Reducing Pain and Fatigue Through Self-Care Ability Support Program among People with Hepatocellular Carcinoma Receiving Transarterial Chemoembolization: A Pretest-Posttest with Repeated-Measures Design

Orathai Kaewjaladvilai, Suchira Chaiviboontham, Bualuang Sumdaengrit*

Abstract: Transcatheter arterial chemoembolization is an effective treatment for intermediate-stage liver cancer. Despite its effectiveness, this treatment often brings about common complications, such as pain and cancer-related fatigue, requiring self-management at home. In Thailand, where liver cancer prevalence is high, structured support is essential to enhance self-care and improve patients' ability to manage symptoms. Guided by Orem's Self-Care Theory, this one-group, pretest-posttest intervention program aimed to assess the potential of a self-care ability support program for reducing pain and cancer-related fatigue among people with hepatocellular carcinoma undergoing transcatheter arterial chemoembolization. Thirty participants being treated at a university hospital in central Thailand were selected through purposive sampling when receiving treatment from October 2022 to January 2023. Data were collected utilizing the Personal Information Questionnaire, the Self-Care Agency Questionnaire, the Pain Numeric Rating Scale, and the Thai version of the Revised Piper Fatigue Scale. Data analysis involved descriptive statistics, repeated measures ANOVA, and paired t-tests.

The results indicated that following participation in the program, there was a notable increase in the average self-care ability score among the participants. Moreover, there was a significant decrease in back pain and abdominal pain scores post-transcatheter arterial chemoembolization from moderate levels on day 1 to mild or no pain by day 21. Additionally, cancer-related fatigue peaked at a moderate level on day 7 before significantly decreasing to a low level by day 21. The findings suggested that the self-care ability support program has the potential benefit of enhancing self-care ability to reduce pain and fatigue among patients with hepatocellular carcinoma undergoing transcatheter arterial chemoembolization. Nurses can integrate this program into their practice. However, further randomized control trials with multi-site studies are recommended to confirm its effectiveness before being integrated into practice.

Keywords: Cancer-related fatigue, Hepatocellular carcinoma, Pain, Self-care ability, Transarterial chemoembolization

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Introduction

Liver cancer stands as the sixth most prevalent cancer worldwide, ranking fifth in males and ninth in females, and the third highest cause of cancer-related death.[1] In Thailand, the 2023 cancer registry data shows liver and bile duct cancer as the most common in males and the fourth most common in females, with 27,936 new cases and 27,143 deaths.[1] This implies that many patients are diagnosed at an advanced stage with poor prognosis. However, early-stage hepatocellular carcinoma (HCC) can be treated with surgery and liver transplantation. However, most cases are diagnosed at the intermediate or advanced stages. In the intermediate stage, transcatheter arterial chemoembolization (TACE) is the most effective treatment, slowing disease progression, managing symptoms, improving quality of life, and prolonging survival.[2,3] Nonetheless, this treatment is associated with frequent complications, including discomfort symptoms, primarily pain, and cancer-related fatigue.

People with HCC (PW-HCC) undergoing TACE commonly report pain, notably in the abdomen and back. TACE involves inserting a catheter through the femoral artery into the hepatic artery to administer a chemotherapeutic agent to the tumor, where it blocks the blood supply and targets the cancer cells. This procedure commonly causes significant pain, affecting up to 80% of patients for one to ten days, with severe discomfort occurring within twelve to twenty-four hours after the procedure.[4] During treatment, patients commonly report significant pain, which typically decreases to mild to moderate levels within four to eight hours after TACE.[5] Fatigue is another common symptom, affecting up to 90% of patients for three days to eight weeks after TACE,[6] which tends to increase during the treatment gradually and significantly impact the overall quality of life.[7] Fear of these symptoms may lead to a delay or refusal of further treatment, which could worsen the disease progression.[8,9]

People with cancer need comprehensive information on their disease conditions, including diagnostic procedures, prognosis, treatment options, disease progression, self-care, and follow-up care,[8] especially from doctors and nurses. To address these needs, this study employs a self-care support approach grounded in Orem's self-care theory,[10] which emphasizes equipping patients with the knowledge and skills necessary to manage their health conditions independently.

There exists a notable gap in support of self-care ability among PW-HCC throughout the continuum of care, from pre-procedure to post-TACE and discharge. International studies have emphasized that while interventions often focus on addressing immediate post-procedural needs, they frequently fail to provide comprehensive self-care support across the continuum of care.[6] Similarly, national studies conducted in Thailand reveal that many patients receive insufficient preparation and follow-up support, hindering their ability to manage symptoms and complications associated with TACE effectively.[2] Enhancing patients' self-care abilities in terms of knowledge and practical skills is critical for preventing complications, managing treatment-related side effects, and facilitating the necessary behavioral adjustments to optimize individual health outcomes.

