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The application of nursing intervention based on the theory of humanistic care in anxiety related to infusion ports in cancer patients

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Abstract: Objective: To explore the efficacy of nursing interventions based on humanistic care theory in alleviating implantable venous access port-related anxiety in cancer patients. **Methods:** A convenience sampling method was used to select 100 cancer patients undergoing implantable venous access port treatment at a tertiary hospital's oncology center from January to December 2024. Participants were randomized into control and experimental groups ($n = 50$ each). The control group received routine care (catheter maintenance, health education, and monitoring), while the experimental group received additional humanistic care interventions for 14 days post-insertion, including staged trust-building communication (25–30 min pre- and post-insertion), knowledge dissemination (visual aids and post-procedure review), distress screening and coping skill-building (10 min daily for 3 days), pain management (local anesthesia and dynamic assessment), relaxation training (breathing exercises and intraoperative music therapy), family involvement, and structured follow-ups (days 3, 7, 14). Outcomes were assessed using the Self-Rating Anxiety Scale (SAS), SF-36 Quality of Life Scale, and compliance rates. **Results:** Post-intervention, the experimental group exhibited significantly lower SAS scores (40.6 ± 5.4 vs. 49.3 ± 6.8 , $P < 0.05$) and higher SF-36 scores (72.8 ± 8.6 vs. 62.4 ± 7.9 , $P < 0.05$) compared to the control group. Compliance rates were also superior in the experimental group (90% vs. 80%, $P < 0.05$). **Conclusion:** Nursing interventions grounded in humanistic care theory effectively reduce implantable venous access port-related anxiety, enhance quality of life, and improve treatment compliance in cancer patients, supporting their clinical adoption.

Keywords: nursing and humanistic care; tumor; implantable venous access port; anxiety; quality of life; compliance

1. Introduction

The implantable venous access port (often simply referred to as a port) is a critical tool for chemotherapy, nutritional support, and long-term intravenous therapy in oncology, significantly improving clinical outcomes. However, studies have shown that approximately 45% to 60% of patients with cancer experience considerable anxiety related to invasive port implantation, the complexity of postoperative maintenance, and concerns about potential complications [1]. These negative emotional responses not only reduce treatment adherence, with non-adherent patients

showing a 2.3-fold increased risk of complications [2] but are also associated with decreased quality of life and prolonged hospital stays [3].

Currently, standard clinical nursing care primarily emphasizes technical aspects of port maintenance (e.g., infection prevention, catheter patency management) and basic health education. However, it often falls short of addressing patients' psychological needs. A multicenter survey revealed that only 30% of patients with cancer received systematic distress screening, and the effectiveness of standard nursing care in alleviating anxiety remains below 50% [4,5]. In recent years, the theory of nursing humanistic care has emerged as a framework for improving patients' psychological outcomes. Rooted in the concept of holistic care, this theory emphasizes empathetic communication, individualized support, and multidimensional intervention (e.g., family involvement, environmental optimization) to meet patients' emotional needs and reduce psychological distress [6]. Swanson's theory of caring provides a robust framework for this study, as its emphasis on "maintaining belief" directly addresses cancer patients' existential uncertainty—fear of treatment failure, port-related complications, or disrupted daily life. "Enabling" (supporting patients to manage their care) and "being with" (emotional presence) further mitigate distress by fostering a sense of agency, a key antidote to cancer-related helplessness. Evidence suggests that interventions based on this theory can reduce anxiety incidence by up to 40% among patients with breast cancer and improve treatment adherence by 25% in intensive care unit populations [7]. Nevertheless, high-quality evidence supporting its application in the management of implantable ports in oncology settings remains limited. Notably, our "technical-psychological" intervention model bridges the long-standing divide in oncology nursing—where technical protocols (e.g., port maintenance) and psychological care are often siloed. By embedding psycho-emotional support into every phase of port therapy (preoperative trust-building, intraoperative relaxation, postoperative follow-up), this model operationalizes holistic care in a structured, replicable manner.

