RESEARCH ARTICLE

# Development of a Nursing Care Model for End-Stage Liver Cancer Patients in the Service Area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province

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## Abstract

This action research aimed to develop a nursing care model for end-stage liver cancer patients, compare quality of life, pain, and family anxiety before and after implementation, and examine care outcomes and satisfaction in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province. The study applied the palliative care concept, Watson's Theory of Human Caring, and one PDCA cycle from November 2024 to March 2025. Participants were 12 health personnel and village health volunteers, and 8 end-stage liver cancer patients referred from Khon Kaen Hospital for home care. Instruments, validated by three experts, included the model, a focus group guideline, and assessments of quality of life, pain, family anxiety, model appropriateness, and satisfaction. Data were analyzed using content analysis, descriptive statistics, the paired t-test, and the Wilcoxon signed-rank test.

The developed NONRANG Model comprised five components: holistic needs assessment, family-centered care planning, palliative nursing activities, multidisciplinary and community coordination, and continuous monitoring with bereavement care. Experts rated its appropriateness at the highest level (mean±S.D. = 4.47±0.38). After implementation, the mean quality of life score increased from 52.38±7.14 to 71.25±5.83 (p-value <0.001), the mean pain score decreased from 6.25±1.28 to 2.88±1.13 (p-value = 0.011), and the mean family anxiety score decreased from 8.13±1.46 to 3.75±1.28 (p-value <0.001). All patients received continuous care until the end of life, and 7 of 8 (87.50%) died peacefully at home as desired. Six of 8 caregivers (75.00%) demonstrated good caregiving skills, and overall satisfaction was at the highest level (mean±S.D. = 4.51±0.42). The NONRANG Model was associated with reduced pain, improved quality of life, and peaceful death at home, and can serve as a guideline for

subdistrict health promoting hospitals in similar rural contexts. Further studies with larger samples and a comparison group are recommended.

**Keywords:** End-stage liver cancer, Palliative care, Nursing care model, Action research

## Introduction

Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver and a leading cause of cancer death worldwide, particularly in Southeast Asia.[1]

In Thailand, liver cancer has one of the highest incidences in the country, especially in the northeastern region, where the prevalence of liver fluke infection and cholangiocarcinoma is high. The main risk factors include chronic hepatitis B and C virus infection, cirrhosis, chronic alcohol consumption, and fatty liver disease.[2] Most patients are diagnosed at an advanced or end stage because early-stage disease is often asymptomatic, which limits the chance of curative treatment.[3] Under the Barcelona Clinic Liver Cancer (BCLC) staging system, patients at stage D, or the terminal stage, are managed primarily with palliative care.[2]

End-stage liver cancer has complex clinical features, including liver failure, ascites, gastrointestinal bleeding, hepatic encephalopathy, and rapid weight loss. Patients at this stage have a median survival of less than 6 months and require intensive palliative care.[2] Pain is the most common and most severe symptom; more than 70.00% of patients with end-stage cancer experience moderate to severe pain, which directly affects their quality of life and ability to perform activities of daily living.[4] The burden of the disease affects not only patients but also causes psychological and economic stress for families, and primary caregivers have been found to carry a high caregiving burden and a higher risk of depression than the general population.[5]

Palliative care is holistic care that aims to relieve suffering and promote the quality of life of patients facing life-threatening illness and their families. It covers symptom control, pain relief, and psychological, social, and spiritual support.[6] The Ministry of Public Health has made palliative care part of the health service system at every level, including primary care units such as subdistrict health promoting hospitals (SHPHs), with nurses playing a key role in assessing symptoms, counseling families, and coordinating referrals when necessary.[7] In addition, most end-stage liver cancer patients in Thailand wish to die at home surrounded by their families,[8] and studies have shown that community-based palliative care provided by registered nurses improves the quality of life of terminally ill

cancer patients and reduces emergency department visits and hospital admissions.[9]

