

RESEARCH ARTICLE

Nurses' comfort care of transarterial chemoembolization patients based on their perceptions around postembolization syndrome and symptom interference

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Abstract

Aim: Post-embolization syndrome is a common adverse event following trans-arterial chemoembolization, which negatively impacts the daily life of the patients involved. This study examined whether perceptions around post-embolization syndrome and symptom interference among nurses affect their comfort care performance toward patients who have undergone this procedure.

Design: A descriptive cross-sectional study.

Methods: One hundred and fifty registered nurses were surveyed from September to November 2020. Perceived post-embolization syndrome, symptom interference, and comfort care (including physical, psychospiritual, sociocultural, and environmental dimensions) were measured. Data were analyzed using *t*-tests, analysis of variance, Pearson's correlation, and a multivariate analysis of variance.

Results: There were no individual effects found of perceived post-embolization syndrome or symptom interference on nurses' comfort care performance. However, statistically significant interaction effects were found in terms of their sociocultural and environmental care.

Conclusion: Nurses who recognized both high post-embolization syndrome and symptom interference among their patients were found to provide greater sociocultural and environmental care. As such, nurses should improve their early symptom and symptom interference detection protocols based on current care guidelines and provide physical, psychospiritual, sociocultural, and environmental comfort care.

KEYWORDS

abdominal pain, chemoembolization, fever, liver neoplasms, nausea, therapeutic, vomiting

1 | INTRODUCTION

Transarterial chemoembolization (TACE) is a first-line method for treating intermediate-stage hepatocellular carcinoma, wherein a

chemotherapeutic drug is injected into a branch of the patient's hepatic artery (Jogi et al., 2020). It also acts as a bridging treatment and is provided to patients who are waiting for a liver transplantation (Coletta et al., 2017). As a result of the treatment, several

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findings have shown an increase in 1- and 2-year relapse-free survival rates (Arslan & Degirmencioglu, 2019; Mason et al., 2015), with 5-year relative survival rates markedly increasing from 10.7% between 1993 and 1995 to 32.8% between 2010 and 2014 (Kim & Park, 2018). Despite the improved survival rate following TACE, the resulting postembolization syndrome (PES) does impact patients' physical and psychological health, as well as their overall quality of life (Shun et al., 2012). PES includes fever, nausea, vomiting and right hypochondrial pain, which is often reported by patients themselves (Cao et al., 2013), with it being defined as a clinical diagnosis driven by increased aspartate aminotransferase (AST). The PES incidence is reported as 36%–80% among all patients following TACE (Arslan & Degirmencioglu, 2019; Cao et al., 2013; Mason et al., 2015), with it being associated with a two-fold increased risk of death in certain cases (Mason et al., 2015), as well as usually occurring within 24 h.

Symptom interference means that a patient's daily activities and quality of life are impaired by a variety of adverse symptoms. Patients undergoing TACE (Cao et al., 2013) are particularly disturbed in terms of fatigue (Hinrichs et al., 2017), depressive and anxious moods (Shun et al., 2012), low vitality, reduced ability to enjoy life and sleep disturbances (Cao et al., 2013). Fatigue, depression and sleep disturbances, which usually occur among cancer survivors (Loh et al., 2018), are behavioural symptoms that may be driven by inflammatory cytokines, such as interleukin-6 (IL-6; Ji et al., 2017), as well as tumour necrosis factor (TNF)-alpha (Bower et al., 2011). Considering the fact that TACE patients experience peak levels of fatigue on the second day following this treatment (Shun et al., 2005), co-symptomatic interference may also peak during this same period. Like breast cancer patients that may forgo 85% of the prescribed chemotherapy due to symptom distress (Yee et al., 2017), some patients requiring repeated TACE interventions might also refuse ongoing treatment owing to PES and symptom interference. Therefore, to enhance compliance toward repeated TACE, interventions that involve psychological, social and environmental dimensions aimed at reducing PES and its interference following TACE must be conducted throughout the treatment.

