examination (MMSE) scores in elderly inpatients.

Methods: We studied 61 consecutive hospitalized patients who received both comprehensive geriatric assessment (CGA) and fall risk assessment at the Department of Geriatric Medicine in Kyoto University Hospital from January 2006 to June 2010. During the fall risk assessment at admission, primary nurses evaluated the cognitive function by four items (with or without disorientation, impaired judgment, lack of comprehension, and memory loss), while a trained clinical assistant performed CGA including MMSE. Patients were divided into three groups according to the MMSE scores. The association between the four items of judgment by nurses and MMSE scores was then studied.

Results: The mean age was 80.1 years and 55.7% of the patients were female. The percentage of patients judged to have impaired judgment, lack of comprehension, and memory loss was higher in patients with lower MMSE scores (impaired judgment, p for trend = 0.001; lack of comprehension, p for trend = 0.043; memory loss, p for trend = 0.001). The percentage of patients judged to have at least one of the four abnormalities was also significantly higher in patients with lower MMSE scores (p for trend < 0.001). However, no significant relationship was found between disorientation and the MMSE scores. Further, nurses could not detect impaired cognition by the four items in one-third of the patients with mild impairment determined by MMSE.

Conclusion: These data indicate that a comprehensive evaluation using all the four items on cognitive impairment is more effective in detecting cognitive impairment in elderly than using individual items, although one-third of cognitively impaired elderly patients may miss detection despite the use of the four items. Better approaches should be developed to identify cognitively impaired elderly patients by nurses.

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1. Introduction

Falls are one of the most common complications of elderly in hospitals, with rates per 1000 patient-days estimated between 1.5 and 7.0,^{1–3} and approximately 30% of those lead to physical injury, with 2.4–6.8% being serious.^{4,5} Falls are associated with cognitive dysfunction, and approximately 60% of the elderly with cognitive impairment fall annually; this incidence is approximately twice

higher than those without cognitive impairment.^{6–10} The increase of elderly population and demented patients in hospital can therefore lead to an increase in falls and fracture events. Accordingly, it is important for nurses to assess cognition in elderly patients to prevent such complications.

Many fall risk screening tools are used as part of fall prevention programs in hospitals. Available screening and fall risk assessment tools used in different settings have been subjected to systematic reviews that reveal considerable differences in practicability and validity, thus raising the question of their usefulness.^{11,12} To identify high-risk patients for falls in institutionalized settings, our hospital developed a fall risk assessment tool. For the assessment, nurses collected information on age, history of falls, visual and hearing

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disturbance, cognition, transfer, and urinary continence, which are risk factors of falls identified by previous studies. Most items were evaluated by nurses' subjective judgment. The advantage of this tool is that nurses can finish the assessment in a relatively short period of time at an early phase of hospitalization and repeat the assessment during hospitalization. However, it was not clear how accurate nurses can assess the cognitive function of elderly patients with this tool. To this end, we tried to investigate whether or not nurses can accurately judge cognitive impairment in elderly patients using this tool by comparing the data independently obtained by mini-mental state examination (MMSE)¹³ performed by a trained clinical assistant.

The aim of this study was, therefore, to examine the relationship between the clinical judgment of nurses on cognitive function during fall risk assessment and independently MMSE scores in elderly inpatients.

2. Methods

2.1. Designs

The design of this study was a cross-sectional study.

2.2. Participants and data collection

In this study we collected data from medical records for 63 inpatients who received comprehensive geriatric assessment (CGA) during hospitalization at the Department of Geriatric Medicine of Kyoto University Hospital from January 2006 to June 2010. The data was collected from CGA of inpatients judged as frail by attending physicians. All inpatients received fall risk assessment as usual care.

Of 63 inpatients, one patient was excluded because CGA was performed after more than one month of clinical judgment and the other was due to missing information. The remaining 61 inpatients were analyzed for this study.

The approval for this study was obtained from Kyoto University Graduate School and Faculty of Medicine Ethics Committee (No. E1042, 2010). Patients were informed about our study at Kyoto University Hospital and the Department of Geriatric Medicine, Kyoto University website.

2.3. Measurements

Cognitive function was evaluated by four items in the fall risk assessment tool on admission, at least within 24 hours after admission by primary nurses, in which nurses clinically judged cognitive function of each patient. The nurses judged the presence or absence of disorientation, impaired judgment, lack of comprehension, and memory loss. The fall risk assessment tool including these items was applied to prevent falls for almost all patients in our hospital.