Furthermore, Watson's Theory of Human Caring, which emphasizes caring for patients as valued human beings and building caring relationships between nurses, patients, and families,[10] and the PDCA (Plan-Do-Check-Act) quality cycle[11] provide appropriate frameworks for developing end-of-life care systems in the community in a systematic and continuous manner.[12]

Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province, under the Khon Kaen Provincial Administrative Organization, is a primary care unit serving a rural community in northeastern Thailand, an area with a high prevalence of liver cancer. Most end-stage liver cancer patients in the area are referred from Khon Kaen Hospital for continuing care at home. However, care in the past has lacked a systematic nursing care model suited to the community context. Most personnel are more accustomed to referring patients to hospital than to providing continuing care at home, primary caregivers lack the knowledge and skills to manage symptoms, access to opioid analgesics at home is limited, and local cultural beliefs that avoid talking about death make advance care planning difficult. Although palliative care models have proven effective in tertiary hospitals, an appropriate nursing care model for communities at the SHPH level is still lacking. There are 1 2 patients with cholangiocarcinoma, liver cancer, or terminal illness in the service area.

Given this background and significance, the researcher developed a nursing care model for end-stage liver cancer patients by applying the palliative care concept, Watson's Theory of Human Caring, and the Ministry of Public Health guidelines through an action research process following the PDCA cycle, in collaboration with a multidisciplinary team, families, and community networks. The aim was to ensure that patients receive comprehensive care in all dimensions, have their suffering relieved, and die peacefully at home, and to provide information for developing palliative care systems in primary care units with similar contexts.

## Research Objectives

1. To study the situation and develop a nursing care model for end-stage liver cancer patients in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province

2. To compare quality of life, pain level, and family anxiety before and after implementing the nursing care model for end-stage liver cancer patients

3. To examine care outcomes and the satisfaction of patients and families with the nursing care model for end-stage liver cancer patients

## Methods

This study was action research following one cycle of the PDCA (Plan-Do-Check-Act) quality cycle,[11,12] conducted from November 2024 to March 2025, a total of 5 months, and divided into 4 phases. Phase 1, Plan: the situation was studied using patient registers in the Java Health Center Information System (JHCIS) database of the subdistrict health promoting hospital and referral records from Khon Kaen Hospital, focus groups were held with health personnel and village health volunteers (VHVs), and a draft nursing care model was developed (November 2024).

Phase 2, Do: the sample was selected, pre-implementation data were collected, and the nursing care model was implemented continuously with the patients (November 2024-February 2025).

Phase 3, Check: post-implementation data were collected, outcomes were compared, and satisfaction was evaluated (February-March 2025); and

Phase 4, Act: strengths and areas for improvement were analyzed, a complete model implementation manual was prepared, and the research findings were disseminated (March 2025).

### Population

**The population** consisted of end-stage liver cancer patients living in the service area of Ban Non Rang Subdistrict Health Promoting Hospital, Sawathi Subdistrict, Mueang District, Khon Kaen Province, and the health personnel and VHVs working in the service area.

#### Sample

The sample was divided into 2 groups. Group 1 comprised 12 health personnel and VHVs in the service area, who served as informants during the situation analysis and model development phases. Group 2 comprised 8 end-stage liver cancer patients referred from Khon Kaen Hospital for continuing home care, who were included in the evaluation phase. Participants were selected by purposive sampling.

#### Inclusion Criteria

Diagnosed by a physician with end-stage liver cancer; residing in the service area of Ban Non Rang SHPH; having a primary caregiver in the family; able to communicate in Thai; and the patient or legal representative voluntarily consented to participate in the study.

#### Exclusion Criteria

Moving out of the service area during the study, or the patient or family requesting to withdraw from the study.

### Research Instruments

**1. Instrument for conducting the research** was the NONRANG Model, a nursing care model for end-stage liver cancer patients developed by the researcher from the

situation analysis, focus groups, and a review of the palliative care concept,[6] Watson's Theory of Human Caring,[10] and the Ministry of Public Health palliative care guidelines.[7] The model consists of a 5-step nursing process:

Step 1 : Holistic Needs Assessment, assessing distressing physical symptoms and psychological, social, and spiritual needs, and recording the Pain Score, ability to perform activities of daily living (ADL), and the Palliative Performance Scale (PPS).