During the treatment process, the role of comfort becomes an integral part of patient care. According to comfort care theory, comfort comprises immediate results (relief), long-lasting well-being (ease) and the highest level of comfort possible (transcendence; Kolcaba, 2003). Comfort care theory covers four comfort needs in the physical, psychospiritual, sociocultural and environmental domains (Dimarco & Kolcaba, 2005). Specifically, symptom management is an important factor in maximizing patients' physical comfort (Wensley et al., 2020). Psychospiritual comfort encompasses relief from depressive and anxious moods through the use of relaxation therapy (Nuraini et al., 2018). Furthermore, patients' sociocultural backgrounds and values must be considered when assessing their discomfort levels (Nuraini et al., 2017). Additionally, cancer patients' satisfaction with the hospital environment is closely related to their overall comfort, as a positive environment can improve their physical and psychological comfort through the alleviation of symptoms like sleep disturbances (Bernatchez et al., 2019) and a loss of vitality.

WHAT DOES THIS PAPER CONTRIBUTE TO THE WIDER GLOBAL CLINICAL COMMUNITY?

- The most frequent PES signs and symptom interference perceived by nurses were fever and mood changes.
- Nurses provided sociocultural and environmental care only when they perceived PES signs and symptom interference simultaneously.
- Patients should be encouraged to report discomfort experienced as a result of PES and symptom interference on their own.
- Nurses recognize the necessity to provide comfort care after perceiving symptoms and symptom interference in an integrated way, rather than in a single symptom or symptom interference manner.

Because the duration of PES onset and symptom interferences is 1 to 2 days, as well as the fact that the typical hospitalization period is 3 days, the provision of immediate relief as a source of comfort in the oncology setting should be increased.

Although comfort care should be provided to relieve PES and symptom interference, most clinicians focus on comparing the effectiveness of TACE with newly adopted methods or drugs (Zhang et al., 2017). Current research has also not focused much on relieving patients' PES, except through the pharmacological use of drugs like lidocaine, steroids and 5 HT3 receptor antagonists (Blackburn & West, 2016). Furthermore, no studies have been conducted on whether nurses actually perceive patients' discomfort following TACE based on both subjective and objective evaluation criteria, such as through the inspection of facial expressions, gestures and discomfort reports, or whether they provide care for alleviating it. These gaps were then used to construct the following research questions:

1. What are the levels of nurses' perception around PES, its symptom interference, and their resulting comfort care performance for TACE patients?
2. How do nurses' perception of PES and symptom interferences influence the comfort care provided?

2 | METHODS

2.1 | Study design

This study employed a descriptive cross-sectional design.

2.2 | Settings and participants

This study was conducted among 150 nurses who provided their informed consent to participate. The inclusion criteria for participants

comprised registered nurses who (a) had recent experiences of caring for TACE patients, (b) had at least 3 months of clinical experience and (c) were not working as administrative nurses (e.g. unit managers). Prior to participating in a web-based survey, screening questions such as "Have you cared for a TACE patient recently?" were provided. Further, the researchers compared current and past clinical experiences on the demographic questionnaire page to ensure that the participants met the inclusion criteria. Potential participants were excluded if they had less than 3 months of clinical experience or did not currently work in an oncology department. Due to the COVID-19 pandemic, contact with the nurses for this survey was limited, with one member of this research team contacting eight nursing acquaintances who worked at four tertiary hospitals and one cancer hospital across two metropolitan cities. These eight core nurses then shared a web-based survey URL with a group of oncology nurses from September to November 2020 in a snowball-style sampling approach.

The sample size was evaluated based on the smallest effect size of 0.0625, with a significance level of 0.05 and a power level of 0.80, using a multivariate analysis of variance (MANOVA) via the global effects of G*power 3.1.9.7. In this study, there were three groups and four response variables. The required sample size was calculated to be 126 and our group of 150 was thus considered reasonable for analysis.

2.3 | Instrumentation

2.3.1 | Perceived PES and symptom interference

Perceived PES was assessed using four items based on previous literature (Blackburn & West, 2016; Cao et al., 2013; US Department of Health and Human Services, 2021), including fever, nausea, vomiting and upper abdominal pain. Perceived symptom interference in terms of patients' cognition, mood and daily activities was assessed using the 6-item Korean version symptom interference subscale of the MD Anderson Symptom Inventory (US Department of Health and Human Services, 2021), which includes assessments on walking, activity, work, relationships with other people, enjoyment of life and mood. In this study, work was substituted with sleep because the participating nurses would not have been able to observe patients' working habits while they were in the hospital. These variables were measured on 11-point Likert scales (0 = *not present*, 10 = *as bad as you can imagine*). The higher the score, the more severe the perceived PES and symptom interference. Cronbach's alphas were found to be 0.76 and 0.93 for the PES and symptom interference variables, respectively.

