RESEARCH ARTICLE

Factors Associated with Place of Death in Korean Patients with Terminal Cancer

Min Kyung Hyun[1], Kyung Hae Jung[2], Young Ho Yun[3]*, Young Ae Kim[4], Woo Jin Lee[4], Young Rok Do[5], Keun Seok Lee[4], Dae Seog Heo[6], Jong Soo Choi[7], Sam Yong Kim[8], Heung Tae Kim[4], Seok-Won Hong[1]

Abstract

　　Aim: To investigate factors that affect the place of death (POD) of terminal cancer patients. **Materials and Methods:** We recruited 702 consecutive patients (≥18 years) from 12 centers during July 2005 to October 2006, and 481 completed the questionnaire. In April 2011, we linked the data for 96.0% (n=462) of the deceased patients to the POD using the 2005-2009 death certificate data of Korea's National Statistical Office. The primary outcome variable was POD, and the predictive value of variables pertaining to patients and caregivers was evaluated using univariate and multivariate analyses. **Results:** Most patients died in a hospital (91.5%, n=441) and age, education, preference for place of terminal care, wish to use hospice/palliative care services, terminal cancer awareness, time between diagnosis and death, and global quality-of-life subscale of the EORTC QLQ-C30 of patients, and education and preference for place of terminal care of caregivers were significant predictors in univariate analyses. On multivariate analysis, patients and caregivers who preferred hospital/palliative care as the terminal care option over home care [adjusted odds ratio (aOR), 2.68; 95% confidential interval (CI), 1.18-7.04 and aOR: 2.65; 95%CI: 1.15-6.09 for patient and caregiver preferences, respectively] and caregivers who were highly educated (aOR, 3.19; 95%CI, 1.44-7.06) were predictors of POD. **Conclusions:** Most of the terminal cancer patients died in a hospital. Our findings indicate that major predictors of hospital deaths are preference of both the patient and caregiver for hospital/palliative care as the terminal care option and higher education of the caregiver.

Keywords: Neoplasms - terminal care - place of death - influencing factors - Korea

Introduction

　　Choice and control over where death occurs (at home or elsewhere) is one of the 12 principles of a good death (Smith, 2000). Place of death also has a significant meaning in the allocation of medical resources. In other words, hospital deaths consume and need more medical resource than home or hospice death.

　　In 2011, 71,579 patients died of cancer in Korea, and 87.6% died in a hospital and 9.3% died at home (StatisticsKorea, 1991-2011). In contrast, in 1991, the proportion of home deaths was 77.2% and that of hospital deaths was approximately 19.1%. Since then, hospital deaths have increased and the proportion of hospital deaths have been more than that of home death in Korea. Analyses of results for other countries do not match. For example, in London, the proportion of hospital deaths

was 56.1% in 2002 and 50.3% in 2007 (Madden et al., 2011). In Italy, the proportion of home deaths increased from 60% in 1987 to 80% in 2007 (Casadio et al., 2010). However, the proportions are similar in Japan and Korea, with hospital death accounting for 85% of cancer deaths in Japan in 2008 (Ministry of Health, 2011).

　　There are a variety of factors affecting the place of death. A systematic review showed that home death was strongly associated with a patients' low function status, preferences of the patient, use of home care, intensity of home care, and whether the patient was living with relatives and had extended family support (Gomes and Higginson, 2006). Recent studies identified that home death was associated with specific parameters in patient subsets, such as whether the patient was living with others, in the case of female patients(Masucci et al., 2010); and with higher socio-economic status, older age, and co-

[1]National Evidence-based Healthcare Collaborating Agency, [2]Department of Oncology, Asian Medical Center, [7]Department of Oncology, Gangneung Asian Hospital, University of Ulsan College of Medicine, [3]Seoul National University Hospital and College of Medicine, [6]Cancer Research Institute, Department of Internal Medicine, Seoul National University Hospital, Seoul, [4]Research Institute and Hospital, National Cancer Center, Goyang, [5]Division of Hematooncology, Department of Internal Medicine, Dongsan Medical Center, Keimyung University School of Medicine, Daegu, [8]Division of Hematooncology, Department of Internal Medicine, Chungnam University School of Medicine, Daejeon, Korea *For correspondence: lawyun08@gmail.com

habitation with others, in the case of non-cancer patients (Houttekier et al., 2009). Home death was also associated with pre-discharge health care support in hospital, post-discharge health care support after transferring to home care; preferences of the caregiver, preferences of the patient, caregiver's perception of social support, number of hospital admission days, and number of palliative home care team visits (Alonso-Babarro et al., 2011).

