# Effects of Network-based Positive Psychological Nursing Model on Negative Emotions, Cancer-related Fatigue, and Quality of Life in Cervical Cancer Patients with Post-operative Chemotherapy

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AIM: Cervical cancer patients with post-operative chemotherapy experience anxiety, depression, and cancer-related fatigue, leading to a decline in their quality of life and posing challenges to the rehabilitation of patients. Therefore, it is necessary to explore effective nursing methods. This study aimed to investigate the effects of a web-based positive psychological nursing model on negative emotions, cancer-related fatigue, self-management efficacy, treatment compliance, and quality of life among cervical cancer patients with post-operative chemotherapy.

METHODS: This retrospective study included 101 cervical cancer patients who underwent surgical intervention at our hospital between January 2019 and December 2023. Patients who received the usual mode of care were included in the control group (n = 48), while those who received the web-based positive psychological care mode were included in the study group (n = 53). For all study subjects, various assessment indices were evaluated, including baseline characteristics, treatment adherence, and the Hamilton Anxiety Scale (HAMA), Hamilton Depression Scale (HAMD), Revised Piper Fatigue Scale (RPFS), the Chinese version of the Strategies Used by Patients to Promote Health (C-SUPPH), and European Organization for Research and Treatment of Cancer Quality of Life questionnaire -Core 30 (EORTC QLQ-C30). Additionally, anxiety/depression, cancer-related fatigue, self-management efficacy, treatment compliance, and quality of life were compared between the two groups.

RESULTS: After the intervention, the HAMA score, HAMD score, and RPFS score were significantly decreased for both groups compared to before intervention (p < 0.05). However, the C-SUPPH score was significantly increased than before intervention (p < 0.05). We observed that HAMA, HAMD, and RPFS scores were substantially lower in the study group than those in the control group after intervention (p < 0.05). In contrast, C-SUPPH scores were significantly higher (p < 0.05). After the intervention, treatment compliance was significantly better in the study group compared to the control group. Furthermore, the EORTC QLQ-C30 score was substantially higher than that of the control group (p < 0.05).

CONCLUSIONS: The network-based positive psychological nursing model can effectively alleviate negative emotions and cancerrelated fatigue in cervical cancer patients who have undergone post-operative chemotherapy, thereby improving their quality of life. Additionally, this model improves patients' self-management effectiveness and treatment compliance. These findings provide novel insights into the nursing of cervical cancer patients with post-operative chemotherapy, underscoring its clinical significance.

Keywords: network platform; active psychological nursing; cervical cancer; negative emotions; cancer-related fatigue; quality of life

# Introduction

Cervical cancer is a common gynecological malignancy with high incidence rates, which seriously threatens women's health and lives [1]. Currently, surgical intervention is the primary treatment option for eligible patients, followed by adjuvant chemotherapy to improve therapeutic outcomes, reduce recurrence risk, and enhance survival rate [2, 3]. However, multi-cycle chemotherapy often triggers long-term adverse reactions, including physiological and psychological manifestations such as pain, fatigue, anxiety/depression, and post-traumatic stress disorder. These challenges usually occur beyond hospitalization, considerably affecting patients' compliance with treatment protocol and compromising the effectiveness of subsequent treatment, thereby reducing the overall quality of life. Therefore, the implementation of continuous and effective nursing intervention is crucial [4, 5]. Traditional nursing care is usually provided within the hospital setting, and the doctorpatient relationship ends upon discharge. Moreover, the patients only receive relevant knowledge or rehabilitation information when they are readmitted for treatment or followup. Furthermore, traditional nursing practices usually rely on clinical experience and often lack comprehensive focus on the patient's mental health and other aspects, thus limiting the overall efficacy of the interventions. This study aims to explore a sustainable clinical nursing model that addresses the cognitive, psychological, social, and other aspects of cervical cancer patients undergoing post-operative chemotherapy.

