

# Effects of Timing of Hospice Care Referral on End-of-Life Care Quality and Health Care Costs in Lung Cancer Patients: A Population-Based Study

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**Background:** End-of-life (EOL) care quality and health care costs for patients with cancer are critical issues for health care providers. We evaluated the effect of the timing of hospice care referral on care quality and health care costs for patients with lung cancer in their EOL.

**Methods:** Using claims data from the Taiwan National Health Insurance Research Database, we analyzed EOL care quality indicators and health care costs in the last month of life for patients with advanced lung cancer who died during 1997-2011.

**Results:** In total, 566 adult patients with lung cancer who received hospice care were enrolled. The appropriate timing of hospice referral for improving care quality was more than 2 months before death. Compared with patients with a short hospice stay before death (<2 months), those with a longer hospice stay (>2 months) had less proportions of one or more quality indicators of EOL care ( $p=0.002$ ), fewer in-hospital deaths ( $p<0.001$ ), as well as lower mean health care costs during the last month of life (NT\$43,642  $\pm$  4,997 vs. NT\$64,560  $\pm$  2,456,  $p<0.001$ ), but more than one hospitalization in the last month of life ( $p=0.048$ ).

**Conclusion:** Our results suggest that the appropriate timing of hospice referral for patients with advanced lung cancer was more than 2 months before death. Patients with more than 2 months of hospice service had improved EOL care and 32.4% lower health care costs in their last month of life than those with less than 2 months of hospice service.

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**Key words:** end-of-life, hospice care, lung cancer, timing referral

## INTRODUCTION

Despite advances in diagnosis and

treatment, cancer remains a major disease burden and a leading cause of death worldwide [1]. End-of-life (EOL) care is

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a public health concern. The World Health Organization recommends that all countries adopt a national palliative care policy as a human right and provide access to palliative care services for patients and their families who would benefit from this care [2].

Hospice care is an interdisciplinary team approach to providing comprehensive physical, social, and spiritual care; emotional and psychological support; and bereavement support for patients with terminally ill diseases and their families. Documented benefits of hospice care include higher quality EOL care [3,4], higher patient and caregiver satisfaction and fewer and shorter acute care admissions for patients at EOL [5-7], and lower health care costs [8,9].

Six indicators of the quality of EOL care have been developed and are outlined as follows: undergoing chemotherapy during the last 2 weeks of life, having more than one emergency room visit in the last month of life (LML), being admitted to a hospital more than once in the LML, receiving intensive care unit (ICU) care in the LML, receiving cardiopulmonary resuscitation (CPR) in the LML, and dying in a hospital [10,11]. These EOL care quality indicators have been adopted in the United States [12], Canada [13], and Taiwan [14] and are considered as aggressive EOL cancer care. More aggressive EOL care is considered inappropriate for the terminally ill patients [13]. Therefore, measuring these indicators is crucial for evaluating the quality of hospice care programs.

The timing of hospice referral is

an important issue for patients and their families, health care providers, and policymakers. The decision of hospice referral must be made at the appropriate time [15], and this appropriate time can be arrived at based on bereaved family members' perception [16,17], patient/family member perception [18], and expert recommendation [5]. A study reported that bereaved family members' perception of the timing of hospice referral, and not the length of stay, is associated with the quality of hospice care [17], whereas other studies have reported that a minimum 90-day hospice stay could provide improved EOL care to patients and their families [5,19]. In the present study, we used the 6 EOL care quality indicators in the LML as variables to predict whether the timing of hospice referral could lead to improved EOL care in their LML. Accordingly, we examined the effect of appropriate timing of hospice referral to EOL care and the health care costs in the LML.

## METHODS

### Data Source

In this nationwide, population-based study, we used data from the computerized Taiwan's National Health Insurance Research Database (NHIRD), which contains data from the National Health Insurance (NHI) program that covered up to 99.9% of all residents in 2012; 97% of medical providers nationwide are affiliated to the program [20]. The NHIRD, a nationally representative database

containing all original claims data for one million NHI beneficiaries from 1996 to 2012, is a random, systematic sample of the 23.31 million NHI enrollees. We followed patients until December 2012 using the 2000 Longitudinal Health Insurance Database (LHID2000). The patients were linked to the LHID2000 to obtain the medical claims data collected from 1997 to 2011. Furthermore, to verify the diagnostic accuracy, National Health Insurance Administration Ministry of Health and Welfare in Taiwan randomly interviews patients and reviews the charts of 1 per 100 ambulatory and 1 per 20 inpatient claims [21].

