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Factors associated with death places among elderly patients receiving home-based care

Jui-Kun Chiang, MD, MSc[a], Yee-Hsin Kao, MD[b,*]

Abstract

The quality of end-of-life (EOL) care for patients receiving home-based care is a critical issue for health care providers. Dying in a preferred place is recognized as a key EOL care quality indicator. We explore the factors associated with death at home or nursing facilities among elderly patients receiving home-based care.

This retrospective study was based on a medical chart review between January 2018 and December 2019 of elderly patients. Multivariate analysis was conducted by fitting multiple logistic regression models with the stepwise variable selection procedure to explore the associated factors.

The 205 elderly patients receiving home-based care were enrolled for analysis. The mean participant age was 84.2 ± 7.8 years. Multiple logistic regression indicated that significant factors for elderly home-based patients who died at home or nursing facilities were receiving palliative service (odds ratio [OR], 3.21; 95% confidence interval [CI], 1.37–7.51; $P = .007$), symptoms of nausea or vomiting (OR, 5.38; 95% CI, 1.12–25.84; $P = .036$), fewer emergency department visits (OR, 0.07; 95% CI, 0.03–0.16; $P < .001$), and less intravenous third-generation cephalosporin use (OR, 0.15; 95% CI, 0.03–0.75; $P = .021$) in the last month of life. Patients with dementia had a lower probability of dying at home or nursing facilities than patients with other diagnosis (OR, 0.34, 95% CI, 0.13–0.90; $P = .030$).

Among elderly home-based patients, receiving palliative service, with nausea or vomiting, and fewer emergency department visits in the last month of life favored home or nursing facilities deaths. Practitioners should be aware of the factors with higher probabilities of dying at home and in nursing facilities. We suggested that palliative services need to be further developed and extended to ensure that patients with dementia can receive adequate EOL care at home and in nursing facilities.

Abbreviation: CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; DNR = Do Not Resuscitate; DSP = diastolic blood pressure; ED = emergency department; EOL = end-of-life; ESRD = end stage of renal disease; ICU = intensive care unit; NG = nasogastric; SBP = systolic blood pressure.

Keywords: elderly, end-of-life, home, home-based care, nursing facilities, palliative care

1. Introduction

In 2019, 100.7 million deaths occurred globally.[1] A previous study reported that the 3 major causes of death between 1990 and 2017 globally were ischemic heart disease, stroke followed by chronic obstructive pulmonary disease (COPD) for males, and dementia for females.[2] The ranking of death in different countries was slightly different. The top 3 causes of death for the elderly in the United States were heart diseases, cancer, and chronic lower respiratory diseases in 2018.[3] In Taiwan, the mortality for the elderly was 126,881(73.3%) in 2020, and the major causes of death for the elderly were cancer, cardiovascular diseases, and diabetes.[4] Aging along with its associated degeneration of body function is now the main reason why human life expectancy can no longer extend, and around 80 years old today in developed countries.[5] Death in a preferred place is recognized as a key end-of-life (EOL) care quality indicator;[6,7] it is also related to the caregiver's postbereavement mental health.[8] Home is the most preferred place to die for most people, and health policy is aimed at enabling people to die in their preferred place.[7] Dying in a hospital is recognized as a poor EOL cancer care quality indicator.[9,10] Understanding the place of EOL care and death could be vital to support health policies, resource allocation, and service delivery.