From a psycho-oncological perspective, port-related anxiety stems from cancer-specific psychological mechanisms beyond procedural fear. Leventhal's Common-Sense Model demonstrates that patients' anxiety is driven by illness representations including treatment efficacy concerns and disease progression fears [8]. Mishel's Uncertainty in Illness Theory is particularly relevant, as patients experience ambiguity about treatment trajectories and potential complications. Fear of recurrence, a core concern in psycho-oncology, is often triggered by medical procedures that serve as reminders of cancer's ongoing presence [9]. These cancer-specific frameworks highlight that effective interventions must address both immediate procedural anxiety and deeper existential concerns about disease control and future uncertainty, aligning with established psycho-oncology priorities for comprehensive distress management.

This study developed and implemented a structured nursing intervention based on the nursing humanistic care theory, comprising preoperative communication, intraoperative support, and postoperative follow-up, aiming to evaluate its effectiveness in alleviating port-related anxiety among patients with cancer. By clearly defining intervention time points (from the preoperative period to 14 days post-implantation) and core strategies (e.g., phased distress screening and coping skill-building, family engagement), this study provides evidence-based guidance for

optimizing port care practices and lays a theoretical foundation for the integration of technical and psychological care models in oncology nursing.

2. Subjects and methods

2.1. Study subjects

Using a convenience sampling method, this prospective randomized controlled trial recruited patients with cancer who received implantable venous access port therapy at the Oncology Center of a grade A tertiary hospital in Suzhou between January and December 2024. Participants were randomly assigned to either the intervention group or the control group to compare the effects of a nursing humanistic care theory-based intervention with those of standard nursing care. The sample size was calculated using the formula for prospective studies [10]: $n = [(Z\alpha/2 + Z\beta)^2 \times 2\sigma^2] / \Delta^2$, where the expected between-group difference in post-intervention Self-Rating Anxiety Scale (SAS) scores was $\Delta = 8$, with a standard deviation (σ) of 6.8, $\alpha = 0.05$, and $\beta = 0.2$. The required sample size was determined to be 44 per group. Accounting for a 10% lost-to-follow-up rate, a final sample of 50 participants per group was enrolled, yielding a total sample size of 100, which was deemed statistically adequate. The study protocol was reviewed and approved by the hospital's Ethics Committee (Approval No. SUDA20241006H04). Informed consent was obtained from all participants.

Inclusion Criteria: (1) Patients under 70 years of age, regardless of sex; (2) Pathologically confirmed malignant tumor requiring ≥ 3 months of port therapy (e.g., chemotherapy, parenteral nutrition); (3) Adequate communication ability and capacity to understand and complete the questionnaire independently; (4) Basic self-care abilities and willingness to cooperate with nursing interventions.

Exclusion Criteria: (1) History of severe psychiatric disorders or diagnosed with severe anxiety or depression; (2) Patients with advanced cancer and an expected survival of less than three months, as assessed by the attending physician based on Eastern Cooperative Oncology Group (ECOG) performance status and tumor staging, to minimize data loss due to clinical deterioration; (3) Patients who had previously received similar interventions at other healthcare institutions.

2.2. Grouping method

The 100 enrolled patients were randomized into two groups: 50 in the control group and 50 in the intervention group. Randomization was conducted using a random number table. Specifically, patients were sequentially numbered based on their order of admission. A random number was then assigned to each patient using a randomly selected row and column from the random number table. These random numbers were then ranked in ascending order. Patients corresponding to the first 50 ranked numbers were allocated to Control Group A, and the remaining 50 were assigned to Intervention Group B.

2.3. Intervention methods

2.3.1. Control group

Patients in the control group received standard port care in accordance with the Chinese Expert Consensus on Management of Central Venous Catheters in Critically Ill Patients [11]. The control group received standard port care according to established clinical protocols, including routine port maintenance, basic health education on catheter care, and regular monitoring for complications.

2.3.2. Intervention group

Based on Swanson's theory of caring [12], an integrated "technical - psychological" intervention model was developed and implemented, structured across the perioperative period as follows:

Preoperative phase (1 day before port implantation)

(1) Trust-building communication: Nurses employed specific empathy techniques including: (a) Active listening with reflective responses (e.g., "I hear that you're worried about..."), (b) Validation of emotional concerns using phrases like "It's completely understandable to feel anxious about this," (c) Open-ended questioning to explore fears (e.g., "What concerns you most about having the port?"), (d) Therapeutic presence through maintaining eye contact, leaning forward, and using calm, reassuring tone, (e) Collaborative goal-setting where patients identified their specific coping needs and preferences for support throughout the process.

