A multiple regression analysis was carried out to more systemically examine the significant predictors of lower walking ability while controlling for statistically significant predictors of a declined ability to walk. The multivariable-adjusted results of declined ability to walk are shown in Table 3. DA group patients were significantly more slender than MA group patients, with an adjusted odds ratio of 0.76 (95%CI, 0.63–0.92). DA group patients had a higher shock or mechanical ventilation rate than MA group patients, but not significantly.

Discussion

As mentioned above, the univariable analysis abstracted the following predictors of walking disability during hospitalization among very elderly patients with AMI: lower BMI score, cardiac shock, longer duration of stay, higher Killip class, pulmonary edema, vasopressors, IABP and mechanical ventilation. However, after multivariable adjustment, a lower BMI value and longer duration of stay were still independent predictors. Although previous published work suggests that acute or chronic illness has an adverse impact on ADL in elderly patients,[1] this is the first study to identify predictors for reduced ADL with regard to very elderly patients hospitalized with AMI. AMI patients often experience prolonged immobilization for close monitoring and intensive life support. Therefore, elderly patients admitted with AMI, especially very elderly patients aged >75, have a higher risk of lower body disability during hospitalization. Our results allow for a more appropriate selection of very elderly patients who easily fall into bedridden status.

Although previous studies have suggested that low BMI is linked to mortality, reduced ADL and prolonged hospital stay,[5–13] the relationship between low BMI and change in ADL caused by acute illness remains unclear. Thus, the present study is probably the first to suggest that the decline in ADL due to acute illness such as AMI is associated with low BMI at baseline. Because DA group patients were more likely to present with heart failure on admission, theoretically, they gained more weight due to edema than MA group patients. Therefore, the difference in BMI value between the two groups may be strongly confirmed. Also, as a recent national study suggests,[14] 20–21 is the average BMI value range for Japanese elderly people aged 75 and over. Thus, in our results, the average value seems to form the boundary between the DA and MA groups.

However, care must be taken in interpreting our results. In most cases, lower BMI is also strongly associated with chronic illness.[6,13,15–17] Because such important predictors of functional impairment including orthopedic illness are not included in our multivariable analysis, it cannot be automatically concluded that a lower BMI itself causes walking impairment. Next, because our results do not provide support for the hypothesis that nutritional treatment decreases the onset of walking disability among protein-energy malnutrition patients, a cause-and-effect relation between protein-energy malnutrition and lower walking ability in AMI elderly patients has not been confirmed. Additional studies are needed to determine whether adding BMI would maintain AMI elderly patients' ability to walk.

Table 2 Procedural characteristics of subjects

	MA ($n = 412$)	DA ($n = 30$)	*P*-value
Transfer to ICU/CCU	78.6	80.0	NS
Thrombolytics	3.6	0.0	NS
Vasopressor	34.5	66.7	<0.01
IABP	10.4	33.3	<0.01
Mechanical ventilation	7.8	46.7	<0.01
Acute PCI	63.6	40.0	NS

Data are presented as percentage of subjects. IABP, intra-aortic balloon pump; ICU/CCU, intensive care unit/coronary care unit; PCI, percutaneous coronary intervention.

Table 3 Variables independently predictive of lesser ability to walk

Variable	Odds ratio	*P*-value	95% confidence interval
Body mass index, kg/m^2	0.76	<0.01	0.63–0.92
End of life stage	–	–	–
Shock	4.50	0.15	0.59–34.28
Duration of stay, days	1.04	<0.01	1.01–1.06
Killip class ≥3	0.37	0.50	0.02–6.85
Pulmonary edema (X-ray)	2.93	0.40	0.25–35.03
Vasopressor	0.70	0.68	0.13–3.91
IABP	0.77	0.76	0.14–4.18
Mechanical ventilation	3.49	0.19	0.55–22.25

$R^2 = 0.3$.

We observed the association between prolonged hospital stay and reduced walking ability in this study. The longer length of stay among DA group might have two explanations: (i) rehabilitation periods were prolonged due to longer recovery time from reduced walking ability; and (ii) it is also possible that early discharge was difficult for DA patients living alone or those with family members working outside the home due to increased care needs. Because explanatory data including rehabilitation was not obtained in this study, further research is needed to determine the related factors that account for the differences.

There are some limitations to the present study. Our questionnaire was not specific enough to capture critical data on chronic illness needed to confirm the relationship between BMI and ADL, and this may have limited our results. Also, the subjects in TAMIS-II were all treated in tertiary care hospitals. Thus, our results may not be applicable to patients hospitalized at other institutions such as geriatric hospitals where care is provided by physicians other than cardiology specialists.

In conclusion, using TAMIS-II data, we identified the predictors of reduced walking ability during hospitalization among very elderly patients with AMI. Our results suggest that a lower BMI value and longer hospital stay are significant predictors. Future studies are needed to confirm our findings.

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ORIGINAL ARTICLE

Age-related differences in care receipt and symptom experience of elderly cancer patients dying at home: Lessons from the DEATH project

Yoshihisa Hirakawa,[1] Yuichiro Masuda,[1] Masafumi Kuzuya,[1] Akihisa Iguchi[1] and Kazumasa Uemura[2]

[1]*Department of Geriatrics, Nagoya University Graduate School of Medicine and* [2]*Center of Medical Education, Nagoya University School of Medicine, Nagoya, Aichi, Japan*

Background: Data on the differences between older and younger elderly cancer patients dying at home is sparse. To clarify age-related differences in symptom experience and care receipt of elderly cancer patients at end-of-life, we conducted a subanalysis study of the Dying Elderly at Home (DEATH) project, a multicenter study of 240 elderly aged 65 and older dying at home.

Methods: We assessed the frequency of symptom experience and end-of-life care receipt in home elderly patients during the last 2 days of their lives and evaluated the differences between younger elderly (aged 65–74) and older elderly (aged 75+) cancer decedents. The general practitioners were asked to fill out a questionnaire immediately after the death of study patients. A total of 66 younger and 51 older elderly cancer decedents were included in the analysis.

Results: Coma and dementia were common among younger and older elderly patients. Older decedents were less likely to experience anxiety, but, after adjustment for baseline characteristics, this age-related difference did not clearly appear. Older decedents were also less likely to receive opioids than younger decedents. There were no significant differences in volume of i.v. hydration between the two groups.

Conclusions: Our results suggested that there were no differences in symptom experience and care receipt among older and younger decedents, except in opioid use, at end-of-life. These findings imply a similar need of end-of-life care for younger and older elderly cancer patients who opt for home death.

Keywords: dehydration, Japan, opioid, pain, terminal care.

Introduction

The growth of the aging population has triggered an increase in the number of elderly cancer decedents.[1] In advanced cancer, when cure is impossible, symptoms should in fact be the focus of attention.[2] Therefore, understanding elderly cancer patients' symptom experience in their last days of life has become an important issue.[3] Meanwhile, the study of age differences on near end-of-life care practice and symptom experience is an area that is received increasing attention.[1,3,4] A number of studies have shown that there are age-related differences in care receipt and distress symptoms such as pain at end-of-life among cancer patients.[1,2,4–7] There is evidence that older patients would likely present with pain

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Correspondence: Dr Yoshihisa Hirakawa MD PhD, Department of Geriatrics, Nagoya University Graduate School of Medicine, 65 Tsuruma-cho, Showa-ku, Nagoya, Aichi 466-8550, Japan. Email: y.hirakawa@k8.dion.ne.jp

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than younger patients.[4,6] Rose *et al.* found in the Study to Understand Prognoses and Preferences for Risks of Treatments (SUPPORT) that older patients (aged ≥65 years) would likely be treated less aggressively.[1] There may in fact be differences in care receipt and symptom experience between older and younger elderly cancer patients. However, data on these differences is sparse.