Globally, the rapidly aging population presents a substantial challenge for future EOL care,[11] and is likely to be accompanied by an increased demand for primary health care, long-term care, and EOL care.[12] The world's most aged country and the world's fastest aging country are both located in East and Northeast Asia.[13] In 2018, Taiwan became a country with an aged population, defined by the World Health Organization as a population with >14% of people aged >65 years. In 2018, 172,859 deaths occurred in Taiwan, of which 88,271 (51.1%), 57,440 (33.2%), 21,888 (12.7%), and 5260 (3.0%) deaths were in hospital, at home, at other places, and at nursing facilities, respectively.[14] An increased population aging and hospital

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deaths have triggered reforms of the medical systems and policies. "Aging and dying in place" is the policy slogan of care for elderly patients in Taiwan. The "in place" includes stay-at-home, long-term care, and nursing facilities. Taiwan's National Health Insurance Administration launched the "Integrated Home Care" pilot project for home-based care and integrated a new policy for long-term care to promote "aging and dying in place" to address the challenges of an aging population and dying in place.[15]

Institution was an important place of death for elderly people, and this indicated the need to optimize models of EOL care according to the setting.[16] A study reported unmet needs of many dying patients in institution from the family perspective, such as symptom amelioration, physician communication, emotional support, and treatment with respect.[17] In the United States, deaths at home or community setting that include assisted-living facilities increased from 30.7% in 2000 to 40.1% in 2015.[18] Another study reported that the institutional death would increase up to 20% in 2030 in England and Wales, based on the trends of death from 1999 to 2003.[19]A previous systemic review reported that institutionalization has negative influences on the quality of life of the elderly.[20] A community-based study reported that dementia was the most potential risk factor for institutionalization, whereas other risk factors also included: functional disability, less social support, and a greater number of prescription drugs.[21] However, the predictors of institutionalization for the elderly were a little different among countries. In the United States, 3 or more activities of daily living dependencies and cognitive impairment were associated with institutionalization.[22] In Germany, the occurrence of widowhood, dementia, and substantial mobility impairment was associated with institutionalization.[23] In Taiwan, cardiovascular, neurological, and skeletal muscular diseases were major contributors.[24]

Knowledge of the probable place of death might identify priority areas for educating and training the current and future workforce in providing care that enables people with an advanced illness to live well and die peacefully in their preferred place.[11] Public policy is required for establishing the determinants of death in home or nursing facilities (HN) to improve EOL quality care.[25] Studies have reported that several factors were associated with home death for patients with advanced cancer, such as low functional status, preferences, home care and its intensity, living with relatives, extended family support system, understanding of prognosis, presence of liver, pancreas, or head and neck cancer, and low education level.[26,27] Moreover, the factor associated with home death for patients receiving home-based palliative care was the frequency of physician home visits.[28] A better understanding of the death place could help practitioners improve their quality of EOL care. The purpose of this study was to explore the factors associated with death place among elderly patients with home-based care.

2. Methods

We retrospectively reviewed the deceased patients with an advanced illness who received home-based care in a secondary teaching hospital in Taiwan, between January 2018 and December 2019. This study received approval from the Research Ethics Committee of the institutional review board of the Tainan Municipal Hospital (Managed by Show Chwan Medical Care Corporation), Taiwan (SCMH_IRB No: 1090104).

2.1. Study participants

The home-based care included palliative and nonpalliative services. The inclusion criteria of the current study were age ≥65 years, presence of a terminal illness, and home-based care duration of >1 month. In Taiwan, a patient is qualified to apply for home-based care if they fulfill the following 3 criteria: limited performance status (i.e., being bed or chair bound >50% of the waking time), definite medical or nursing care needs, chronic conditions requiring long-term or continuous nursing care needs following hospital discharge, and inability to go out for medical treatment.[29] We divided our patients into 2 groups based on the place of death, obtained from the death certificates, as the hospital (H) and HN groups.

2.2. Data collection and definition of variables

The following information was ascertained from the medical records: gender, age, primary diagnosis (including cancer, COPD, dementia, stroke, cirrhosis, end-stage of renal disease, and congestive heart failure), invasive devices (including nasogastric tube, urinary catheter, and tracheostomy tube), total number of drugs per day in the last month (where, liquid drugs were defined as one class of medication, notwithstanding the amount of liquid), and place of death on the death certificate. The clinical signs and symptoms of patients from the first home visit were also noted. The data retrieved from the medical records during the first home visit in the current study were adapted from Lee et al.[30] The body temperature was recorded, and a fever episode was considered to be present when the core temperature was ≥37.5°C. Data on demographics, clinical symptoms and signs, laboratory test results, and subsequent places of death were collected by an experienced registered nurse, and the accuracy of the data was rechecked by one of the authors.