Conceptual Framework and Literature Review

The conceptual framework of this study is based on Orem's Self-Care Theory.[10] According to Orem, self-care is the activities individuals initiate and perform to maintain life, health, and well-being by preventing, alleviating, curing, or controlling unwanted conditions, including seeking and participating in medical care.[10] Individuals are viewed as active decision-makers responsible for fulfilling their self-care requirements. Self-care is a deliberate action and goal-oriented process composed of two phases: intentional acts and productive actions.[10] The first phase, intentional acts, involves

what the person plans or intends to do to achieve a particular end or goal. Thus, in this phase, the person needs knowledge and understanding of the health state and self-care requirements. The second phase, the productive phase, consists of a person's actions and their effectiveness. According to self-care theory, symptoms experienced by the patient, such as pain, cancer-related fatigue, nausea, vomiting, and insomnia, are components of the health state, one of the essential conditioning factors that create more self-care requirements. If people have insufficient self-care abilities, nurses must exercise their nursing agency to meet the requirements (by doing for) or to increase people's self-care abilities by teaching, guiding and coaching, providing physical and psychological support, and providing an environment to support self-care.[10]

Several studies have explored intervention programs for people undergoing TACE, employing various approaches and theoretical frameworks. For instance, Jamnongsilp et al.[11] evaluated a symptom management program integrated with auricular acupressure, which significantly reduced pain and improved self-care abilities among PW-HCC. Similarly, other studies[6] demonstrated the effectiveness of strategies for managing cancer-related fatigue and educational programs. However, these studies were not explicitly based on Orem's Self-Care Theory. Despite evidence supporting the efficacy of various intervention programs, there is a notable gap in research explicitly utilizing Orem's framework to guide the development and evaluation of comprehensive self-care programs for people undergoing TACE. These findings highlight the need for a more systematic integration of self-care theory to address the self-care requirements of people undergoing TACE in a holistic manner with various methods of help, as outlined above.

Additionally, most existing studies focus on isolated outcomes, such as pain or cancer-related fatigue, rather than addressing the broader spectrum of self-care abilities. This gap underscores the need for a holistic, theory-driven approach, as implemented in this study, to enhance patient outcomes and fill the current void in the literature. Orem's Self-Care Theory is particularly well-suited for effective symptom management, including the management of pain, cancer-related fatigue, and self-care abilities. It emphasizes the importance of equipping people with the necessary skills and knowledge, including understanding their condition, decision-making skills regarding symptom management, awareness of the importance of self-care, and practical self-care skills. By strengthening these aspects, individuals can actively engage in their care, fostering greater autonomy and improving overall health outcomes.

Pain was chosen as the primary outcome for this study because the studies indicate that 49%-56.8% of PW-HCC experience pain following TACE.[12,13] This pain often peaks within 24 hours post-procedure and gradually decreases over time.[5] Progressive muscle relaxation (PMR), developed by Jacobson,[14] is a relaxation technique that involves systematically tensing and relaxing muscle groups. This method has been shown to induce deep relaxation, reduce anxiety, and enhance quality of life and self-care abilities in patients with various conditions.[15] Additionally, PMR demonstrated a significant reduction in postoperative pain and muscle tightness over multiple measurement points in people with head and neck cancers.[16] Moreover, it has been utilized in inpatient surgical settings, including extremity fracture surgery,[17] stoma surgery,[18] open kidney surgery,[19] and gastrointestinal surgery.[20] By focusing on pain reduction, this study aimed to demonstrate the program's immediate effectiveness while simultaneously addressing secondary outcomes like cancer-related fatigue and self-care ability, which reflect broader, long-term improvements.

Cancer-related fatigue (CRF) is defined as a persistent, subjective sense of physical, emotional, or cognitive exhaustion associated with cancer or its treatment, disproportionate to recent activity and impairing daily functioning.[21] It is a prevalent and debilitating symptom, affecting 62.5% of PW-HCC undergoing TACE.[13] Fatigue was identified as the most significant determinant of quality of life.[7]

Management strategies include initiating or maintaining physical activity programs, as advised by healthcare providers, incorporating cardiovascular endurance (e.g., walking, jogging, swimming), resistance training (e.g., weight lifting), and progressive muscle relaxation.[21] Progressive muscle relaxation (PMR) may be the most appropriate management strategy for PW-HCC undergoing TACE who experience acute pain. PMR involves sequential muscle contraction and relaxation, inducing a neuromuscular response that promotes relaxation. This technique also effectively reduces fatigue in cancer patients undergoing radiation therapy and chemotherapy.[22] Additionally, studies have demonstrated its effectiveness in alleviating fatigue in PW-HCC undergoing TACE.[23] Self-care is essential for patients, and nurses are vital in providing information and support to enhance self-care abilities. A self-care ability support program (SCA-SP), based on Orem's Self-Care Theory,[10] was developed for PW-HCC undergoing TACE to strengthen their self-care abilities to manage pain and cancer-related fatigue.

Study Aim

This study aimed to assess the change in pain, cancer-related fatigue, and self-care ability through the SCA-SP among PW-HCC undergoing TACE.

Hypotheses

1. PW-HCC undergoing TACE who participate in the SCA-SP will have significantly higher self-care ability scores after the intervention than before it.
2. PW-HCC undergoing TACE who participate in the SCA-SP will have significantly lower pain scores (back pain and abdominal pain) and cancer-related fatigue scores after the intervention compared to before it.