Using the 10-year death certificate data from Korea Statistics, one study found that hospital deaths were associated with young age, high education, white-collar jobs, and availability of more hospital beds in the region (Yun et al., 2006). The study could not gather detailed characteristics and data pertaining to quality of life (QOL) in the decision for a place of death (POD) because it was a retrospective population-based study. Wright et al. (Wright et al., 2010) found that worse QOL is associated with hospital or Intensive care unit (ICU) death.

However, few studies have comprehensively examined the relationship of various factors including QOL and quality of care with preferred place of care. Therefore, we investigated the relationship between the demographic characteristics, job status, burden of patient and caregiver, the preference of place for terminal care, wish to use hospice/palliative care service, terminal cancer awareness, treatment satisfaction, the time between diagnosis and death; and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core-30 (EORTC QLQ-C30) and the place of care. The Study to Understand Risks, Priority, and Issues at End-of-Life (SURPRISE), a multicenter study, was designed to identify important issues in the end-of-life (EOL) care from July 2005 to October 2006 (Yun et al., 2010; 2011). In this study, we sought to identify the factor(s) that affected the POD in patients with terminal cancer the most significantly in this prospective longitudinal multicenter study. It is generally difficult to identify factors associated with hospital deaths, because hospital death may be influenced by the condition of patient and caregiver. As a result, we performed a comprehensive analysis to determine the POD of terminal cancer patients to identify factors predictive of POD through seven patient-related parameters (the demographic characteristics, job status, burden of patient and caregiver, preference for POD, terminal cancer awareness, treatment satisfaction, the time between diagnosis and death), and the EORTC QLQ-C30 and six caregiver-related parameters (the demographic characteristics, job status, burden of patient and caregiver, preference for POD, terminal cancer awareness, and treatment satisfaction).

Materials and Methods

Patients and data collection

SURPRISE was a prospective, longitudinal, multicenter (11 university hospitals and the National Cancer Center) cohort study of terminal cancer patients and their caregivers. Details of the study design have been published elsewhere (Yun et al., 2010; 2011). The study protocol was approved by the Institutional Review Board (IRB) of the Seoul National University College of Medicine and each institution.
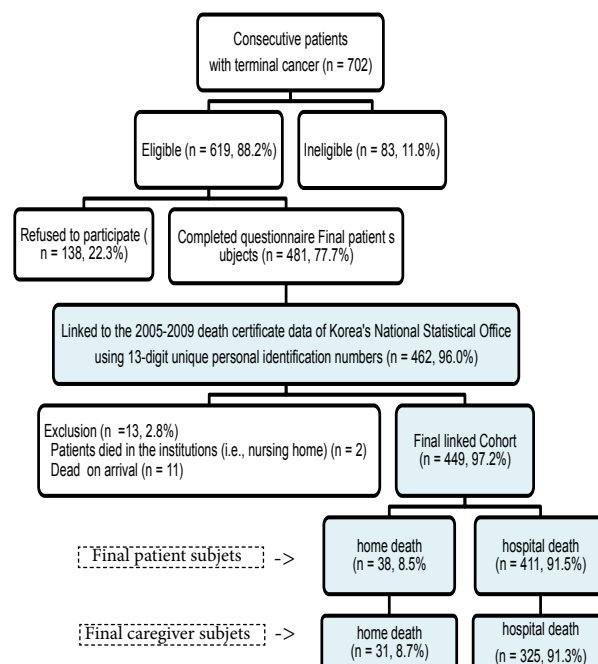
Between July 2005 to October 2006, 702 consecutive patients (≥18 years) who provided informed consent to participate in this study were recruited to the SURPRISE, and 11.8% (n=83) patients were excluded because of continuous anticancer therapy, non-evaluable disease, follow-up loss, and physical or mental incapacitation that prohibited them from completing the questionnaire. Of the remaining 619 eligible participants, 138 patients did not participate for reasons such as lack of time, illness and violation of privacy. Then, a total of 481 patients who had completed the questionnaire remained in the study (Figure 1). We conducted face-to-face interviews of patients and their caregivers at the baseline time point of the study and mailed a monthly survey within 2 months. We also conducted bereavement telephone surveys after the patient died.