In addition, variables related to quality indicators of EOL care were adopted and collected.[9,31,32] The 4 indicators of poor quality of EOL care are as follows: number of emergency department (ED) visits, number of hospital admissions, intensive care unit care during the final month of life, and mechanical ventilator requirement during the final month of life.

For descriptive purposes, the primary diagnoses were categorized using International Classification of Diseases, Tenth Revision, Clinical Modification: cancer (C00–C97), COPD (J43 and J44), congestive heart failure (I50 and I50.x), end-stage of renal disease on hemodialysis (Z99.2), dementia (F00, F00.x, F01, F01.x, F02, F02.x, and F03), cirrhosis (K74.0, K74.60, and K74.69), and cerebrovascular accidents (stroke; I60–I68.x).

2.3. Study outcome

Variables from the medical records as above mentioned were collected to explore the factors associated with death at home or in nursing facilities for home-based elderly patients.

2.4. Statistical analysis

The distribution properties of continuous variables were expressed using means ± standard deviations and categorical variables using frequencies and percentages. Normality was examined using the Shapiro–Wilk test. For the univariate analysis, the two-sample *t* test, Wilcoxon rank-sum test, Chi-square test, and Fisher's exact test were used to examine differences in the distributions of continuous and categorical variables between the H and HN groups as indicated.

Multivariate analysis was conducted by fitting multiple logistic regression models with the stepwise variable selection procedure to explore the associated factors. We assessed the goodness of fit of the final logistic regression model based on the estimated area under the receiver operating characteristic curve (also called the "*c* statistic"). Statistical tools for regression diagnostics, including checking multicollinearity, were applied to ascertain any problems associated with the regression model

or data. All statistical analyses were performed on R (version 4.0.3; R Foundation for Statistical Computing, Vienna, Austria). A 2-sided *P* of ≤.05 was considered statistically significant.

3. Results

In total, 321 patients receiving home-based care who died between 2018 and 2019 were studied. After the exclusion of patients with no death certificate (n = 93), aged <65 years (n = 17), and with missing data (n = 6), 205 elderly patients receiving home-based care were enrolled for analysis. In total, 71 (34.6%) patients received home palliative service. The study design was depicted in Figure 1.

The patients were then divided into 2 groups based on the place of death, obtained from the death certificates, as the H and HN groups. The most common clinical sign and symptom was conscious disturbance (98, 47.8%), followed by constipation (77, 37.6%), pressure ulcer (70, 34.1%), and fever (45, 22.0%). The mean systolic and diastolic blood pressures were 127.9 ± 20.3 and 71.8 ± 12.6 mmHg, respectively; moreover, the mean heart rate was 84.4 ± 18.4 beats/min, and the mean respiratory rate was 19.0 ± 5.3 breaths/min. In total, 132 (64.4%) patients received antibiotics during hospitalization in the last month of life; the most frequently used antibiotic was piperacillin–tazobactam (tazocin; 68, 33.2%), followed by intravenous (IV) third-generation cephalosporins (ceftazidime, ceftriaxone, cefoperazone–sulbactam, and flomoxef; 31, 15.1%). There were 6 (2.9%) patients with tracheostomy. The H and HN groups did not show significant differences in their gender, age, vital signs (including blood pressure, pulse rate, and respiratory rate) during the first home-based care visit, tracheostomy, nasogastric tube use, urinary catheter use, number of drugs taken per day; and do-not-resuscitate (DNR) orders. However, the HN group had fewer ED visits (0.4 ± 0.6 vs 1.2 ± 0.5), fewer hospitalizations (0.3 ± 0.5 vs 1.0 ± 0.7), and fewer hospital stays (4.4 ± 7.8 vs 10.8 ± 9.3 days; all *P* < .001) in the last month of life, but a higher percentage of patients receiving palliative service (50.7% vs 26.5%; *P* < .001). Regarding the clinical signs and symptoms on the first day of enrollment, the HN group had a significantly higher percentage of patients with fever (30.4% vs 17.6%; *P* = .049) and nausea or vomiting (14.5% vs 3.7%; *P* = .009) but a lower percentage of patients using third-generation cephalosporins (2.9% vs 21.3%; *P* < .001; Table 1). The duration from signing a DNR order to death within 2 weeks was our key time. The rate for patients with key time in the H group was significantly higher than that in the HN group (47.1% vs 30.4%; *P* = .025).