Methods

Design: This study utilized a one-group, pretest-posttest design with repeated measures. This report followed the TREND (Transparent Reporting of Quasi-experimental/non-randomized evaluations) guideline for quasi-experimental studies.

Sample and Setting: The participants were PW-HCC who were scheduled to receive TACE, and all received routine care as part of their standard treatment. The SCA-SP was an adjunct intervention to enhance self-care ability, manage pain, and alleviate cancer-related fatigue. The population effect size was determined based on a previous study that is closest to this current study.[11] The sample size was calculated using G*Power 3.1.9.4 based on repeated measures ANOVA (within factors). The effect size (f) was set at 0.40, with an alpha level of 0.05 and a power of 0.80. The calculation assumed four measurement time points, a correlation among repeated measures of 0.5, and a non-sphericity correction of 1.0. This yielded a required sample size of 10 participants. To account for a 20% potential dropout rate, the sample size was increased to 12. Since the intervention program in this study differs from that of Jamnongsilp et al.,[11] which included auricular acupressure, the intervention effects may vary. To ensure efficient power to detect any changes in the outcomes specific to this program, the final sample size was increased to 30 participants.

The inclusion criteria for the participants were as follows: age 20 or above; if aged 60 or older, a score of less than 8 on the 6-item Thai version of the Cognitive Impairment Test (6CIT), indicating good cognitive function; good consciousness and cognitive function; and accessibility via telephone or the LINE application. Participants were also required to have HCC at an intermediate stage (not advanced stage), as they were eligible for TACE based on clinical guidelines. The exclusion criterion was the participant's inability to be contacted post-discharge.

The study was conducted at a university hospital in central Thailand. People scheduled for TACE were admitted to a short-stay unit one day prior to the procedure. Nurses provided information about the procedure and potential complications during outpatient

visits and on the day of admission. Patients typically stayed for three days; nurses provided care for complication prevention, comfort, and discharge education. However, continuity of care following discharge was lacking.

Ethical Considerations: The researchers conducted ethically sound research on human subjects, with approval from the Ethics Committee of the Faculty of Medicine Ramathibodi Hospital, Mahidol University (COA. MURA.2022/535). All participants were informed about the aim and details of this study. Their right to participate or decline participation in the research was always respected. They were voluntary participants and signed the consent form.

Instruments: The study used a screening instrument, data collection instruments, and the Self-Care Ability Support Program, as detailed below.

Screening instrument

The Six Item Cognitive Impairment Test (6CIT): This tool was developed by Brooke and Bullock,[24] and translated into Thai by Aree-Ue and Youngcharoen in 2020.[25] The scores range from 0 to 28. Scores of 8 or higher indicated cognitive impairment.

Data collection instruments

The Personal Data Record Form: This form was developed by the researchers. This form included data on gender, age, marital status, religion, education level, occupation, income, and healthcare coverage.

The Self-Care Assessment Tool for HCC Patients Receiving TACE was adapted from Self As Carer Inventory Thai Version: SCIT with permission from Isaramalai.[26] This tool was developed based on Orem's conceptual framework to assess patients' self-care ability, consisting of 40 items. Responses are measured on a rating scale from 1 to 6, ranging from least to greatest, across four dimensions: 1) Knowledge and understanding of self-care, e.g., "Do you understand how to manage your symptoms and prevent complications after TACE?" 2) Decision-making regarding self-care, e.g., "When you feel fatigued or in pain, do you decide on an appropriate self-care method to relieve your symptoms?" 3) Awareness of the importance of self-care, e.g., "Do you believe that actively managing your symptoms will improve your recovery and overall health?" and 4) Skills and satisfaction with self-care practices, e.g., "Are you confident in performing the self-care activities recommended for pain and fatigue management after TACE?" The average score ranges from 1.00 to 6.00, categorized into four groups: 1.00-2.25 = Poor self-care ability, 2.26-3.51 = Fair self-care ability, 3.52-4.77 = Good self-care ability, and 4.78-6.00 = Excellent self-care ability. In this study, the Cronbach's alpha for this tool was 0.89.

The Pain Numeric Rating Scale (Pain NRS) was used as an assessment tool to measure the level of pain based on the patient's perception and response to discomfort or distress. Pain NRS provides simple, efficient, and minimally intrusive measures of pain intensity that have been widely used in clinical and research settings where a quick and standardized pain assessment is required. This tool is publicly available and widely recognized as a validated measure for pain assessment.[27] In the Numerical Rating Scale (NRS), patients are asked to rate their pain intensity on a scale from 0 to 10 that best fits their pain intensity, where 0 represents 'no pain at all' and 10 represents 'the worst pain ever possible.' Pain intensity is categorized into three levels based on established cut-off points: mild pain (1-3), moderate pain (4-6), and severe pain (7-10).

