Original Article

The Relationship of Pain, Uncertainty, and Hope in Taiwanese Lung Cancer Patients

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Abstract
The impact of cancer pain on the quality of life of lung cancer patients is obvious, but the relationship of cancer pain to uncertainty and level of hope in cancer patients is not clear and has been the subject of only a few studies. The purpose of this study is to look at the relationship of pain to uncertainty and hope in Taiwanese lung cancer patients. A cross-sectional and descriptive correlational design was used in this study. A convenience sample of lung cancer patients was recruited from chest medicine and oncology inpatient units at three teaching hospitals in the Taipei area of Taiwan. The research instruments included the Brief Pain Inventory-Chinese version (BPI-C), Mishel's Uncertainty Illness Scale (MUIS), and the Herth Hope Index (HHI). Data were analyzed using descriptive statistics, Pearson's correlation, and multiple regression. A total of 164 subjects were recruited, including 79 patients with cancer pain and 85 patients without cancer pain. The major findings were: 1) there were significant differences in level of uncertainty and level of hope between patients with cancer pain and those without. Patients with cancer pain reported higher levels of uncertainty and lower levels of hope than did patients without cancer pain; 2) pain severity was not significantly related to level of uncertainty; however, pain interference with daily life was positively correlated to level of uncertainty; 3) both pain severity and pain interference were negatively correlated with level of hope; and 4) after controlling for pain severity and pain interference, uncertainty was a significant predictor of level of hope. Important implications for future studies are discussed. J Pain Symptom Manage 2003;26:835–842.

Key Words
Lung cancer, pain, uncertainty, hope

Introduction

Cancer of the lung is one of the most common types of cancer in Taiwan and, indeed, worldwide. World Health Organization statistics reveal that the incidence and mortality of lung cancer have been increasing throughout the world.[1–3] Lung cancer has a great impact on people's lives, especially for those with pain associated with advanced disease. In Japan, Tanaka et al.[4] found that pain interfered with all daily activities in 40% of lung cancer patients. Pain was also significantly associated

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with psychological distress in Japanese lung cancer patients.[5] In the United States, Given et al.[6] observed that lung cancer is a significant predictor of pain in elderly cancer patients. However, even though pain appears to be a significant problem for lung cancer patients worldwide, there has been very limited research on pain in lung cancer patients, including those in Taiwan.

Ambiguous physical symptoms and an unpredictable prognosis for their illness may cause individuals to experience uncertainty.[7] Faced with uncertainty about cancer and cancer pain, patients are aware of the limitations of life. Therefore, when lung cancer patients experience cancer pain, the level of pain may be increased because they not only fear the physical pain, but also have to face the threat of an uncertain future, which may include death.

An individual's ability to cope with illness is influenced by several factors, including anxiety, fear, body impairment, and uncertainty originating from the diagnosis and subsequent therapies. Hope is an index of an individual's ability to cope with, and adapt to, an illness.[8] Hope also can be viewed as a fundamental part of living and as an important factor in influencing human activities. Hope may have a positive effect on helping individuals with their grief, worry, and uncertainty, and may even prolong their lives. Consequently, hope can be a powerful tool for fighting helplessness in lung cancer patients.[9]

In Western societies, several studies have demonstrated that pain and uncertainty each separately influence the level of hope of cancer patients. Herth[10] maintained that the engendering of hope was hampered by unrelieved cancer pain. Christman[11] proposed that the level of hope was negatively associated with uncertainty. However, in Taiwan, very limited research has been conducted related to pain, uncertainty, and hope.

Pain, as a crisis event, implies a threat to an individual's life and may drive feelings of loss concerning financial status and social activities.[12] Pain is a distressful and personal experience, and can destroy an individual's life.[13] Even in the absence of pain, patients' physiological, psychological, and social adjustments are influenced by uncertainty associated with their prognosis, hospitalization, residual treatment, and decreasing ability to perform daily activities.[14] The greatest impact of cancer on patients is that it is a life-threatening situation which causes them to fear their own death.[15] The word "cancer" elicits immediate fears associated with death. Mishel et al.[16] investigated 54 women with gynecologic cancer and found that the following four variables influenced their psychosocial adjustment: uncertainty, optimism, the perceived seriousness of the illness, and one's control over physical functions. Uncertainty was the most significant explanatory variable for adjustment.

Hope is a multidimensional and dynamic phenomenon.[17–19] A wide variety of studies have documented the correlation between cancer and hope. Zook and Yasko[20] and Herth[9] discovered a significant relationship between the level of hope and the length of illness in cancer patients. Herth[8] also noted that the response to cancer is influenced by coping resources and hope. Nowotny[21] mentioned hope as an important factor for an effective response to a stressor.

