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Original Article

Impact of hospice care on end-of-life hospitalization of elderly patients with lung cancer in Taiwan

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Abstract

Background: This study investigated the impact of hospice care on end-of-life elderly patients with lung cancer in Taiwan.
Methods: Data were collected from deceased inpatients with lung cancer who were at least 65 years old, using the National Health Insurance Research Database of 2004.
Results: A total of 1282 patients were enrolled, of whom 277 (21.6%) received hospice care (hospice-care group) and the other 1005 (78.4%) received general acute ward care (control group). The patients' age, gender, and institution of hospitalization did not differ significantly between the two groups, and most of the patients had chosen medical centers and their affiliated hospices for terminal care. The hospice-care group had a significantly shorter hospital stay and lower costs of hospitalization than the control group, with patients cared for primarily by family physicians and radiation oncologists (all $p < 0.05$). The hospice-care group had an elevated incidence of co-morbid diabetes mellitus, higher scores on the Charlson Comorbidity Index, fewer acute lower respiratory conditions, and fewer invasive procedures than the control group (all $p < 0.05$). Natural opium alkaloids were the most commonly prescribed drugs in the hospice-care group, whereas parenteral solutions were most frequently requested in the control group.
Conclusion: Hospice care has provided a humane and cost-efficient pathway for end-of-life elderly patients with lung cancer. Parenteral nutrition/hydration should be limited for terminal care patients. Opioids should be promoted for the relief of pain and dyspnea in acute ward care. Family physicians and radiation oncologists play important roles in hospice care. Compared with the prevalence of hospice care in the United Kingdom and other developed countries, hospice care in Taiwan is in the position to be expanded.

Keywords: aged; family practice; hospice care; lung neoplasms; radiation oncology

1. Introduction

Hospice care, also known as palliative care, started in the United Kingdom over 30 years ago and has expanded worldwide. In the West, palliative care has developed to serve all types of terminal patients, not only those with advanced cancer, as in the Liverpool Care Pathway and Palliative Care for Advanced Diseases.[1–3]

In Taiwan, hospice care was introduced by local religious hospitals in the mid-1980s,[4] and has been legislated and enrolled with the National Health Insurance (NHI) since 2000. From September 2009, NHI has expanded the indications of hospice care from patients with advanced cancer or amyotrophic lateral sclerosis to those with other terminal conditions requiring comprehensive care.[5]

Lung cancer has been the primary cause of cancer deaths in both genders in Taiwan over the past 20 years.[6] Previous

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statistics gathered from local hospices throughout Taiwan further confirm that patients with lung cancer accounted for the majority of all patients in hospice care.[4,7] However, the impact of hospice care on patients with lung cancer remains unclear, especially when elderly patients are involved. Based on population-based dataset analyses, focussed on end-of-life hospitalized elderly care cases, the aim of this study was to extend our understanding of the aforementioned issues.

2. Methods

2.1. Study design

Retrospective and nested case-control analyses were performed. End-of-life hospitalization data were collected, focussing on deceased inpatients at least 65 years old with lung cancer, taken from the National Health Insurance Research Database (NHIRD) in 2004. In Taiwan, the NHI (established in 1995) has accumulated voluminous nationwide claim data. The NHIRD was established by National Health Research Institute in 1998, and provides encrypted claim data relating to NHI to local academic institutions for study.[8] We obtained the complete inpatient service claim datasets for patients at least 65 years of age (DD2004.dat), with corresponding prescription and ordering files (OO2004.dat) for the year 2004. Data for deceased inpatients with a major diagnosis of lung cancer were extracted using the *International Classification of Diseases*, the Ninth Revision Clinical Modification (ICD-9-CM) code of 162. Patients with lung cancer who received hospice care were listed as the hospice-care group. Those who received other general acute ward care were listed as the control group. Certain special conditions other than hospice or acute ward care were excluded (Fig. 1).