The Revised Piper Fatigue Scale (PFS) is an assessment tool used to measure the perception of fatigue, lack of energy, discomfort, and interference with normal functioning. It was developed and refined by Piper et al.[28] and translated into Thai by Pritsanapanurungsie et al.[29] Approval was granted for the instrument to be used in this study. The PFS consists of 22 questions, e.g., "At this moment, how much distress are you experiencing due to fatigue?"

Each question measures a different aspect of fatigue using a numeric rating scale. The scale consisted of four dimensions: 1) Behavior/Severity, 2) Affective Meaning, 3) Sensory, and 4) Cognitive/Mood.

The response options for each item range from 0 to 10. The total score for the PFS ranges from 0 to 220, and dividing the total score by 22 provides the average fatigue score. The interpretation of the fatigue score according to Piper's criteria is as follows: 7.00-10.00 = a high level of fatigue, 4.00-6.99= a moderate level of fatigue, 0.01-3.99 = a low level of fatigue, and 0.00 = no fatigue symptoms. In this study, the Cronbach's alpha for this tool was 0.97.

Self-Care Ability Support Program (SCA-SP)

This program was developed for PW-HCC receiving TACE based on Orem's Self-Care theory.[10] It was designed to enhance self-care ability and assist patients in effectively managing symptoms, including pain and fatigue. The SCA-SP was structured into three key phases to systematically support patients throughout their recovery, including: 1) Assessing the self-care ability to meet the self-care requirements in pain management and fatigue, 2) Supporting self-care ability and symptom management, and 3) Evaluating outcomes and supporting self-care ability. The program was initiated on the day of patient admission before undergoing TACE. Baseline data collection, including self-care ability assessment, was conducted the day before the intervention began. The SCA-SP continued for three weeks post-TACE to prevent and manage complications, promote symptom management, and improve patient well-being. Data were collected at four time points: days 1, 7, 14, and 21 post-TACE, except for self-care ability, which was assessed twice—before TACE during admission and again on day 21 post-TACE.

Three experts—a physician, a nursing instructor, and an advanced practice nurse specializing in hepatobiliary care—validated the program. They assessed its content validity, including its content, activities, duration, and structure. Based on their recommendations, revisions were made. The details of the program and its implementation are outlined in **Appendix Table A1.**

Data Collection: Following ethical approval, potential participants were approached by the ward nurse and introduced to the PI, who recruited participants according to the inclusion criteria. The PI explained the study's objectives, benefits, expected time commitment, and required activities. Those willing to participate were asked to sign a consent form. The PI collected data and assessed self-care abilities upon patient admission to the short-stay unit before TACE. Pain and fatigue levels were initially evaluated on day 1 post-TACE while the patient was in the hospital. Subsequent assessments of pain and fatigue were conducted remotely via telephone or the LINE application, a mobile phone application, on days 7 and 14 post-TACE, with the final assessment occurring in person on day 21 post-TACE. The PI provided the intervention and guided participants through the SCA-SP. This program was implemented over three weeks, emphasizing symptom management, pain relief strategies, and fatigue reduction techniques.

Data Analysis: Descriptive statistics, including frequency distribution, mean, and standard deviation, were employed to analyze the personal data. The paired t-test was used to compare the differences in self-care abilities before and after treatment. Repeated Measures ANOVA with Bonferroni post hoc test was used to study the change over time in pain and fatigue before and after treatment on days 7, 14, and 21. The statistical significance level was set at 0.05.

Results

The sample comprised 30 individuals. The majority were male (86.7%). Most participants were aged 60 and above (70%), and 73.3% were married. For educational background, 73.3% had completed undergraduate degrees. All participants were Buddhists. Most of them were unemployed (73.3%) and had a monthly income of over 10,000 Baht (over 280 USD) (76.7%). Furthermore, more than half (56.7%) were covered under the Universal Coverage Scheme. The data on the participants' characteristics are presented in **Table 1.**

Table 1. Participants' characteristics (N = 30)

Characteristics	Frequency	Percentage
Gender		
Male	26	86.7
Female	4	13.3
Age (years)		
40-50	4	13.3
51-60	5	16.7
61-70	15	50.0
71-80	6	20.0
(Range 45-79, Mean = 62.97, SD = 8.91)		
Marital status		
Single	5	16.7
Married	22	73.3
Widowed	3	10.0
Educational background		
Below bachelor's degree	14	16.7
Bachelor's degree	15	73.3
Higher than bachelor's degree	1	10.0
Religion		
Buddhist	30	100
Occupation		
Government officer	5	16.7
Business employee	1	3.3
Company employee	2	6.7
Unemployed	22	73.3
Income/month in Thai baht (USD)		
< 10,000 (< 280)	7	23.3
10,000-20,000 (280-560)	5	16.7
20,001-30,000 (560-840)	3	10.0
30,001-40,000 (840-1,120)	4	13.3
40,001-50,000 (1,120-1,400)	8	26.7
> 50,000 (> 1,400)	3	10.0
Payment		
Government or state enterprise officer	7	23.3
Universal coverage scheme	17	56.7
Social security scheme	6	20.0

Potential benefit of the SCA-SP

The self-care ability scores of PW-HCC undergoing TACE were evaluated before and after participation in the SCA-SP. The results indicated that the mean self-care ability score after program participation was significantly higher than before, suggesting an improvement in self-care abilities following the intervention, as shown in **Table 2.**