Of particular concern are elderly patients dying at home. Although some patients with advanced cancer opt for aggressive care, home patients represent those who are likely to receive non-hospital palliative care. Although most deaths reportedly occur at hospitals, the increasing preference of elderly patients to spend their last days of life at home, rather than at a hospital,[8,9] has called public attention to home end-of-life care for elderly cancer patients. The setting of care (hospital, hospice, home) is important because different levels of treatment may be provided to control symptoms. Most published studies of the evolution and management of symptoms at the end-of-life have focused almost exclusively on hospital patients, and there are limited data about the degree of access to palliative care in the community-based settings. Therefore, home patients with advanced cancer would be an important group to examine.

Using the data of the Dying Elderly at Home (DEATH) project, a multicenter observational study, we compared two age-related groups of younger (aged 65–74) and older old (aged 75+) cancer patients in this secondary analytic study. The study time interval was selected to reflect the last days of life, although in general frequency and intensity of symptoms change during the course of the advanced cancer. If a cancer patient opts for home death, physicians should be able to notice imminent death and reorient the care toward a more palliative approach rather than hospitalize. Therefore, our chosen time frame was the last 2 days of life.

The purpose of this study was to understand the impact of age on symptom experience and treatment of elderly patients dying with cancer at home. This study will be helpful to clinicians and contribute to improved home patient quality of life.

Methods

Study design and population

The present data was obtained from the DEATH project, a multicenter observational study. The DEATH project was conducted in collaboration with the Japanese Society of Hospice and Home Care. The society is a non-profit organization which consists of general physicians and other medical and social professionals interested in hospice and home-care. To recruit physicians for the study, we sent a prospectus on our research to clinical physicians who were principle members of the society and who were experienced in providing end-of-life home care. Sixteen clinic physicians agreed to participate, representing 16 clinics in western Japan. The subjects of the study were 240 consecutive decedents aged 65 or older who had used one of the study clinics while diagnosed with any illness, including advanced cancer, and who had died at home between October 2002 and September 2004. Decedents were excluded if they were transferred to a hospital at death because assessors no longer had access to patient information. The following information was collected: sociodemographics, activities of daily living (ADL; Japan's Ministry of Welfare identifies four ranks of ADL of disabled elderly as follows:[10] Rank J [independent in ADL]; Rank A [house-bound]; Rank B [chair-bound]; and Rank C [bed-ridden]), cognitive impairment, observed symptoms and end-of-life care provided during the last 48 h of their lives. With the approval of the Japanese Society of Hospice and Home Care, we used a questionnaire that included a list of common symptoms and treatments in the end-of-life as follows.

Symptoms

Dyspnea, uncontrolled pain, controlled pain, coma, acute confusion, anxiety, dizziness, nausea and vomiting, anorexia, diarrhea, constipation, fever, urinary and fecal incontinence, hematemesis, hemoptysis, bottom blood, other types of hemorrhage, cough, sputum, and others.

End-of-life care

Heart massage, intubation, mechanical ventilation, oxygen inhalation, air-way placement, sputum suction, hyperalimentation, i.v. drip injection (except hyperalimentation), antibiotics, vasopressor, blood transfusion, opioids, urinary catheter placement, mental support, religious healing, and others.

Data collection

Immediately after the death of study patients, general practitioners (GPs) were asked to fill out a questionnaire based on the patients' medical charts and their recollection of the clinical course followed. Family members or visiting nurses who witnessed the last 48 h of the patients' lives were asked to provide additional information by the GPs. The GPs and other information providers were blinded to the study hypothesis or anticipated study results. A development of various symptoms was defined as present if it was reported by family members and/or visiting nurses. Informed consent for participation was obtained verbally from the patients or, for those with substantial cognitive impair-

ment, from a surrogate. For ethical reasons, data on all eligible participants obtained from the Japanese Society of Hospice and Home Care remained anonymous. The research protocol was reviewed and approved by the Nagoya University Research Ethics Board.

Statistical analysis

All analyses were performed using Statview-J5.0. We used data from the DEATH sample of decedents whose cause of death was any type of cancer with and without metastasis. Decedents who were diagnosed with cancer but did not die of it were not included in the analysis. Thus, a total of 66 younger (aged 65–74) and 51 older (aged 75+) elderly cancer decedents were included in the analysis. To assess the differences in characteristics and symptom experience among younger and older elderly decedents, the survey data was divided into two age groups. Group differences were compared using the unpaired *t*-test and the χ^2 test. A *P*-value of less than 0.05 was considered to be statistically significant.

We also performed a multivariable logistic regression analysis to identify any independent association between age group and symptom, after controlling for the effects of baseline factors that included sex, ADL, cognitive impairment, and type of cancer. Because the presence and severity of non-cancer illness was not examined in depth, as predictors of symptoms, non-cancer complications were not allowed to enter the model. We present the results as odds ratios and 95% confidence intervals.

Results

The distribution of younger and older elderly cancer decedent characteristics is shown in Table 1. There were no significant differences in gender, ADL, cognitive impairment, cause of death, or illness complications between the two age groups.

Younger and older elderly cancer decedents' symptom experience in the last 2 days of life is shown in Table 2 (Table 2). Coma and dementia were common in

Table 1 Elderly cancer decedent characteristics and cause of death

Variables		65–74 years (n = 66)		≥75 years (n = 51)		*P*
		n	%	*n*	%	
Female		26	39.39	26	50.98	0.211
Age (years, average ± SD)		68.14 ± 5.14		83.00 ± 5.25		0.000
ADL scale of disabled elderly	J	2	3.03	0	0.00	0.060
	A	4	6.06	7	13.73	
	B	10	15.15	16	31.37	
	C	37	56.06	22	43.14	
	Unknown	13	19.70	6	11.76	
Cognitive impairment	Present	14	21.21	13	25.49	0.793
Cause of death (primary tumor)	Gastric	13	19.70	14	27.45	0.741
	Lung	16	24.24	12	23.53	
	Liver	10	15.15	3	5.88	
	Colorectal	6	9.09	7	13.73	
	Pancreas	3	4.55	3	5.88	
	Kidney	3	4.55	1	1.96	
	Blood	0	0.00	0	0.00	
	Brain	0	0.00	0	0.00	
	Others	13	19.70	9	17.65	
	Unknown	2	3.03	2	3.92	
Complication (non-cancer illness)	Pulmonary	5	7.58	3	5.88	0.719
	Cardiovascular	2	3.03	2	3.92	0.793
	Cerebrovascular	1	1.52	1	1.96	0.854
	Kidney	0	0.00	0	0.00	–
	Liver	3	4.55	7	13.73	0.078
	Gastrointestinal	0	0.00	2	3.92	0.105
	Others	6	9.09	6	11.76	0.636
	Unknown	1	1.52	1	1.96	0.854

ADL, activities of daily living.