### Identification

Patient data were linked to the LHID2000 to obtain the hospital claims data collected from 1997 to 2011. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and A codes were used to define lung cancer (A101, 162, 162.0, 162.2, 162.3, 162.4, 162.5, 162.8, 162.9, 165.0, 165.8, and 165.9). To increase the validity of the diagnosis of diabetes or hypertension, we defined only patients who had 3 reported diagnoses of diabetes [22] or 2 instances of hypertension [23], which we determined by the ICD-9-CM or A codes for these disease entities in their medical claims.

### Variables

Patient characteristics included age, sex, age at death, mean survival years after cancer diagnosis, comorbidities,

chemotherapy administration, and level of urbanization. The Charlson comorbidity index (CCI) and common comorbidities (eg, diabetes, hypertension, stroke, and chronic kidney disease) were identified according to the ICD-9-CM system.

### Definition of Variables

Quality indicators of EOL cancer care: The clinical effectiveness of palliative care services for adult patients with terminal illness and their family caregivers includes symptom control, quality of life, and caregiver distress and satisfaction with care. In this study, we used the following quality indicators to appraise the quality of EOL cancer care: chemotherapy administration in the last 2 weeks of life, more than one emergency department (ED) visit, more than one hospitalization, at least one ICU admission, or in-hospital death [11,24].

Appropriate timing of hospice referral: In this study, we used the 6 EOL care quality indicators and one or more of the 6 quality indicators of EOL cancer care in the LML as dependent variables to explore the appropriate timing of hospice referral.

Longer-stay hospice group (LH group) and short-stay hospice group (SH group): This pertained to the duration of hospice care and/or home hospice care as reported on a patient's medical records. Patients with advanced lung cancer were categorized into the LH group if their durations of hospice care were more than 2 months before death; otherwise, they were categorized into the SH group.

CCI: The CCI scores were calculated

by examining the ICD-9-CM diagnosis and procedure codes recorded in the year before diagnosis according to the Deyo method. The calculated indices were subsequently applied to the inpatient and outpatients claims as reported by Klabunde et al [25,26].

**Health care costs:** Each patient's health care costs were calculated by summing the inpatient services and outpatient services listed in the patient's claims records. We converted costs according to the U.S. Dollar and New Taiwan Dollar exchange rate in 2006 (US\$1.00= NT\$32.53).

The study protocol was reviewed and approved by the Research Ethics Committee of the Buddhist Dalin Tzu Chi Hospital, Taiwan (No. B10301001). Because the NHIRD files contained only deidentified secondary data, the review board waived the requirement for informed consent.

### Statistical Analysis

Categorical variables are presented as frequency and percentage, and continuous variables are presented as mean  $\pm$  standard deviation (SD) or standard error. The survival duration was defined as the duration from the day of diagnosis to the date of death (in years). Survival probabilities were analyzed using the Kaplan–Meier method and tested using the log-rank test. Normality was examined using the Shapiro–Wilk test. In the univariate analysis, the 2-sample *t* test, Wilcoxon rank-sum test, chi-squared test, and Fisher exact test were used to examine the differences in the distribution of continuous and categorical variables

between the 2 groups (i.e., the LH and SH groups).

A multivariate analysis was conducted by fitting multiple logistic regression models using the stepwise variable selection procedure to determine vital predictors of the 6 quality indicators during the LML. Generalized additive models were fitted to detect the potential nonlinear effects of continuous covariates (such as age) and determine appropriate cutoff points for discretizing continuous covariates including the number of months receiving hospice care during the stepwise variable selection.

We assessed the goodness of fit of the final logistic regression model according to the estimated area under the receiver operating characteristic curve (AUC; also called the *c* statistic). In practice, the value of the *c* statistic ( $c=0-1$ )  $\geq 0.7$  suggests an acceptable level of discrimination power. The effects of hospice durations on the 6 quality indicators were assessed using the multivariate logistic regression models.

All statistical operations were performed using R 3.4.1 software (R Foundation for Statistical Computing, Vienna, Austria). A 2-sided *p* value of  $\leq 0.05$  was considered statistically significant.