Table 2. Comparison of self-care ability in people with hepatocellular carcinoma undergoing transcatheter arterial chemoembolization before and after the program (N = 30)

Self-care Ability	Mean	SD	Mean difference	SD of Mean difference	t	p-value	95% Confidence Interval	
							Lower	Upper
Before receiving the program	2.73	0.64	0.80	0.81	5.44	< 0.001	0.499	1.101
After receiving the program	3.53	0.51						

For pain, the study examined the average pain scores, including back pain and abdominal pain, after TACE at four time intervals. Results showed that on the first day post-TACE, the average back pain score was 1.70 (SD = 0.326), considered mild pain, and dropped to 0 = no pain on day 7. The abdominal pain score was 3.50 (SD = 0.481), which was moderate and dropped to no pain on day 14 post-TACE, as shown in **Figure 1.** A one-way repeated measures ANOVA was conducted to determine whether these differences were statistically significant. The Shapiro-Wilk test confirmed normal data distribution, and Mauchly's Test of Sphericity showed no significant variance differences between different time points. Significant differences in the back pain ($F = 27.24$, $p = 0.001$) and abdominal pain ($F = 42.85$, $p < 0.001$) scores across four time points were found. Post-hoc pairwise comparisons using the Bonferroni method indicated that pain scores on the first day post-TACE were significantly higher than at other time points ($p < 0.05$), as shown in **Table 3.**

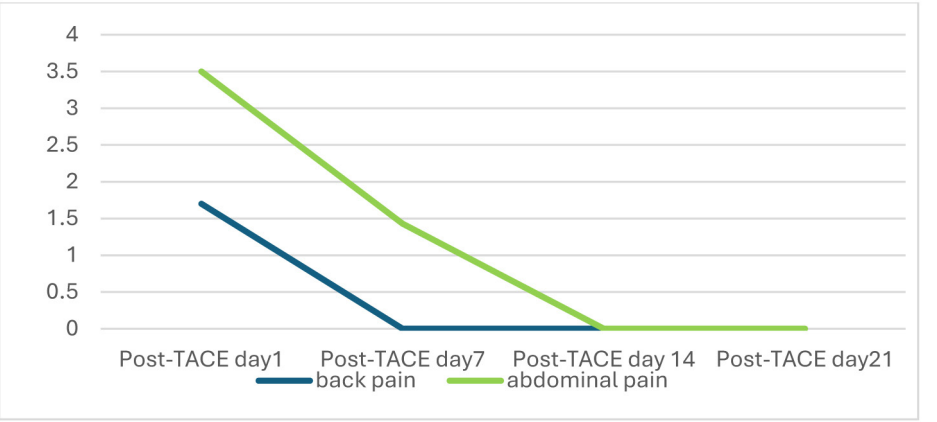

Figure 1. Mean pain scores in people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization

Table 3. Comparison of mean back pain and abdominal pain scores in people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization (TACE) at different time points (n = 30)

	Difference in pain score		95% Confidence interval	
	Mean difference	p-value	Lower	Upper
Back Pain				
Post TACE day 1 – day 7	1.70	< 0.001	0.778	2.622
Post TACE day 1 – day 14	1.70	< 0.001	0.778	2.622
Post TACE day 1 – day 21	1.70	< 0.001	0.778	2.622
Post TACE day 7 – day 14	0.00	-	0.000	0.000

Table 3. Comparison of mean back pain and abdominal pain scores in people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization (TACE) at different time points (n = 30) (Cont.)

	Difference in pain score		95% Confidence interval	
	Mean difference	p-value	Lower	Upper
Post TACE day 7 – day 21	0.00	-	0.000	0.000
Post TACE day 14 – day 21	0.00	-	0.000	0.000
Abdominal Pain				
Post TACE day 1 – day 7	2.07	< 0.001	0.990	3.144
Post TACE day 1 – day 14	3.50	< 0.001	2.137	4.863
Post TACE day 1 – day 21	3.50	< 0.001	2.137	4.863
Post TACE day 7 – day 14	1.43	< 0.001	0.634	2.233
Post TACE day 7 – day 21	1.43	< 0.001	0.634	2.233
Post TACE day 14 – day 21	0.00	-	0.000	0.000

The average cancer-related fatigue (CRF) scores were measured at four-time points post-TACE: day 1 M = 2.07 (SD = 0.438), day 7 M = 4.13 (SD = 0.505), day 14 M = 2.77 (SD = 0.404), and day 21 M = 1.41 (SD = 0.307), as illustrated in **Figure 2.** A one-way repeated measures ANOVA revealed statistically significant differences in CRF across the time points ($F = 15.14$, $p < 0.001$). The Shapiro-Wilk test confirmed normal data distribution, and Mauchly's Test of Sphericity indicated no significant variance violations. Post-hoc pairwise comparisons using the Bonferroni method showed that fatigue on day 1 was significantly lower than on days 7 and 14 ($p < 0.05$). Fatigue peaked on day 7, followed by a significant reduction on days 14 and 21 ($p < 0.05$), as detailed in **Table 4.**