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Positive psychology, initially proposed by Professor Seligman [6] of the University of Pennsylvania in 1998, postulates that utilizing the power of positive psychology can help individuals find and use their inner resources. Positive psychology adopts scientific principles and methods to study happiness, advocating for a positive approach in psychology. It focuses on human health, happiness, and harmonious development by assessing positive psychological qualities. Studies have shown that positive psychology can improve patients' mental conditions and enable them to cope with diseases actively, leading to its application in treating mental issues and chronic diseases [7, 8]. In 2007, Phipps [9] applied the concept of positive psychology to the adaptive style of children with cancer, signifying its broader use among cancer patients. Raque-Bogdan TL et al. [10] indicated that positive psychological group intervention can effectively improve anxiety, depression, and pain levels in cancer patients. Albers et al. [11] reported positive psychological intervention for cancer patients aged 15-39 and found that it positively affected peer support and happiness levels. Chen J et al. [12] found that positive psychological intervention can reduce the caregiving burden on spouses of cancer patients and enhance their level of hope. Furthermore, research reveals that positive psychological nursing intervention can alleviate depression and improve sexual function and subjective well-being in postoperative patients with early cervical cancer [13]. However, current psychological nursing interventions for cancer chemotherapy patients are usually limited to the hospitalization period, lacking support during the intervals between chemotherapy sessions.

With the development of network communication technology, internet-based cognitive therapy has become increasingly common in the clinical care of patients with malignant tumors [14, 15]. The efficiency, speed, and convenience of the internet broaden hospital's medical and nursing services beyond the hospitalization process to ongoing treatment and rehabilitation after discharge. This enables patients to access relevant information about their conditions from home, with specialized nursing staff available to guide, supervise, and promptly answer their questions. Based on the patient's individual situation, tailored exercise and diet programs are recommended. WeChat, a widely used social communication network in China, provides the advantages of simplicity and high efficiency, making it an excellent tool for obtaining timely and convenient information. In recent years, several studies have indicated that nursing intervention delivered via the WeChat platform can substantially improve the negative emotions and social functions of cancer patients [16, 17, 18].

Although both the positive psychological concept and the WeChat platform have been applied in the nursing care of cancer patients, there are no reports on the effect of their combined application. This study combines the positive psychological concept with the WeChat platform to address the gap in psychological nursing for patients during chemotherapy interval. It investigates the feasibility of implementing a web-based positive psychological nursing model to provide new perspectives for improving negative emotions, cancer-related fatigue, and quality of life in cervical cancer patients after chemotherapy.

# **Materials and Methods**

# Research Subjects

This study included 101 cervical cancer patients who underwent surgical intervention and were admitted to our hospital between January 2019 and December 2023. The study protocol followed the ethical guidelines outlined in the Declaration of Helsinki of the World Medical Congress. The study design was explained to the patients, and their informed consent was obtained.

### Inclusion and Exclusion Criteria

The study participants were enrolled using the following inclusion criteria: (1) Patients diagnosed with cervical cancer confirmed by cervical tissue biopsy or colposcopy. (2) Patients eligible for cervical cancer surgery who received surgical treatment at our hospital. (3) Patients aged 18–75 years. (4) Patients with at least a primary school education and normal communication and understanding skills. (5) Those with stable vital signs and the expected survival time of >6 months.

However, the exclusion criteria were set as follows: (1) Patients with other malignant tumors. (2) Patients with serious diseases affecting the heart, liver, lung, kidney and other vital organs. (3) Patients with other cervical diseases. (4) Those with severe coagulation or immune system diseases or severe infections. (5) Patients with visual, hearing, or writing impairments. (6) Patients with mental health diseases or those taking psychoactive drugs.

### Research Methods

The baseline characteristics and clinical data of the study participants were retrospectively analyzed, including age, body mass index (BMI), disease type, clinical stage, lesion diameter, surgical method, educational level, ASA level, anxiety, depression, cancer-related fatigue, selfmanagement efficacy, treatment compliance, and quality of life. Furthermore, various behaviors of the patients were assessed as follows:

A. Anxiety level: The Hamilton Anxiety Scale (HAMA) [19] was used to evaluate the anxiety levels of patients before and after the intervention. The scale consists of 14 items, each item adopts 0–4 points and 5-level scoring method, and the total score ranges from 0 to 56 points. The higher the score, the higher the anxiety level. The total Cronbach's alpha coefficient for HAMA was 0.87.