2.2. Parameters

The patients' general data, co-morbidities and claims for charges and prescriptions during their end-of-life hospitalizations were analyzed. The co-morbidities were defined and screened using the relevant ICD-9-CM codes for the discharge diagnosis of the patients. Co-morbidities, commonly seen in the elderly, such as diabetes mellitus (ICD-9-CM code 250.x), stroke (ICD-9-CM code 430.x-438.x), chronic obstructive pulmonary disease (ICD-9-CM code 490.x -496.x), ischemic heart disease (ICD-9-CM code 410.x-414.x), and acute lower respiratory conditions (ICD-9-CM code 480.x-487.x) were included. The patients' severities of illness were presented and compared using the Charlson Comorbidity Index.[9] Drug prescriptions were screened among the claimed orders during the patients' end-of-life hospitalizations, and were classified by Anatomic Therapeutic Chemical (ATC) Classification codes. Invasive procedures, in our study, included cardiopulmonary resuscitations (CPR), defibrillation/cardioversion, endotracheal intubations, tracheostomy, chest tapping/intubations, nasogastric intubations, urinary catheterizations, central venous catheter insertions, hemodialysis, intensive care unit (ICU) admission, and respirator care.

To protect our patients' privacy, data identifying patients, physicians, and institutions were cryptographically scrambled. This study was approved by the Institutional Review Board of National Yang-Ming University (IRB No. 990062).

2.3. Statistical analysis

Data-mining and processing was conducted using the Microsoft SQL Server (Microsoft Inc., Redmond, WA, USA). Data in the text and tables are illustrated as mean ± standard deviation. SPSS software (SPSS version 17.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The independent *t*, Chi-square, trend Chi-square, and Fisher's exact tests were used to assess statistical significance. A p value of < 0.05 was considered statistically significant (two-tailed tests).

3. Results

During the study period, a total of 1282 patients were fitted the criteria for the study design and were enrolled; 277

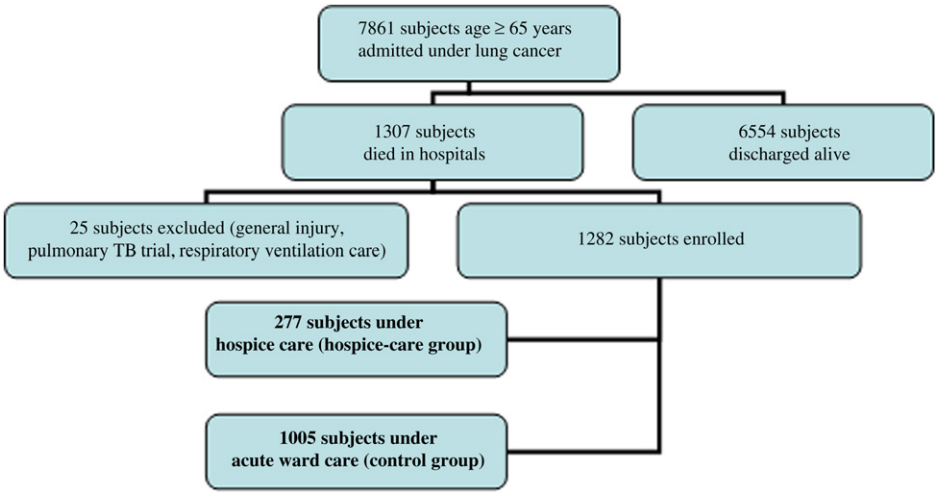

Fig. 1. Design of the study for patients aged ≥ 65 years with lung cancer dying in hospitals or hospices during 2004. TB = tuberculosis.

Table 1
The demographic characteristics and costs of end-of-life hospitalization in elderly lung cancer patients during 2004.