## RESULTS

We enrolled 566 adult patients with lung cancer (347 men and 219 women; ratio=1.58:1) who received hospice care and died during 1997-2011. Among 566 patients with lung cancer who received hospice care, 555 patients (98.1%) were enrolled between

2002 and 2011. The mean age was  $69.9 \pm 12.0$  years. Figure 1 depicts the study design.

The mean  $\pm$  SD (median) number of days from hospice care enrollment to death was  $54.7 \pm 100.2$  (23.0). Furthermore, 128 (22.6%) patients were in the LH group and 438 (77.4%) in the SH group. The median survival after diagnosis was longer for patients in the LH group (1.4 years) than for those in the SH group (0.7 years) ( $p < 0.001$ ). Table 1 presents a comparison of the demographic characteristics of patients with advanced lung cancer in the LH and SH groups. Compared with the SH group, the LH group had more women ( $p = 0.001$ ),

longer median survival years after diagnosis (1.4 vs. 0.7,  $p < 0.001$ ), and larger portion of care in the teaching hospital (70.3% vs. 54.8%,  $p = 0.020$ ).

Table 2 shows a comparison of indicators of the quality of EOL care and health care costs in patients with advanced lung cancer in the LH and SH groups during the LML. The proportions of patients having more than one hospitalization and dying in a hospital were significantly lower in the LH group than in the SH group (18.0% vs. 26.7% [ $p = 0.048$ ] and 46.9% vs. 68.9% [ $p < 0.001$ ], respectively). The proportion of one or more of these 6 indicators was lower in the LH group than in the SH group (77.3%

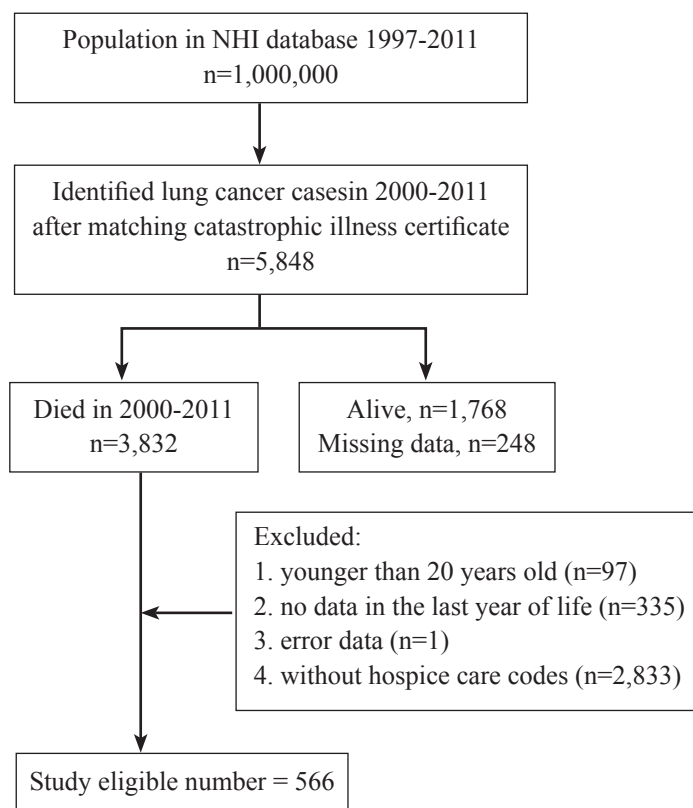


Figure 1. Flow chart of patients selection.

Table 1. Demographic Characteristics of Advanced Lung Cancer Patients by Hospice Care Duration