(2) Knowledge dissemination and health education: Patients received structured education on port usage. Simple, illustrated brochures or videos were used to explain key concepts, supplemented with verbal explanations of the procedure and post-intervention care. The session lasted 20–30 min. (**Figure 1**)

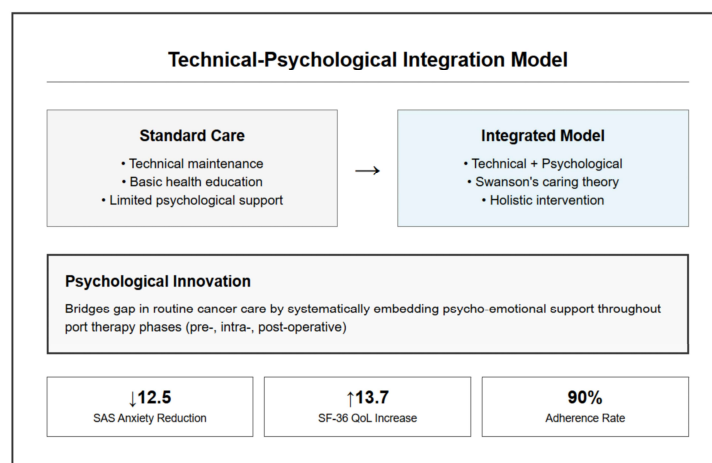


Figure 1. Conceptual diagram of the psycho-emotional components in the humanistic care intervention. The model integrates preoperative (trust-building, knowledge dissemination), intraoperative (distress mitigation, pain-anxiety management), and postoperative (family support, staged follow-up) components to address port-related treatment distress.

Intraoperative phase (day of catheter implantation)

(1) Distress screening and coping skill-building: Nurses utilized structured psychological assessment tools including: (a) Distress thermometer (0-10 scale) to quantify anxiety levels, (b) Problem checklist to identify specific concerns (fear of complications, body image, treatment burden), (c) Individualized coping strategy training based on patient preferences: cognitive techniques (thought restructuring, positive self-talk), behavioral strategies (progressive muscle relaxation, guided imagery), and mindfulness-based approaches (present-moment awareness, acceptance of difficult emotions), (d) Collaborative development of personalized coping cards with patient-identified mantras and breathing cues for use during procedures.

(2) Pain management: Multimodal pain relief strategies combining local anesthesia with dynamic pain assessment and individualized comfort measures.

(3) Relaxation training and non-pharmacologic intervention: Patients received comprehensive stress-reduction training including: (a) Diaphragmatic breathing techniques with specific instruction on 4-7-8 breathing pattern (inhale for 4 counts, hold for 7, exhale for 8), (b) Progressive muscle relaxation starting from toes to head with tension-release cycles, (c) Guided imagery sessions using personalized calming scenarios (favorite peaceful places, positive memories), (d) Mindfulness meditation techniques focusing on present-moment awareness and acceptance of physical sensations, (e) Cognitive restructuring exercises to replace catastrophic thoughts with realistic, balanced thinking patterns.

(4) Family involvement and support system: Comprehensive family-centered interventions included: (a) Family assessment to identify communication patterns, cultural values, and existing support dynamics, (b) Structured family education covering emotional support techniques (active listening, validation, avoiding minimization of concerns), practical caregiving skills (recognizing signs of infection, supporting medication adherence), and self-care strategies for family members to prevent caregiver burnout, (c) Role clarification sessions where family members identified specific ways to provide meaningful support (emotional, practical, informational), (d) Family coaching in therapeutic communication skills including empathetic responding, problem-solving collaboration, and creating a supportive home environment, (e) Regular family conferences (days 3, 7, 14) to assess family functioning, address emerging concerns, and reinforce positive coping strategies.