Table 2 Elderly cancer decedent symptom experience in last 2 days of life

Symptom	65–74 years ($n = 66$)		≥75 years ($n = 51$)		P
	n	%	n	%	
Dyspnea	31	46.97	25	49.02	0.826
Pain (uncontrolled)	11	16.67	14	27.45	0.158
Pain (controlled)	35	53.03	23	45.10	0.395
Coma	30	45.45	21	41.18	0.644
Acute confusion	16	24.24	10	19.61	0.550
Anxiety	12	18.18	2	3.92	0.018
Dizziness	2	3.03	0	0.00	0.210
Nausea and Vomiting	21	31.82	12	23.53	0.323
Anorexia	40	60.61	31	60.78	0.984
Diarrhea	3	4.55	4	7.84	0.456
Constipation	7	10.61	2	3.92	0.179
Fever	17	25.76	13	25.49	0.974
Incontinence	11	16.67	7	13.73	0.637
Hematemesis	3	4.55	1	1.96	0.446
Hemoptysis	1	1.52	0	0.00	0.377
Bottom blood	4	6.06	3	5.88	0.968
Other hemorrhage	6	9.09	3	5.88	0.518
Cough	7	10.61	8	15.69	0.415
Sputum	19	28.79	16	31.37	0.762
Other symptom	14	21.21	15	29.41	0.308

Table 3 Elderly cancer decedent care receipt in last 2 days of life

Care	65–74 years ($n = 66$)		≥75 years ($n = 51$)		P
	n	%	n	%	
Heart massage	0	0.00	1	1.96	0.253
Intubation	0	0.00	0	0.00	–
Mechanical ventilation	0	0.00	0	0.00	–
Oxygen inhalation	30	45.45	15	29.41	0.077
Airway placement	3	4.55	0	0.00	0.124
Sputum suction	17	25.76	12	23.53	0.782
Hyperalimentation	10	15.15	4	7.84	0.242
Antibiotics	6	9.09	5	9.80	0.896
Vasopressor	0	0.00	0	0.00	–
Blood transfusion	0	0.00	0	0.00	–
i.v. drip injection volume (average ± SD)	25	37.88	13	25.49	0.156
24–48 h before death	478.08	349.87	403.57	365.57	0.531
0–24 h before death	415.83	323.45	221.43	288.04	0.071
Opioids	42	63.64	19	37.25	0.005
Urinary catheter placement	13	19.70	10	19.61	0.990
Mental support	2	3.03	1	1.96	0.717
Religious healing	1	1.52	1	1.96	0.862
Others	7	10.61	2	3.92	0.179

both age groups. Although older decedents were less likely to experience anxiety, there were no significant differences in the frequency of all symptoms we listed in the study.

The care receipt of younger and older elderly cancer decedents in the last 2 days of life is shown in Table 3. Except in opioid use, there were no significant differences in all care options between the two groups. Older

Table 4 Odds ratio of symptom experience in older (75+) versus younger (65–74) elderly cancer decedents

Symptom	Odds ratio unadjusted	95%CI	Odds ratio adjusted for sex	95%CI	Odds ratio adjusted for sex, ADL, dementia and cause of death	95%CI
Dyspnea	1.09	0.52–2.256	1.14	0.54–1.39	1.72	0.57–5.18
Pain (uncontrolled)	1.89	0.78–4.62	1.83	0.74–4.49	1.67	0.48–5.82
Pain (controlled)	0.73	0.35–1.52	0.76	0.36–1.59	1.25	0.46–3.43
Coma	0.84	0.40–1.76	0.71	0.32–1.55	1.27	0.43–3.69
Acute confusion	0.76	0.31–1.86	0.71	0.29–1.76	0.48	0.14–1.62
Anxiety	0.18	0.04–0.86	0.19	0.04–0.89	0.28	0.05–1.65
Dizziness	–		–		–	
Nausea and vomiting	0.66	0.29–1.51	0.59	0.25–1.38	0.48	0.14–1.59
Anorexia	1.01	0.48–2.13	1.05	0.49–2.24	1.09	0.39–3.03
Diarrhea	1.79	0.38–8.37	1.82	0.38–8.60	1.32	0.09–19.82
Constipation	0.34	0.07–1.73	0.32	0.62–1.63	0.34	0.06–2.02
Fever	0.99	0.43–2.28	1.01	0.44–2.36	2.18	0.65–7.25
Incontinence	0.78	0.28–2.18	0.76	0.27–2.13	1.16	0.30–4.45
Hematemesis	0.42	0.04–4.16	0.46	0.05–4.59	0.58	0.03–10.52
Hemoptysis	–		–		–	
Bottom blood	0.97	0.21–4.54	1.05	0.22–4.99	1.24	0.13–12.26
Other hemorrhage	0.63	0.15–2.63	0.69	0.16–2.97	1.13	0.12–11.01
Cough	1.57	0.53–4.65	1.62	0.54–4.85	3.13	0.63–15.63
Sputum	1.13	0.51–2.51	1.28	0.56–2.91	1.23	0.40–3.73
Other symptom	1.55	0.67–3.60	1.59	0.68–3.72	2.11	0.67–6.61

95%CI, 95% confidence interval.

decedents were less likely to receive opioids than younger decedents. i.v. hydration was prevalent among the two groups, but there were no significant differences in volume.

The unadjusted and multivariable-adjusted results of symptom experience are shown in Table 4. Age was not significantly related to symptom experience during the last 2 days of life, after adjustment for differences in baseline characteristics.

Discussion

Symptom experience

This multicenter observational study examined the influence of age on symptom and care receipt in home elderly cancer patients at end-of-life. As mentioned above, it has been reported that age is a predictor of symptom experience at end-of-life. For example, Smith *et al.*[11] and Nugent *et al.*[6] observed that older lung cancer patients reported more severe dyspnea than younger patients. Some studies noted that older patients were less likely to present with pain.[3,4,6] A study by Morita *et al.*[12] reported that older patients were less likely to present with nausea and vomiting. However, our results suggested that there were no differences in symptom experience at end-of-life, inconsistent with these previous studies. Various factors may explain the similar symptom experience rates between younger and older elderly decedents found in our study.

The present study demonstrates that pain experience was not lower among the older elderly decedents. It is generally believed that pain is less common in older elderly cancer decedents than in younger cancer patients.[3,7,12–15] Therefore, we hypothesized that more decedents of the younger group showed pain than of the older group. A possible explanation for the result is that, unlike this study, the above-mentioned studies compared older and younger patients including patients aged <65. Because we focused strictly on elderly patients, the differences in symptom experience may have been reduced. Another possible explanation is that both younger and older elderly decedents had difficulty in informing nurse and physicians about their pain or other distress symptoms because of high prevalence of coma or dementia.[13,14] It is also possible that lower opioid use in the older group may also contribute to a greater prevalence of pain in the older group than we expected, because opioids were possibly avoided in very elderly patients due to a critical condition or physicians' fear of the side-effects of opioids. Thus, we should interpret these results with caution.

Also, the present study demonstrates that anxiety experience was lower among the older elderly decedents than among the younger before adjustment. However, after adjustment for baseline factors, this age-related difference did not clearly appear. Thus, our findings suggested that age itself is not a predictor of anxiety.