| Variables  | Total                 | SH group<br>(<2 months),<br>n (%) | LH group<br>(≥2 months),<br>n (%) | <i>p</i> value |
|--|-----------------------|-----------------------------------|-----------------------------------|----------------|
| Number of patients                                       | 566                   | 438 (77.4)                        | 128 (22.6)                        |                |
| Age  | 69.9 ± 12.0           | 69.8 ± 12.0                       | 70.3 ± 12.1                       | 0.409          |
| Gender   |                       |                                   |                                   | 0.001          |
| Male   | 347 (61.3)            | 285 (65.1)                        | 62 (48.4)                         |                |
| Female   | 219 (38.7)            | 153 (34.9)                        | 66 (51.6)                         |                |
| Hospice days to death                                    | 54.7 ± 100.2          | 19.5 ± 15.6                       | 175.2 ± 157.9                     | <0.001         |
| Age at diagnosis (years)                                 | 68.5 ± 12.3           | 68.5 ± 12.2                       | 68.4 ± 12.4                       | 0.808          |
| Interval between diagnosis and death                     |                       |                                   |                                   | <0.001         |
| <6 months  | 183 (32.3)            | 167 (38.1)                        | 16 (12.5)                         |                |
| 6-36 months  | 317 (56.0)            | 225 (51.4)                        | 92 (71.9)                         |                |
| > 3 years  | 66 (11.7)             | 46 (10.5)                         | 20 (15.6)                         |                |
| Survival years, after diagnosis*                         | 1.40 ± 0.07<br>(0.86) | 1.25 ± 0.07<br>(0.73)             | 1.89 ± 0.15<br>(1.42)             | <0.001         |
| Number of comorbidities<br>(Charlson co-morbidity index) |                       |                                   |                                   | 0.838          |
| <3   | 229 (40.5)            | 176 (40.2)                        | 53 (41.4)                         |                |
| ≥3   | 337 (59.5)            | 262 (59.8)                        | 75 (58.6)                         |                |
| Diabetes   | 82 (14.5)             | 65 (14.8)                         | 17 (13.3)                         | 0.775          |
| Hypertension   | 139 (24.6)            | 101 (23.1)                        | 38 (29.7)                         | 0.130          |
| Stroke   | 43 (7.6)              | 32 (7.3)                          | 11 (8.6)                          | 0.704          |
| Chronic kidney disease                                   | 9 (1.6)               | 8 (1.8)                           | 1 (0.8)                           | 0.692          |
| Urbanization level                                       |                       |                                   |                                   |                |
| Urban  | 302 (53.5)            | 234 (53.4)                        | 68 (53.5)                         | 1              |
| Suburban   | 174 (30.8)            | 130 (29.7)                        | 44 (34.6)                         | 0.326          |
| Rural  | 89 (15.8)             | 74 (16.9)                         | 15 (11.8)                         | 0.213          |
| Teaching hospital  | 330 (58.3)            | 240 (54.8)                        | 90 (70.3)                         | 0.020          |

Survival years, after diagnosis

\* by Kaplan–Meier method, mean ± SE (median)

† By log-rank test

Table 2. Comparison of the Aggressiveness of Cancer Care and Healthcare Costs in the Last Month of Life Between SH Group and LH Group

| Variables                                 | Total          | SH group<br>(<2 months),<br>n (%) | LH group<br>(≥2 months),<br>n (%) | <i>p</i> value |
|---|----------------|-----------------------------------|-----------------------------------|----------------|
| Number of patients                        | 566            | 438 (77.4)                        | 128 (22.6)                        |                |
| Chemotherapy*                             | 338 (59.7)     | 263 (60.0)                        | 75 (58.6)                         | 0.834          |
| More than one emergency department visit† | 28 (4.9)       | 26 (5.9)                          | 2 (1.6)                           | 0.060          |
| More than one Hospitalization†            | 140 (24.7)     | 117 (26.7)                        | 23 (18.0)                         | 0.048          |
| Intensive care unit admission†            | 3 (0.5)        | 3 (0.7)                           | 0                                 | 1              |
| Cardiopulmonary†                          | 10 (1.8)       | 9 (2.1)                           | 1 (0.8)                           | 0.469          |
| Dying in hospital†                        | 362 (64.0)     | 302 (68.9)                        | 60 (46.9)                         | <0.001         |
| One or more of above                      | 488 (86.2)     | 389 (88.8)                        | 99 (77.3)                         | 0.002          |
| Cost (NT\$) (mean ± SE)‡                  | 59,823 ± 2,245 | 64,560 ± 2,456                    | 43,642 ± 4,997                    | <0.001         |

\* Receiving chemotherapy within 14 days before death.

† These quality indicators were within the last month of life.

‡ SE: the standard error of the mean of a sample.

vs. 88.8%,  $p=0.002$ ). The mean health care costs in the LML were significantly lower in the LH group (mean ± standard error: NT\$43,642 ± 4,997) than in the SH group (NT\$64,560 ± 2,456) ( $p<0.001$ ). Patients with advanced lung cancer in the LH group had 32.4% lower health care costs than those in the SH group in their LML.