In the univariate analysis, patients with lung cancer (odds ratio [OR], 10.05; 95% confidence interval [CI], 2.11–47.93; *P* = .004), fever during first home visit (OR, 2.04, 95% CI, 1.04–4.02; *P* = .039), and palliative services (OR, 2.86; 95% CI, 1.56–5.24; *P* = .001) had higher probability of dying at HN. Moreover, patients with dementia (OR, 0.40; 95% CI, 0.20–0.82; *P* = .012), with more ED visits (OR, 0.07; 95% CI, 0.09–0.29; *P* < .001), using urinary catheters (OR, 0.53; 95% CI, 0.29–0.97; *P* = .040), with more hospitalizations (OR, 0.16; 95% CI, 0.09–0.29; *P* < .001), and using third-generation cephalosporins (OR, 0.11; 95% CI, 0.03–0.48; *P* = .003) in the last month of their life would had lower probability of dying at homes or nursing facilities (Table 2).

By multiple logistic regression analyses, elderly home-based patients who died at HN were receiving palliative service (OR, 3.21; 95% CI, 1.37–7.51; *P* = .007), demonstrating nausea or vomiting (OR, 5.38; 95% CI, 1.12–25.84; *P* = .036), having fewer ED visits (OR, 0.07; 95% CI, 0.03–0.16; *P* < .001), and using third-generation cephalosporins less (OR, 0.15; 95% CI, 0.03–0.75; *P* = .021) in the last month of life. Patients with dementia had a lower probability of dying at HN than did those who received other diagnoses (OR, 0.34; 95% CI, 0.13–0.90; *P* = .030; Table 3). The area under the receiver operating characteristic curve (0.898; 95% CI, 0.846–0.950) for this predictive model was favorable (Fig. 2).