Few studies have investigated the impact of pain on level of uncertainty and level of hope, and explored the relationship among these three variables, especially in Taiwanese lung cancer patients. Therefore, the purposes of this study were as follows: a) to determine the different levels of uncertainty in lung cancer patients, both those with and those without cancer pain; b) to determine the different levels of hope in lung cancer patients, both those with and those without cancer pain; c) to explore the relationship between pain and uncertainty, between pain and hope, and between uncertainty and hope; and d) to explore whether or not pain severity, pain interference, and uncertainty predict level of hope in Taiwanese lung cancer patients.

Methods

Subjects and Setting

A cross-sectional and descriptive correlational design was used in this study. Lung cancer patients were recruited by convenience sampling from chest medicine and oncology inpatient units at three teaching hospitals in the Taipei area of Taiwan. Patient selection criteria were as follows: (a) a diagnosis of lung cancer;

(b) 18 years or older; and (c) able to communicate in Mandarin or Taiwanese. A total of 168 patients accepted, but four patients were excluded from the study because of the rising level of pain. The final sample consisted of 164 patients (response rate 98%), including 79 patients with pain and 85 patients without pain.

Instruments

A four-part survey was used to collect the data. The questionnaires included (a) a demographic questionnaire, (b) the Brief Pain Inventory-Chinese version (BPI-C), (c) the Mishel Uncertainty Illness Scale (MUIS), (d) and the Herth Hope Index (HHI).

Demographic Questionnaire. The demographic questionnaire was used to assess patients' basic information, such as gender, age, marital status, employment, education, religious affiliation, type of disease, time of diagnosis, stage of the disease, and site of the pain.

Brief Pain Inventory-Chinese Version (BPI-C). The BPI-C was used to measure the multidimensional nature of the pain, including its severity and subsequent interference with daily activities during the preceding week.[22] The first part of the BPI-C consists of four single-item measures of pain severity: worst pain, least pain, average pain, and current pain. Each item is rated on a scale of 0 (no pain) to 10 (the worst pain I can imagine). Pain severity is the average of the four items. The second part of the BPI-C assesses the extent to which pain interferes with the following seven aspects of life: general activity, mood, walking, working, relations with others, sleeping, and enjoyment of life. Each item is rated on 0–10 point scale. An interference score was computed from the average of the seven items.

The BPI has been used worldwide to measure pain and has been shown to be reliable and valid. The test-retest reliability of the scale of worst pain was 0.93 over a 2-day period in a sample of inpatients with cancer.[23] Lin's[24] work reported that alpha coefficients of BPI-C for pain severity and pain interference items were 0.87 and 0.90, respectively. Validity was supported by factor analysis, and a significant correlation was found between the pain severity and pain interference ($\underline{r} = 0.60$, $P < 0.05$).[22] In the current study, the internal consistency for pain severity and that for pain interference items were 0.85 and 0.96, respectively.

Mishel Uncertainty Illness Scale (MUIS). The MUIS, modified in 1987, was used to measure individuals' perceived uncertainty in the areas of symptoms, diagnosis, treatment, prognosis, and relationships with caregivers.[25] This scale has 28 items, including two factors, ambiguity and complexity, which are measured on five-point Likert scales. The subscale alphas were 0.87 for ambiguity (16 items), 0.87 for complexity (12 items), and 0.89 for the total scale.[25] The predictive validity of the scale had been demonstrated when the expected positive correlation appeared for the uncertainty of illness and stress factors ($\underline{r} = 0.33$, $P < 0.001$).[26] Construct validity was demonstrated when the scale differentiated patient populations according to level of uncertainty ($P < 0.001$).[7]

The Chinese version was translated from the MUIS by Sheu and Hwang.[27] Factor analysis, internal consistency, and content validity of the scale were tested with 65 inpatients with myocardial infarction. Based on the results of this test, three items were omitted from the Chinese version of the MUIS (leaving a total of 25 in the Chinese version as opposed to 28 in the English version) because these items did not show adequate reliability. The Cronbach's alpha was 0.89, and the Content Validity Index was 0.92.[27] In this study, the internal consistency was 0.86 for the total scale, 0.86 for the ambiguity subscale, and 0.73 for the complexity subscale.

Herth Hope Index (HHI). The HHI was used to measure individuals' perceived level of hope.[18] The HHI is a 12-item scale using a four-point Likert-type format with the categories of strongly disagree, disagree, agree, strongly agree. HHI responses are summed (range 12 to 48), and the total score is a measurement of the level of hope. The HHI was translated into Chinese using a translation and back-translation approach. In this study, the internal consistency reliability was 0.89.