B. Depression level: The Hamilton Depression Scale (HAMD) [20] was used to assess the depression levels of patients before and after the intervention. The scale consists of 17 items. Items 1, 2, 3, 7, 8, 9, 10, 11 and 15 are

scored on a 5-level scoring method from 0~4 points, while items 4, 5, 6, 12, 13, 14, 16, 17 use a 3-level scoring method from 0~2 points. The total score ranges from 0 to 52 points, with a higher score indicating a higher level of depression. The total Cronbach's alpha coefficient for HAMD was 0.89. C. Cancer-related fatigue: The Revised Piper Fatigue Scale (RPFS) [21] was used to evaluate the degree of cancerrelated fatigue before and after the intervention. The scale includes 22 items across 4 dimensions, including behavioral severity (6 items), affective meaning (5 items), sensory/emotional severity (5 items), and cognitive severity (6 items). Each item is scored from 0 to 10, with 0 indicating "no" and 10 indicating "very serious". The score for each dimension is the sum of all the items in the dimension divided by the number of items. The total score is equal to the total score/number of items, and the higher the score, the more serious the fatigue degree of this dimension. The total Cronbach's alpha coefficient for RPFS was 0.97.

D. Self-management effectiveness: The Chinese version of the Strategies Used by Patients to Promote Health (C-SUPPH) [22] was used to evaluate patients' selfmanagement abilities before and after the intervention. The scale includes three dimensions: self-decompression (items 1-9, 14), self-decision-making (items 10-12), and positive attitude (items 13, 15-28), with a total of 28 items. Each item is scored on a 5-level scoring method from 1–5 points, with a total score ranging from 28~140. The higher the score, the stronger the self-management effectiveness. The total Cronbach's alpha coefficient for C-SUPPH was 0.91. E. Treatment compliance: In this system, patients are divided into various levels and grades. Level 0 patients voluntarily follow the doctor's advice and receive timely treatment. Level I patients receive treatment on time under reminders from their family members and medical staff. Level II patients receive treatment on time after repeated persuasion and urging by their family members and medical staff. Level III patients occasionally receive treatment under reminders from their family members and medical staff. Level IV patients refuse treatment even after repeated persuasion and reminders.

F. Quality of life: The European Organization for Research and Treatment of Cancer Quality of Life questionnaire -Core 30 (EORTC QLQ-C30) [23] was used to evaluate patients' quality of life after the intervention. This study assessed five functional dimensions: physical functioning (items 1-5), role functioning (items 6 and 7), emotional functioning (items 21-24), cognitive functioning (items 20 and 25), social functioning (items 26 and 27). Each item is scored on a 4-point scale from 1-4 points. The score for each dimension is calculated by dividing the total score of all items in the dimension by the number of items and then converting to a standardized score ranging from 0-100, using the formula below: the standard score = [1 - (rough $score - 1/3 \times 100$ . A higher score indicates a better quality of life. The Cronbach's alpha coefficients for EORTC QLQ-C30 were all  $\geq 0.70$ .

#### Grouping Methods

Patients were categorized into two groups based on their care management approach. The control group (n = 48) included patients who received the usual mode of care. The study group (n = 53) comprised patients who received both routine nursing and web-based positive psychological care. Specific implementation details are shown below.