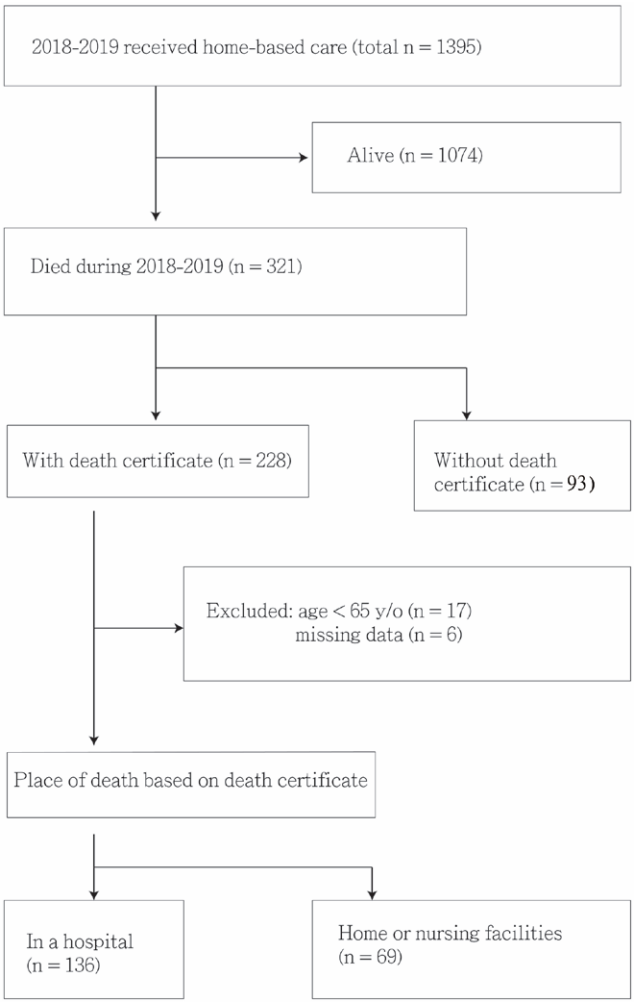

Figure 1. Flow chart of patient selection.

4. Discussion

In the present study, the significant factors associated with death at HN were receipt of palliative services and the presence of nausea or vomiting symptoms. Elderly home-based patients with dementia, more ED visits, or IV third-generation cephalosporin use in the last month of life were significant factors associated with deaths in hospitals.

Health policies worldwide have viewed home as a panacea for a place to die, and attempts have been made to enable a shift from hospital care to home care; thereby, enabling more people to be cared for and to die at home.[33] A prospective study reported that cancer patients who died in a hospital experienced more physical and emotional distress and had a lower quality of life than did those who received home palliative care. Studies have increasingly reported that the more the number of deaths occurring at an older age, the greater the growth in palliative service needed.[33,34] In the present study, palliative service enabled elderly home-based patients to die at home, corroborating previous findings.[35,36] Thus, home palliative service favors home death and supports the project "Integrated Home Care" with palliative service to promote "aging and dying in place" in Taiwan.[15] In the current study, we found that the percentage of DNR order between the H and HN groups was similar, and

Table 1

Demographic data of the elderly patients receiving home-based care.

Variables	Total 205	HN group 69 (33.7%)	H group 136 (66.3%)	*P* value
Female	103 (50.2%)	34 (49.3%)	69 (50.7%)	.883
Age	84.2 ± 7.8	83.9 ± 7.6	84.3 ± 7.9	.716
Primary diagnosis				
Cancer				
Lung	11 (5.4%)	9 (13.0%)	2 (1.5%)	.008
Colon-rectal	13 (6.3%)	5 (7.2%)	8 (5.9%)	
Liver	16 (7.8%)	6 (8.7%)	10 (7.4%)	
Stomach	4 (2.0%)	3 (4.3%)	1 (0.7%)	
Others	16 (7.8%)	6 (8.7%)	10 (7.4%)	
COPD	13 (6.3%)	7 (10.1%)	6 (4.4%)	
Dementia	59 (28.8%)	12 (17.4%)	47 (34.6%)	
Stroke	48 (23.4%)	12 (17.4%)	36 (26.5%)	
Cirrhosis	3 (1.5%)	1 (1.4%)	2 (1.5%)	
ESRD	12 (5.9%)	5 (7.2%)	7 (5.1%)	
CHF	10 (4.9%)	3 (4.3%)	7 (5.1%)	
Conscious disturbance	98 (47.8%)	37 (53.6%)	61 (44.9%)	.241
Fever	45 (22.0%)	21 (30.4%)	24 (17.6%)	.049
Dyspnea	36 (17.6%)	14 (20.3%)	22 (16.2%)	.560
Nausea/vomiting	15 (7.3%)	10 (14.5%)	5 (3.7%)	.009
Respiratory rate, time/min	19.0 ± 5.3	19.8 ± 8.5	18.6 ± 2.2	.430
SBP, mmHg	127.9 ± 20.3	127.8 ± 21.7	128.0 ± 19.7	.988
DBP, mmHg	71.8 ± 12.6	72.1 ± 12.4	71.6 ± 12.7	.783
Heart rate, beat/min	84.4 ± 18.4	86.5 ± 20.4	83.3 ± 17.2	.090
Tracheostomy	6 (2.9%)	2 (2.9%)	4 (2.9%)	.658
NG tube	141 (68.8%)	43 (62.3%)	98 (72.1%)	.202
Urinary catheter	92 (44.9%)	24 (34.8%)	68 (50.0%)	.053
Antibiotics use, third generation of cephalosporins*	31 (15.1%)	2 (2.9%)	29 (21.3%)	<.001
ICU admission*	12 (5.9%)	1 (1.4%)	11 (8.1%)	.064
Times of ED visits*	0.9 ± 0.7	0.4 ± 0.6	1.2 ± 0.5	<.001
Times of hospitalization*	0.8 ± 0.7	0.3 ± 0.5	1.0 ± 0.7	<.001
Mechanical ventilator*	6 (2.9%)	1 (1.4%)	5 (3.7%)	.666
Numbers of drugs per day*	12.4 ± 6.0	12.8 ± 5.7	12.2 ± 6.1	.340
DNR order	152 (74.1%)	54 (78.3%)	98 (72.1%)	.400
Patients with the day of DNR to death within 2 wk	85 (41.5%)	21 (30.4%)	64 (47.1%)	.025
Palliative service	71 (34.6%)	35 (50.7%)	36 (26.5%)	.001