Postoperative phase (up to 14 days after port implantation)

(1) Postoperative follow-up and continuous care

On postoperative days 3, 7, and 14, the nursing team maintained contact with patients through telephone calls or online platforms. Follow-ups focused on identifying any issues related to catheter use, assessing patients' psychological status, and offering timely guidance and emotional support to ensure safe and effective catheter management.

The "nursing humanistic care theory-based nursing intervention" implemented in the intervention group significantly differed from standard nursing care in several key dimensions:

i) Communication approach: Standard nursing care primarily involved unidirectional information delivery (e.g., verbal instructions on catheter maintenance),

whereas the humanistic care intervention emphasized bidirectional, empathic communication. This included preoperative psychological assessments using open-ended questions to explore patient concerns and postoperative emotional support through daily bedside visits.

ii) Patient and family education: Standard nursing care relied mainly on verbal explanations. In contrast, the humanistic care model incorporated illustrated brochures, video demonstrations, and active family involvement to ensure that both patients and caregivers comprehensively understood self-care procedures for catheter management.

iii) Pain management: In standard nursing care, analgesics were administered as needed. The humanistic care intervention applied a multimodal strategy, combining preoperative local anesthesia (lidocaine gel), intraoperative music therapy (patient-selected music), and dynamic pain assessment using the NRS every 4 h for 24 h postoperatively.

iv) Family support: Standard nursing care did not include structured family engagement. The humanistic care intervention model required family members to accompany patients throughout the process and provided caregiver training within the first 7 postoperative days to strengthen the family support system.

v) Follow-up protocol: Standard nursing care lacked a structured follow-up framework. In contrast, the humanistic care intervention model adopted a staged follow-up plan at 14 days, 1 month, and 3 months postoperative to continuously monitor patients' psychological well-being and identify potential complications.

These differences underscore the core principle of Swanson's theory of caring, i.e., holistic care, which integrates empathy, individualized support, and multidimensional collaboration. By combining technical nursing practices with psychological interventions, this model aims to systematically improve patient outcomes.

2.4. Outcome measures

The following outcome measures were collected during the 3-month postoperative follow-up:

2.4.1. Anxiety levels

The SAS was used to assess patients' anxiety levels. As a widely utilized psychological evaluation tool, the SAS can effectively quantify anxiety levels in patients. The SAS score ranges from 20 to 80, with higher scores indicating more severe anxiety. A score of 20–44 is considered within the normal range (no significant anxiety), 45–59 indicates mild anxiety, 60–74 moderate anxiety, and ≥ 75 severe anxiety. The SAS has demonstrated strong internal consistency, with a reported Cronbach's α coefficient of 0.89 [13].

2.4.2. Quality of life

Quality of life was measured using the Short Form-36 Health Survey (SF-36), which evaluates multiple domains including physical functioning, emotional well-being, and social functioning. Each dimension is scored on a scale from 0 to 100, with higher scores reflecting better quality of life. The SF-36 provides a comprehensive assessment of both physical and psychological outcomes following intervention [14].

In this study, the SF-36 demonstrated excellent internal consistency, with a Cronbach's α coefficient of 0.92 [15].

2.4.3. Patient adherence

Adherence was evaluated based on the patient's compliance with port care and treatment protocols. Adherence was defined as the extent to which patients followed nursing instructions and actively cooperated with prescribed care, quantified by the completion of $\geq 90\%$ of required catheter-related tasks (e.g., timely dressing changes, and avoidance of catheter tension). Adherence levels were categorized as excellent ($\geq 90\%$), good (70%–89%), fair (50%–69%), and poor ($< 50\%$). Scoring was based on routine assessments of patients' daily catheter care practices and compliance with scheduled follow-up visits.

2.5. Data collection and quality control

To ensure the accuracy of the data and the scientific rigor of the study, strict protocols were implemented for data collection and quality control. All nursing staff involved in data collection received specialized training to standardize their procedures according to the study protocol. Anxiety and quality-of-life assessments for each patient were conducted and recorded independently by two nurses who were not involved in the intervention and were blinded to group allocation, thereby minimizing assessment bias. During data entry, each dataset was double-checked by the research team to avoid transcription errors. Throughout the study, all nursing interventions were implemented in strict accordance with standardized procedures to ensure consistency and uniform quality of care across all participants.