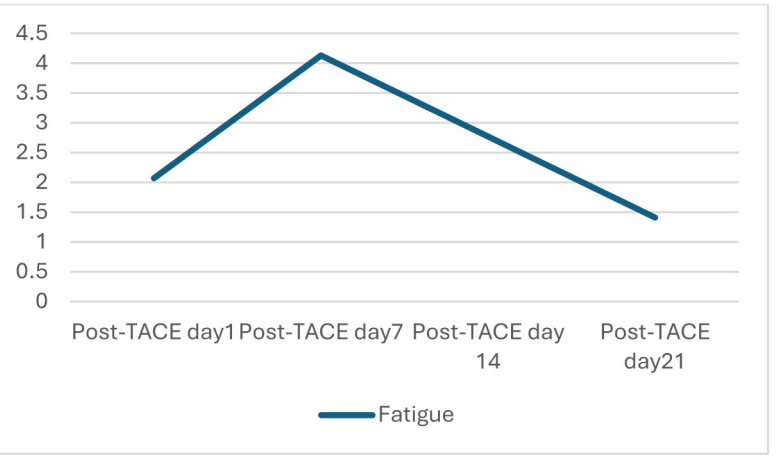

Figure 2. Mean cancer-related fatigue scores in people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization

Table 4. Comparison of mean cancer-related fatigue scores in people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization (TACE) at different time points (n = 30)

	Difference in cancer-related fatigue scores		95% Confidence interval	
	Mean difference	p-value	Lower	Upper
Post TACE day 1 – day 7	-2.06	0.008	3.694	-0.417
Post TACE day 1 – day 14	-0.69	1.000	-2.094	0.703
Post TACE day 1 - day 21	0.66	0.578	-0.430	1.759
Post TACE day 7 – day 14	1.36	0.004	0.347	2.373
Post TACE day 7 - day 21	2.72	< 0.001	1.569	3.871
Post TACE day 14 - day21	1.36	< 0.001	0.714	2.006

Discussion

Most participants were male (86.7%), reflecting the higher prevalence of HCC among males, consistent with broader population trends.[30] The higher prevalence among males is often linked to risky behaviors such as alcohol consumption and smoking.[31] In contrast, females tend to engage in healthcare-seeking behaviors more frequently than males.[32] Most participants were over 60 years (70%), aligning with the elevated cancer incidence in the 40-75 age group, which accounted for 63.3% of new cancer cases in 2020.[30]

Results from this study revealed a significant enhancement in self-care ability among PW-HCC after participation in the program. This could be explained by the fact that our program notably empowered participants to manage side effects by teaching practice and monitoring adeptly, particularly addressing pain and fatigue symptoms post-TACE. Moreover, the program offers a guidebook and two-way communication consultation via telephone or LINE application. These findings are consistent with a previous study employing Orem's self-care framework, which found the positive impact of a self-care ability program on postoperative recovery among gynecological surgery patients.[33]

The pain scores post-TACE at 4-time intervals revealed that both back and abdominal pain scores on day 1 post-TACE were markedly higher than other time intervals. The pain pattern could be explained in terms of the TACE procedure, which involves inserting a catheter through the femoral artery into the hepatic artery and injecting a chemotherapeutic agent mixed with lipiodol directly into the tumor. After injection, the lipiodol remains in the tumor, prolonging the effect of the chemotherapy and blocking the microcirculation, resulting in necrosis. The patients typically experience deep pain in the right subcostal region or a tight, cramped feeling in the abdomen.[34] The program implemented a pain management technique on relaxation, attention strategies, and progressive muscle relaxation (PMR), which was taught and trained before undergoing TACE. Patients were also prescribed pain medications to help manage their pain levels, with the type and dosage determined by the severity of the pain. As a result, patients could manage their pain effectively and immediately following the procedure. The average pain scores on day 1 post-TACE were mild for both back and abdominal pain, indicating that the combination of pharmacological and non-pharmacological interventions contributed to improved pain control. Our findings are more likely effective than those of a previous study that assessed the effects of PMR on symptom clusters in HCC patients. The study reported that the initial symptom cluster encompassed abdominal distension, upper back pain, and shoulder pain, while the second cluster comprised lower back and abdominal pain. All symptoms had significantly decreased from moderate to mild pain within six weeks.[35] Our study indicates that back pain

decreased from mild to no pain by Day 7, while abdominal pain reduced from moderate to no pain by Day 14. This improvement may be attributed to the SCA-SP not only providing the PMR but also providing ongoing support for self-care abilities and symptom management throughout the three-week period.