Delirium is a frequent occurrence in advanced cancer patients and elderly patients.[16] Our results corroborated the finding of Cobb *et al.* that advanced age is not a significant risk factor of delirium.[16]

End-of-life care receipt

There were no significant age-related differences in the prevalence of care receipt except in opioid use. The similarity in volume of i.v. drip infusion among the two groups was consistent with a previous study of Morita *et al.*[4] conducted in a hospice. Whether or not physicians should be allowed to administer i.v. drip infusions to cancer patients at end-of-life has been the focus of discussion.[17] Moreover, the referral pattern for i.v. drip infusion may differ for home, hospital and hospice patients.[4,18] Our results add a new insight to current data on i.v. drip infusion at home end-of-life care for advanced cancer elderly patients. As can be expected in a home setting, few decedents received life-sustaining interventions such as heart massage, intubation and mechanical ventilation, regardless of age group. As for aggressive care such as resuscitation or use of ventilator, Rose *et al.*[1] observed that older cancer patients aged 65 and over received less aggressive care than younger cancer patients at teaching hospitals. The difference in settings may account for the differences between the study of Rose *et al.* and ours. Our results supplement previous data on home end-of-life care.[19]

Study limitations

Our study had a number of limitations. First, we enlisted each clinic to perform evaluations because of the large quantity of settings. This may have biased the assessors' evaluation and limited the validity of the results because it is possible that the data collecting procedures and quality varied depending on the GPs in charge of data collection. Second, judging from the high prevalence of coma in both age groups, seriously ill patients were in comas during the last days of their life and this might have reduced the frequency of symptom complaint such as anxiety or pain. Third, we were unable to compare the backgrounds of younger and older elderly cancer patients because our database did not capture the full extent of the subjects' characteristics which could contribute to symptom experience, especially the ability to verbalize symptoms or the severity of illness complication. Forth, because of the small number of patients and limited study settings, the findings cannot be generalized for Japanese elderly patients. Moreover, the Japanese Society of Hospice and Home Care and the study physicians are interested in hospice and home care and selection bias is thereby possible. Finally, due to the difficulty in collecting data, we excluded those patients who received home care but who were finally admitted to hospitals prior to death. We think that this population is an interesting target population with serious symptoms. We should conduct a survey of symptom experience and care receipt at end-of-life on patients who were hospitalized near death.

Conclusions

The purpose of this analytic study was to evaluate the age-related differences in symptom experience and care receipt of elderly cancer patients dying at home during the last 2 days of life. Patients' age did not influence symptom experience and care receipts among these patients, although opioid use was less frequent among older elderly patients. Coma and dementia were common among these patients and this might have reduced the frequency of symptom complaint. These findings imply a similar need of end-of-life care for younger and older elderly cancer patients who opt for home death. However, due to the important limitations of this study, further research is needed to cast a better light on the issue.

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ORIGINAL ARTICLES: EPIDEMIOLOGY, CLINICAL PRACTICE AND HEALTH

Age-related differences in clinical characteristics, early outcomes and cardiac management of acute myocardial infarction in Japan: Lessons from the Tokai Acute Myocardial Infarction Study (TAMIS)

Yoshihisa Hirakawa,[1] Yuichiro Masuda,[1] Masafumi Kuzuya,[1] Takaya Kimata,[1] Akihisa Iguchi[1] and Kazumasa Uemura[2]

[1]*Department of Geriatrics, and* [2]*Center of Medical Education, Nagoya University School of Medicine, Aichi, Japan*

Recent data suggest substantial variations in the treatment strategies for patients with acute myocardial infarction (AMI) based on age. This study aimed to compare the management and early outcomes of AMI across age groups in Japan. Data from 13 acute care hospitals that were included in the Tokai Acute Myocardial Infarction Study sample were used. This is a retrospective study of all patients admitted to the hospitals with the diagnosis of AMI from 1995–1997. We abstracted the baseline and procedural characteristics from detailed chart reviews. Patients were stratified into four age categories: up to 64; 65–74; 75–84; and 85 or more years of age. A total of 966 patients were aged up to 64 years, 608 were 65–74 years, 365 were 75–84 years, and 79 were 85 or more years. The rates at which the treadmill test, coronary angiography and percutaneous coronary intervention were performed decreased with advancing age (–14%, $P < 0.01$; –55%, $P < 0.01$; and –42%, $P < 0.01$, respectively, for the up to 64-year-old vs 85-year-old or more groups). Thrombolytic therapy was less often prescribed in the older groups ($P < 0.01$). At discharge, aspirin, β-blockers, angiotensin-converting enzyme inhibitors, nitrates, calcium antagonists, and anti-hyperlipidemics were prescribed less often in the older groups ($P < 0.01$, <0.05, <0.01, <0.01, <0.01, <0.01, respectively), while diuretics were prescribed more often in the older groups ($P < 0.01$). Our results suggest that fewer elderly patients were undertreated and had a significantly higher risk of in-hospital mortality.

Keywords: acute myocardial infarction, management, medications, older, percutaneous coronary intervention.

Introduction

Previous studies have demonstrated that elderly individuals with acute myocardial infarction (AMI) experience lower rates of intervention and technology-based services and have a poorer mortality rate than the younger population.[1–6] However, the impacts of age on

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Correspondence: Dr Yoshihisa Hirakawa MD, Department of Geriatrics, Nagoya University Graduate School of Medicine, 65 Tsuruma-cho, Showa-ku, Nagoya, Aichi 466-8550, Japan. Email: y.hirakawa@k8.dion.ne.jp

the clinical characteristics, early outcomes and treatment in patients with AMI are not sufficiently known yet, especially in Japan.

The Tokai Acute Myocardial Infarction Study (TAMIS) is a multi-hospital retrospective study performed in the Tokai region (central Japan). All of the study subjects were adult patients who had been hospitalized for newly diagnosed AMI at one of 13 acute care hospitals between January 1995 and December 1997. Using this dataset, we aimed to compare the management and outcome of AMI across age groups in Japan.

Methods

The present data were obtained from TAMIS. All of the 2020 study subjects were adult patients who had been hospitalized for newly diagnosed AMI at one of 13 acute care hospitals between January 1995 and December 1997. Because the methods used in the TAMIS have been published elsewhere,[7] we state them only briefly here.

Study subjects' diagnoses were confirmed by later chart review. With regard to the recruitment of participant hospitals, we first selected the major hospitals that had an interchange of personnel with Nagoya University Hospital, where we are based. Second, we sent out a prospectus on our research to the selected hospitals. Thirteen hospitals then approved the study; all 13 were municipal or non-profit general hospitals that provide coronary angiography (CAG) and percutaneous coronary intervention (PCI).

Data collection

We abstracted the baseline and procedural characteristics from detailed chart reviews. The examiners included both physicians and skilled nurses trained to fill out our questionnaire, which included information on age, sex, body temperature, heart rate, systolic blood pressure, independent activities of daily living (ADL), medical history, locations of myocardial infarctions, Q-wave AMI, reported chest pain that lasted 30 min or longer during the period from onset to admission, ejection fraction, pulmonary edema confirmed by X-ray examination, and hospital outcomes (length of stay, transfer to intensive care unit/coronary care unit, shock or any sort of bleeding including major bleeding and puncture site bleeding during hospitalization, and in-hospital mortality). The location of myocardial infarctions and the ejection fraction were confirmed by ultrasound-echocardiogram examination. A history of various comorbid conditions was recorded as present if it was documented in the medical charts. If no information was documented, comorbid conditions were recorded as absent.

We also investigated the procedural characteristics of the patients (thrombolytics, vasopressor, ultrasound echocardiogram, treadmill test [TMT], CAG, intra-aortic balloon pumping (IABP), mechanical ventilation, and discharge medications (aspirin, β-blocker, angiotensin-converting enzyme [ACE] inhibitors, nitrates, calcium channel blockers, diuretics, and anti-hyperlipidemics)].

Statistical analysis

Patients were stratified into four age categories: up to 64; 65–74; 75–84; and 85 or more years of age. We excluded from the analysis two subjects whose ages had not been specified. We compared the baseline and procedural characteristics as well as the clinical outcomes among age groups. Statistical analysis was performed using the χ^2 test for categorical variables and the Kruskal–Wallis test for continuous variables. The data were analyzed using Statview-J 5.0 (SAS Institute, Cary, NC, USA). A *P*-value of less than 0.05 was considered statistically significant.