Parameters	Hospice-care group ($n = 277$)	Control group ($n = 1005$)	p[a]
Age (y)	76.5 ± 6.4	77.2 ± 6.6	0.119
Gender (male/female)	204/73	775/230	0.232
Grade of hospitalization institutions (medical centers/regional hospitals/local hospitals)	163/83/31	547/314/144	0.121
Hospital stay (d)	10.7 ± 10.9	18.5 ± 15.2	< 0.001
Daily charges of laboratory examinations (USD/d)	6.8 ± 11.7	25.4 ± 29.9	< 0.001
Daily charges of radiological examinations (USD/day)	4.0 ± 12.7	15.2 ± 34.6	< 0.001
Daily charges of drug prescriptions (USD/d)	27.1 ± 27.0	54.5 ± 61.0	< 0.001
Daily charges of hospitalization (USD/d)	145.9 ± 18.4	226.5 ± 186.3	< 0.001
Total charges of hospitalization (USD)	1564.2 ± 1661.4	3864.6 ± 4272.8	< 0.001

USD = United States Dollar.
[a] Independent t test and Chi-square test.

(21.6%) were listed in the hospice-care group and 1005 (78.4%) in the control group. The patients' age, gender, and grade of hospitalization institutes did not differ noticeably between the two groups, and most of them chose medical centers and their affiliated hospices for end-of-life hospitalization. The hospice-care group had significantly shorter hospital stays and lower daily/total charges of hospitalization, including the daily costs of laboratory examinations, radiological examinations, and drug prescriptions compared with the control group ($p < 0.05$; Table 1).

The admission departments for patients' end-of-life hospitalization are listed in Table 2, and their distributions can be seen to be significantly different ($p < 0.001$). The hospice-care group had an apparently higher ratio of care provided by family medicine and radiation oncology than the control group. In contrast, the control group had a higher ratio of care provided by internal medicine and surgery.

Table 3 lists patients' co-morbidities. The hospice-care group had significantly higher scores on the Charlson Comorbidity Index, more individuals with diabetes mellitus, and fewer with acute lower respiratory conditions than the control group ($p < 0.05$). No CPR, defibrillation/cardioversion, endotracheal intubation, tracheostomy, hemodialysis, ICU admissions, or respirator care was performed with the hospice-care group. The hospice-care group had significantly fewer invasive procedures than the control group ($p < 0.001$ for all; Table 4).

Table 2
Departments of admission of end-of-life hospitalizations in elderly lung cancer patients in 2004.[a]

Admission Sections	Hospice-care group $n = 277$ (%)	Control group $n = 1005$ (%)
Family medicine	114 (41.2)	48 (4.8)
Internal medicine	120 (43.3)	869 (86.5)
Surgery	2 (0.7)	36 (3.6)
Orthopedics	0 (0)	2 (0.2)
Neurological surgery	0 (0)	7 (0.7)
Neurological medicine	3 (1.1)	6 (0.6)
Emergent medicine	0 (0)	1 (0.1)
Radiation oncology	38 (13.7)	36 (3.6)

[a] Trend Chi-square test, $p < 0.001$.

In terms of prescriptions, natural opium alkaloids (ATC code N02AA) were the most commonly ordered prescriptions in the hospital-care group, whereas parenteral electrolyte solutions (ATC code B05BB) were more common in the control group. Analgesics (ATC code N02AA, M01AB), parenteral solutions (ATC code B05BB), steroids (ATC code H02AB), benzodiazepines (ATC code N05CD, N02BA), gastrointestinal kinetic or laxative agents (ATC code A06AB, A03FA, A02AA), drugs for respiratory care (ATC code R03AC, R05CB), and cephalosporin (ATC code J01DA) were the major components of prescriptions in hospice-care group (Table 5).