We collected and recorded data pertaining to the following eight parameters: the demographic characteristics (age, sex, marital status, education, religion); job status (before cancer diagnosis, at terminal cancer diagnosis); burden of patient and caregiver (patient and caregiver burden, patient and caregiver needs of future treatment plan and financial plan etc); preference for POD (preference for place of terminal care; wish to use/ not use hospice/palliative care services); terminal cancer awareness; treatment satisfaction; time between diagnosis and death; and EORTC QLQ-C30.

In April 2011, we linked these data of the 481 patients to the 2005–2009 death certificate data from Korea's National Statistical Office (NSO) using the 13-digit unique personal identification numbers, and were able to link the POD data for 96.0% (n=462) of the deceased patients.

In addition, we excluded patients who died in

Consecutive patients with terminal cancer (n = 702)

Eligible (n = 619, 88.2%) | Ineligible (n = 83, 11.8%)

Refused to participate (n = 138, 22.3%) | Completed questionnaire Final patient subjects (n = 481, 77.7%)

Linked to the 2005-2009 death certificate data of Korea's National Statistical Office using 13-digit unique personal identification numbers (n = 462, 96.0%)

Exclusion (n =13, 2.8%)
Patients died in the institutions (i.e., nursing home) (n = 2)
Dead on arrival (n = 11) | Final linked Cohort (n = 449, 97.2%)

Final patient subjets -> | home death (n = 38, 8.5%) | hospital death (n = 411, 91.5%)

Final caregiver subjets -> | home death (n = 31, 8.7%) | hospital death (n = 325, 91.3%)

Figure 1. Flow Chart for Patient Selection. Modified from Yun YH, et al. Impact of Awareness of Terminal Illness and Use of Palliative Care of Intensive Care unit on the Survival of Terminally Ill Patients With Cancer: Prospective Cohort Study. J Clin Oncol published online on May 16, 2011

institutions (i.e, nursing homes; n=2) or were dead on arrival at the hospital (n=11), and finally analyzed data for a cohort of 449 deceased patients. And we also obtained completed questionnaires from 356 caregivers (Figure 1).

Statistical analysis

As a primary outcome variable, we used the variable 'POD' from NSO, and predictor variables from the EORTC QLQ-C30, including the time between diagnosis and death, terminal care awareness, and preference for place of terminal care. We calculated the scores of EORTC QLQ-C30 according to the EORTC scoring manual (Fayers et al., 2001), and linearly transformed the EORTC QLQ-C30 data to yield scores from 0-100; a higher score represents a better global health status and a better performance on the functional scales; a lower score represents a worse performance on the symptoms scale. We divided the patients into two groups; the problematic and non-problematic groups. The problematic group had scores <33.33 (poorer QOL and functional scales) or >66.66 (poorer performance on the symptoms scales) (Fayers, 2001a; 2001b; Ahn et al., 2007).

The Chi-square test was used to compare the differences in POD between different subsets of patients through a univariate logistic regression analysis. In addition, for factors significantly associated with POD in the univariate analysis, we performed a multivariate logistic regression analysis, with stepwise selection for each dependent variable, to evaluate the independent variables that best predicted POD. A two-sided p value of <0.05 was considered to indicate statistical significance in our study. Statistical analysis was performed using SAS version 9.1 (SAS Institute Inc, Cary, NC, USA).

Results

Patient characteristics and POD

Most patients died in a hospital (91.5%, n=411) and only 8.5% (n=38) died at home. Table 1 shows the characteristics of the patients and place of death at the time of the first face-to-face survey. The survey data indicated that 43.7% (n=191) patients wanted to die at home, but only 13.6% (n=26) of these patients died at home. On the other hand, 56.3% (n=246) patients wanted to die while under hospital/hospice/palliative care, and 95.1% (n=234) of these patients died at their preferred POD.

Significant differences were found in the age, education, preference for place of terminal care, desire to use palliative care, terminal cancer awareness, and the time between diagnosis and death between the problematic and non-problematic groups of patients (Table 1).

Association between POD and EORTC QLQ-C30

Different parameters within the global QOL subscales of the EORTC QLQ-C30 showed significant differences in the POD of patients in the two groups (Table 2).