2.6. Statistical methods

Statistical analysis was performed using SPSS26.0. Categorical data were described using frequencies (n) and percentages (%) and compared between groups using the chi-square (χ^2) test or rank-sum test. Continuous variables following normal distributions were presented as mean $\pm$ standard deviation ($\bar{x} \pm s$). Between-group comparisons were conducted using independent-samples t-tests, while within-group comparisons were analyzed using paired-samples t-tests. A P -value of < 0.05 was considered statistically significant.

3. Results

3.1. Baseline characteristics

Before the intervention, the baseline characteristics of patients in the intervention and control groups were analyzed. No statistically significant differences were found between the two groups in sex, age, cancer type, disease duration, educational background, type of health insurance, annual household income, presence of comorbidities, cancer stage, metastatic status, or choice of chemotherapy regimen (all $P > 0.05$), indicating comparability between groups. See **Table 1**.

Table 1. Baseline characteristics.

Variable	Control group (n = 50)	Intervention group (n = 50)	P-value
Sex (M/F)	28/22	26/24	0.67
Age (y/o)	55.2 ± 8.6	54.7 ± 8.9	0.78
Cancer type			0.86
Gastric cancer	18 (36%)	17 (34%)	
Lung cancer	16 (32%)	18 (36%)	
Breast cancer	10 (20%)	9 (18%)	
Others	6 (12%)	6 (12%)	
Disease duration (yrs)	2.3 ± 1.1	2.1 ± 1.2	0.64
Type of health insurance (urban/rural)	38/12	40/10	0.65
Annual income (10,000 CNY)	8.5 ± 3.2	8.8 ± 3.5	0.71
Comorbidities (≥1)	22 (44%)	20 (40%)	0.68
Cancer stage (III/IV)	36/14	38/12	0.69
Metastasis (Y/N)	30/20	28/22	0.73
Chemotherapy regimen (including platinum-based)	34 (68%)	32 (64%)	0.69

3.2. Pre- and post-intervention comparisons

3.2.1. SAS scores

After the intervention, the intervention group showed significantly lower SAS scores compared with the control group (40.6 ± 5.4 vs. 49.3 ± 6.8 , $P < 0.001$). Before the intervention, there was no statistically significant difference between the two groups ($P > 0.05$). The intervention group demonstrated a significant reduction in anxiety following the intervention (from 53.1 ± 7.0 to 40.6 ± 5.4 , $P < 0.001$). In contrast, the control group showed no significant change (from 52.4 ± 7.2 to 49.3 ± 6.8 , $P = 0.08$). See **Table 2**.

Table 2. Comparison of SAS scores before and after intervention.

Group	Pre-intervention SAS score ($\bar{x} \pm s$)	Post-intervention SAS score ($\bar{x} \pm s$)	P ₂ -value
Control group	52.4 ± 7.2	49.3 ± 6.8	0.08
Intervention group	53.1 ± 7.0	40.6 ± 5.4	<0.001
P ₁ -value	0.68	0.02	/

3.2.2. SF-36 scores

There was no significant difference in SF-36 scores between the two groups before the intervention ($P > 0.05$). After the intervention, the intervention group showed a significant improvement in SF-36 scores (from 59.1 ± 8.0 to 72.8 ± 8.6 , $P < 0.001$), whereas the control group showed only a modest improvement (from 58.6 ± 8.1 to 62.4 ± 7.9 , $P = 0.04$). The post-intervention SF-36 scores in the intervention group were significantly higher than those in the control group (72.8 ± 8.6 vs. 62.4 ± 7.9 , $P = 0.01$). See **Table 3**.

Table 3. Comparison of SF-36 scores before and after intervention.

Group	Pre-intervention SF-36 score ($\bar{x} \pm s$)	Post-intervention SF-36 score ($\bar{x} \pm s$)	P_2 -value
Control group	58.6 ± 8.1	62.4 ± 7.9	$P = 0.04$
Intervention group	59.1 ± 8.0	72.8 ± 8.6	<0.001
P_1 -value	0.73	0.01	/

3.2.3. Patient adherence

After the intervention, the intervention group demonstrated significantly higher adherence compared with the control group. A greater proportion of patients in the intervention group achieved “excellent” or “good” adherence ($P < 0.05$). See **Table 4**.