The average fatigue scores among PW-HCC undergoing TACE at 4-time intervals following the procedure revealed a peak score on day 7 and a significantly gradual decline on days 14 and 21. This could explain why the implemented program, which utilized telehealth via telephone and the LINE application to provide support and consultations for people, may have played a crucial role in enhancing adherence to symptom management and ultimately mitigating fatigue levels. Our results were congruent with previous research examining the impact of a PMR program on fatigue among PW-HCC undergoing TACE, which showed a significant reduction in fatigue levels on days 14 and 28 post-TACE at a low level.[36]

However, previous studies have found that managing side effects typically addresses individual symptoms separately and at different times. In contrast, the SCA-SP developed by the researchers for PW-HCC receiving TACE provides comprehensive care from before the procedure, during the procedure, until discharge, and continuous follow-up and support, with nurses serving as valuable resources for self-care. This nursing support is crucial and enhances the individual's ability to care for themselves comprehensively.

Strengths and Limitations

Overall, the findings of our study are plausible and reinforce the empirical adequacy of Orem's Self-Care Theory, which was used to guide the SCA-SP. This contributes to the advancement of nursing science. However, this study has limitations. Firstly, a one-group, pretest-posttest study design limits our ability to draw causal inferences. However, our SCA-SP is feasible and has potential benefits for self-care management of pain and fatigue, as evidenced by the fact that there is no pain on day 7 and low fatigue levels on day 14.

Thus, future studies should include larger sample sizes and use more rigorous, multi-site studies research designs, such as pragmatic randomized controlled trials, to enhance the practicality and external validity of the SCA-SP. Secondly, as all outcome variables were collected using self-report measures, potential measurement bias is unavoidable. Third, conducting a longer follow-up of outcome measures should focus on assessing these symptoms until they subside entirely. This will provide a clearer understanding of the pattern of decline, offering valuable evidence for improving symptom management. Additionally, a descriptive study exploring factors associated with pain and fatigue, particularly the effects of pharmacological and non-pharmacological interventions, would further enhance clinical decision-making and patient care strategies.

Conclusion and Implications for Nursing Practice

In conclusion, this SCA-SP has the potential to enhance self-care abilities in managing pain and fatigue in PW-HCC undergoing TACE. The program spans from pre-procedure preparation to during the procedure and continues from hospital discharge to home. It includes ongoing follow-up and support, with nurses playing an essential role as valuable resources to support self-care. Furthermore, using technology, such as the LINE application, as a user-friendly communication platform was critical in providing continuous support and fostering patient engagement throughout the program. This approach aligns with the growing emphasis on digital tools in healthcare, enhancing accessibility and convenience for patients. Nurses with special training in symptom management can use this program in clinical practice. However, further randomized control trials with multi-site studies are recommended to confirm its effectiveness before being integrated into practice.

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Appendix

Table A1. Summary of SCA-SP for people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization

Time schedule	Objective of content	Helping method/Activities
Day of Admission **1st Step:** Assessing self-care ability, pain levels, fatigue levels, and symptom management (10-15 minutes)	To provide knowledge and understanding of self-care practice, awareness of the importance of self-care	Helping methods: teaching; guiding and directing; providing physical and psychological support; providing and maintaining the environment Activities: 1. Introduction and Program Overview (Teaching & Guiding) • Introduce the program's purpose, structure, and expected outcomes • Guide participants in understanding the importance of self-care ability and symptom management
2nd Step: Supporting self-care ability, pain management, and fatigue management using the Promoting Program (20-40minutes)	Develop skills in self-care ability, including decision-making regarding self-care, awareness of its importance, self-care and satisfaction	2. Assessment of Self-Care Ability and Symptom Management (Guiding & Supporting) • Evaluate participants' ability to manage symptoms and perform self-care • Identify areas where additional support is needed to enhance self-care practices 3. Educational on Hepatocellular Carcinoma and Symptom Assessment (Teaching & Coaching) • Provide knowledge on HCC and the TACE procedure to enhance participants' understanding • Teach participants how to assess their pain and fatigue 4. Pain Management Strategies (Guiding, Supporting & Providing an Appropriate Environment) • Pain Score 1-3: Teach and guide participants in using relaxation and attention strategies (e.g., breathing exercises) to manage mild pain • Pain Score 4-10: Support participants by integrating pharmacological interventions along with breathing exercises for effective pain relief 5. Fatigue Management (Teaching & Supporting) • Teach participants progressive muscle relaxation (PMR) techniques to alleviate fatigueProvide ongoing support to reinforce proper technique and adherence 6. Electronic Guidebook Provision (Providing the Environment) • Give an electronic guidebook for continuous learning and reference, enabling participants to access information anytime

Table A1. Summary of SCA-SP for people with hepatocellular carcinoma receiving transcatheter arterial chemoembolization (Cont.)