Table 1. Patient Characteristics and Place of Death (n=449)

		Total (n=449)	Place of death Home (n=38)	Place of death Hospital (n=411)	p
Age (years)*	<55	173 (38.53%)	9 (5.20%)	164 (94.80%)	0.0494
	≥55	276 (61.47%)	29 (10.51%)	247 (89.49%)	
Sex	Male	259 (57.68%)	23 (8.88%)	236 (91.12%)	0.7109
	Female	190 (42.32%)	15 (7.89%)	175 (92.11%)	
Marital status (n=443)	Single	107 (24.15%)	6 (5.61%)	101 (94.39%)	0.2077
	Married	336 (75.85%)	32 (9.52%)	304 (90.48%)	
Education*	Less than middle school	218 (48.55%)	27 (12.39%)	191 (87.61%)	0.0037
	High school or beyond	231 (51.45%)	11 (4.76%)	220 (95.24%)	
Has a religious affiliation (n=443)	No	138 (31.15%)	13 (9.42%)	125 (90.58%)	0.5847
	Yes	305 (68.85%)	24 (7.87%)	281 (92.13%)	
Job status before cancer diagnosis	Employed	257 (57.24%)	19 (7.39%)	238 (92.61%)	0.3458
	Unemployed	192 (42.76%)	19 (9.90%)	173 (90.10%)	
Job status at terminal cancer diagnosis	Employed	72 (16.04%)	10 (13.89%)	62 (86.11%)	0.0711
	Unemployed	377 (83.96%)	28 (7.43%)	349 (92.57%)	
Patient and caregiver burden	No	33 (7.35%)	5 (15.15%)	28 (84.85%)	0.1831
	Yes	416 (92.65%)	33 (7.93%)	383 (92.07%)	
What patient and caregiver need (n=412)					
	Future treatment plan	175 (42.48%)	15 (8.57%)	160 (91.43%)	0.695
	Financial support	170 (41.26%)	16 (9.41%)	154 (90.59%)	
	Psychological counseling	56 (13.59%)	4 (7.14%)	52 (92.86%)	
	Religious assistance	11 (2.67%)	2 (18.18%)	9 (81.82%)	
Preference for place of terminal care* (n=437)	Home	191 (43.71%)	26 (13.61%)	165 (86.39%)	0.0013
	Hospital, hospice, palliative care	246 (56.29%)	12 (4.88%)	234 (95.12%)	
Wish to use hospice/palliative care service* (n=431)					
	No	268 (62.18%)	31 (11.57%)	237 (88.43%)	0.0098
	Yes	163 (37.82%)	7 (4.29%)	156 (95.71%)	
Terminal cancer awareness*	Unaware	187 (41.65%)	22 (11.76%)	165 (88.24%)	0.0337
	Aware	262 (58.35%)	16 (6.11%)	246 (93.89%)	
Treatment satisfaction	Not satisfied	224 (49.89%)	23 (10.27%)	201 (89.73%)	0.1704
	Satisfaction	225 (50.11%)	15 (6.67%)	210 (93.33%)	
The time between diagnosis and death*	≤4 months	342 (76.17%)	24 (7.02%)	318 (92.98%)	0.0491
	≥4 months	107 (23.83%)	14 (13.08%)	93 (86.92%)	

*p<0.05 by the Chi-square test, Abbreviations: DNR, do not resuscitate

Table 2. Association between Patients' Place of Death and the EORTC QLQ-C30 Scales