Routine nursing care approach: Upon hospital admission, patients are provided a comfortable and clean environment, introduced to the ward, patients are educated about disease, and reduced their tension. Before starting the chemotherapy, the typical adverse reactions and preventive measures are explained to patients and their families. During and after chemotherapy, patients are advised on the significance of nutritional supplements, adequate rest, proper exercise, and limiting access to public places. Furthermore, patients are directed to keep their hair clean to help them overcome hair loss and associated psychological risks. Similarly, patients are instructed to take medication as prescribed by the doctor and to regularly monitor liver, kidney and white blood cell functions. Finally, family members are encouraged to monitor the patient's emotional changes, provide support, and use listening and comforting skills to alleviate anxiety. Positive psychological nursing model: This nursing care approach includes the following specific implementation:

A. Nursing intervention group formation: The nursing intervention team includes a chief physician in psychopsychology, who provides guidance for the intervention program and delivers lectures on mental health science. A deputy chief physician develops and promotes the popularization of science and education programs on diseases. Furthermore, a head nurse (deputy chief nurse) acts as a team leader, and is responsible for the organization and management of this study. Additionally, the nursing intervention team included two psychological counselors and 6 responsible nurses who implemented specific intervention measures and handled data collection and collation.

B. Network-based communication (First day of admission): Full-time nursing staff can establish communication channels with patients via WeChat, the hospital's public account, and register tracking members for long-term tracking and intervention. Furthermore, communication channels between nurses and patients facilitate communication and guide interventions through group chats, network broadcasts or recordings, article pushing, and comments.

C. Web-based health education (1–2 times per chemotherapy interval): Patients are educated through article pushes, online lectures, video conferences, and theme discussions. Health knowledge includes disease knowledge, post-operative lying positions, medication, bladder function training, wound care, defecation control, chemotherapy course, the importance of chemotherapy, cost, potential complications and coping measures, and sexual life guidance. Every month, there is a special theme content, and full-time nurses are arranged to produce the content,

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Variables	Study group	Control group	$\chi^2/t$	n-value	
variables	( <i>n</i> = 53)	( <i>n</i> = 48)	χμ	<i>p</i> -value	
Average age (Mean $\pm$ SD, years old)	$53.45\pm9.46$	$53.17\pm7.03$	0.171	0.865	
Disease types $[n (\%)]$			0.019	0.891	
Squamous cell carcinoma	38 (71.70)	35 (72.92)			
Adenocarcinoma	15 (28.30)	13 (27.08)			
Clinical stages [n (%)]			0.871	0.351	
Phase I	27 (50.94)	20 (41.67)			
Phase II	26 (49.06)	28 (58.33)			
Tumor diameter (Mean $\pm$ SD, cm)	$3.75\pm0.77$	$3.64\pm0.85$	0.654	0.514	
Surgical method $[n (\%)]$			< 0.001	0.988	
Total hysterectomy	43 (81.13)	39 (81.25)			
Partial hysterectomy	10 (18.87)	9 (18.75)			
Education $[n (\%)]$			0.026	0.871	
Primary/Junior high school	39 (73.58)	36 (75.00)			
High school and above	14 (26.42)	12 (25.00)			
ASA level $[n (\%)]$			0.006	0.940	
Level I	28 (52.83)	25 (52.08)			
Level II	25 (47.17)	23 (47.92)			
SD, standard deviation; ASA, America	n society of Anes	sthesiologists.			

#### Table 1. Comparison of clinical baseline characteristics between the two groups (n = 101).

Table 2. Comparison of anxiety and depression between the two groups after intervention ( $\bar{x} \pm s$ , points) (n = 101).

Experimental groups	n	HAMA	score	HAMD score		
Experimental groups		Before intervention	After intervention	Before intervention	After intervention	
Study group	53	$14.92\pm4.16$	$10.11 \pm 3.33*$	$13.81\pm3.19$	$9.51\pm2.61*$	
Control group	48	$15.50\pm3.69$	$11.98\pm3.01*$	$14.21\pm2.92$	$10.98\pm2.76*$	
<i>t</i> -value		-0.732	-2.943	-0.651	-2.750	
<i>p</i> -value		0.466	0.004	0.517	0.007	

Notes: "\*" indicates a significant difference before and after intervention in the same group (p < 0.05); HAMA, Hamilton Anxiety Scale; HAMD, Hamilton Depression Scale.

and share it with patients through online channels after approval. Additionally, routine rehabilitation nursing exercises are explained and demonstrated by specially assigned people in plain language and made into online videos. During the playback of the videos, nurses are online throughout the whole process to answer any patient questions.