For this study, participants were classified into three groups across each variable: high, moderate and low levels in terms of perceived PES and symptom interference. The participants with more than nine points for at least one question were classified into the high perceived group, while those with below one point for at least one question were classified into the low perceived group. No

participants gave more than nine points for one question and less than one point for any other, meaning that the distinction among the groups was clear. The rest of the participants were classified into the moderate perceived group. This grouping method was applied due to Korean peoples' conservative tendencies when expressing their negative feelings; for example, any extreme response might mean more than what was expressed (Lee et al., 2011). This method also served to minimize the effects of any neutral responses.

2.3.2 | Comfort care

Comfort care in this study was assessed using four theory-based subcategories (Dimarco & Kolcaba, 2005).

Physical comfort

According to comfort care theory, while hospitalized, patients are satisfied in terms of any unmet comfort needs when nurses accurately identify any remaining needs and implement appropriate comfort measures (Kolcaba, 2003). For example, in interventions that promote physical comfort through pain control, pain is frequently assessed to reduce any factors that may increase it, to examine its causes and anticipated discomfort, and to ensure that patients experience standardized treatment methods (Lima et al., 2017). Therefore, PES assessment among nurses is a critical factor for affecting their perceptions of the need for physical comfort care. Four items were used in this study, including the recognition of PES assessment, the PES assessment frequency, the discrimination of PES and the standardized guidelines for relieving PES. As the participants of this study belonged to different institutions, asking for specific details about their physical care procedures could have potentially diffused the results, which is why we employed more standardized items. A five-point Likert scale was used to measure the items (ranging from "*definitely disagree*" to "*definitely agree*"), with the Cronbach's alpha for physical comfort being 0.70.

Psychospiritual comfort

Psychospiritual comfort comprises the mental, emotional and spiritual components of the self (Kolcaba, 2003). We focused on the mental and emotional comfort dimensions, specifically, by examining levels of anxiety and depression. Therefore, content from the general anxiety disorder 2-item (GAD-2; Ahn et al., 2019) and patient health questionnaire (PHQ)-2 (Jo et al., 2019) were used for this subcategory. The GAD-2 represents items 1 and 2 of the GAD-7, which list the core anxiety symptoms (Ahn et al., 2019). The PHQ-2 enquires about the frequency of depressed mood and anhedonia (Jo et al., 2019). Herein, we asked, "Do you provide psychological comfort care as ~?" using a five-point Likert scale. A higher score implies a better degree of psychospiritual comfort care. Cronbach's alpha for the Korean version of the GAD-2 was 0.86 (Ahn et al., 2019), that for the Korean version of the PHQ-2 was 0.75 (Jo et al., 2019) and that for the GAD-2 and PHQ-2 combined was 0.79 in this study.

Sociocultural comfort

To assess sociocultural comfort care, we used the 13-item ComOn Coaching Rating scale. This scale was developed by de Figueiredo et al. (2019) to evaluate coaching skills for physicians in oncology. Based on comfort care theory, sociocultural comfort needs are met through "coaching," including the promotion of a can-do attitude, messages of hope and encouragement (Dimarco & Kolcaba, 2005). In this context, the Korean ComOn coaching scale has been found to adequately report oncology nurses' competencies and patient-centred caring attitudes relative to this kind of comfort (Kim et al., 2022). Four oncology nurses and one nursing professor examined the content validity of this scale in this study. The item-level index (CVI) and scale-level CVI were both found to be one and acceptable. Each question was measured on a five-point Likert scale, with a higher score representing better coaching behaviours. Cronbach's alpha for this subcategory was 0.87 in this study.

Environmental comfort

Environmental comfort was assessed using five standardized items. Based on the definition of comfort care theory (Kolcaba, 2003), as well as existing literature reviews (Bernatchez et al., 2019), items were developed by the researchers through the question "Do you provide environmental comfort care as~?" and included items like being free from noise, appropriate light, safety, undisturbed sleep and comfortable bedding or furniture. Each question was measured on a five-point Likert scale. A higher score indicated a more positive environmental care performance. Cronbach's alpha for this subcategory was 0.76 in this study.