		Total (n=449)	Place of death Home (n=38)	Hospital (n=411)	p
Global health status/QOL					
Quality of life*	Non-problematic group	258 (57.46%)	28 (10.85%)	230 (89.15%)	0.0345
	Problematic group	191 (42.54%)	10 (5.25%)	181 (94.76%)	
Functional scales					
Physical functioning	Non-problematic group	0	0	0	
	Problematic group	449 (100%)	38 (8.46%)	411 (91.54%)	
Role functioning	Non-problematic group	0	0	0	
	Problematic group	449 (100%)	38 (8.46%)	411 (91.54%)	
Emotional functioning	Non-problematic group	367 (81.74%)	31 (8.45%)	336 (91.55%)	0.9789
	Problematic group	82 (18.26%)	7 (8.54%)	75 (91.46%)	
Cognitive functioning	Non-problematic group	375 (83.52%)	32 (8.53%)	343 (91.47%)	0.9044
	Problematic group	74 (16.48%)	6 (8.11%)	68 (91.89%)	
Social functioning	Non-problematic group	279 (62.14%)	27 (9.68%)	252 (90.32%)	0.2363
	Problematic group	170 (37.86%)	11 (6.47%)	159 (93.53%)	
Symptom scales/items					
Fatigue	Non-problematic group	174 (38.75%)	14 (8.05%)	160 (91.95%)	0.8005
	Problematic group	275 (61.25%)	24 (8.73%)	251 (91.27%)	
Nausea/vomiting	Non-problematic group	319 (71.05%)	26 (8.15%)	293 (91.85%)	0.7091
	Problematic group	130 (28.95%)	12 (9.23%)	118 (90.77%)	
Pain	Non-problematic group	216 (48.11%)	21 (9.72%)	195 (90.28%)	0.3561
	Problematic group	233 (51.89%)	17 (7.30%)	216 (92.70%)	
Dyspnea	Non-problematic group	260 (57.91%)	22 (8.46%)	238 (91.54%)	0.9988
	Problematic group	189 (42.09%)	16 (8.47%)	173 (91.53%)	
Insomnia	Non-problematic group	193 (42.98%)	18 (9.33%)	175 (90.67%)	0.5683
	Problematic group	256 (57.02%)	20 (7.81%)	236 (92.19%)	
Appetite loss	Non-problematic group	150 (33.41%)	13 (8.67%)	137 (91.33%)	0.9127
	Problematic group	299 (66.59%)	25 (8.36%)	274 (91.64%)	
Constipation	Non-problematic group	239 (53.23%)	21 (8.79%)	218 (91.21%)	0.7928
	Problematic group	210 (46.77%)	17 (8.10%)	193 (91.90%)	
Diarrhea	Non-problematic group	351 (78.17%)	31 (8.83%)	320 (91.17%)	0.5953
	Problematic group	98 (21.83%)	7 (7.14%)	91 (92.86%)	
Financial problems	Non-problematic group	191 (42.54%)	17 (8.90%)	174 (91.10%)	0.7746
	Problematic group	258 (57.46%)	21 (8.14%)	237 (91.86%)	

* p<0.05 by the Chi-square test, Note. The patients were sorted into two groups, the problematic and non-problematic groups. In the problematic group: the score was ≤33.33 (quality of life and functional scales), and >66.66 (symptoms scales) on a scale of 0-100

Caregivers' characteristics and POD

The characteristics of the caregivers in the two patient groups and their association with the POD at the time of the first face-to-face survey are shown in Table 3 Significant differences were found in the education and preference for place of terminal care between the two groups of patients (Table 3).

Factors associated with hospital death of patients in multivariate analysis

The results of the multivariate analysis of factors that were associated with POD in the univariate analysis are shown in Table 4. In multivariate analysis, patients who preferred hospital/palliative terminal care [adjusted odds ratio (aOR), 2.88; 95% confidential interval (CI), 1.18-7.04], had caregivers who were highly educated (aOR, 3.19; 95%CI, 1.44-7.06), preferred hospital/hospice/palliative terminal cancer care (aOR, 2.65; 95%CI, 1.15-6.07) were more likely to have the hospital as the POD (Table 4).

Discussion

In this prospective longitudinal multicenter study, we found that 91.5% of terminal cancer patients in our cohort died in a hospital, after linkage of the cohort data with death certificate data of Korea's NSO. Our data indicated that 43.7% of the patients wanted to die at home, but only 13.6% of these patients died at home. On the other hand, 56.3% of the patients wanted to die in the hospital/hospice/palliative care, and most 95.1% of these patients died at this preferred POD.

Multivariate analysis indicated that the three most powerful predictors of hospital death were a caregiver with a higher education status, and the preferences of the caregiver and the patient for hospital/palliative care of terminal cancer. The patient's age, education, wish to use palliative care, the time between diagnosis and death, global quality-of-life subscale data of EORTC QLQ-C30 were significantly associated with POD in univariate logistic regression analysis, but were not significant in multivariable logistic regression analysis when analyzed in conjunction with caregivers' independent predictor variables.