Step 2: Family-Centered Care Planning, setting care goals and preparing an advance care plan (Advance Care Planning).

Step 3 : Palliative Nursing Activities, consisting of 5 main activities: management of distressing symptoms and pain; education and skills training for primary caregivers; psychological and spiritual care; weekly home visits by the multidisciplinary team; and continuous telephone follow-up and coordination with VHVs.

Step 4 : Multidisciplinary and Community Coordination among the SHPH, the parent hospital, VHVs, and families; and

Step 5 : Continuous Monitoring and Bereavement Care. If distressing symptoms do not subside, practitioners return to revise the nursing plan and repeat the activities, providing continuous care until the end of the patient's life.

**2. Data collection instruments** consisted of: 1) a patient general information form covering sex, age, education level, occupation, and duration of illness, together with a clinical record form (Pain Score, ADL, and PPS); 2) a focus group guideline for analyzing problems, limitations, and needs for model development; 3) a patient quality of life assessment developed by the researcher, consisting of 25 items with a total score of 0-100, classified into 3 levels: poor (0.00-40.99), moderate (41.00-60.99), and good (61.00-100.00); 4) a pain assessment (Pain Score) using a 0-10 numeric rating scale, classified as no pain (0), mild pain (0.01-3.99), moderate pain (4.00-6.99), and severe pain (7.00-10.00); 5) a family anxiety assessment using a 0-10 numeric rating scale, with higher scores indicating greater anxiety; 6) a model appropriateness assessment for experts; and 7) a patient and family satisfaction questionnaire on the nursing care model, using a 5-point rating scale with a passing criterion of a mean score of 3.50 or higher, with mean scores interpreted at 5 levels: 1.00-1.80 lowest, 1.81-2.60 low, 2.61-3.40 moderate, 3.41-4.20 high, and 4.21-5.00 highest. In addition, care outcomes were assessed using a primary caregiver skills assessment tool with criteria for a "good level" and a place-of-death record form.

**3. Instrument quality testing:** the nursing care model and all instruments were reviewed by 3 experts for content validity and appropriateness. The Index of Item-Objective Congruence (IOC) ranged from 0.67 to 1.00, with an overall IOC of 0.79, and the

instruments were revised according to the experts' suggestions before actual use. The quality of life assessment, family anxiety assessment, and satisfaction questionnaire were then tried out with 10 terminally ill cancer patients and families with characteristics similar to the sample in a nearby area, yielding Cronbach's alpha coefficients of 0.86, 0.82, and 0.89, respectively.

### Data Collection

The researcher collected pre-implementation data in Phase 2 and post-implementation data in Phase 3 (February-March 2025) using the quality of life assessment, the pain assessment, and the family anxiety assessment. Satisfaction was assessed in Phase 3. Data were collected from end-stage patients, with the timing of post-implementation measurement recorded relative to the date of death, along with the number of patients with complete pre- and post-implementation data for all variables.

### Data Analysis

1. General data of the sample were analyzed using frequency, percentage, arithmetic mean ($\bar{x}$), and standard deviation (S.D.). Qualitative data from the focus groups for model development were analyzed using content analysis.

2. Mean scores for quality of life, pain level, and family anxiety before and after implementing the nursing care model were compared using the paired t-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data. Normality was tested with the Shapiro-Wilk test, and the test results, mean differences with 95% confidence intervals (CI), and effect sizes were reported. The level of statistical significance was set at $\alpha = 0.05$.

3. Care outcomes, namely receiving continuous care until the end of life, dying at home as desired, and the caregiving skills of primary caregivers, were analyzed using frequency, percentage, and Clopper-Pearson 95% confidence intervals for proportions. Model appropriateness and satisfaction were analyzed using mean and standard deviation.