Table 4. Patient adherence

Group	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Excellent + Good (%)	χ^2 value	P -value
Intervention group	35 (70%)	10 (20%)	5 (10%)	0 (0%)	90%	6.32	0.02
Control group	24 (48%)	16 (32%)	8 (16%)	2 (4%)	80%		

3.3. Patient experiences and perspectives

Semi-structured interviews with 20 intervention participants revealed three key themes that illustrate how interventions resonated emotionally with patients:

- Theme 1: From fear to empowerment

Patients described transformation from overwhelming anxiety to manageable concern. One lung cancer patient noted: “Before the intervention, the port felt like this foreign thing taking over my body. The nurses helped me see it as a tool that would help me get better.” This emotional shift reflects movement from threat-focused to growth-focused coping.

- Theme 2: Feeling heard and valued

Patients emphasized the importance of empathetic presence: “Other nurses just explained the technical stuff. These nurses actually wanted to know how I was feeling about everything” (gastric cancer patient). This highlights how humanistic care addresses emotional needs beyond clinical requirements.

- Theme 3: Family as partners

Family involvement transformed relationship dynamics: “My husband used to worry that he’d do something wrong with my port care. Now he knows exactly how to help, and I don’t feel like I’m burdening him” (breast cancer patient). This demonstrates how comprehensive care reduces both patient and family distress.

4. Discussion

This study investigated the effectiveness of a nursing intervention based on the nursing humanistic care theory in alleviating port therapy-related anxiety among patients with cancer and evaluated its impact on quality of life and patient adherence. The findings demonstrated that patients in the intervention group experienced significant improvements in anxiety levels, quality of life, and adherence, indicating that the application of the nursing humanistic care theory can effectively reduce the psychological burden and enhance the overall nursing care experience. The core innovation lies in redefining port care as a dynamic interplay of technical proficiency and emotional attunement. Unlike routine care that treats anxiety as a byproduct of treatment, our model positions psychological well-being as a central outcome, with tailored interventions addressing fear of complications, uncertainty about long-term use, and stigma related to visible medical devices.

The nursing humanistic care theory-based intervention developed in this study exhibits several core features that distinguish it from standard nursing care: (1) Holistic care orientation: Grounded in Swanson’s theory of caring, the intervention emphasizes an integrated “technical-psychological” model. In addition to technical maintenance of the port, the approach systematically incorporates psychological support, family involvement, and environmental optimization. For instance, preoperative bidirectional communication through empathetic questioning helps identify patients’ deep-seated fears, while postoperative follow-ups at 1 and 3 months allow for dynamic tracking of psychological well-being. This comprehensive model addresses the common shortcomings of standard nursing care, which often prioritizes technical aspects while overlooking patients’ emotional needs. (2) Personalized support strategies: Interventions were tailored to accommodate individual patient differences. For example, during catheter placement, patients were allowed to choose their own music as part of a non-pharmacological stress-reduction strategy. Family training sessions were adapted to align with each family’s cultural and communication background. This contrasts sharply with the standardized and uniform procedures typical of standard nursing care. By addressing patient needs across preoperative, intraoperative, and postoperative phases, the intervention exemplifies the dynamic, patient-centered adaptability central to humanistic care theory. In essence, this care model represents a paradigm shift from the unidirectional, reactive nature of conventional nursing to a proactive, empathetic, and individualized approach.

4.1. Effect of nursing humanistic care theory on anxiety relief

The findings of this study align with previous literature [16], confirming that humanistic care interventions significantly reduce anxiety (with a 12.5-point decrease in SAS scores) and improve quality of life (with a 13.7-point increase in SF-36 scores). While most existing studies have focused on the short-term efficacy of single