We divided the participants into 2 groups based on the place of death from death certificates as hospital group (H group) and the home or nursing facilities group (HN group).

CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; DNR = Do Not Resuscitate; DSP = diastolic blood pressure; ED = emergency department; ESRD = end-stage of renal disease; ICU = intensive care unit; NG = nasogastric; SBP = systolic blood pressure.

*In the last month of life.

the H group had a higher percentage of palliative service than the HN group. There might be a prescription bias in the current study. The duration from signing a DNR order to death within 2 weeks was our key time. We further analyzed the key time among H and HN groups and found the rate for patients with key time in the H group was significantly higher than that in the HN group. The explanation might be that patients or their families signing DNR within 2 weeks before death had a higher possibility of dying hospital.

A previous study reported that elderly hospitalized palliative patients had 9 physical symptoms and cancer patients had fewer physical symptoms than noncancer patients.[37] In this study, we report that nausea or vomiting is a common symptom, and the frequency and intensity of nausea or vomiting for cancer and noncancer patients were not significantly different.[37] Nausea and vomiting can be extremely debilitating symptoms at the end of life. Identification of the pathophysiologic origin of nausea is helpful in prescribing effective pharmacologic interventions.[38] Effective control of these symptoms can be achieved in most patients by home palliative service, and that might be one of the explanations of a higher probability of death in patients with nausea or vomiting at HN. Improving the patients' symptoms might be a challenge and responsibility of the home-based provider.

Despite most elderly patients preferring to be cared and die at home,[39] their number of ED visits during EOL care increased.[40,41] ED visits are potentially burdensome for patients and their families, and >1 ED visit in the last month of life was considered a poor-quality indicator of EOL care.[42]In the present study, we found that the mean number of ED visits in the last month was 0.9 ± 0.7, and multiple ED visits increased hospital death risk. This finding was similar to that of a previous study.[32] The previous study also reported that for patients with an advanced cancer and their families, the visit to the ED could be distressing, disruptive, and exhausting.[43] Early palliative service might help patients by reducing ED visits in the last month of life and death out of hospital.[40]

Patients often receive antibiotics during the last weeks of life,[44] and the percentage of antibiotics use was from 27% to 90%.[45,46] A systemic review study reported that no definite conclusion exists about symptoms relief after provision of antibiotics to patients during EOL.[47] Another prospective study reported that survival benefit is associated with antibiotics use for patients with advanced dementia and suspected with pneumonia.[48] In the present study, we found that patients who received IV third-generation cephalosporins had a higher probability of death in hospital compared with those receiving other antibiotics. We further analyzed the factors associated with third-generation cephalosporin use and found that vancomycin usage and patients with primary diagnosis of stomach, colon, and liver cancers had higher probabilities of using these antibiotics. Although antibiotics use might be less burdensome