CGA was conducted less than 30 days of the initial hospital stay. The mean \pm standard deviation of the period from admission to evaluation was 8.0 ± 6.0 days. The information was collected on socio-demographic data, living environment, health status and hospitalization data. We collected data to assess functional and cognitive status, and depressed mood by MMSE and geriatric depression scale (GDS), and so forth. MMSE was performed by a trained clinical assistant and the patients were divided into three groups according to MMSE scores. Patients with MMSE scores from 0 to 17 points were classified as moderate to severe impairment, those from 18 to 23 points as mild impairment, and those from 24 to 30 points as slight or no impairment.¹⁴

2.4. Statistical analysis

We described mean \pm standard deviation or median, minimum and maximum for the continuous variable and numbers and percentages for the discrete variable. Linear regression models were constructed to examine the association of nurse's judgments on cognitive function with the MMSE scores. Additionally, at least one of the four abnormalities of judgment by nurses was compared in the two groups according to the MMSE scores using Chi-square test. The cutoff of these groups was 24.

The Statistical Package for Social Sciences, version 18.0 J (SPSS Japan Inc., Tokyo, Japan) was used for statistical analysis. All probability values were two-tailed with a significant level of $p < 0.05$.

3. Results

Table 1 shows the characteristics and main measurements of the patients. The mean age was 80.1 years and 55.7% of them were female. The median of their hospitalization length was 19 days. Of the 61 patients, 56 were discharged to home (91.8%). In terms of their cognitive function, 36% of the patients were judged to have memory loss, which was the highest among the four items. Twenty-six percent of the patients were judged to have impaired judgment, 21% lack of comprehension, and 13% disorientation. Furthermore, 43% of the patients were judged to have at least one of the four abnormalities. The median of MMSE scores was 26.

Table 2 shows the percentage of cognitive impairment judged by nurses in each group of patients classified according to their MMSE scores. Twenty-five percent of patients with moderate to severe impairment, 21% with mild impairment, and 9.3% with slight or no impairment were judged to be disoriented, respectively. Although no statistically significant association was found between disorientation and MMSE scores (p for trend = 0.053), the percentage of patients judged to have disorientation in the moderate to severe impairment group tended to be higher than those with slight or no impairment. In terms of impaired judgment, 75% of the patients with moderate to severe impairment, 36% with mild impairment, and 19% with slight or no impairment were judged to have impaired judgment, respectively. As a result, the percentage of patients judged to have impaired judgment was significantly higher in patients with lower MMSE scores (p for trend = 0.001). In lack of comprehension, 50% of the patients with moderate to severe impairment, 21% with mild impairment, and 19% with slight or no impairment were judged to have lack of comprehension,

Table 1
Characteristics and main measurements of the inpatients

	All n = 61
Age; years	80.1 \pm 6.0
Gender, female (%)	34 (55.7)
Length of stay in the hospital, days	19 [5, 56]
Place after discharge from the hospital	
Home	56 (91.8)
Other hospitals	3 (4.9)
Other departments	2 (3.3)
Cognitive function of judgment by nurses	
Disorientation	8 (13.1)
Impaired judgment	16 (26.2)
Lack of comprehension	13 (21.3)
Memory loss	22 (36.1)
At least one of the 4 abnormalities	26 (42.6)
Mini-Mental State Examination scores	26 [13, 30]

Number(%).

Mean \pm standard deviation or median [minimum, maximum].

Table 2
Relationship between nurses' clinical judgment and Mini-Mental State Examination scores

	Moderate to severe impairment n = 4	Mild impairment n = 14	Slight or no impairment n = 43	p for trend
Cognitive function of judgment by nurses				
Disorientation	1 (25.0)	3 (21.4)	4 (9.3)	0.053
Impaired judgment	3 (75.0)	5 (35.7)	8 (18.6)	0.001
Lack of comprehension	2 (50.0)	3 (21.4)	8 (18.6)	0.043
Memory loss	3 (75.0)	7 (50.0)	12 (27.9)	0.001
At least one of the 4 abnormalities	4 (100)	9 (64.3)	13 (30.2)	<0.001

Number (%).

All patients were divided into 3 groups according to MMSE scores.