Results

The baseline characteristics of the patients according to age are shown in Table 1. Approximately half of the study sample was aged up to 64 years. The percentage of women increased with advancing age. Body temperature decreased with advancing age. Heart rate was higher in those aged 85 or more years, while systolic blood pressure was higher in those aged up to 64 years. A history of hypercholesterolemia, diabetes and smoking were more common in those aged up to 64 years. The prevalence of previous angina and the prevalence of previous cerebrovascular disease were higher in patients aged 75–84 years and increased with increasing age. A history of previous heart failure increased with increasing age. The proportion of patients showing pulmonary edema by X-ray examination or dependent ADL increased gradually with increasing age. The percentage of patients with chest pain was comparatively low (20–27%).

Comparisons of the procedural characteristics of patients are shown in Table 2. The rate of TMT decreased with advancing age (20.08% in the up to 64 years group vs 6.33% in the 85 or more years group). Also, the rate of CAG and PCI decreased with advancing age (95.65% and 74.12% in the up to 64 years group vs 40.51% and 31.65% in the 85 or more years group, respectively). Thrombolytic therapy was less often prescribed in the older groups, while vasopressors were prescribed more frequently to these patients. The rate of mechanical ventilation was highest among patients aged 65–74 years and was less utilized in the youngest and oldest groups.

Aspirin, β-blockers, ACE inhibitors, nitrates, calcium antagonists, and anti-hyperlipidemics were all less often

Table 1 Baseline characteristics of the patients ($n = 2018$)

	Age groups, years				
	64 ($n = 966$)	65–74 ($n = 608$)	75–84 ($n = 365$)	85– ($n = 79$)	*P*-value
Women	144 (14.91%)	175 (28.78%)	176 (48.22%)	40 (50.63%)	0.000
Age (mean ± SD)	54.97 ± 0.23	69.35 ± 0.12	78.95 ± 0.15	87.08 ± 0.26	0.000
Body temperature (mean ± SD)	36.2 ± 0.02	36.11 ± 0.03	36.08 ± 0.05	35.83 ± 0.10	0.000
Heart rate (beats/min, mean ± SD)	80.86 ± 0.60	80.22 ± 0.86	81.57 ± 1.14	86.95 ± 2.57	0.025
Systolic blood pressure (mmHg, mean ± SD)	131.61 ± 0.86	128.39 ± 1.14	126.29 ± 1.49	127.4 ± 3.43	0.014
Body mass index (mean ± SD)	23.84 ± 0.11	22.53 ± 0.14	21.93 ± 0.26	21.65 ± 0.73	0.000
Independent ADL	943 (97.62%)	573 (94.24%)	319 (87.40%)	62 (78.48%)	0.000
Medical history					
Hypertension	346 (35.82%)	239 (39.31%)	153 (41.92%)	30 (37.97%)	0.190
Hypercholesterolemia	141 (14.60%)	58 (9.54%)	16 (4.38%)	4 (5.06%)	0.000
Diabetes	258 (26.71%)	153 (25.16%)	66 (18.08%)	10 (12.66%)	0.001
Previous angina	103 (10.66%)	101 (16.61%)	62 (16.99%)	13 (16.46%)	0.001
Previous heart failure	29 (3.00%)	29 (4.77%)	32 (8.77%)	10 (12.66%)	0.000
Previous myocardial infarction	85 (8.80%)	68 (11.18%)	42 (11.51%)	8 (10.13%)	0.335
Smoking	647 (66.98%)	291 (47.86%)	86 (23.56%)	17 (21.52%)	0.000
Renal failure	22 (2.28%)	17 (2.80%)	9 (2.47%)	1 (1.27%)	0.827
Cerebrovascular disease	50 (5.18%)	73 (12.01%)	54 (14.79%)	11 (13.92%)	0.000
Aortic aneurysm	9 (0.93%)	3 (0.49%)	4 (1.10%)	1 (1.27%)	0.699
Peptic ulcer	87 (9.01%)	46 (7.57%)	32 (8.77%)	7 (8.86%)	0.791
Q-wave MI	119 (12.32%)	85 (13.98%)	56 (15.34%)	15 (18.99%)	0.594
Locations of MI					
Antero/septal	451 (46.69%)	276 (45.39%)	167 (45.75%)	34 (43.04%)	0.426
Lateral	58 (6.00%)	30 (4.93%)	25 (6.85%)	4 (5.06%)	
Posterior	171 (17.70%)	105 (17.27%)	55 (15.07%)	5 (6.33%)	
Inferior	284 (29.40%)	189 (31.09%)	115 (31.51%)	25 (31.65%)	
Subendocardial	12 (1.24%)	9 (1.48%)	0 (0.00%)	0 (0.00%)	
Others	50 (5.18%)	38 (6.25%)	17 (4.66%)	4 (5.06%)	
Chest pain	217 (22.46%)	131 (21.55%)	98 (26.85%)	16 (20.25%)	0.233
EF (%, mean ± SD)	55.79 ± 0.76	55.31 ± 0.90	54.34 ± 1.34	48.68 ± 2.78	0.089
Pulmonary edema (X-ray)	206 (21.33%)	173 (28.45%)	138 (37.81%)	35 (44.30%)	0.000

ADL, activity of daily living; COPD, chronic obstructive pulmonary disease; EF, ejection fraction; MI, myocardial infarction.

prescribed in the older groups. Diuretics were prescribed more often in the older groups, showing a peak in patients aged 75–84 years (20.82%).

The hospital outcomes of the patients are shown in Table 3. The length of hospitalization was shortest in those aged 85 or more years (24 days). The in-hospital mortality rate increased with advancing age (4.04% in the up to 64 years group vs 35.44% in the 85 or more years group). The proportion of patients with shock increased with advancing age, showing a peak in those aged 75–84 years (25.75%) and declining thereafter.

Discussion

This secondary analysis study examined the influence of age on the delivery of cardiac management and early outcomes among patients with AMI. In accordance with previous studies,[1–6] our data show that the proportion of patients treated with any type of coronary reperfusion therapy or medication decreased with increasing age. Moreover, this study suggested that elderly patients had a higher risk of in-hospital death. Although it is somewhat dated, we believe that this study is valuable for confirming the results of previous studies because those studies have not been well conducted in the Japanese population.

In our results, as seen in other studies,[1,8,9] older patients had an increased prevalence of risk profile, including previous angina, previous heart failure and cerebrovascular disease. However, among the important risk factors for AMI, hypercholesterolemia, diabetes and smoking were factors that were inversely related to age.