Procedures

After ethical approval was obtained from each hospital, eligible subjects were recruited for this sample. Head nurses of inpatient units identified potential participants who met the

sample criteria. The research assistant contacted all patients and gave a verbal explanation of the study. Those patients who were willing to participate in the study were asked to give written consent. Patients were given a questionnaire that they were asked to fill out independently. If a patient was unable to complete the questionnaire on his/her own, the researcher read the questionnaire items to the patient and recorded the answers.

Statistical Analysis

Descriptive statistics were used to describe the sample characteristics in terms of demographics and levels of pain, uncertainty, and hope. T-tests were applied to determine the different levels of uncertainty and hope in patients, both those with and those without cancer pain. Pearson's correlation and t-tests were used to determine the relationships among pain, uncertainty, and level of hope. Finally, multiple regression analysis was employed to explore whether or not pain versus uncertainty predicted level of hope.

Results

Demographic and Disease Characteristics

Analyses were first performed to determine if there were differences in demographic variables between the two groups of patients (those with cancer pain as opposed to those without). No differences were found in demographics; however, there were significant differences in disease characteristics between the two groups. Of the patients with cancer pain, 67 (81.01%) had Stage III disease, whereas 43 (50.59%) of the patients without cancer pain had Stage IV disease ($\chi^2 = 43.41$, $P < 0.001$). In most of patients with cancer pain, the disease state was metastatic; the disease was localized in most patients without cancer pain ($\chi^2 = 46.36$, $P < 0.001$).

Severity of Pain and Subsequent Interference with Daily Activities

Patients with cancer pain ($n = 76$) were asked to report severity of pain and subsequent interference with daily activities in the preceding week. The average of pain severity ranged from 1.75 to 7.5 with a mean (SD) of 4.44 (1.77). For worst pain, the mean (SD) score was 8.30 (1.46); for the least pain, the mean (SD) score was 1.44 (1.56); for average pain, the mean (SD) score was 5.24 (1.74); for current pain, the mean (SD) score was 2.77 (2.30). The average of pain interference with life activities ranged from 3.14 to 10.00 with a mean (SD) of 7.41 (1.89). The three subscales with greatest impact on life activities were mood (mean = 7.70, SD = 2.13), walking (mean = 7.54, SD = 2.06), and working (mean = 7.63, SD = 1.95) (Table 1).

Perceived Uncertainty

The MUIS had a mean of 79.46 ($\underline{n} = 164$). Patients with cancer pain appeared to have significantly higher scores on every MUIS subscale and on the total MUIS score than did patients without cancer pain. For ambiguity, the respective mean (SD) scores were 56.99 (7.77) and 42.14 (9.96) ($\underline{t} = -10.59$, $P < 0.001$); for complexity, the respective mean (SD) scores were 30.87 (5.59) and 28.91 (2.67) ($\underline{t} = -2.91$, $P < 0.01$); for total MUIS, the respective mean (SD) scores were 87.86 (10.84) and 71.05 (10.67) ($\underline{t} = -10.01$, $P < 0.001$).

Perceived Hope

The HHI had a mean of 33.86 ($n = 164$). For patients without cancer pain, the mean (SD) of the HHI was 36.91 (5.18), and for patients with cancer pain, the mean (SD) was 30.81 (5.95). To determine levels of hope in the two groups of lung cancer patients, those with cancer pain as opposed to those without, a t-test was used to compare the mean total HHI scores. Pa-

Table 1
Brief Pain Inventory-Chinese Version (BPI-C) for Lung Cancer Patients with Pain ($n = 79$)

	Mean	SD	Maximum	Minimum
Severity	4.44	1.77	7.50	1.75
Worst pain	8.30	1.46	10.00	5.00
Least pain	1.44	1.56	5.00	0.00
Average pain	5.24	1.74	8.00	2.00
Current pain	2.77	2.30	7.00	3.14
Interference with daily activities	7.41	1.89	10.00	3.14
General activities	7.42	1.98	10.00	2.00
Mood	7.70	2.13	10.00	2.00
Walking	7.54	2.06	10.00	1.00
Working	7.63	1.95	10.00	3.00
Relations with others	7.09	2.20	10.00	2.00
Sleeping	7.08	2.29	10.00	0.00
Enjoyment of life	7.42	2.12	10.00	3.00

Range for all subscales is 0 to 10.

tients without cancer pain appeared to have significantly higher levels of hope ($\underline{t} = 7.01$, $P < 0.001$).