2.4 | Ethical considerations

This study was approved by the institutional review board (IRB No: 1041386-202007-HR-39-02). On the first page of the survey, the study's purpose, research methods, information around voluntary participation, security of anonymity and the right of withdrawal were explained to the participants and their informed consent was obtained.

2.5 | Data analysis

Using the IBM statistical software SPSS 25.0, descriptive statistics were calculated for the degree of perceived PES, symptom interference and comfort care, including its physical, psychospiritual, sociocultural and environmental dimensions. The degrees of comfort care according to participants' characteristics were analysed using a t-test and an analysis of variance (ANOVA), with a Scheffe test done as the post hoc test. Further, Pearson's correlation was conducted to investigate the correlations among the variables. Based on this, a MANOVA was conducted to investigate the influence of perceived PES and symptom interference on comfort care

(Tabachnick et al., 2007). This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

3 | RESULTS

Almost all the participants (99.3%) were female and their mean age was 28.1 years. Of all participants, 77.3% were single and 84.7% of them had a Bachelor of Science in Nursing degree. About half of the participants worked in a medical ward (48.7%), while 40.7% had 1 to 3 years of clinical experience in their current department. There were significant differences found in environmental care according to age ($F = 3.62$, $p = 0.029$). In addition, participants working in medical wards had higher scores (3.20 ± 0.49 and 3.73 ± 0.43) compared to those working in surgical wards (2.88 ± 0.57 and 3.51 ± 0.42) in terms of physical care and sociocultural care, respectively (Table 1).

The highest mean scores of PES were for fever (5.51 ± 2.56). The mean scores for symptom interference were mood (5.19 ± 2.36), activity (4.78 ± 2.21), sleep (4.70 ± 2.59) and enjoyment of life (4.66 ± 2.58), in that order (Figure 1). The overall mean scores for physical, psychospiritual, sociocultural and environmental care were 3.07 ± 0.54 , 3.41 ± 0.65 , 3.64 ± 0.43 and 3.38 ± 0.58 , respectively (Table 1).

As for the MANOVA, the assumptions concerning normality, homoscedasticity and linearity were checked first. Prior to performing the MANOVA, the Pearson's correlations between perceived PES, symptom interference and comfort care were examined. The results revealed that all correlations were within the range of $r = 0.14$ to 0.61 , indicating the absence of multicollinearity (Table 2). Further, the homogeneity of variance-covariance matrices was evidenced by having a non-significant Box's M ($F = 1.02$, $p = 0.432$). Additionally, the MANOVA revealed no statistically significant multivariate differences in the four independent variables based on perceived PES and symptom interference. However, regarding the interaction effects, statistically significant effects were found in sociocultural ($F = 3.58$, $p = 0.008$) and environmental care ($F = 2.52$, $p = 0.044$; Table 3).

4 | DISCUSSION

The most frequently perceived PES signs and symptom interferences among the participating nurses were fever and mood, respectively. Although there was no significant difference found in comfort care according to perceived PES signs or symptom interferences, the interaction term between a higher perception of PES and symptom interferences was related to greater sociocultural and environmental comfort care. This means that nurses recognize the necessity to provide sociocultural and environmental comfort when identifying symptoms and their interference in an integrated way, rather than when focusing on a single symptom or its interference. So far, there

TABLE 1 Physical, psychospiritual, sociocultural and environmental care according to the characteristics of the participants