The significant factors for these 6 quality indicators in EOL care were explored through multivariate logistic regression. (Table 3) The independent factors listed in Table 1 and 2 were included in these procedures. The results of the Hosmer–Lemeshow test indicated a good fit, except for hospitalization more than once, and that the AUCs were generally

acceptable.

Based on these final models listed in Table 3, the probabilities of all these 6 quality indicators decreased with the durations of hospice care (Figures 2-3).

The timings (X-axis labels) at the intersections of the curves (Figures 2-3) and the gray line for  $\text{logit}(p)=0$  indicate the 50% probability of deriving quality indicators for patients at the corresponding (X-axis) duration of hospice care. That is, the longer the duration of hospice care, the lower the probability of quality indicators [in other words, the aggressiveness of cancer care (one or more of these quality indicators) in the LML]. The cutoff points for the duration of hospice care for 50% probability

Table 3. The Significant Factors for the Quality Indicators by Multivariate Logistic Regression for Patients with Advanced Lung Cancer

| Variable                    | Chemotherapy                | ED visit>1                    | Hospitalization>1            | ICU admission                  | CPR                             | Dying in hospital             | One or more of above  |
|-----------------------------|-----------------------------|-------------------------------|------------------------------|--------------------------------|---------------------------------|-------------------------------|---|
| Intercept                   | 4.74 (<0.001)               | -1.85 (<0.001)                | -1.51 (<0.001)               | -6.31 (<0.001)                 | -4.37 (<0.001)                  | -0.23 (0.194)                 | 0.35 (0.085)  |
| Age                         | -0.07 (<0.001)<br>0.92-0.95 |                               |                              |                                |                                 |                               |   |
| Age 40-60 y/o               |                             |                               |                              |                                |                                 |                               | 1.18 (0.009)<br>(1.34-7.96)                                 |
| Male                        |                             |                               | -0.54 (0.008)<br>(0.39-0.87) |                                |                                 |                               |   |
| Hospice stay (days)         |                             | -0.02 (0.027)<br>(0.97-0.998) |                              |                                |                                 |                               |   |
| Hospice stay > 2 months     |                             |                               |                              |                                |                                 | -0.66 (0.003)<br>(0.34-0.79)  |   |
| Admission days              |                             |                               | 0.04 (<0.001)<br>(1.02-3.84) |                                |                                 | 0.062 (<0.001)<br>(1.05-1.08) | 0.09 (<0.001)<br>(1.06-1.23)<br>0.83 (0.021)<br>(1.13-4.60) |
| Hypertension                | 1.12 (<0.001)<br>1.95-4.79  |                               |                              |                                |                                 |                               |   |
| Stroke                      |                             |                               | 0.68 (0.046)<br>(1.01-3.84)  |                                |                                 |                               |   |
| Chronic kidney disease      |                             |                               |                              | 4.44 (<0.001)<br>(7.21-993.04) |                                 |                               |   |
| Hemodialysis history        |                             | 3.53 (0.001)<br>(4.32-268.14) |                              |                                | 4.78 (<0.001)<br>(17.09-824.68) |                               |   |
| Charlson co-morbidity index |                             | -0.14 (0.023)<br>(0.78-0.98)  |                              |                                |                                 |                               |   |
| Nagelkerke's R squared      | 0.185                       | 0.113                         | 0.063                        | 0.139                          | 0.198                           | 0.159                         | 0.204   |
| Hosmer-Lemeshow test        | 0.892                       | 0.392                         | <0.001                       | 0.973                          | 1                               | 0.340                         | 0.101   |
| AUC                         | 0.720<br>(0.677-0.763)      | 0.722<br>0.643-0.802          | 0.635<br>(0.587-0.684)       | 0.833<br>(0.663-1)             | 0.648<br>(0.498-0.798)          | 0.703<br>(0.658-0.749)        | 0.774<br>(0.714-0.834)                                      |

\* The values indicated: estimate (*p* value) (95% CI).

Abbreviation: AUC, area under the receiver operating characteristic curve; CPR, cardiopulmonary resuscitation; ED, emergency department; ICU, intensive care unit.

of deriving quality indicators were 3 months for chemotherapy administration in the last 2 weeks of life; 2 months for CPR, more than one ER visit, and ICU care; and 1 month each for more than one hospitalization, in-hospital death, and one or more of these 6 indicators. Duration longer than the cutoff duration was viewed as the appropriate timing of hospice referral. Accordingly, we considered the appropriate timing of hospice referral for patients with lung cancer to be more than 2 months before death.