Table 2 Procedural characteristics of the patients ($n = 2018$)

	Age groups, years 64 ($n = 966$)	65–74 ($n = 608$)	75–84 ($n = 365$)	85+ ($n = 79$)	*P*-value
UCG	833 (86.23%)	529 (87.01%)	320 (87.67%)	67 (84.81%)	0.856
TMT	194 (20.08%)	99 (16.28%)	33 (9.04%)	5 (6.33%)	0.000
CAG	924 (95.65%)	556 (91.45%)	258 (70.68%)	32 (40.51%)	0.000
PCI	716 (74.12%)	412 (67.76%)	182 (49.86%)	25 (31.65%)	0.000
CABG	46 (4.76%)	37 (6.09%)	14 (3.84%)	1 (1.27%)	0.169
Thrombolytics	198 (20.50%)	112 (18.42%)	45 (12.33%)	4 (5.06%)	0.000
Vasopressor	304 (31.47%)	227 (37.34%)	166 (45.48%)	40 (50.63%)	0.000
IABP	148 (15.32%)	98 (16.12%)	46 (12.60%)	6 (7.59%)	0.127
Mechanical ventilation	95 (9.83%)	102 (16.78%)	54 (14.79%)	11 (13.92%)	0.001
Discharge medication					
Aspirin	726 (75.16%)	390 (64.14%)	200 (54.79%)	28 (35.44%)	0.000
β-Blocker	54 (5.59%)	20 (3.29%)	11 (3.01%)	0 (0.00%)	0.014
ACE inhibitors	379 (39.23%)	208 (34.21%)	99 (27.12%)	18 (22.78%)	0.000
Nitrates	764 (79.09%)	453 (74.51%)	241 (66.03%)	40 (50.63%)	0.000
Calcium channel blockers	458 (47.41%)	259 (42.60%)	114 (31.23%)	19 (24.05%)	0.000
Diuretics	95 (9.83%)	89 (14.64%)	76 (20.82%)	16 (20.25%)	0.000
Anti-hyperlipidemics	127 (13.15%)	58 (9.54%)	14 (3.84%)	1 (1.27%)	0.000

CABG, coronary artery bypass graft; CAG, coronary angiography; IABP, intra-aortic balloon pump; PCI, percutaneous coronary intervention; TMT, treadmill test; UCG, ultrasound-echocardiogram.

Table 3 Hospital outcome of the patients ($n = 2018$)

	Age groups, years 64 ($n = 966$)	65–74 ($n = 608$)	75–84 ($n = 365$)	85- ($n = 79$)	*P*-value
Length of stay† (days, mean ± SD)	28.76 ± 0.68	31.38 ± 1.02	31.39 ± 1.28	24.18 ± 1.56	0.003
Transfer to ICU/CCU	768 (79.50%)	477 (78.45%)	280 (76.71%)	63 (79.75%)	0.728
Shock	174 (18.01%)	126 (20.72%)	94 (25.75%)	20 (25.32%)	0.012
Bleeding	132 (13.66%)	90 (14.80%)	47 (12.88%)	7 (8.86%)	0.493
In-hospital death	39 (4.04%)	67 (11.02%)	76 (20.82%)	28 (35.44%)	0.000

†Patients who died during hospitalization were excluded. ICU/CCU, intensive care unit/coronary care unit.

Also, hypertension was not significantly related to age.[8] One good explanation for the lower prevalence of risk profiles among elderly patients is that patients with risk profiles may have shorter survival durations and therefore rarely reach an advanced age.[1] Another explanation is that the important risk factors for AMI among elderly patients are different from those among young patients.

Heart rate was higher in the oldest group, while systolic blood pressure was higher in the youngest group. In a result that is consistent with a previous study,[8] our study demonstrated that the elderly were more likely to exhibit the complications of heart failure and cardiogenic shock. This finding may account for the higher heart rate and lower blood pressure among elderly patients.

Chest pain was less common in all age groups than in a previous study.[8] This may be because the present study was retrospective and because chest pain was strictly defined as a reported chest pain that lasted 30 min or longer during the period from onset to admission.

Our results also showed that in-hospital cardiac management of patients with AMI was prescribed less often in elderly patients. In contrast, vasopressors or diuretics

were used more frequently among those patients. The higher rate of prescription of vasopressors or diuretics may be due to the more frequent occurrence of severe heart failure among elderly patients. Elderly patients were less likely to be given TMT than younger patients, probably because of the higher prevalence of ADL impairment, congestive heart failure or risk of in-hospital death.

According to the American College of Cardiology (ACC)/American Heart Association (AHA) guidelines for the management of patients with myocardial infarction,[10] PCI use was not limited to young patients. However, some previous studies have suggested that PCI was prescribed less often in elderly patients with AMI than in those who are younger.[1,9,11] In our study, CAG and PCI were prescribed less often in elderly patients. It is possible that the lower referral of elderly patients than younger patients for PCI is due to the lower prevalence of CAG in elderly patients, because the proportion of patients who underwent CAG and were referred for PCI was similar among the four age groups (χ^2 test, $P = 0.11$). One possible explanation for the lower prevalence of CAG is that CAG was avoided in elderly patients with a critical condition, because they were more likely to present with cardiac shock or to be given mechanical ventilation and had a higher in-hospital mortality rate than younger patients. Another possible explanation is that the differences in the prescription of CAG among the age groups are due to differences in the socioeconomic situation between young and old patients.[11] Moreover, it is possible that elderly patients with AMI failed to be given CAG because they tended to consult their physicians later after the onset of their conditions.[12] However, because our explanation is limited in the present study, further research is needed to determine which factors account for the difference in referral for CAG between young and old patients.

Although the benefits of thrombolytic therapy have been substantiated in numerous trials,[8,13–15] as previous studies have reported, our results suggest that thrombolytic therapy is more likely to be withheld from elderly patients than from younger patients.[1,8,13,14] Our results suggest that increased age is progressively associated with previous cerebrovascular disease, and thus fear of major bleeding complications such as cerebral bleeding in elderly patients may lead to a lower utilization of thrombolytics.[1,16,17]

Regarding discharge medications, all of the medicines chosen in our study, including aspirins, β-blockers, ACE inhibitors, nitrates, calcium antagonists and anti-hyperlipidemics were prescribed less often in elderly patients with AMI in the TAMIS. One possible explanation for this is that physicians feared the side-effects of those medicines or refrained from prescribing them due to polypharmacy.[8,18–20] Another possible reason is that the rate of contraindications to those medications was higher among elderly patients.[1] However, although nitrates and calcium antagonists have not been proven to be beneficial,[1,17,21] the benefits of aspirin, β-blockers, ACE inhibitors, or anti-hyperlipidemics have been shown in previous studies.[6,22–27] Although our results should be more cautiously evaluated to avoid misinterpretation, as previous studies have suggested,[1,2,13] our results may indicate that elderly patients with AMI were excluded from standardized and optimal medications.

Our results suggest that age has an impact on the length of hospitalization, even after excluding from the analysis the patients who died during hospitalization. Although this result appears to be positive for elderly patients, because fewer elderly patients underwent cardiac management in our study, the earlier discharge of elderly patients may relate to the lack of utilization of intensive therapies for AMI. Therefore, the result should be cautiously interpreted, and additional study is needed to assess the difference in the length of hospitalization between young and old patients.

There were several important limitations of this study. To our knowledge, the TAMIS is one of the largest multicenter studies in Japan; however, the study setting was geographically narrow. Also, the TAMIS data may be old. It is possible that our results do not reflect temporal trends in AMI management. We may not have captured the full extent of the study subjects' characteristics and clinical course because the data collecting procedures may have varied among the hospitals depending on who was in charge of the data collection in each hospital, as not all trained nurses are familiar with medical data on circulatory illnesses. Finally, although our intention was to construct a comprehensive questionnaire, there was a large amount of missing laboratory data, such as the distribution of the cholesterol level, creatine kinase myocardial band, or ST elevation, which could influence cardiac management.

Conclusion

Using the TAMIS data, we compared the cardiac management and early outcomes of AMI across age groups. Our results suggest that elderly patients were undertreated and had a significantly higher risk of in-hospital mortality. Further study using more recent data is needed to confirm these trends.