Characteristics	Categories	N (%)	M ± SD	Physical care	Psychospiritual care	Sociocultural care	Environmental care
				M ± SD			
Mean score				3.07 ± 0.54	3.41 ± 0.65	3.64 ± 0.43	3.38 ± 0.58
Sex	Female	149 (99.3)					
	Male	1 (0.7)					
Age (M ± SD = 28.1 ± 3.1)	-25	39 (26.0)		3.11 ± 0.64	3.44 ± 0.66	3.67 ± 0.46	3.58 ± 0.56 ^a
	26-30	86 (57.3)		3.11 ± 0.48	3.42 ± 0.63	3.63 ± 0.43	3.28 ± 0.59 ^b
	31-	25 (16.7)		2.89 ± 0.54	3.32 ± 0.73	3.62 ± 0.39	3.38 ± 0.50
	F(p)			1.77 (0.174)	0.27 (0.766)	0.16 (0.853)	3.62 (0.029)
Marital status	Married	32 (21.3)		2.95 ± 0.51	3.34 ± 0.71	3.62 ± 0.43	3.34 ± 0.54
	Single	116 (77.3)		3.10 ± 0.55	3.42 ± 0.63	3.65 ± 0.43	3.39 ± 0.06
	Others	2 (1.3)		3.40 ± 0.01	3.25 ± 1.06	3.58 ± 0.24	3.10 ± 0.14
	F(p)			1.35 (0.262)	0.25 (0.780)	0.06 (0.942)	0.34 (0.709)
Educational status	College	10 (6.7)		2.86 ± 0.53	3.13 ± 0.62	3.57 ± 0.34	3.28 ± 0.64
	BSN	127 (84.7)		3.10 ± 0.55	3.40 ± 0.65	3.65 ± 0.45	3.39 ± 0.56
	Master	13 (8.7)		2.94 ± 0.34	3.69 ± 0.63	3.66 ± 0.27	3.37 ± 0.74
	F(p)			1.38 (0.255)	2.24 (0.110)	0.17 (0.847)	0.15 (0.857)
Working department	Surgical ward	59 (39.3)		2.88 ± 0.57 ^b	3.31 ± 0.66	3.51 ± 0.42 ^b	3.28 ± 0.60
	Medical ward	73 (48.7)		3.20 ± 0.49 ^a	3.45 ± 0.65	3.73 ± 0.43 ^a	3.40 ± 0.56
	Paediatrics	4 (2.7)		3.55 ± 0.27	3.69 ± 0.52	3.77 ± 0.21	3.60 ± 0.65
	Others	14 (9.3)		3.06 ± 0.33	3.46 ± 0.65	3.68 ± 0.40	3.61 ± 0.53
	F(p)			5.20 (0.002)	0.80 (0.493)	3.00 (0.032)	1.56 (0.201)
Working experience in current department (months) (M ± SD = 4.9 ± 29.14)	-12	14 (9.3)		2.87 ± 0.43	3.43 ± 0.75	3.56 ± 0.49	3.34 ± 0.53
	13-36	61 (40.7)		3.13 ± 0.58	3.41 ± 0.65	3.71 ± 0.41	3.48 ± 0.63
	37-60	40 (26.7)		3.13 ± 0.56	3.36 ± 0.72	3.59 ± 0.42	3.36 ± 0.54
	61-	35 (23.3)		2.99 ± 0.47	3.44 ± 0.54	3.62 ± 0.44	3.24 ± 0.55
	F(p)			1.24 (0.297)	0.09 (0.966)	0.89 (0.447)	1.32 (0.270)

Note: a > b.

Abbreviations: BSN, bachelor of science in nursing; M, mean; SD, standard deviation.

have been few studies on nurses' perspectives, with most extant literature on comfort care focusing on physical discomfort (Nuraini et al., 2017). Therefore, this study and its finding are meaningful in our focus on various aspect of comfort care and through our subsequent illumination of the importance of symptom and symptom interference, as perceived by nurses.

The most frequently perceived PES signs were fever and pain, which is consistent with the results of a previous study that reported that up to two-thirds of patients experienced fever and pain following TACE (Kedarisetty et al., 2021). Particularly, fever in TACE patients is known to be caused by heat absorption due to the necrosis

of the tumour tissue and the effects of chemotherapy-drugs (Sun et al., 2017). As this fever is not caused by an infection, symptoms can be controlled with antipyretics in most cases (Jun et al., 2013). Although fever after TACE is common and has no impact on survival (Siriwardana et al., 2015), patient survival rates can be managed if the resulting fever is well taken care of because the risk factors affecting survival and fever are similar (Jun et al., 2013). Therefore, oncology nurses need to pay attention to postembolization fever and its risk factors because it can be an indirect index of survival.