4. Discussion

In Taiwan, relevant local studies have highlighted some advantages of hospice care, including reduced medical costs and promoting satisfaction for terminal patients and their families.[10] Local patients under palliative care tended to stay in wards instead of receiving care at home.[11] In this claim-based study, the advantages of hospice care have been proven once again, such as short hospital stays and low daily/total costs for the end-of-life hospitalizations in contrast to the control group (acute ward care). Besides, the differences in payment policy also led to savings on medical resources in hospice care. In the NHI of Taiwan, hospice care involved fixed payment for services, while general ward care involved fee-for-service. The low daily costs of laboratory examinations, radiological examinations, and drug prescriptions reflect the impact of fixed payment on medical behaviors, and it is beneficial to distribute limited or expensive medical resources. Similar financial benefits have also been reported in Spain and the United States.[12,13]

It is interesting to note that most patients in the hospice-care group chose medical centers for their end-of-life hospitalization (163 of 277 patients, 58.8%). This phenomenon is associated with the characteristics of the medical systems and patients' attitudes in Taiwan. In the West, hospices are usually independent institutions and receive referrals from general hospitals. In contrast, most hospices in Taiwan are affiliated with general hospitals.[14] In the United States, patients referred

Table 3
Comparison of patient co-morbidities between elderly lung cancer patients receiving and not receiving hospice care during 2004.

	Hospice-care group $n = 277$ (%)	Control group $n = 1005$ (%)	p[a]
Diabetes mellitus	38 (13.7)	89 (8.9)	0.023
Stroke	8 (2.9)	37 (3.7)	0.712
Chronic obstructive pulmonary disease	27 (9.7)	141 (14.0)	0.070
Ischemic heart disease	10 (3.6)	49 (4.9)	0.422
Acute lower respiratory conditions	40 (14.4)	316 (31.4)	< 0.001
Charlson Comorbidity Index	6.8 ± 2.7	6.0 ± 3.0	< 0.001

[a] Independent t test, Chi-square and Fisher's exact tests.

from academic medical centers needed more medical and nursing services when admitted to a hospice.[15] Predominantly, admissions to medical center-affiliated hospices reflected the patients' and/or families' confidence in medical care, but also are identified as being at least partially responsible for the underlying waste of medical resources. Within this area, however, relevant issues and patients'/families' concepts as they relate to terminal cancer care need further research.

The ultimate decision regarding patients' choice for end-of-life hospitalization reflected the noticeable roles of family physicians and radiation oncologists in hospice care in Taiwan. Patient experiences in the United States and France also revealed similar roles of family physicians and general practitioners in hospice care.[16,17] In contrast, some studies indicate conservative views on this issue.[18,19] In particular, radiation oncologists perform an important role in inpatient hospice care in Taiwan. In 1990, the first hospice in Taiwan was created by radiation oncologists, which has since become the model for the rest of Taiwan hospices.[20] The participation of different specialists in hospice care, such as family physicians, internal physicians, medical oncologists, and radiation oncologists, needs to be considered for further research and in order t establish a comparison with different countries or cultures.

It should be noted that internal physicians (including relevant specialists) still cared for the majority of elderly patients with lung cancer during their end-of-life hospitalization in both the hospice-care and control groups (43.3 vs 86.5%, respectively). Traditionally, internal physicians and surgeons have been trained to take acute and critical care for granted. Consequently, there are still opportunities to educate and modify the perception, working concepts, and role of hospice care for these groups.

The minor role of invasive or aggressive procedures is compatible with the principles of hospice care, such as avoidance of CPR, defibrillation/cardioversion, endotracheal intubation, tracheostomy, and respirator care. In contrast, the control group (acute ward care) still widely received invasive procedures, especially ICU admissions and respirator care, although over two-thirds of the control-group patients were not resuscitated at the end of life. Reducing unnecessary invasive procedures should be an important issue when considering whether a patient should receive palliative care.

Therapeutic roles related to co-morbid diabetes mellitus were interesting and difficult in terms of patients with advanced cancer. The complications of advanced cancer, such as poor appetite, nausea/vomiting, and the use of steroids all make blood sugar levels difficult to control.[21,22] There is still no therapeutic guideline on diabetes mellitus for those with advanced cancer.[23] Our results showed a relatively high ratio of co-morbid diabetes mellitus in the hospice-care group, and the therapeutic challenges need to be further investigated in hospice patients.