interventions, this study is the first to validate the long-term benefits of a holistic care model in the context of port management, as evidenced by sustained improvements observed at the 3-month follow-up. The nursing humanistic care theory emphasizes alleviating psychological distress through empathy, compassion, and supportive interactions—an approach particularly valuable during long-term treatment. Among patients with cancer, anxiety is often fueled by fear and uncertainty surrounding the use of ports [6]. This intervention addressed those concerns through trust-building communication, structured health education, and professional psycho-oncological support, allowing patients to better understand and accept port therapy. These strategies effectively mitigated anxiety symptoms. One patient shared during a postoperative counseling session: “Before the intervention, I was terrified about the port. I couldn’t sleep thinking about complications. But the nurse took time to really listen to my fears and explained everything step by step. Now I feel like I can handle this treatment journey.” Another participant noted: “Having my family involved made such a difference. We all learned together, and I didn’t feel alone anymore. The results are consistent with previous studies [17] demonstrating that enhanced psychological support and psychosocial care significantly reduce anxiety and depressive symptoms in patients undergoing complex treatments, thereby improving psychological resilience. In contrast, standard nursing care primarily relies on verbal health education, which has shown limited effectiveness in anxiety reduction (with reported response rates below 50%). The humanistic care intervention, by incorporating empathetic communication and family involvement, directly reinforces patients’ sense of psychological security. This alignment with Swanson’s theory advances psycho-oncology’s holistic care agenda, which seeks to address not only disease-related symptoms but also the psychosocial “costs” of cancer treatment (e.g., anxiety about treatment adherence, body image changes due to port placement) [6].

Comparative Analysis with Psycho-oncological Interventions: Our anxiety reduction (12.5-point SAS decrease) compares favorably with established cancer psychology interventions. Cognitive-behavioral therapy for cancer-related anxiety typically achieves 8–15 point reductions with effect sizes of 0.6–1.2 [18], while mindfulness-based stress reduction programs demonstrate similar improvements (Cohen’s $d = 0.8$ – 1.1) but require 8-week structured protocols [19]. Unlike traditional CBT that focuses on cognitive restructuring, our humanistic model emphasizes relational healing and emotional validation, which may be particularly effective for cancer-related trauma responses [20]. The unique advantage of humanistic care lies in its integration into routine clinical care without requiring specialized mental health professionals, while addressing the social support deficits that Helgeson’s Social-Cognitive Processing Model identifies as critical for psychological adjustment in cancer.

4.2. Improvement in quality of life

This study found that patients in the intervention group demonstrated significantly higher post-intervention quality of life scores compared with those in the control group. Quality of life is a critical parameter reflecting a patient’s overall health status and therapeutic outcomes [6]. Rooted in the nursing humanistic care theory, the

intervention extended beyond physical health to include psychological and emotional support, thereby enhancing patients' emotional state and mental well-being. Through a comprehensive set of nursing intervention measures such as health education, pain management, relaxation training, and family involvement, patients undergoing port therapy experienced multidimensional benefits, including improvements in physical condition, emotional regulation, and social functioning, collectively contributing to a notable enhancement in quality of life [21]. A breast cancer patient reflected: "The music therapy during the procedure was calming, but what really helped was knowing the nurses cared about how I felt, not just the technical aspects. It made me feel human again, not just a medical case." Furthermore, the observed improvement in quality of life in the intervention group underscores the interrelated impact of anxiety reduction on overall health outcomes. The benefits extended beyond physical recovery to include emotional and social reintegration. This finding resonates with the core of the nursing humanistic care theory, which advocates for the treatment of patients as whole individuals, emphasizing the restoration of both physical and psychological integrity.

4.3. Impact on patient adherence

Patient adherence refers to the extent to which patients actively cooperate with medical care and nursing interventions. In this study, the adherence rate in the intervention group was significantly higher (90%) than in the control group (80%). This improvement is primarily attributed to patients feeling respected and supported, thereby fostering a greater willingness to engage in their care. These findings align with the "care-trust-cooperation" chain reaction model proposed by Khademi et al. [7]. Patients with high adherence demonstrated greater initiative in port maintenance, including following medical advice for routine care, attending scheduled follow-ups, and maintaining catheter hygiene. This increased adherence is largely attributable to the implementation of the nursing humanistic care theory [22], which emphasizes the establishment of trustful relationships, comprehensive health education, and emotional support. These measures helped patients feel cared for and respected, boosting their confidence in the treatment process and enhancing their capacity for self-management. Previous studies [23] have shown that improved health education and distress screening and coping skill-building can significantly enhance patient adherence and reduce the incidence of complications. In the present study, the enhanced adherence observed in the intervention group not only contributed to fewer port-related complications but also facilitated better therapeutic outcomes and accelerated overall recovery.