## Research Ethics

The researcher protected the rights of participants by explaining the objectives, research procedures, and expected benefits to patients and families in advance. Participants had the right to accept or refuse participation and to withdraw from the study at any time without any effect on their access to public health services. Communication about end-of-life care was conducted with sensitivity and respect for the beliefs of patients and families. All data were kept

confidential using codes instead of real names, and the results were presented in aggregate for academic purposes only.

## Results

### 1. General Characteristics of the Sample

Of the 8 end-stage liver cancer patients in the sample, most were male (5 patients, 62.50%). The mean age was 61.38±8.24 years (minimum 60 years, maximum 78 years). Most had completed primary education (6 patients, 75.00%) and worked as farmers or general laborers (7 patients, 87.50%). The mean duration of illness from diagnosis to the end stage was 8.25±3.11 months, as shown in Table 1.

**Table 1 General characteristics of the sample of end-stage liver cancer patients in the service area of Ban Non Rang Subdistrict Health Promoting Hospital (n = 8)**

| Characteristics | Number | Percentage |
|---|---|---|
| **1. Sex** | | |
| Male | 5 | 62.50 |
| Female | 3 | 37.50 |
| **2. Age (years)** | | |
| Mean age 61.38±8.24 years; minimum 60 years, maximum 78 years | | |
| **3. Education level** | | |
| Primary education | 6 | 75.00 |
| Secondary education or higher | 2 | 25.00 |
| **4. Main occupation** | | |
| Farmer and general laborer | 7 | 87.50 |
| Trading | 1 | 12.50 |
| **5. Duration of illness from diagnosis to end stage** | | |
| Mean duration 8.25±3.11 months | | |

### 2. Results of the Development of the Nursing Care Model for End-Stage Liver Cancer Patients

**2.1 Situation and care problems** The situation analysis of patient registers, referral records, and focus groups with 12 health personnel and VHVs identified 4 key problems: 1) most personnel were more accustomed to referring end-stage cancer patients to Khon Kaen Hospital than to providing continuing care at home, and there were no clear nursing guidelines at the SHPH level; 2) primary caregivers, mostly elderly spouses or children with full-time jobs, lacked the knowledge and skills to manage

symptoms at home; 3) obtaining opioid analgesics for patients at home involved complex procedures and legal restrictions; and 4) local beliefs and culture that avoid talking about death made advance care planning difficult.

**2.2 Nursing care model** Based on this analysis, the NONRANG Model was developed, consisting of 5 main components: holistic needs assessment, family-centered care planning, palliative nursing activities, multidisciplinary and community coordination, and continuous monitoring with bereavement care, together with 1 practice manual for SHPH staff.

**2.3 Appropriateness of the model** Three experts, using the model appropriateness assessment form, rated the appropriateness of the model at the highest level ($\bar{x}$±S.D. = 4.47±0.38).

### 3. Comparison of Quality of Life, Pain Level, and Family Anxiety Before and After Implementing the Nursing Care Model

After implementing the NONRANG Model, the mean overall quality of life score of the sample increased from 52.38±7.14, a moderate level, to 71.25±5.83, a good level (mean difference = 18.87, 95% CI = 14.77-22.97, t = 10.89, df = 7, p-value <0.001). The pain score decreased from 6.25±1.28, a moderate level, to 2.88±1.13, a mild level (Z = -2.53, p-value = 0.011), and the family anxiety score decreased from 8.13±1.46 to 3.75±1.28 (mean difference = -4.38, 95% CI = -5.37 to -3.39, t = -10.41, df = 7, p-value <0.001), as shown in Table 2.