The predominance of acute lower respiratory conditions in the control group (up to 31.4%) reflected the indications of acute ward care. The control group also had a higher ratio of chronic obstructive pulmonary disease, although this was not statistically significant. These characteristics could explain the distribution of prescriptions in Table 5. Compared with the hospice-care group, patients under acute ward care were

Table 4
Comparison of invasive procedures between elderly lung cancer patients receiving and not receiving hospice care during 2004.

	Hospice-care group $n = 277$ (%)	Control group $n = 1005$ (%)	p[a]
Cardiopulmonary resuscitation	0 (0)	168 (16.7)	< 0.001
Defibrillation or cardioversion	0 (0)	33 (3.3%)	< 0.001
Endotracheal intubation	0 (0)	287 (28.6)	< 0.001
Tracheostomy	0 (0)	16 (1.6%)	< 0.001
Chest tapping or intubation	5 (1.8)	342 (34.0)	< 0.001
Nasogastric intubation	38 (13.7)	856 (85.6)	< 0.001
Urinary catheterization	101 (36.5)	775 (77.1)	< 0.001
Central venous catheter insertion	13 (4.7)	287 (28.6)	< 0.001
Hemodialysis	0 (0)	25 (2.5%)	< 0.001
Intensive care unit admission	0 (0)	353 (35.1%)	< 0.001
Respirator care	0 (0)	430 (42.8%)	< 0.001

[a] Chi-square and Fisher's exact tests.

Table 5
The top 12 prescribed drugs in end-of-life hospitalization of elderly lung cancer patients receiving and not receiving hospice care during 2004.

Ranking	Hospice-care group (ATC code, number, and % of patients receiving the drug) ($N = 277$)	Control group (ATC code, number, and % of patients receiving the drug) ($N = 1005$)
1	Natural opium alkaloids [a] (N02AA, $n = 226$, 81.6 %)	Solutions affecting electrolyte balance (B05BB, $n = 966$, 96.1%)
2	Solutions affecting electrolyte balance (B05BB, $n = 220$, 79.4%)	Contact laxatives (A06AB, $n = 670$, 66.7%)
3	Glucocorticoids (H02AB, $n = 184$, 66.4%)	Solutions for parenteral nutrition (B05BA, $n = 642$, 63.9%)
4	Benzodiazepine derivatives (N05CD, $n = 162$, 58.5%)	Sulfonamide plain diuretics (C03CA, $n = 638$, 63.5%)
5	Contact laxatives (A06AB, $n = 161$, 58.1%)	Glucocorticoids (H02AB, $n = 626$, 62.3%)
6	Magnesium compounds (A02AA, $n = 147$, 53.1%)	Magnesium compounds (A02AA, $n = 595$, 59.2%)
7	Propulsives (A03FA, $n = 127$, 45.8%)	Adrenergic and dopaminergic agents (C01CA, $n = 593$, 59.0%)
8	Mucolytics (R05CB, $n = 109$, 39.4%)	Cephalosporins (J01DA, $n = 593$, 59.0%)
9	Beta-2 adrenoceptor agonists (R03AC, $n = 104$, 37.5%)	Electrolyte solutions (B05XA, $n = 576$, 57.3%)
10	Cephalosporins (J01DA, $n = 102$, 36.8%)	Antiasthmatics/anticholinergics (R03BB, $n = 567$, 56.4%)
11	Benzodiazepines (N02BA, $n = 100$, 36.1%)	Beta-2 adrenoceptor agonists (R03AC, $n = 548$, 54.5%)
12	Acetic acid derivatives (M01AB, $n = 91$, 32.9%)	Propulsives (A03FA, $n = 548$, 54.5%)

ATC = Anatomic Therapeutic Chemical Classification.
[a] In the control group, the prescriptions of natural opium alkaloids covered 371 patients (36.9% of the control group).

additionally prescribed parenteral electrolyte/nutritional supplements (ATC code B05BA, B05XA), diuretics (ATC code C03CA), adrenergic/dopaminergic agents (ATC code C01CA), and antiasthmatics/anticholinergics (ATC code R03BB). The coverage of opioids (ATC code N02AA) was much lower in the control group. The prescriptions for the control (acute ward care) group were aimed at nutritional support, maintaining blood pressure, and controlling respiratory problems or fluid overload. Pain control should be promoted for patients with advanced cancer, even under acute ward care.