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ORIGINAL ARTICLES: SOCIAL RESEARCH, PLANNING AND PRACTICE

Director perceptions of end-of-life care at geriatric health services facilities in Japan

Yoshihisa Hirakawa,[1] Yuichiro Masuda,[1] Masafumi Kuzuya,[1] Akihisa Iguchi[1] and Kazumasa Uemura[2]

[1]Department of Geriatrics, Nagoya University Graduate School of Medicine, and [2]Center of Medical Education, Nagoya University School of Medicine, Aichi, Japan

Geriatric health services facilities (GHSF) are expected to assume a greater role in caring for the dying elderly in the future. However, very little research has dealt with the topic. The aim of this nationwide study is to clarify current end-of-life care policies and practices of GHSF. The subjects were 2876 managing directors of GHSF. Data was collected through mailed questionnaires in 2003. The content of the questionnaires included: (i) general characteristics; (ii) end-of-life care policies; (iii) available medical treatments; and (iv) staff education. To evaluate the factors associated with end-of-life care policies at GHSF, we divided the facilities into two groups, according to whether their policy toward end-of-life care was progressive or regressive. The response rate was 40.3%. The results indicated that a total of 513 GHSF implemented progressive policies for end-of-life care. The factors associated with a progressive policy for end-of-life care were: (i) availability of medical intervention within and outside of the facilities; (ii) staff education; and (iii) discussion about end-of-life care policy with residents and family. Duration of stay also was positively associated with a progressive policy. Our study highlights the need for a national consensus on reforming the end-of-life care system of long-term care facilities.

Keywords: elderly, end-of-life care, geriatric intermediate care facility, long-term care facility, policy.

Introduction

In April 2000, Japan introduced a public long-term care insurance system to confront the challenges brought on by an aging society. Geriatric health services facilities (GHSF; i.e. geriatric intermediate care facilities) are public long-term care facilities, which include nursing homes, geriatric health service facilities and geriatric hospitals, covered by public insurance.[1] GHSF are facilities that provide nursing care and rehabilitation services aimed at enabling the elderly who do not need to be hospitalized to return home, thereby assuming an intermediary position between nursing homes and geriatric hospitals (http://www.roken.or.jp/english.htm).

Due to the aging of the population, the preferences of elderly patients, and the rising health-care costs, a gradual shift in the place where elderly people spend their last years from hospitals to long-term care facilities is expected in the near future.[2–7] As a result, it is anticipated that GHSF will assume a growing responsibility in caring for the dying elderly.[8] Successful end-of-life care requires that the elderly and their families be guided in making decisions about the available treatment and about where to die.[9,10] Because the range of medical expertise or resources presumed necessary for optimal care is limited at long-term care facilities,[5,11] the elderly and their family should be well-informed about the various end-of-life care options available to them at the place where they want to spend the last days of their life.

However, so far, very little research has focused on end-of-life care at long-term care facilities for the elderly

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Correspondence: Dr Yoshihisa Hirakawa, Department of Geriatrics, Nagoya University Graduate School of Medicine, 65 Tsuruma-cho, Showa-ku, Nagoya, Aichi 466-8550, Japan. Email: y.hirakawa@k8.dion.ne.jp

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in Japan. Therefore, the aim of this study is to clarify and compare current end-of-life care policies and practices at GHSF in Japan.

Methods

Study sample

The subjects in this study were 2876 managing directors of GHSF belonging to the Japan Association of Geriatric Health Services Facilities as of November 2003.

Research content

Data was collected through mailed, self-reported, structured questionnaires covering: (i) general characteristics; (ii) end-of-life care policies; (iii) available medical treatments; and (iv) staff education. As for medical treatments, we chose 13 items that we estimated might be necessary in providing end-of-life care at GHSF.

In addition, GHSF that responded that they do not offer end-of-life care at their facilities were given the opportunity to explain their reasons in a structured questionnaire. Because relatively few studies have been carried out on end-of-life care at GHSF, we conducted interviews with several leading members of the Japan Association of Geriatric Health Services Facilities to define the possible barriers to end-of-life care provision at GHSF and draw up the questionnaire.

Data analysis

To evaluate the factors correlated with end-of-life care policies at GHSF, we divided the GHSF into two groups according to whether they had a progressive or a regressive policy toward end-of-life care. We then compared the characteristics of the two policy groups.

The data was analyzed using Statview-J5.0. Group differences were compared using the unpaired Student's t-test and the χ^2 test. P-values of <0.05 were considered to be significant.

Results

Of the 2876 subjects, 1160 (40.3%) responded. We excluded 26 GHSF that failed to provide data on their policies in responding to the questionnaire. The general characteristics of respondents are shown in Table 1. The average quota of the facilities was 91, and there was no significant difference between the groups. A greater number of facilities with a regressive policy towards end-of-life care were established after the year 2000. Two-thirds of the policy groups were found to be run by incorporated medical institutions, which are private not-for-profit organizations. There was no significant difference in the type of organization among the groups. Moreover, no statistically significant results regarding the number of affiliated hospitals or clinics were found between the two groups. As for staff, the facilities with a progressive policy towards end-of-life care had more full- or part-time physicians than those with a regressive policy. No statistically significant results regarding the number of nurses or professional caregivers were found between the two groups. The average duration of stay was longer by over 100 days in facilities with a progressive policy than at those with a regressive policy. Facilities with a progressive policy were more likely to provide a private room. To cope with emergencies, facilities with a progressive policy had a full-time physician on 24-h call. Also, facilities with a progressive policy were more likely to secure a hospital which could send a physician in case of an emergency or a hospital to which their users could be admitted if necessary. These facilities were also more likely to secure a hospital which could send a physician in the impending death of a user. Facilities with a progressive policy were more likely to provide training and education concerning medical management and end-of-life care for nurses and/or professional caregivers. They were also more likely to routinely discuss their end-of-life care policy with the resident and family on admission.

The types of medical treatment available at GHSF are shown in Table 2. Except for treatment of bedsores, all listed treatments, namely i.v. drip injection, i.v. hyperalimentation, gastrostomy tube-feeding, nasogastric tube-feeding, oxygen inhalation, pain management, non-opioid drugs, opioids, sputum suction, indwelling urinary catheter, intermittent urinary catheterization and mechanical ventilation, were more likely to be available at facilities with a progressive policy. It should be noted that very few GHSF of either group confirmed that they offered i.v. hyperalimentation or mechanical ventilation.

We also asked the facilities with a regressive policy to explain the reasons for adopting such a policy. The reasons are shown in Table 3. The most frequent reason was medical staff shortage (52.7%), followed by organic barrier (40.4%) and restriction on medical intervention among nurses or caregivers (34.9%).

Discussion

Because the response rate was not satisfactorily high, partly due to GHSF with a regressive policy tending to refrain from responding, our results may be somewhat biased. In addition, because GHSF provide rehabilitation services in addition to nursing care, our research findings may not extend over to other types of long-term care facilities such as nursing homes.