Relationships Between Pain and Uncertainty

To explore the relationship between pain and uncertainty, the Pearson correlation was used to test if pain severity and pain interference with daily activities were related to ambiguity, complexity, or uncertainty. There was no significant correlation between severity of pain and uncertainty ($\underline{r} = 0.14$, $P < 0.05$), ambiguity ($\underline{r} = 0.14$, $P < 0.05$), or complexity ($\underline{r} = 0.08$, $P < 0.05$). Pain interference with daily activities had no significant correlation with complexity ($\underline{r} = 0.16$, $P < 0.05$), but there was a significant positive relationship between uncertainty ($\underline{r} = 0.23$, $P < 0.05$) and ambiguity ($\underline{r} = 0.21$, $P < 0.05$) (Table 2).

Relationships Between Pain and Hope

To explore the relationship between pain and hope, the Pearson correlation was used to test if pain severity and pain interference with daily activities were related to hope. The severity of pain had a significant negative correlation with hope ($\underline{r} = -0.20$, $P < 0.05$), as did pain interference ($\underline{r} = -0.30$, $P < 0.05$) (Table 2).

Relationships Between Uncertainty and Hope

To explore the relationship between uncertainty and hope, Pearson correlation coefficients were computed. Total HHI scores were negatively associated with total MUIS scores ($\underline{r} = -0.38$, $P < 0.05$). Moreover, correlations between hope and uncertainty are presented in Table 2.

Predictors of Levels of Hope

Multiple regression analysis was employed to explore whether pain severity, pain interference, or uncertainty predicted level of hope. Level of hope was entered as the dependent variable, and pain severity, pain interference, and level of uncertainty were entered as predictors after controlling for age, levels of education, and disease stage. Analysis showed that level of uncertainty was the only significant predictor of level of hope ($\underline{\beta} = -0.31$, $P < 0.05$) (Table 3).

Discussion

In this current study, the mean (SD) of worst pain in the preceding week was 8.30 (1.46). Portenoy et al.[28] found that the mean of worst pain, least pain, and average pain in lung cancer patients was 5.80, 3.10, and 4.90, respectively. Lin,[24] Lin,[29] and Lin et al.[30] found the mean (SD) of worst pain to be 5.11 (3.19), 6.38 (2.69), and 6.00 (3.25), respectively. Thus, the mean of worst pain scores in this study was higher than the results of other studies conducted in Taiwanese cancer patients.

For study participants, pain interference with daily activities in the preceding week remained moderately high but did not significantly differ between subscales. The mean total of the scales was 7.41, and the average of subscales was 7.08 to 7.70. The means of mood, walking, and working were higher than those of other subscales. Ger et al.[31] found that for general cancer patients the average of the subscales was 2.86 to 5.08, and the mean of sleeping, relations with others, and enjoyment of life were the highest of the subscales. The score of pain interference with daily activities was also higher than that which was reported in the other studies mentioned above. The perception of greater pain severity and pain interference with daily activities could be because more participants in this study had Stage III or IV disease and distant metastases than did those in the other studies. In addition, lung cancer patients with cancer pain

Table 2
Correlation Matrix of Pain, Interference, Uncertainty, and Hope ($n = 79$)

	Pain severity	Pain interference	Uncertainty	Ambiguity	Complexity
Pain severity					
Interference	0.79[a]				
Uncertainty	0.14	0.23[a]			
Ambiguity	0.14	0.21[a]	0.87[a]		
Complexity	0.08	0.16	0.73[a]	0.30[a]	
Hope	−0.20[a]	−0.30[a]	−0.38[a]	−0.43[a]	−0.14

[a] $P < 0.05$

Table 3
Regression Analysis for the Predictors of Levels of Hope (n = 164)

	β	t	*P*	R^2	F	*P*
Uncertainty	−0.305	−2.87	0.00[a]	0.25	4.06	0.00[a]
Pain severity	−0.07	−0.09	0.93			
Pain interference	−0.18	−0.99	0.32			

[a] $P < 0.05$.

often have respiratory problems that create difficulties performing normal daily activities.