The wide use of bronchodilators (ATC code R03BB, R03AC) in the control group reflected paradoxical views related to dyspnea in end-of-life patients with lung cancer. For instance, over half the control group used beta-2 adrenoceptor agonists, whereas only 37.5% of the hospice-care group did. Document reviews have proven the advantages of using opioids for the control of cancer-related dyspnea instead of bronchodilators.[24,25] Hospice care has been proven to reduce unnecessary prescriptions and save resources for elderly patients.[26] Opioids have their place in promoting the relief of dyspnea in acute ward care.

Parenteral nutrition/hydration also reflected paradoxical issues for hospice care in Taiwan. Up to 79.4% of the hospice-care group received parenteral hydration (ATC code B05BB). Furthermore, parenteral nutrition and electrolyte supplements (ATC code B05BA, B05XA) were given almost to those under end-of-life acute ward care. Although parenteral nutrition/hydration had few benefits for terminal patients, [27] inaccurate beliefs still existed among terminal patients and their families in Taiwan.[28,29] The use of parenteral nutrition/hydration requires rigorous guidelines.[30]

The role of antibiotics in terminal cancer patients is interesting. For ICU care, the continuous use of antibiotics for terminal patients had no benefit because of the development of resistant strains and nosocomial infections.[31] The use of antibiotics in hospice care should be imposed for the control of symptoms.[32] In this study, the prescription of cephalosporin (ATC code J01DA) still covered 36.8% of the hospice-care group. A further reduction of any unnecessary use of antibiotics should be aggressively promoted.

It should be noted that both groups had a very substantial number of prescriptions for constipation, possibly correlated with the use of opioids. Optimal dose adjustments may be considered to reduce side effects under good pain control.[33] In addition, re only 21.6% of enrolled elderly patients with lung cancer were undergoing hospice care at their end-of-life hospitalization. This ratio is lower than in the United Kingdom (36%), Spain (25–50%) and Norway (26%; including nursing home care), but higher than in Ireland (12%; 16% if including nursing home care).[34–37] Hospice care still has room to promote itself and expand in Taiwan.

The design of our study had, however, some limitations. Focussing on elderly patients with lung cancer limited the investigation of other cancers and different age groups. Screening with ICD-9-CM codes may have some limitations of accuracy, underestimating the actual prevalence of comorbidities without the ability to clearly identify pathological types and stages of lung cancer. Out-of-hospital deaths, including dying at home and discharge with critical conditions, could not be considered in this study concerning end-of-life hospitalization. In addition, the role of psychological and spiritual therapies in hospice care could not be evaluated due to the limited data. Further studies on hospice care and its impact on medical systems are indicated in Taiwan.

In conclusion, hospice care has made an impact on elderly patients with lung cancer. The experiences of hospice care patients, however, have been different from those of patients in acute ward care, such as shorter hospital stays, reduced cost of stays, and fewer invasive procedures. The distributions of comorbidities and common prescriptions were quite different between the two groups. From experiences in Taiwan, opioids should be promoted for the control of dyspnea, and the use of parenteral nutrition/hydration and antibiotics should be reduced in hospice care. Hospice care provides an economic advantage in caring for elderly patients with lung cancer at the end of their lives. Family physicians and radiation oncologists both perform an important role in hospice care. Ultimately,

compared with prevalence of hospice care in the United Kingdom and other developed countries, there is still an opportunity to improve hospice care in Taiwan.

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