The perceived symptom interference was higher in mood, activity and sleep, which is partially consistent with a previous study that reported that sadness and sleep disturbances were the most impacted areas (Cao et al., 2013). Further, TACE patients' depressed mood involved characteristics of sadness and lasted about 1 month after the procedure, which had a substantial effect on their work, daily life and sleep (Walker et al., 2013). Thus, 89.3% of the hepatocellular carcinoma patients were poor sleepers (Huang et al., 2020), with sleep disturbances being one of the most severe symptom interferences among TACE patients (Cao et al., 2013). Nurse-led psychological interventions significantly lowered not only pain and nausea/vomiting, but also improved the mood and alleviated the anxiety, depression and fatigue of cancer patients undergoing chemotherapy (Kim et al., 2018). In addition, health education before intervention is also beneficial for pain relief during TACE. Psychological interventions, alone, cannot improve patients' negative mood (Liu et al., 2016). Hence, psycho-educational care is needed. The content of a psycho-education program with concrete content and strategy for patients undergoing TACE has not yet been developed and needs further research attention.

The nurses in this study demonstrated the degree of highest performance in sociocultural comfort care, which, in this study, refers to communication skills. Required communication skills in health coaching, such as tailored information provision, are an important intervention to support self- pain management by cancer patients (EIMokhallati et al., 2018). In a systematic review, the

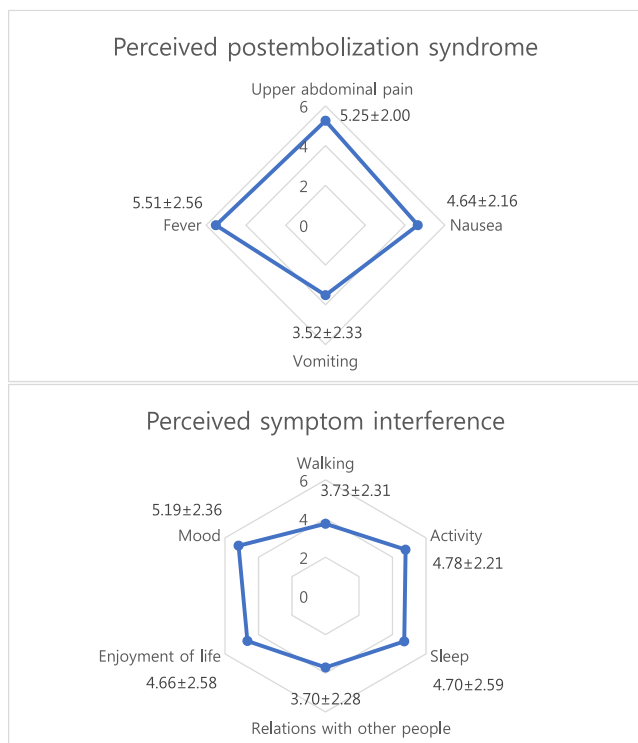


FIGURE 1 Degrees of perceived postembolization syndrome and symptom interference

TABLE 2 Correlations among perceived postembolization syndrome, perceived symptom interference, physical, Psychospiritual, sociocultural and environmental care

	Perceived postembolization syndrome	Perceived symptom interference	Physical care	Psychospiritual care	Sociocultural care	Environmental care
Perceived postembolization syndrome	1.00					
Perceived symptom interference	0.61 (<0.001)**	1.00				
Physical care	0.18 (0.026)*	0.19 (0.020)*	1.00			
Psychospiritual care	0.28 (0.001)**	0.38 (<0.001)**	0.40 (<0.001)**	1.00		
Sociocultural care	0.20 (0.014)*	0.26 (0.001)**	0.31 (<0.001)**	0.55 (<0.001)**	1.00	
Environmental care	0.14 (0.100)	0.20 (0.015)*	0.13 (0.109)	0.23 (0.005)**	0.27 (0.001)**	1.00

* $p < .05$; ** $p < .01$.

TABLE 3 The differences of physical, psychospiritual, sociocultural and environmental care according to perceived postembolization syndrome and symptom interference

	Roy's largest root	F	df	Sig.	η^2
Postembolization syndrome					
Physiological care	0.35 (0.302)	1.13	2	0.326	0.016
Psychospiritual		1.47	2	0.234	0.020
Sociocultural		1.03	2	0.361	0.014
Environmental		0.66	2	0.516	0.009
Symptom interference					
Physiological care	1.33 (0.262)	0.47	2	0.626	0.007
Psychospiritual		0.38	2	0.687	0.005
Sociocultural		2.55	2	0.081	0.035
Environmental		0.23	2	0.797	0.003
Postembolization syndrome					
Physiological care \times symptom interference	5.68 (<0.001)	1.51	4	0.204	0.041
Psychospiritual		1.08	4	0.370	0.030
Sociocultural		3.58	4	0.008	0.092
Environmental		2.52	4	0.044	0.067