4.4. Psychological mechanisms underlying intervention effectiveness

The anxiety reduction observed can be attributed to specific psychological mechanisms addressing core cancer-related fears.

4.4.1. Trust-building and catastrophic thinking reduction

Trust-building communication addressed catastrophic thinking patterns common in cancer patients by helping them distinguish realistic concerns from anxiety-driven catastrophic predictions [8]. As one patient noted: "I was convinced the port would get infected and ruin my whole treatment. The nurse helped me understand the actual

risks and what we could do to prevent problems.” This illustrates how humanistic care transforms vague, overwhelming fears into specific, manageable concerns.

4.4.2. Empowerment and helplessness reduction

The enabling component directly countered cancer-related helplessness by restoring patient agency through collaborative goal-setting and personalized coping strategies. One breast cancer patient reflected: “For the first time since my diagnosis, I felt like I had some control over what was happening to my body.”

4.4.3. Social support enhancement

Family involvement reduced social isolation that frequently accompanies visible medical devices, addressing the social constraints that impede psychological adjustment. One family member commented: “Learning about the port together made it less scary and foreign. Now it’s just part of our normal routine.” This demonstrates how education transforms family dynamics from avoidance to support.

4.5. Limitations and generalizability considerations

Several important limitations affect the generalizability of our findings:

Population limitations: Our exclusion of advanced cancer patients (survival <3 months) and those >70 years limits applicability to vulnerable populations who may experience the highest psychological distress [24]. Advanced cancer patients often face more complex psychological challenges including existential concerns and anticipatory grief, which may require modified intervention approaches. Future research should examine intervention effectiveness in palliative care settings with appropriate outcome modifications.

Cultural specificity: This single-center Chinese study may limit cross-cultural generalizability. Chinese collectivistic cultural values emphasizing family involvement and hierarchical patient-provider relationships may have enhanced intervention effectiveness compared to individualistic healthcare systems [25]. The cultural framework that prioritizes family harmony and interdependence may not translate directly to Western healthcare contexts. Cross-validation studies in diverse cultural settings are essential to establish broader applicability.

Healthcare system considerations: Our intervention was implemented in a well-resourced tertiary hospital with established nursing protocols. Translation to under-resourced settings may face significant barriers including staffing constraints and training requirements. Future implementation studies should identify minimum effective intervention components for diverse healthcare contexts.

4.6. Clinical implications

This study demonstrates significant clinical implications for psycho-oncology practice. Our findings provide evidence-based support for integrating structured humanistic care interventions into routine port management, yielding measurable improvements in patient outcomes. The 12.5-point reduction in anxiety scores (SAS) and 13.7-point improvement in quality of life (SF-36) represent clinically meaningful changes that translate to reduced psychological distress and enhanced treatment tolerance. The 10% improvement in adherence rates (90% vs. 80%) has direct implications for reducing port-related complications and healthcare costs, as non-

adherent patients show 2.3-fold increased complication risks. Our “technical-psychological” intervention model offers a replicable framework that bridges the traditional gap between clinical port care and psychosocial support. The sustained benefits observed at 3-month follow-up indicate that brief, structured humanistic interventions can produce lasting psychological improvements, supporting the cost-effectiveness of incorporating empathetic communication, family involvement, and systematic distress screening into standard oncology nursing protocols.

5. Conclusion

This study presents several opportunities for future research advancement. First, expanding to multi-center designs could assess the cultural adaptability of humanistic care interventions across diverse healthcare settings and patient populations, potentially enhancing generalizability. Second, incorporating qualitative metrics alongside quantitative measures may capture nuanced emotional shifts and provide deeper insights into the mechanisms underlying psychological improvements. Third, extending follow-up periods beyond three months could illuminate the long-term sustainability of intervention benefits and inform optimal timing for booster sessions. Fourth, future studies could explore dose-response relationships by varying intervention intensity, helping to optimize resource allocation while maintaining clinical effectiveness. These research directions represent exciting opportunities to refine and expand evidence-based humanistic care models in oncology settings.

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