The proportion of cancer patients who had hospital deaths was 22.1% in United States in 2009 (Teno et al., 2013), 61.4% in Belgium in 2003 (Cohen et al., 2010), 31.0% in Netherlands in 2003 (Cohen et al., 2010), 49.9% in England in 2003 (Cohen et al., 2010), 50.3% in London in 2007 (Madden et al., 2011), 18% in Italy in 2007 (Casadio et al., 2010), 60% and 85.2% in 2007 and 2009, respectively, in Korea (Statistics Korea, 1991-2011)

Table 3. Association between Caregivers' Characteristics and Patients' Place of Death

		Total (n=356)	Place of death		p
			Home (n=31)	Hospital (n=418)	
Age years (n=354)	<55	245 (69.21%)	20 (8.16%)	225 (91.84%)	0.5535
	≥55	109 (30.79%)	11 (10.09%)	98 (89.91%)	
Sex (n=356)	Male	116 (32.58%)	9 (7.76%)	107 (92.24%)	0.6588
	Female	240 (67.42%)	22 (9.17%)	218 (90.83%)	
Marital status (n=355)	Unmarried	68 (19.15%)	6 (8.82%)	62 (91.18%)	0.9764
	Married	287 (80.85%)	25 (8.71%)	262 (91.29%)	
Education* (n=356)	Less than middle school	89 (25.00%)	14 (15.73%)	75 (84.27%)	0.0067
	High school or beyond	267 (75.00%)	17 (6.37%)	250 (93.63%)	
Has a religion (n=346)	No	114 (32.95%)	11 (9.65 %)	103 (90.35%)	0.6502
	Yes	232 (67.05%)	19 (8.19%)	213 (91.81%)	
Job status before cancer diagnosis (n=353)	Employed	195 (55.24%)	15 (7.69%)	180 (92.31%)	0.4217
	Unemployed	158 (44.76%)	16 (10.13%)	142 (89.87%)	
Job status at terminal cancer diagnosis (n=341)	Employed	120 (35.19%)	8 (6.67%)	112 (93.33%)	0.306
	Unemployed	221 (64.81%)	22 (9.95%)	199 (90.05%)	
Patient and caregiver burden (n=353)	No	8 (2.27%)	0 (0%)	8 (100.00%)	0.3747
	Yes	345 (97.73%)	31 (8.99%)	314 (91.01%)	
What patient and caregiver need (n=338)	Future treatment plan	161 (47.63%)	13 (8.07%)	148 (91.93%)	0.9656
	Financial support	122 (36.09%)	12 (9.84%)	110 (90.16%)	
	Psychological counseling	44 (13.02%)	4 (9.09%)	40 (90.91%)	
	Religious assistance	11 (3.25%)	1 (9.09%)	10 (90.91%)	
Preference for place of terminal care* (n=355)	Home	97 (27.32%)	17 (17.53%)	80 (82.47%)	0.0003
	Hospital, hospice, palliative care	258 (72.68%)	14 (5.43%)	244 (94.57%)	
Wish to use hospice/palliative care service (n=348)	No	170 (48.85%)	19 (11.18%)	151 (88.82%)	0.1466
	Yes	178 (51.15%)	12 (6.74%)	166 (93.26%)	
Terminal cancer awareness (n=355)	Unaware	58 (16.34%)	7 (12.07%)	51 (87.93%)	0.3251
	Aware	297 (83.66%)	24 (8.08%)	273 (91.92%)	
Treatment satisfaction (n=350)	Not satisfied	189 (54%)	19 (10.05%)	170 (89.95%)	0.2834
	Satisfaction	161 (46%)	11 (6.83%)	150 (93.17%)	

and 85% in Japan in 2008 (Ministry of Health, 2011). The hospital deaths in this study reached 91.5% in terminal cancer patients. Korea and Japan have a greater proportion of aged members and therefore a discussion of an efficient distribution of limited health care resources is imperative in both countries, in the light of the high medical cost of the care and treatment of terminal cancer patients. Therefore, policy makers need to know the predicting factors for hospital death of terminal cancer patients and suggest policy changes to improve the likelihood of a good death for these patients, while weighing the impact of the policies on health care costs.