0–17points: moderate to severe impairment

18–23points: mild impairment

24–30points: slight or no impairment

A liner trend test was used with the discrete value in each groups according to the MMSE scores in liner regression models.

respectively. The percentage of patients judged to have lack of comprehension was significantly higher in patients with lower MMSE scores (p for trend = 0.043). In memory loss, 75% of patients with moderate to severe impairment, 50% with mild impairment, and 28% with slight or no impairment were judged to have memory loss, respectively. The percentage of patients judged to have memory loss was significantly higher in patients with lower MMSE scores (p for trend = 0.001). Finally, all patients with moderate to severe impairment, 64% with mild impairment, and 30% with slight or no impairment were judged to have at least one of the four abnormalities, respectively. The percentage of patients judged to have at least one of the four abnormalities was significantly higher in patients with lower MMSE scores (p for trend <0.001).

In the 14 patients with mild impairment, nine were judged to have at least one of the four abnormalities and five were not. Although those five patients were not judged to have impaired cognition using the four items by nurses at admission, four were judged to have at least one of the four abnormalities at the second time of evaluation by nurses during hospitalization. The second evaluation by nurses was performed from 1 to 2 weeks after admission. Thus, most of the patients were judged to have at least one of the four abnormalities by nurses at the second assessment (data not shown). Therefore, we assume that it takes time for nurses to assess the cognitive function of inpatients.

Fig. 1 shows how many of the patients with mild to severe impairment or slight to no impairment can be judged to have at least one abnormality by nurses. The patients with mild to severe impairment determined by MMSE were more likely to be judged to have at least one of the four abnormalities than those with slight or no impairment ($p = 0.002$). However, nurses could not detect impaired cognition using the four items in one-third of the patients with mild to severe impairment determined by MMSE, while they judged to have some kind of cognitive impairment in one-third of the patients with slight to no impairment.

Fig. 2 shows the number of items judged to have abnormality in four items on cognitive function by nurses in each group of patients classified according to their MMSE scores. There was no relationship between the number of items judged to have abnormality and the level of cognitive function according to MMSE scores.

4. Discussion

In the present study, we demonstrated that the percentage of patients judged by nurses to have cognitive impairment were

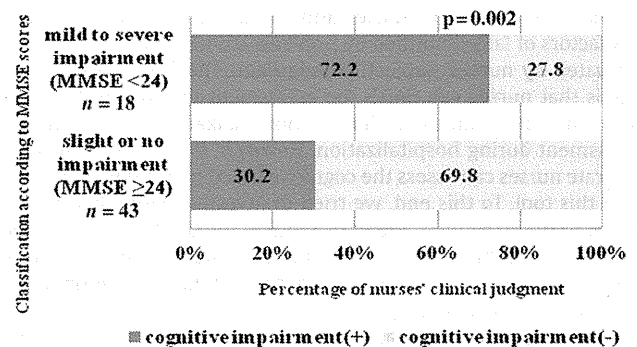


Fig. 1. The percentage of patients to be judged to have at least one abnormality by nurses in patients with mild to severe cognitive or slight to no impairment by MMSE. The difference was determined using Chi-square test.

higher in elderly patients with lower MMSE scores than those with higher MMSE scores. Despite using the four items to detect cognitive impairment, our study demonstrated that the assessment used by nurses was not completely successful to evaluate the cognitive function of elderly patients.

According to our data, nurses could not detect impaired cognition with the four items in one-third of the patients with mild impairment determined by MMSE. This percentage was unexpectedly high. We assume that it is difficult for nurses to accurately assess patient's cognitive function at admission; however, nurses could detect impaired cognition in patients with mild impairment at the second assessment, which was done 1 to 2 weeks after admission. Thus, it is conceivable that nurses may not have obtained sufficient information for the assessment at admission. However, most falls in hospital occur within a week.¹⁵ In addition, demented patients have a markedly increased fall and fracture risk, almost two times more in comparison with nondemented elderly.^{16–18} Furthermore, diminished motor control is related to cognitive status in older adults. Thus, changes in cognitive function may contribute to an increased fall risk. Accordingly, it is necessary