Time schedule	Objective of content	Helping method/Activities
		7. Personalized Support and Q&A Sessions (Guiding, Coaching & Supporting) • Allow participants to seek clarification, ask questions, and receive individualized advice • Coach and support participants in developing confidence in their self-care practices
1 day after receiving TACE	Support the self-care ability	• Visit participants • Review and explain the assessment and management of pain and fatigue using an electronic guidebook • Assess the levels of pain and fatigue • Demonstrate and practice breathing exercises and progressive muscle relaxation techniques • Give advice and encouragement
7, 14 days after receiving TACE (Telephone or LINE application follow-up 15 minutes)	Support the continuation of self-care ability and monitor the levels of pain and fatigue	• Assess the levels of pain and fatigue • Continuation to stimulate symptom management with each patient using an electronic guidebook • Consultation on various self-care problems
21 days after receiving TACE **3rd Step:** Follow-up, Evaluation, and Self-Care ability Support (20 minutes)	Monitor self-care ability, pain levels, and fatigue levels	• Evaluation of the self-care ability, pain levels, and fatigue levels • Consultation on various self-care problems

การลดความปวดและอาการเหนื่อยล้าโดยใช้โปรแกรมส่งเสริมความสามารถในการดูแลตนเองของผู้ป่วยมะเร็งตับที่ได้รับการรักษาด้วยเคมีบำบัดทางหลอดเลือดแดง : การศึกษาแบบวัดผลก่อน-หลังโดยการวัดซ้ำ

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บทคัดย่อ: การรักษาด้วยเคมีบำบัดทางหลอดเลือดแดง (transcatheter arterial chemoembolization: TACE) เป็นวิธีการรักษาที่มีประสิทธิภาพสำหรับผู้ป่วยมะเร็งตับในระยะกลาง ถึงแม้ว่าจะเป็นวิธีที่มีประสิทธิภาพ แต่ยังพบภาวะแทรกซ้อนที่เกิดขึ้นได้บ่อยหลังทำหัตถการ เช่น อาการปวดและความเหนื่อยล้าจากมะเร็ง ในประเทศไทยมีอุบัติการณ์ของมะเร็งตับสูง การช่วยเหลือสนับสนุนอย่างเป็นระบบจึงมีความจำเป็นในการส่งเสริมการดูแลตนเองและเพิ่มความสามารถของผู้ป่วยในการจัดการกับอาการของโรค การวิจัยกึ่งทดลองแบบกลุ่มเดียววัดซ้ำนี้ใช้ทฤษฎีการดูแลตนเองของโอเร็มเป็นกรอบแนวคิด มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมการส่งเสริมความสามารถในการดูแลตนเองในการลดความปวด และอาการเหนื่อยล้าของผู้ป่วยมะเร็งตับที่ได้รับการรักษาด้วยเคมีบำบัดทางหลอดเลือดแดง ในการศึกษาครั้งนี้คัดเลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามคุณสมบัติที่กำหนดจำนวน 30 ราย ที่เข้ารับการรักษาที่โรงพยาบาลมหาวิทยาลัยแห่งหนึ่งในภาคกลางของประเทศไทย เข้ารับการรักษาระหว่างเดือนตุลาคม พ.ศ. 2565 ถึงเดือนมกราคม พ.ศ. 2566 เก็บรวบรวมข้อมูลโดยใช้แบบบันทึกข้อมูลส่วนบุคคล แบบคัดกรองสมรรถภาพการรู้คิด แบบประเมินความสามารถในการดูแลตนเองของผู้ป่วยมะเร็งตับที่ได้รับการรักษาด้วยยาเคมีบำบัดทางหลอดเลือดแดง แบบประเมินความปวดแบบตัวเลขและแบบประเมินอาการเหนื่อยล้าของไปเปอร์ วิเคราะห์ข้อมูลโดยใช้สถิติเชิงบรรยาย repeated measures ANOVA และ paired t-test

ผลการศึกษาพบว่า หลังจากเข้าร่วมโปรแกรม คะแนนเฉลี่ยความสามารถในการดูแลตนเองของกลุ่มตัวอย่างเพิ่มขึ้นอย่างมีนัยสำคัญ คะแนนอาการปวดหลังและปวดท้องลดลงอย่างมีนัยสำคัญ จากระดับปานกลางในวันที่ 1 เป็นระดับเล็กน้อยหรือไม่มีอาการปวดเลยในวันที่ 21 หลังการทำ TACE นอกจากนี้ยังพบว่าคะแนนอาการเหนื่อยล้าสูงสุดในวันที่ 7 หลังการทำ TACE และลดลงอย่างมีนัยสำคัญในวันที่ 21 ผลการศึกษาครั้งนี้ชี้ให้เห็นว่าโปรแกรมส่งเสริมความสามารถในการดูแลตนเองสามารถนำไปใช้ได้อย่างมีประสิทธิภาพเพื่อเพิ่มความสามารถในการดูแลตนเองเพื่อลดอาการปวดและความเหนื่อยล้าในผู้ป่วยมะเร็งตับที่เข้ารับการทำ TACE ซึ่งพยาบาลสามารถบูรณาการโปรแกรมนี้ในการปฏิบัติทางคลินิกได้ อย่างไรก็ตาม แนะนำให้มีการศึกษาแบบสุ่มที่มีกลุ่มควบคุม และดำเนินการในหลายพื้นที่เพื่อยืนยันประสิทธิผลของโปรแกรมต่อไป

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คำสำคัญ: อาการเหนื่อยล้าในผู้ป่วยมะเร็ง ผู้ป่วยมะเร็งตับ ความปวด ความสามารถในการดูแลตนเอง การรักษาด้วยเคมีบำบัดทางหลอดเลือดแดง

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