In this study, we identified three patient- and caregiver-related factors associated with POD, consistent with data in some recent reports (Yun et al., 2006; Houttekier et al., 2009; Alonso-Babarro et al., 2011; Cardenas-Turanzas et al., 2011), and inconsistent with the results of some other studies (Wright et al., 2010). In particular, in our study, we investigated the effects of EORTC QLQ-C30, and found that only some items in the questionnaire were significantly associated with differences in POD. However, the recent report from Wright et al. (2010) found that a worse QOL at the end of life was increasing the risk of hospital deaths. We propose that the reason for this discrepancy is that the scale for QOL used in that study is different from that in this study, in that they used the Likert scale (from 0-10) to evaluate the QOL at the end of life, but our study used the EORTC QLQ-C30, which is a cancer-specific instrument. Also, we surmise that there are differences in the cultural and healthcare systems relevant to the two studies. Many patients, caregivers, or medical health professionals still think that end-of-life treatments in hospital have some utility in Korea, and

Table 4. Multivariate Logistic Regression Analysis of Hospital Deaths in Terminal Cancer Patients and Caregivers (n=356)

Patients	Odds ratio	95% CI
Age (years)		
<55		
≥55	N/S	
Education		
Less than middle school		
High school or beyond	N/S	
Preference for place of terminal care		
Home	1	
Hospital, hospice, palliative care	2.88	(1.182-7.037)
Wish to use hospice/palliative care service		
No		
Yes	N/S	
Terminal cancer awareness		
Unaware		
Aware	N/S	
The time between diagnosis and death		
Less than 4 months		
More than 4 months	N/S	
Quality of life		
Non-problematic group		
Problematic group	N/S	
Education		
Less than middle school	1	
High school or beyond	3.19	(1.443-7.064)
Preference for place of terminal care		
Home	1	
Hospital, hospice, palliative care	2.65	(1.149-6.088)

*All binary variables significant at p<0.05 in the Chi-square test in the univariate logistic regression analysis were included in the multivariate analysis with stepwise selection. An odds ratio (OR) <1 indicated that the condition is less likely to occur in the group of patients who died at a hospital, N/S, not significant; Ref, reference

they choose hospital care even at the terminal stages of cancer for cultural reasons specific to Asia, namely, the satisfaction from or the perception of having done their best for the patient till death. According to the National Evidence-based Healthcare Collaborating Agency report, the number of patients receiving futile life-sustaining treatments (within 1 month before death) in terminally ill patients was 138,181 (57.7% of the all deaths) in 2007, and cancer patients (26.6% of the total) accounted for the largest proportion of patients who were receiving medical treatment (Ryu, 2009). In the Korean healthcare system, medical treatment costs are less expensive than in other countries and the palliative/home care system for terminal cancer is not well-developed. This limitation has led to a disproportionate increase in hospital deaths in Korea, compared to the increases in other countries. In this study, the patients that preferred hospital/palliative terminal care over home care were more likely to die in a hospital. Although 40.1% (n=165) of the patients in this study preferred home care, only 13.6% of these patients died at home, with the remaining experiencing a hospital death. These data suggest that even when the patient preferred a home death, they could not select home as the POD at the end. This disagreement between where people want to die and where people actually die is consistent with the data described in previous studies (Cohen et al., 2006).

In this study, 43.7% (n=191) of patients and 27.3% (n=97) of caregivers wanted home as the place of terminal care. This proportion of patient preference is different from that described in a 2005 study by Choi et al. (Choi et al., 2005), which found that 53% of the patients and 49% of family members prefer their home, and 30% of patients and 40% of family members prefer the hospital/hospice/palliative care as the place of terminal care. In 2003, 45.1% of deaths were hospital deaths in Korea and this was the first time that the proportion of hospital deaths was higher than that of home deaths (StatisticsKorea, 1991-2011). Since 2003, the proportion of hospital deaths has continually increased, and reached 87.6% in 2011(StatisticsKorea, 1991-2011). In this study, we found that the preference of the patients and caregivers is very important. Therefore, policy makers would need to publicize the advantage of home deaths and home death could be better option than futile life-sustaining treatments in a hospital for terminal cancer patients. The different parameters that must be taken into consideration by the patients, their caregivers, and the medical professionals responsible for the care and treatment of terminally ill cancer patients have been defined from the perspective of optimizing the likelihood of a good death for the patient.