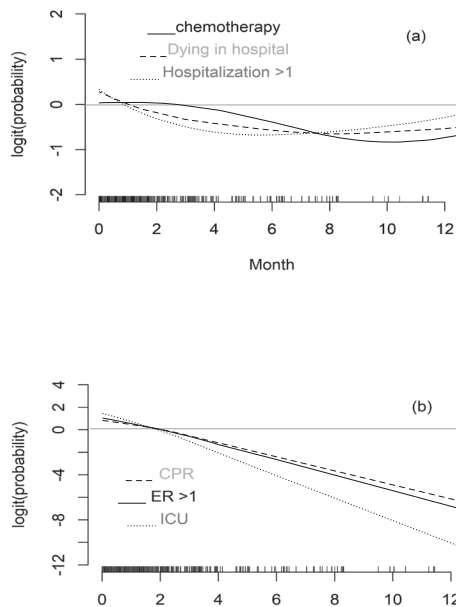


Figure 2. Estimated probabilities (by logit function) of different quality indicators  
2a: chemotherapy administration in the last 2 weeks, hospitalization more than once in the last month, and death in a hospital.  
2b: emergency department visit more than once, ICU admission, and CPR in the last month for patients with durations of hospice care derived from the fitted multivariate logistic regression model.

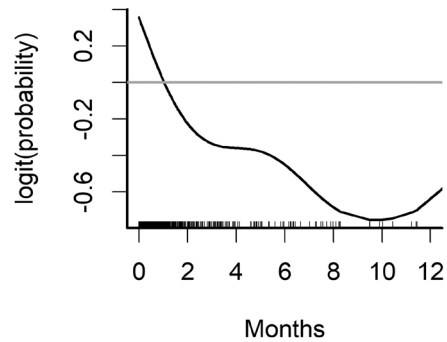


Figure 3. Estimated probabilities (by logit function) of one or more quality indicators in the last month of life for patients with durations of hospice care derived from the fitted multivariate logistic regression model.

## DISCUSSION

The probabilities of all these 6 quality indicators in the LML decreased as the duration of hospice care increased. The appropriate cutoff points for these quality indicators were 1-3 months for different quality indicators. We considered that the appropriate timing of hospice referral was more than 2 months before death. We found that patients with advanced lung cancer who received hospice service more than 2 months before death had improved EOL care and 32.4% lower health care costs in their LML, compared with other patients.

Hospice care is designed specifically to provide care at the EOL. The timing of hospice referral is crucial to determining EOL care quality and health care costs for patients with advanced cancer in the LML. A study reported that the timing of hospice referral, but not the length of stay, was associated with the quality of hospice care

from the perception of decedents' families [17]. However, another study reported that decedents' families felt they received greater benefits from longer durations of hospice stay [5]. In the present study, we attempted to determine the appropriate length of hospice stay from the view of quality indicators of EOL cancer care. We observed that patients receiving hospice care for more than 2 months had fewer hospitalizations (18.0% vs. 26.7%,  $p=0.048$ ) and in-hospital deaths (46.9% vs. 68.9%,  $p<0.001$ ), compared with other patients. A similar outcome was found in Hui's study that examined patients receiving early palliative care referral (>3 months before death) [19].

We also found that only 0.5% of hospice patients received ICU care and 1.8% received CPR in the LML, and we noted no significant difference in terms of these 2 quality indicators between the LH and SH groups. This might be because on June 7, 2000, the Taiwanese government passed the Natural Death Act (Hospice-Palliative Care Act), which enabled patients to forgo CPR and legalized hospice care for terminally ill patients [27]. In the present study, the proportion of patients with more than one ED visit in the LML was lower in the LH group than in the SH group, although the difference did not reach significance ( $p=0.060$ ); by contrast, the proportion was significantly lower in the early hospice referral group ( $p<0.001$ ) in Hui's study [19]. His finding might indicate that patients who received hospice referral more than 2 months before

death, as well as their families, had unmet needs. We recommend that future studies investigate how to alleviate the suffering and distress of patients with advanced lung cancer during the EOL. The proportions of patients receiving chemotherapy in the last 14 days of life were not significantly different between the LH and SH groups; a similar result was derived for non-early hospice referral (>3 months of hospice care). As chemotherapy becomes increasingly available and better tolerated, its appropriate role near the EOL becomes a complex issue [28]. To help patients and their family make informed decisions, oncologists should discuss with them the quality and quantity of life with and without chemotherapy [29].