Table 2

Factors for the places of death at home or nursing facilities by univariate logistic regression

Covariates	Estimate	Std. Error	*P* value	OR (95% CI)
Age	−0.01	0.02	.714	0.99 (0.96–1.03)
Male vs female	0.06	0.30	.843	1.06 (0.59–1.89)
Primary diagnosis				
Lung cancer	2.31	0.80	.004	10.05 (2.11–47.93)
Colon-rectal cancer	0.22	0.59	.705	1.25 (0.39–3.98)
Liver cancer	0.18	0.54	.735	1.20 (0.42–3.45)
Stomach cancer	1.81	1.16	.119	6.14 (0.63–60.13)
Other cancers	0.18	0.54	.735	1.20 (0.42–3.45)
COPD	0.90	0.58	.121	2.45 (0.79–7.59)
Dementia	−0.92	0.37	.012	0.40 (0.20–0.82)
Stroke	−0.54	0.37	.150	0.59 (0.28–1.21)
Cirrhosis	−0.02	1.23	.990	0.99 (0.09–11.06)
ESRD	0.37	0.61	.547	1.44 (0.44–4.71)
CHF	−0.18	0.71	.802	0.84 (0.21–3.35)
Conscious disturbance	0.35	0.30	.236	1.42 (0.80–2.54)
Fever	0.71	0.35	.039	2.04 (1.04–4.02)
Dyspnea	0.28	0.38	.465	1.33 (0.63–2.77)
Nausea/vomiting	1.49	0.57	.009	4.44 (1.45–13.56)
Respiratory rate (per 1 time/min)	0.06	0.05	.221	1.06 (0.96–1.17)
SBP (per 1 mmHg)	−0.001	0.01	.938	1.00 (0.99–1.01)
DBP (per 1 mmHg)	0.003	0.01	.782	1.00 (0.98–1.03)
Heart rate (per 1 beat/min)	0.01	0.01	.249	1.01 (0.99–1.03)
NG tube	−0.44	0.31	.156	0.64 (0.35–1.19)
Urinary catheter	−0.63	0.31	.040	0.53 (0.29–0.97)
Antibiotics use, 3rd generation of cephalosporins*	−2.21	0.75	.003	0.11 (0.03–0.48)
ICU admission*	−1.79	1.06	.090	0.17 (0.02–1.32)
Times of ED visits*	−2.72	0.39	<.001	0.07 (0.03–0.14)
Times of hospitalization*	−1.81	0.30	<.001	0.16 (0.09–0.29)
Mechanical ventilator*	−0.95	1.10	.388	0.39 (0.04–3.36)
Number of drugs per day*	0.02	0.03	.492	1.02 (0.97–1.07)
DNR order	0.33	0.35	.339	1.40 (0.71–2.77)
Palliative service	1.05	0.31	.001	2.86 (1.56–5.24)

We divided the participants into 2 groups based on the place of death from death certificates as hospital group (H group) and home or nursing facilities group (HN group).
CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; DNR = Do Not Resuscitate; DSP = diastolic blood pressure; ED = emergency department; ESRD = end stage of renal disease; ICU = intensive care unit; NG = nasogastric; SBP = systolic blood pressure.
*In the last month of life.

Table 3

Significant factors for the places of death at home or nursing facilities by multiple logistic regression.

Covariates	Estimate	Std. Error	*P* value	OR (95% CI)
Palliative service	1.17	0.43	.007	3.21 (1.37–7.51)
Nausea/vomiting	1.68	0.80	.036	5.38 (1.12–25.84)
Dementia	−1.07	0.49	.030	0.34 (0.13–0.90)
Times of ED visits	−2.62	0.42	<.001	0.07 (0.03–0.16)
Receiving third generation of cephalosporin*	−1.90	0.83	.021	0.15 (0.03–0.75)
Intercept	1.36	0.43	.001	

CI = confidence interval; ED = emergency department; OR = odds ratio.
*Third generation of cephalosporin included Ceftazidime, Ceftriaxone, Cefoperazone/sulbactam, and Flomoxef.