D. Network-based psychological counseling (1–2 times per chemotherapy interval): During this session, the patients are provided with regular mental health counseling and personalized psychological guidance. Psychological counselors focus on specific topics, addressing psychological problems, providing normal psychological advice, and emphasizing the significance of mental health. Through communication, listening, and encouragement, patients are helped to relieve psychological problems or are not active in communication, family groups are established, providing personalized psychological counseling for patients and their families.

E. Network-based group psychological intervention (Once per chemotherapy interval): Patients are reminded of online video participation time and are introduced to the purpose, form, schedule, time arrangement, and precautions of group psychological counseling. Group members are guided to get to know each other and share their basic information. Moreover, activities include mental health education about cervical cancer, interactive online games, sharing successful cancer experiences, and accomplishing homework exercises. These activities help patients better understand their health condition, eliminate the misconception of "cancer equals death", and build confidence in group psychological rehabilitation. Group members are encouraged to review and share their progress and experiences from group activities, sum up their learnings, recognize their personal growth, rebuild their hopes for the future, and strengthen social support within the group.

F. Web-based life guidance (Once per chemotherapy interval): The patients are guided on diet, exercise, and sleep timings. Patients are recommended to consume the Mediterranean diet and medicinal diet formula through channels. They are instructed to focus on nutrition and a light diet, avoiding spicy, irritating, raw and cold, fried, and unclean food. Regarding exercise, patients are encouraged to engage in appropriate physical exercise, suggesting different methods based on their physical conditions through

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Experimental n groups n	Behavior	al severity	Affectiv	e meaning	Sensory/emotional severity		
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	
Study group	53	$6.53 \pm 1.27$	$4.52\pm0.93*$	$7.10\pm1.52$	$5.11\pm0.99*$	$8.65 \pm 1.52$	$5.81 \pm 1.33 *$
Control group	48	$6.43 \pm 1.49$	$5.16 \pm 1.22 *$	$7.09 \pm 1.34$	$5.77 \pm 1.26 *$	$8.46 \pm 1.37$	$6.39 \pm 1.27 *$
<i>t</i> -value		0.368	-3.017	0.023	-2.931	0.645	-2.240
<i>p</i> -value		0.714	0.003	0.982	0.004	0.520	0.027

Table 3a. Comparison of RPFS scores between the two groups after intervention ( $\bar{x} \pm s$ , points) (n = 101).

Table 3b. Comparison of RPFS scores between the two groups after intervention ( $\bar{x} \pm s$ , points) (n = 101).

Experimental groups	п	Cognitive	severity	Total score		
Experimental groups	n	Before intervention	After intervention	Before intervention	After intervention	
Study group	53	$6.21 \pm 1.41$	$3.58 \pm 1.18 *$	$28.49\pm3.12$	$19.01\pm2.11*$	
Control group	48	$6.18 \pm 1.51$	$4.62\pm1.14*$	$28.16\pm3.08$	$21.94\pm2.18*$	
<i>t</i> -value		0.104	-4.505	0.525	-6.847	
<i>p</i> -value		0.918	< 0.001	0.601	< 0.001	

Notes: "\*" indicates a significant difference before and after intervention in the same group (p < 0.05); RPFS, Revised-Piper Fatigue Score.

online channels and providing information on exercise frequency and duration. Furthermore, patients are guided to reduce daytime naps, encouraging them to go to bed early and get up early. Patients with a high degree of cancerrelated fatigue are advised to take medicine regularly and as prescribed by their physicians.

G. Network-based continuity care (before discharge): Before discharge, the nursing team will share information about precautions and the treatment of common complications, such as cervical cancer prevention and treatment, managing complications from cervical cancer chemotherapy, follow-up content and schedules, and the latest advancements in cervical cancer treatment. This relevant information will be permanently available in the group space for patients to download. Moreover, family members are encouraged to participate in prevention efforts and ensure regular gynecological cancer examinations. Additionally, the head nurse will provide daily online answers and guidance every month.