The mean of illness uncertainty in lung cancer patients on a scale of 25 to 125 was 79.46. This uncertainty score is moderately high compared with Hwang et al.'s[32] study of breast cancer patients, in which the mean of uncertainty was 76.48. This could be due to differences in diagnoses, prognoses, and progress between the two studies. Data from the current study show that the level of uncertainty in patients with Stage IV disease was higher than that of patients with Stage III disease; in addition, some patients with metastatic lung cancer had greater ambiguity and uncertainty than did the others. The findings support the theory that individuals experience uncertainty with unpredicted illness prognosis and progression, and with worsening symptoms.[33]

Patients with cancer pain had higher scores for uncertainty (mean = 87.86, SD = 1.84) than did patients without cancer pain (mean = 71.05, SD = 10.67). Cancer patients with pain also perceived greater ambiguity and complexity, meaning they had more uncertainty. This finding is consistent with the result of Tsai's[34] study. Pain can cause patients to lose control over their physical functions, which may increase ambiguity and complexity of uncertainty. Mishel et al.[16] believe that pain has a significant correlation with complexity of uncertainty. Pain is not only an unexpected symptom but also the indicator for patients of a worsening illness. Also, ambiguity of uncertainty may arise if illness-related information is not completely provided or if the course of the disease is unpredictable. For such reasons, uncertainty in patients with cancer pain is significantly higher than that in patients without cancer.

The mean of hope in lung cancer patients on a scale of 12 to 48 was 33.86, meaning that individuals had a moderate level of hope. Herth[35] used the same scale on terminal-stage patients, which resulted in a mean of hope of 39, which was higher than the score in this study. The low scores of hope in the studies in Taiwan might result from differences in culture and race, but further investigations would be required to discover whether or not this is the cause.

The score on the hope subscale in patients without cancer pain (36.91) was significantly higher than it was for those patients with cancer pain (30.81). Herth[35] stated that hope may decrease when patients have untreatable pain and are uncomfortable. Raleigh[36] found that patients' levels of hope had an immediate influence on their experience of illness symptoms. Ferrell and Dean[13] also stated that pain had an impact on the level of the human spirit and could cause hopelessness. Schreiber and Galai-Gat[37] reported that some people with physical injury have more stressors than others, including losing control and suffering severe and uncontrollable pain. These stressors may also influence the level of hope of patients. Therefore, levels of hope in patients with cancer pain are significantly lower than those in patients without cancer pain.

This study found that uncertainty and pain severity had no correlation. In contrast, uncertainty and pain interference with daily life were positively correlated. In the current study, we found that both pain severity and pain interference had negative correlations with hope. This indicates that greater pain severity (or pain interference) may have an impact on lung cancer patients' levels of hope and uncertainty, which was also the finding of Brandt's[38] study.

Data from this study show that uncertainty, complexity, and ambiguity had negative correlations with hope. This indicates that higher uncertainty is associated with a lower level of hope, which is the same result of Hwang et al.'s[32] study. This correlation also indicates that higher complexity and ambiguity is associated with a reduced level of hope. Hope is an adaptive response to illness distress, but uncertainty can cause stress and interfere with the efficiency of adjustment. Therefore, uncertainty is negatively correlated with hope. Mishel and Braden[39] also state the same outcome in their study.

Although some studies have indicated that pain and uncertainty have the same impact on hope, the results of the multiple regression

analysis in this study indicated that uncertainty was the best predictor of hope. This result means that uncertainty had a greater influence on hope than did pain severity or interference. Pain in patients may have an impact on the levels of hope, because patients may see pain as a sign that their illness is worsening. The onset of pain may make patients feel that the progress of the illness is more unpredictable and ambiguous, which in turn decreases their level of hope. Christman[11] found that patients' who receive inadequate information about their illness or unclear information experienced greater problems of psychosocial adjustment. For such reasons, decreased levels of hope could be related to uncertainty caused by the pain, and not the pain itself.

Because hope is an adjustment reaction when individuals face conflicts such as illness and distress, increasing the level of hope may help individuals adapt to cancer. Mishel and Braden[39] stated that illness uncertainty can create stress, which interferes with the efficiency of adjustment. Therefore, it is important for clinicians to decrease uncertainty in patients to improve their levels of hope.

Conclusions and Implications

Poor adjustment and decreased quality of life in lung cancer patients results from the influence of pain and uncertainty on hope. Clinicians need to control pain symptoms as well as provide information that enhances hope. If clinicians can reduce uncertainty about the illness and the patient's future, the patient's level of hope may increase and positively affect the attitude toward life. In Taiwan, courses on cancer pain management have received increased attention, but theories of uncertainty and hope are rarely presented in those courses. Due to the significant relationship among illness uncertainty, hope, and illness adjustment, clinicians who understand the relationship of these variables to patient quality of life will be able to provide information to their patients that can help these patients better cope with the disease. Future studies may warrant replication of this study with a larger sample or demonstration with a longitudinal design.

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