The advance in treatment for patients with lung cancer included the use of epidermal growth factor receptor (EGFR) tyrosine kinase inhibitors, such as gefitinib or erlotinib. Previous study reported that gefitinib is superior to carboplatin-paclitaxel as an initial treatment for lung adenocarcinoma in East Asia, and that the 12-month rates of progression-free survival were 24.9% with gefitinib and 6.7% with carboplatin-paclitaxel. The presence in the tumor of a mutation of the EGFR gene is a strong predictor of a better outcome with gefitinib [30]. The NHI approved gefitinib in 2004 and erlotinib in 2007 as second-line therapy for pretreated lung adenocarcinoma and third-line therapy for non-small-cell lung cancer [31]. Accordingly, the EGFR tyrosine kinase inhibitors might have the effects on survival as well as hospice

referral.

One of the important factors for appropriate timing of hospice referral is to predict the survival of patients with terminally ill diseases. However, a major obstacle to providing appropriate hospice care is the physician's optimistic prognostication of the patient's survival [32,33]. A study reported that a more accurate prognostication for patients with advanced cancer is feasible and can be achieved by combining physician experience, clinical symptoms and signs, laboratory examination, and prognostic score [34]. Other factors include interventions to improve hospice care referral, such as hospice candidate identification, advanced care planning programs, and education [35]. Future studies are also required to prospectively evaluate our study outcome and correlate with the unmet needs and satisfactions of patients and their families. Because appropriate referrals to hospice improved EOL care and reduced health care costs, such referrals should be encouraged to maximize both the satisfaction and needs of patients and their families.

### **Limitations**

This study has some limitations. First, we included only patients with lung cancer; hence, our results cannot be generalized to patients with other types of cancer. Second, the choice of EOL cancer care involves not only access to hospice but also patient and family attitudes toward hospice care and chemotherapy and the relationship with

their specialist physicians. Third, we used administrative data to assess EOL cancer care, which can be an imprecise approach because it depends on the quality of coding and because important clinical features regarding patients' needs, preferences, and performance status were not collected. Fourth, a selection bias might have occurred because this study was not randomized.

### **Conclusion**

Our findings reveal that the appropriate timing of hospice referral was a minimum of 2 months before death for patients with advanced lung cancer. Patients with more than 2 months of hospice service had better EOL care and 32.4% lower health care costs in their LML, compared with those with less than 2 months of hospice service.

Competing interest: The authors declare no conflict of interest.

Disclosures: None.

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## 肺癌病人轉介安寧療護時機對生命末期照護品質與醫療花費的影響：人口資料庫研究

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**背景與目的：**癌症病人的生命末期照護品質和醫療花費，是健康照護提供者所關心的重要議題。本研究目的在評估安寧療護之轉介時間，對於肺癌病人的生命末期照護品質與醫療花費的影響。

**方法：**我們使用台灣全民健康保險研究資料庫，分析1997 - 2011年間因肺癌死亡的病人，在生命最後一個月的照護指標與醫療花費。

**結果：**共566位接受安寧療護的成年肺癌病人納入分析。肺癌病人轉介安寧療護的適當時間為病人死亡前2個月以上。相較轉介安寧療護時間小於2個月的病人，轉介安寧療護時間大於2個月的病人有顯著較低的比例有一項或多項的生命末期照護品質指標( $p=0.002$ )、較少在醫院死亡的比例( $p<0.001$ )、以及生命最後一個月的平均醫療花費較低 (NT\$43,642±4,997 相對 NT\$64,560 ± 2,456,  $p<0.001$ )，但是有較多的比例在生命最後一個月住院次數大於一次者( $p=0.048$ )。

**結論：**本研究結果顯示，末期肺癌病人轉介安寧照護的適當時機在病人死亡前2個月以上。肺癌病人接受安寧療護2個月以上者，相較於接受安寧療護小於2個月者，前者有較佳的生命末期照護品質且最後一個月的醫療花費較少32.4%。

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**關鍵詞：**安寧療護、轉介時間、生命末期、肺癌

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