However, the present study is a first step in analyzing the current situation of end-of-life care for elderly residents at long-term care facilities. This study

Table 1 Characteristics of geriatric health services facilities

Variables	Progressive group $n = 513$ Average no.	SD %	Regressive group $n = 621$ Average no.	SD %	*P*-value
Quota (average)	91.04	25.34	91.81	25.23	0.616
Establishment					
2000	61	11.89	106.00	17.07	0.007
Organization					
Government	26	5.07	40.00	6.44	0.454
Nonprofit organization					
Incorporated medical institution	355	69.20	402.00	64.73	
Incorporated social welfare institution	92	17.93	128.00	20.61	
Union	5	0.97	10.00	1.61	
Others	34	6.63	40.00	6.44	
Affiliated institution					
Hospital	203	39.57	232.00	37.36	0.330
Clinic	73	14.23	58.00	9.34	
Others	27	5.26	7.00	1.13	
None	213	41.52	295.00	47.50	
Staff occupation					
Physician	1.96	2.02	1.76	1.20	0.044
Nurse	11.64	5.73	11.56	3.75	0.804
Licensed care worker/helper	30.76	10.07	31.60	10.64	0.189
Duration of stay (day, average)	460.63	725.21	335.97	222.98	0.000
Private room	184	35.87	103.00	16.59	0.000
Physician's standby in case of emergency	430	83.82	439.00	70.69	0.000
Physician's visit from the outside available in case of emergency	271	52.83	236.00	38.00	0.000
Admission to hospital available in 24 h	476	92.79	554.00	89.21	0.025
Physician's visit from the outside available when the resident dies	278	54.19	127.00	20.45	0.000
Staff education medical treatment	489	95.32	551.00	88.73	0.000
End-of-life care	377	73.49	223.00	35.91	0.000
Having a discussion about end-of-life care policy with the resident and family on admission	459	89.47	253.00	40.74	0.000

demonstrates that current end-of-life care policies vary among geriatric health services facilities in Japan, and that the characteristics of GHSF differ according to policy.

Our results indicate that, after the year 2000, a greater number of facilities with a regressive policy were established than facilities with a regressive policy. This may be related to it taking much time to achieve a consensus before making a major policy decision to provide end-of-life care at GHSF. Facilities with a progressive policy had more full- or part-time physicians than those with a regressive policy, although both groups had less than two physicians (GHSF are required to arrange for at least one full-time physician in Japan). Also, facilities with a progressive policy were more likely to provide an on-call physician in case of emergencies. Unless facilities have more than one physician, it is nearly impossible for them to maintain a 24-h emergency call system. These results suggest that physician shortage is a barrier to end-of-life provision at GHSF. A progressive policy towards end-of-life care provision was positively related to duration of stay. Our guess was that the facilities with a progressive policy had a shorter average duration of stay because they had more residents with worse clinical conditions than facilities with a regressive policy. As mentioned above, GHSF generally aim at enabling disabled elderly to return from acute care hospitals to home by providing nursing care and rehabilitation services. Therefore, it is possible that the GHSF with a regressive policy encouraged their residents to leave the GHSF without delay rather than to convalesce over long periods of time. Our results suggest that medical

Table 2 Medical treatments available at geriatric health services facilities

Variables	Progressive group $n = 513$		Regressive group $n = 621$		*P*-value
	No.	%	No.	%	
i.v. drip injection	482	93.96	557	89.69	0.013
i.v. hyperalimentation	53	10.33	23	3.70	0.000
Gastrostomy tube-feeding	456	88.89	484	77.94	0.000
Nasogastric tube-feeding	387	75.44	391	62.96	0.000
Oxygen inhalation	429	83.63	387	62.32	0.000
Dealing with pain	421	82.07	405	65.22	0.000
Non-opioid	448	87.33	482	77.62	0.000
Opioid	155	30.21	82	13.20	0.000
Dealing with bedsores	508	99.03	607	97.75	0.098
Sputum suction	506	98.64	588	94.69	0.002
Indwelling urinary catheter	498	97.08	568	91.47	0.000
Intermittent urinary catheterization	434	84.60	443	71.34	0.000
Mechanical ventilation	32	6.24	21	3.38	0.025

Table 3 Reasons for having regressive policy towards end-of-life care provision ($n = 621$)

Reasons	No.	%
Medical staff shortage	327	52.66
Structural barrier	251	40.42
Restriction on medical intervention among nurses or caregivers	217	34.94
Shortage of hospital or clinic involvement	136	21.90
Care staff shortage	132	21.26
Financial difficulty	92	14.81
Lack of understanding of the persons concerned	83	13.37
Others	115	18.52

assistance from the outside is more readily available at GHSF with a progressive policy. According to previous reports, when compared with hospitals, long-term care facilities have high rates of residents with untreated pain and greater limitations in medical resources such as infrequent physician presence.[5,11,12] These factors may explain the high rates of medical assistance from the outside among GHSF with a progressive policy. However, it is difficult to determine from this study the reasons for building closer connections with outside medical assistance for end-of-life care at GHSF. Issues related to the profiles of GHSF, such as symptom management or other assistance received by dying GHSF residents, should be examined through additional research. We can also see a positive relationship between GHSF policies and staff education or discussion with residents or families on admission. Because inadequate staff education and lack of a clear grasp of residents' or families' needs for end-of-life care are identified as limitations to quality end-of-life care,[7,13] our results seem agreeable. Although staff education programs have rarely been studied at long-term care facilities such as GHSF in Japan, previous studies in other countries[12–14] have called attention to the insufficiency of end-of-life care education for nursing home staff. We may also need to develop effective educational programs for non-medical professionals, such as GHSF staff, to promote essential knowledge and information regarding end-of-life care. However, we did not investigate the quality of staff education. Additional studies are needed to prove our hypothesis.

As for medical treatments, few GHSF reported that their facilities provide i.v. hyperalimentation or mechanical ventilation. Because palliative or comfort care is desirable for end-of-life residents, these life-sustaining interventions are not always required at end-of-life care settings. Therefore, our results seem logical. Also, opioids were available at only a few GHSF. Previous published work has suggested that elderly patients who suffer from dementia are more tolerant of pain,[15,16] or that they are often unable to inform health-care providers about their pain due to a high prevalence of dementia or difficulty in communication.[15–17] Because dementia is prevalent in long-term care facilities,[11] these are possible explanations for the lower frequency in opioid use at GHSF. However, previous published work has also indicated that pain is prevalent even in elderly residents at long-term care facilities.[18–20] It is possible that pain control is a major problem for dying elderly residents at GHSF regardless of whether or not they have cancer. Thus, nurses and/or caregivers should monitor and evaluate the pain of all patients on a daily basis.

In addition, the inside availability of the medical end-of-life care treatments we listed was significantly correlated to type of policy. In fact, we can presume that the greater number of physicians available at GHSFs with a progressive policy enables these facilities to provide a wider range of medical care options. We can also assume that the decision to provide end-of-life care prompted GHSF managers to implement procedures allowing for inside medical management. It is difficult to determine from this study precisely to what extent medical care support is needed for quality end-of-life care at GHSF. We need to perform a narrative study to gather further in-depth data.

Our results suggest that there were inconsistencies among the GHSF in terms of how they perceive their own capacity to provide end-of-life care at their facilities. GHSF with a regressive policy listed a number of official requirements for not providing end-of-life care, including shortage of personnel, living environment and treatment limitations of nurses or nursing assistants. The director perceptions presented in this paper suggest areas of focus for promoting end-of-life care in long-term care institutions. Although the extent to which a revision of the official requirements impact end-of-life care at GHSF is not yet determined, our results indicate that a national consensus on reforming the end-of-life care system at long-term care facilities is needed to provide better end-of-life care at GHSF.

Conclusions

We conducted the present study to clarify current end-of-life care policies and practices of GHSF in Japan, and related policy considerations. Our results suggest that there are inconsistencies among the GHSF in terms of how they perceive their own capacity to provide end-of-life care at their facilities. Also, GHSF were found to have distinct backgrounds and characteristics according to whether they held a progressive or a regressive policy, especially with respect to the availability of inside or outside medical end-of-life care. Additional studies and a national consensus on reforming the end-of-life care system of long-term care facilities such as GHSF are needed to improve end-of-life care for the elderly.

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