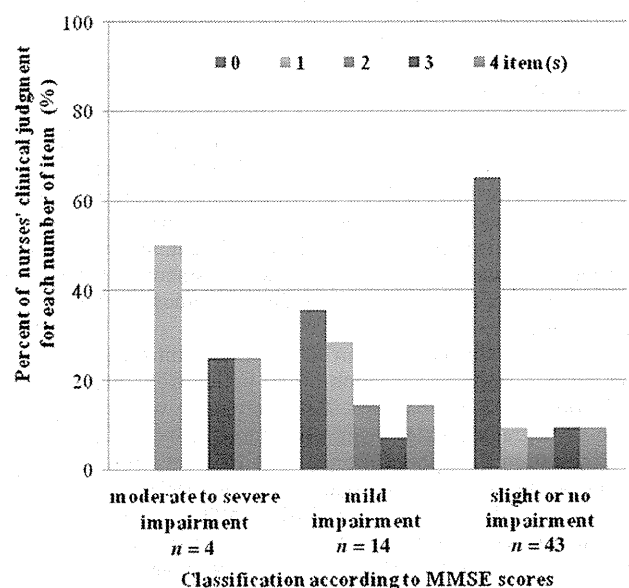


Fig. 2. The number of items judged to have abnormality in four items on cognitive function by nurses in each group of patients classified according to their MMSE scores.

for nurses to assess even mild cognitive impairment as well as severe impairment at an early stage of admission.¹⁹ According to these results, it is conceivable to think that we should develop a better fall assessment tool to detect mild cognitive impairment and educate nurses to assess patients with cognitive impairment more accurately. However, generally speaking, screening of cognitive function by nurses should be aimed for higher sensitivity than higher specificity.

Although all patients with moderate to severe impairment were judged to have at least one of the four abnormalities, they were not completely judged to have each abnormality. It is suggested that a comprehensive evaluation using all of the four items of cognitive impairment is better to evaluate than using each item at admission. The percentage of patients judged by nurses to have memory loss was the highest among the four items. In contrast, the percentage of patients judged by nurses to have disorientation was the lowest. Nurses obtain information of patients during nursing care including active daily life assistance. It is extremely difficult to confirm whether a patient recognizes date, a day of the week, and a place during active daily life assistance. However, it is easy to assess whether or not a patient forgets recent episodes, to repeat the same questions and talks, and forgets where he or she puts something. The most likely explanation is that the judgment of disorientation is more difficult to assess than memory loss. Therefore, the judgment of disorientation might be unnecessary in this tool.

Many studies have shown the development of effective several assessment tools to identify fall risk in the elderly at high risk in institutionalized settings.^{11,12} Many hospitals have implemented routine screening to assess fall risk for a patient, followed up with a more focused assessment of those deemed to be at high risk.^{11,12} In addition, previous study showed that nurses' clinical judgments could predict falls of a patient as well as fall risk assessment tool.^{20–22} However, these studies did not indicate how nurses made successful predictions. They only implicated that the intuition by nurses can predict falls. Because of this, we thought it necessary to show the validity of nurses' clinical judgment by performing MMSE in frail geriatric patients.

Several potential limitations should be considered when interpreting these results. First, the two measurements used in this study, four items of cognitive impairment in the fall risk assessment tool and MMSE, were not evaluated at the same time so information bias could occur. However, we excluded the data in which CGA was performed after more than one month of clinical judgment. Clinical judgment by nurses was also performed at admission, and all of the patients were judged by nurses before MMSE. The nurses were not informed of the patients' MMSE scores. Thus, the evaluation of MMSE did not affect nurses' clinical judgment. Second, we did not investigate the experience of nurses which might have affected the results. Third, the education level in the patients was also a confounding factor in this study. Information about the education levels of the patients was not obtained, because the literacy rate is extremely high in Japan and the education levels of Japanese patients is quite similar. Therefore, we assumed that the effect of educational levels would be minimal. Finally, the patients were limited those who admitted only to the Department of Geriatric Medicine in one university hospital and selected for CGA. It could be difficult to generalize these results.

In conclusion our data indicated that a comprehensive evaluation using all of the four items on cognitive impairment more effective in detecting cognitive impairment in elderly than using individual items. However, one-third of cognitively impaired elderly patients based on the result of MMSE were not accurately assessed by nurses despite using the four items on cognition, while

the presence of disorientation assessed by nurses was not able to predict cognitive impairment based on the results of MMSE. Therefore, disorientation in this tool should be deleted in the future. Furthermore, it is important to repeat nurses' assessment on cognition after 1 or 2 weeks of admission because cognition levels might change after the acute phase. It is important to educate nurses to assess patients with cognitive impairment more accurately.

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