**Table 2 Comparison of mean scores for quality of life, pain level, and family anxiety before and after implementing the NONRANG Model (n = 8)**

| Variable | Before $\bar{x}$±S.D. (level) | After $\bar{x}$±S.D. (level) | $\bar{d}$ | Test statistic (t/Z) | p-value |
|---|---|---|---|---|---|
| Overall quality of life | 52.38±7.14 (moderate) | 71.25±5.83 (good) | 18.87 | t = 10.89 | <0.001* |
| Pain level (0-10) | 6.25±1.28 (moderate) | 2.88±1.13 (mild) | -3.37 | Z = -2.53 | 0.011* |
| Family anxiety | 8.13±1.46 | 3.75±1.28 | -4.38 | t = -10.41 | <0.001* |

*Statistically significant at p-value <.05

### 4. Care Outcomes and Satisfaction with the Nursing Care Model

All 8 patients (100.00%; 95% CI 63.06-100.00) received continuous care until the

end of life; 7 patients (87.50%; 95% CI 47.35-99.68) died peacefully at home as desired by the patients and families; and 6 primary caregivers (75.00%; 95% CI 34.91-96.81) demonstrated good caregiving skills, as shown in Table 3. Overall satisfaction of patients and families with the nursing care model was at the highest level ($\bar{x}$±S.D. = 4.51±0.42), exceeding the set criterion (a mean of 3.50 or higher), as shown in Table 4.

**Table 3 Care outcomes of end-stage liver cancer patients under the NONRANG Model (n = 8)**

| Care outcome | Number | Percentage (95% CI) |
|---|---|---|
| 1. Received continuous care until the end of life | 8 | 100.00 (63.06-100.00) |
| 2. Died peacefully at home as desired by the patient and family | 7 | 87.50 (47.35-99.68) |
| 3. Primary caregiver demonstrated good caregiving skills | 6 | 75.00 (34.91-96.81) |

**Table 4 Appropriateness of the nursing care model and satisfaction of patients and families with the NONRANG Model**

| Item | $\bar{x}$ | S.D. | Interpretation |
|---|---|---|---|
| 1. Appropriateness of the nursing care model (experts, n = 3) | 4.47 | 0.38 | Highest |
| 2. Satisfaction of patients and families (n = 8) | 4.51 | 0.42 | Highest |

## Discussion

The development results showed that the NONRANG Model was rated by experts as appropriate at the highest level. This may be related to a development process grounded in an analysis of the actual local situation, including patient registers, referral records, and focus groups with health personnel and VHVs, combined with the application of the palliative care concept and the Ministry of Public Health guidelines, which produced components that respond to the problems and context of a rural community. This is consistent with a study that found that applying the PDCA cycle to develop a care model for end-stage cancer patients in the community made the care process more systematic and enabled patients to receive continuous and comprehensive care,[12] and

with a study that found that SHPHs that systematically applied the Ministry of Public Health guidelines provided more comprehensive care to end-stage cancer patients.[13]

Regarding quality of life, after implementing the nursing care model, the patients' overall quality of life score increased from a moderate to a good level. This may be related to the model beginning with a holistic needs assessment covering physical, psychological, social, and spiritual dimensions and care planning together with families, so that care responded to the needs of each patient. This is consistent with a study that found that holistic home care for end-stage cancer patients improved overall quality of life scores,[14] and that community-based palliative care covering symptom management, psychological support, and family participation meaningfully improved the quality of life of end-stage cancer patients.[9,15]

Regarding pain, the pain score decreased from a moderate to a mild level (a reduction of 3.37 points). Possible contributing factors include regular pain assessment during weekly home visits, coordination with physicians and pharmacists at Khon Kaen Hospital to obtain and adjust opioid analgesics in a timely manner as symptoms changed, and educating primary caregivers on medication administration and non-pharmacological pain management. This is consistent with cancer pain management guidelines that emphasize reassessment and symptom-based dose adjustment,[4] and with a study that found that a home-based pain management program led by community nurses reduced pain scores and improved patients' sleep quality.[16]