promoting factors for effective communication between nurses and patients were found to be competency and supportive facilitation skills on the nurses' part, with active participation in their care and information-seeking behaviours being important on the patients' part. Communication between nurses and patients facilitates empathy, touch, comfort and support for their nurses (Kruijver et al., 2000). In healthcare coaching, nurses' informative and affiliative communication skills also bring about healthier behaviours and improved health outcomes (de Figueiredo et al., 2015). Furthermore, cancer patients demonstrate different information-seeking behaviours according to how they interpret the role of their physician; for example, they may, at times, seek information outside of the physician-patient relationship, such as through other survivors (Adamson et al., 2018). In such cases, within the context of effective nurse-patient communication, the patient would recognize the nurse as a key informant outside of the physician-patient relationship. Therefore, it is vital to improve the communication skills of TACE nurses.

According to our MANOVA, there were no individual effects of perceived PES or symptom interference on nurses' comfort care performance; however, an interaction effect was observed. Nurses tended to provide sociocultural and environmental care when they perceived both PES signs and symptom interference simultaneously. This means that comfort care changes when PES signs and symptom interference in a patient's life become more dominant. However, patients undergoing TACE seldom express their symptoms or symptom interference. According to a previous study, patients do not report fatigue because of the fear of distracting physicians from their overall disease care (Shun et al., 2009). Moreover, it is difficult for nurses to detect patients' discomfort during their hospitalization as it normally only lasts for 2 to 3 days (Gjoreski et al., 2020). Therefore, patients should be encouraged to report any discomfort following

their PES and in terms of any symptom interference on their own. Additionally, an early detection protocol of these symptoms among TACE patients is required.

Generally, nurses attempt to provide sociocultural and environmental care because these two domains have relatively guaranteed autonomy. Particularly, based on the Nightingale's environmental theory, environmental care must precede other comfort care dimensions as physical and psychological comfort can automatically be created via a conducive healing environment (Hegge, 2013). In this study, TACE nurses notably perceived the impact of noise, light, safety and bedding/furniture, with them then providing environmental comfort care in this regard. According to a recent study (Tinner et al., 2018), the top needs for cancer patients are ease of movement, natural light and thermal comfort. Natural light regulates patients' circadian rhythm, including their sleep/wake cycle, metabolism and body temperature (Potter et al., 2016). Exposure to light also mitigates depression, anxiety and suicidal tendencies in cancer patients (Cvetković & Nenadović, 2016). Few studies have examined thermal condition and patients' comfort levels. However, based on temperature variability according to the type of weather and geographical location, the risk of cancer mortality fluctuates (Yi et al., 2021). Hence, further research related to the effects of stable temperature for patients undergoing TACE in a hospital room should be conducted.

5 | STRENGTHS AND LIMITATIONS OF THIS STUDY

The strengths of the present study include its examination of the comfort care performance of nurses based on the established comfort theory. It also focused on nurses' point of view and comfort care

performance to develop potential care guidelines in physical, psychological, sociocultural and environmental care.

However, the possibility of recall bias among the participating nurses, as we asked them if they had ever cared for TACE patients anytime in the past to secure more data for the target participants, may be a limitation of this study. Furthermore, as actual comfort care performance was not measured, the perceived comfort care performance may have been overexpressed, highlighting the discrepancies between the two. Therefore, future investigations into time-constrained nursing experiences and observations of actual comfort care performance could rectify these limitations.

6 | CONCLUSION

The most frequent PES signs and symptom interference perceived by nurses were fever and mood. The nurses recognized that they frequently provided comfort care to TACE patients in the order of sociocultural care, psychospiritual care, environmental care and physical care. When nurses perceived the patient's PES signs and symptom interference simultaneously, they frequently provided sociocultural and environmental comfort care. This study's findings suggest that TACE patients should be encouraged to report their PES and symptom interference so that their nurses can then create an early detection protocol based on their care guidelines. Furthermore, nurses must provide combined comfort care, including physical, psychospiritual, sociocultural and environmental care. Future research should identify the possible discrepancies between patients and nurses for the development of effective comfort care guidelines that would then be provided to TACE patients.

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CONFLICT OF INTEREST

None declared.

DATA AVAILABILITY STATEMENT

The datasets generated and analysed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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