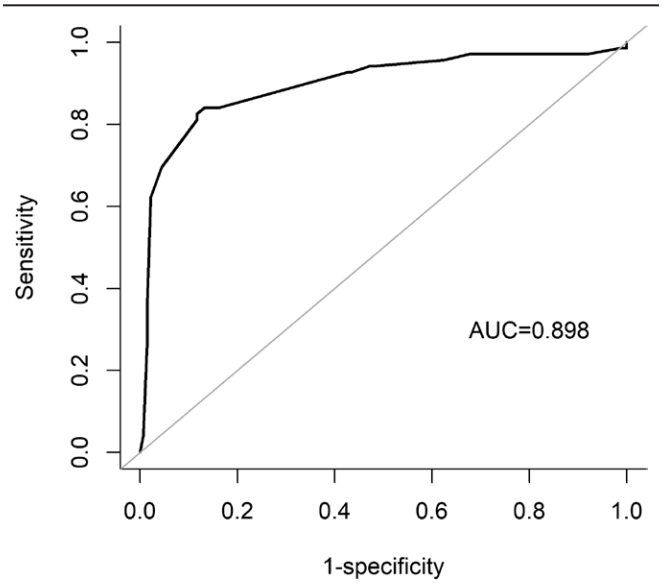

Figure 2. Receiver operating characteristic curve for predicting home or nursing facilities death. The AUC is 0.898. AUC = area under the receiver operating characteristic curve.

than other life-sustained treatments, the purpose of antibiotics use should be discussed with patients or their families during EOL care.

According to a World Health Organization report, there are approximately 50 million people having dementia worldwide, and nearly 10 million new cases are found every year.[49] Providing quality and equitable EOL care for dementia patients has become a major public health challenge.[50] A national study reported that the places of death for about two-thirds (66.9%) of elderly patients with dementia were nursing facilities.[50] Another study reported that dementia patients were more likely to die in nursing facilities than other primary diseases, such as cancer.[51] In the present study, we found that elderly patients with dementia had a higher probability of dying in hospitals. One possible explanation might be that hospitals were the more appropriate care setting during EOL for elderly dementia

patients.[52] Another explanation might be that hospitals were the available EOL care setting, and less of an economic burden for families of patients with advanced illnesses in Taiwan because they are covered under the national insurance system. The spectrum of home palliative service might cover home and nursing facilities that provide a specified EOL care for elderly patients with advanced illnesses such as dementia.

4.1. Limitations

The present study has several limitations. First, this retrospective study employed a medical record review, which had limitations inherent to this type of study design; the patients would have utilization from other healthcare resources and these medical records were not available in the medical record from our hospital. Second, missing data are common in a retrospective study, and we did not enroll these 6 (2.8%) missing data for analysis. Third, a hospital-based study may not be fully applied to community-based patients, and there was selection bias about our population from a community hospital in southern Taiwan. Finally, the sample size was limited to the number of elderly patients enrolled in the home-based care offered by the hospital.

5. Conclusion

In the present study, we found that elderly home-based patients who received palliative service, with nausea or vomiting, and fewer ED visits in the last month of life were associated with higher probabilities of dying at HN. Elderly patients with dementia, or receiving IV third-generation cephalosporins in the last month of life had higher probabilities of dying in hospitals. Practitioners should be aware of the factors with higher probabilities of dying at home and in nursing facilities. We suggested that palliative services need to be further developed and extended to ensure that patients with dementia can receive adequate EOL care at home and in nursing facilities.

Author contributions

JKC and YHK contributed to conception, design, drafting, and writing the manuscript.
JKC analyzed and interpreted the data.
JKC and YHK revised and approved the final version.

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