Our study has the following limitation: it is likely that the high probability of hospital deaths in this study was due to enrollment/selection of the patients receiving hospital treatment at the time of diagnosis of terminal cancer. If we could include home care patients with terminal cancer, the results might have been different.

In conclusion, most of the terminal cancer patients died in a hospital and three factors, the availability of a highly educated caregiver and preference of both the patient and caregiver for hospital/hospice/palliative terminal care, were associated with the POD in Korea.

References

Ahn SH, Park BW, Noh DY, et al (2007). Health-related quality of life in disease-free survivors of breast cancer with the general population. *Ann Oncol*, **18**, 173-82.

Alonso-Babarro A, Bruera E, Varela-Cerdeira M et al (2011). Can this patient be discharged home? Factors associated with at-home death among patients with cancer. *J Clin Oncol*, **29**, 1159-67.

Cárdenas-Turanzas M, Torres-Vigil I, Tovalín-Ahumada H, Nates JL (2011). Hospital versus home death: results from the Mexican health and aging study. *J Pain Symptom Manage*, **41**, 880-92.

Casadio M, Biasco G, Abernethy A, et al (2010). The national tumor association foundation (ANT): a 30 year old model of home palliative care. *BMC Palliat Care*, **9**, 12.

Choi KS, Chae YM, Lee CG, et al (2005). Factors influencing preferences for place of terminal care and of death among cancer patients and their families in Korea. *Support Care Cancer*, **13**, 565-72.

Cohen J, Bilsen J, Hooft P, et al (2006). Dying at home or in an institution using death certificates to explore the factors associated with place of death. *Health Policy*, **78**, 319-29.

Cohen J, Houttekier D, Onwuteaka-Philipsen B, et al (2010). Which patients with cancer die at home? A study of six European countries using death certificate data. *J Clin Oncol*, **28**, 2267-73.

Fayers PM (2001). Interpreting quality of life data: population-based reference data for the EORTC QLQ-C30. *Eur J Cancer*, **37**, 1331-4.

Fayers PM, Bjordal K, Groenvold M, et al (2001). The EORTC QLQ-C30 Scoring Manual (3rd Edition). European Organisation for Research and Treatment of Cancer, Brussels.

Gomes B, Higginson IJ (2006). Factors influencing death at home in terminally ill patients with cancer: systematic review. *BMJ*, **332**, 515-21.

Houttekier D, Cohen J, Bilsen J, et al. (2009). Determinants of the place of death in the Brussels metropolitan region. *J Pain Symptom Manage*, **37**, 996-1005.

Madden P, Coupland V, Moller H, Davies E (2011). Using maps and funnel plots to explore variation in place of death from cancer within London, 2002-2007. *Palliat Med*, **25**, 323-32.

Masucci L, Guerriere DN, Cheng R, Coyte PC (2010). Determinants of place of death for recipients of home-based palliative care. *J Palliat Care*, **26**, 279-86.

Ministry of Health (2011). Vital Statistics 2008 (in Japanese).

Ryu HG, Jung SY, Jo JH, Lee LR (2009). Societal consensus formation regarding the withdrawal of meaningless life-sustaining treatment (NC2009-002). The National Evidence-based Healthcare Collaborating Agency (NECA).

Smith R (2000). A good death. An important aim for health services and for us all. *BMJ*, **320**, 129-30.

Teno JM, Gozalo PL, Bynum JP, et al (2013). Change in end-of-life care for medicare beneficiaries: site of death, place of care, and health care transitions in 2000, 2005, and 2009. *JAMA*, **309**, 470-7.

Wright AA, Keating NL, Balboni TA, et al (2010). Place of death: correlations with quality of life of patients with cancer and predictors of bereaved caregivers' mental health. *J Clin Oncol*, **28**, 4457-64.

Yun YH, Kwon YC, Lee MK, et al (2010). Experiences and attitudes of patients with terminal cancer and their family caregivers toward the disclosure of terminal illness. *J Clin Oncol*, **28**, 1950-7.

Yun YH, Lee MK, Kim SY, et al. (2011). Impact of awareness of terminal illness and use of palliative care or intensive care unit on the survival of terminally ill patients with cancer: prospective cohort study. *J Clin Oncol*, **29**, 2474-80.

Yun YH, Lim MK, Choi KS, Rhee YS (2006). Predictors associated with the place of death in a country with increasing hospital deaths. *Palliat Med*, **20**, 455-61.