### Statistical Analysis

The findings of this study were summarized and recorded in an Excel sheet. Statistical analysis was performed using SPSS 27.0 software (International Business Machines Corporation, Armonk, NY, USA). The Kolmogorov-Smirnov test was used to evaluate the normal distribution of the data. Continuous variables conforming to the normal distribution were expressed as mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ) and analyzed using the *t*-test. However, continuous variables that did not follow normal distribution were compared using the Mann-Whitney test. Categorical variables were expressed as [n (%)] and were compared utilizing the  $\chi^2$  test. The rank-sum test was used to compare rank data. A *p*value < 0.05 was considered statistically significant.

# Results

#### Comparison of Clinical Baseline Characteristics

There were no significant differences between the two experimental groups in baseline characteristics such as age, disease types, clinical stages, tumor diameter, surgical method, education, and American society of Anesthesiologists (ASA) level (p > 0.05, Table 1).

### Comparison of Anxiety and Depression

We observed that post-intervention HAMA and HAMD scores were notably lower in both experimental groups compared to their pre-intervention scores (p < 0.05). Furthermore, patients in the study group exhibited significantly lower HAMA and HAMD scores than the control group after the intervention (p < 0.05). A comparison of anxiety and depression between the two experimental groups is outlined in Table 2.

### Comparison of Cancer-related Fatigue

The post-intervention RPFS scores were substantially lower for both experimental groups than their pre-intervention scores (p < 0.05). Furthermore, the study group had significantly lower RPFS scores than the control group after the intervention (p < 0.05). A comparison of RPFS scores between the two groups is shown in Table 3a,b.

#### Comparison of Self-management Effectiveness

We found that post-intervention C-SUPPH scores were substantially higher in both groups than pre-intervention scores (p < 0.05). Furthermore, the study group exhibited significantly higher C-SUPPH scores than the control group after the intervention (p < 0.05). A comparison of C-SUPPH scores between the two groups is outlined in Table 4a,b.

Experimental groups	11	Self-decor	npression	Self-decision-making		
Experimental groups	п	Before intervention	After intervention	Before intervention	After intervention	
Study group	53	$22.34\pm 6.02$	$31.08\pm5.72*$	$7.40 \pm 1.91$	$10.72 \pm 2.08*$	
Control group	48	$22.65\pm5.84$	$28.13\pm5.32^{\ast}$	$7.56\pm2.38$	$9.67\pm2.16^{\ast}$	
<i>t</i> -value		-0.259	2.674	-0.389	2.491	
<i>p</i> -value		0.796	0.009	0.698	0.014	

Table 4a. Comparison of C-SUPPH scores between the two groups after intervention ( $\bar{x} \pm s$ , points) (n = 101).

Table 4b. Comparison of C-SUPPH scores between the two groups after intervention ( $\bar{x} \pm s$ , points) (n = 101).

Experimental groups	11	Positive	attitude	Total scores		
Experimental groups	п	Before intervention	After intervention	Before intervention	After intervention	
Study group	53	$33.21\pm7.30$	$43.68\pm6.16^{\ast}$	$62.94 \pm 9.88$	$85.47 \pm 9.43*$	
Control group	48	$33.96\pm8.24$	$39.73\pm7.00*$	$64.17\pm9.82$	$77.52\pm8.53*$	
<i>t</i> -value		-0.486	3.015	-0.623	4.428	
<i>p</i> -value		0.628	0.003	0.535	< 0.001	

Notes: "\*" indicates a significant difference before and after intervention in the same group (p < 0.05); C-SUPPH,

Chinese version of the Strategies Used by Patients to Promote Health.

### Comparison of Treatment Compliance

As shown in Table 5, compared to the control group, patients in the study group had significantly better treatment compliance after intervention (p < 0.05).

### Comparison of Quality of Life

We observed significantly higher EORTC QLQ-C30 scores in the study group after intervention compared to the control group (p < 0.05, Table 6).