Regarding family anxiety and primary caregiver skills, the family anxiety score decreased, and 75.00% of primary caregivers demonstrated good caregiving skills. This may be related to the model's application of Watson's Theory of Human Caring to build caring relationships with patients and families, together with individualized preparation of primary caregivers and continuous telephone follow-up, which gave families confidence and a source of support when symptoms changed. This is consistent with a study that found that nursing based on Watson's Theory of Human Caring increased psychological and spiritual comfort and reduced anxiety among end-stage cancer patients,[17] and that a competency-building program for caregivers of end-stage cancer patients in the community increased caregivers' knowledge and skills and reduced their caregiving burden.[18]

Regarding end-of-life care outcomes, all patients received continuous care until the end of life, and 87.50% died peacefully at home as desired. This may reflect that coordination among the multidisciplinary team and community networks, including the

SHPH, the parent hospital, VHVs, and families, can create a continuous and connected care system at the primary care level, although these data come from only 8 patients. This is consistent with the wish of most end-stage liver cancer patients in Thailand to die at home,[8] and with a study that found that community care for end-stage cancer patients by SHPH nurses together with VHVs provided continuous care and reduced unnecessary hospital referrals.[19]

Regarding satisfaction, patients and families were satisfied with the nursing care model overall at the highest level. This may be related to the model being designed to fit the lifestyles and beliefs of rural communities in northeastern Thailand, with home visits and follow-up through multiple channels, and communication about end-of-life care conducted with respect and sensitivity. This is consistent with a study that found that families of end-stage cancer patients who received home care from community nursing teams reported high satisfaction with care,[20] and that end-stage liver cancer patients who received systematic palliative care were more satisfied with their care than those who did not receive this type of care.[21]

However, this study had several limitations: 1) the sample was small, with only 8 patients, resulting in low statistical power and wide confidence intervals; 2) it was a single-group study without a comparison group, confounding variables were not controlled, and only one PDCA cycle was conducted, so the outcomes may have been influenced by other factors, such as treatment at the parent hospital, the natural course of the disease, and regression to the mean; the findings therefore represent pre-post changes rather than the effectiveness of the model; 3) end-stage patients who deteriorated rapidly or died before post-implementation measurement may not have been included (survivor bias); 4) multiple variables were tested; and 5) the JHCIS system does not yet have specific codes and indicators for palliative care at the SHPH level, so recording and monitoring required additional forms.

## Conclusion

The findings can be summarized according to the objectives as follows: 1) a nursing care model for end-stage liver cancer patients, the NONRANG Model, was developed, consisting of 5 main components, and was rated by experts as appropriate at the highest level; 2) after implementing the model, quality of life scores increased, while pain and family anxiety scores decreased with statistical significance; and 3) all 8 patients received continuous care until the end of life, 7 died peacefully at home, and patients and families were satisfied at the highest level. These are pre-post changes in a small sample without a comparison group.

## Recommendations

### 1. Recommendations for Applying the Research Findings

1.1 Subdistrict health promoting hospitals under the Khon Kaen Provincial Administrative Organization with similar contexts should adopt and scale up the NONRANG Model and its practice manual, adapting them to the resources and context of each area.

1.2 The Khon Kaen Provincial Administrative Organization and local administrative organizations should: 1) integrate policies and budgets for end-of-life care into local development plans; 2) develop a palliative patient monitoring database within the JHCIS system; and 3) build collaborative networks with parent hospitals to ensure smooth referral and access to opioid analgesics at home.

1.3 Registered nurses and multidisciplinary teams in SHPHs should continuously develop their knowledge and skills in palliative care, communication about end-of-life care, and advance care planning, while respecting the beliefs and local culture of patients and families.

1.4 The capacity of primary caregivers and VHVs should be continuously developed, including home caregiving skills, recognizing warning signs that must be reported to staff, and supporting families after bereavement, to make the community care system strong and sustainable.

### 2. Recommendations for Future Research

2.1 Future research should increase the sample size, use a research design with a comparison group, conduct multiple PDCA cycles, and follow up for longer than 1 year to evaluate the continuity and sustainability of the nursing care model at the SHPH level.

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