### Discussion

Cervical cancer, ovarian cancer, and endometrial cancer are the three major gynecological malignancies, typically treated with surgery, chemotherapy and radiotherapy [24]. Patients experience significant physical and mental pain due to these diseases, facing substantial psychological pressure before and after surgery. Moreover, repeated radiotherapy and chemotherapy, along with adverse reactions such as fatigue, nausea, and vomiting lead to prolonged psychological stress. Specifically, they experience comparatively increased psychological and social pressure during the rehabilitation process compared to other cancer types. This is due to the concerns of cervical cancer patients about the impact of hysterectomy on their femininity and dissatisfaction with their partner regarding sexual life, which can result in elevated depression, anxiety, and other negative emotions [25, 26]. These negative emotional challenges not only reduce recovery but also affect family harmony, causing further distress for the patient and their families.

In this study, the HAMA and HAMD scores of the study group were significantly lower than the control group after intervention. The results indicated that anxiety and depression improved more substantially in the study group. This positive outcome may be due to the following two factors: (1) During the intervention period, web-based psychological counseling and group psychological intervention helped patients learn to view and address problems positively, thereby reducing the anxiety and depression associated with the physical function decline caused by the disease and its treatment. (2) The continuous network-based nursing intervention extended in-hospital nursing and education services for patients. Moreover, the continuous health guidance of nurses reduces patients' fear and worry about the unknown, promoting a good mental state. Nissen et al. [27] conducted internet-based cognitive therapy with 137 breast cancer patients and 13 prostate cancer patients, revealing a significant improvement in anxiety symptoms, which aligns with our findings. However, unlike our study, they did not indicate substantial improvement in depression symptoms during the follow-up period. Similarly, Akkol-Solakoglu and Hevey [28] conducted a group trial on 72 cancer patients and observed that after two months of internet-based cognitive behavioral therapy, patients in the intervention group had lower hospital anxiety and depression scale scores; however, there was no significant difference between the two groups. The reason for the analysis is that the previous intervention only involved internet-based cognitive therapy for patients, while we combined positive psychology nursing intervention methods. Smith et al. [29] reported that emotion-focused internet interventions help improve and maintain adaptive emotional regulation in cancer survivors. Similarly, Kang et al. [30] demonstrated that the implementation of internet-based psychological stress reduction interventions during the novel coronavirus pandemic was effective in improving anxiety and depression and alleviating insomnia among Chinese cancer survivors.

Cancer-induced fatigue is very common in cancer patients due to certain factors, such as the long cycles of chemotherapy and the adverse reactions caused by chemotherapy drugs. Cancer-induced fatigue primarily manifests as a general decline in function, fatigue, weakness, and lethargy

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Experimental groups	n	Lv. 0	Lv. I	Lv. II	Lv. III	Lv. IV
Study group	53	23 (43.40)	15 (28.30)	9 (16.98)	4 (7.55)	2 (3.77)
Control group	48	14 (29.17)	11 (22.92)	10 (20.83)	9 (18.75)	4 (8.33)
Z-value				-2.111		
<i>p</i> -value				0.035		

Table 5. Comparison of treatment compliance in the two groups after intervention [n (%)].

Table 6. Comparison of EORTC QL	Q-C30 scores between t	the two groups after intervention	n ( $ar{x}\pm s$ , points) ( $n$ = 101).
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Experimental groups	n	Physical functioning	Role functioning	Emotional functioning	Cognitive functioning	Social functioning
Study group	53	$59.37 \pm 16.50$	$57.55\pm19.77$	$52.52\pm12.40$	$65.09 \pm 19.41$	$59.43 \pm 19.20$
Control group	48	$48.89 \pm 19.46$	$46.87\pm21.92$	$43.92\pm16.56$	$54.51\pm23.50$	$45.49\pm21.12$
<i>t</i> -value		2.928	2.573	2.969	2.475	3.477
<i>p</i> -value		0.004	0.012	0.004	0.015	< 0.001

EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life questionnaire -Core 30.

[31]. Although there is increasing evidence that comprehensive treatment can help reduce cancer-related fatigue, clear treatment recommendations are still lacking due to the lack of rigorous trials and replication [32]. In this study, the RPFS score of patients in the study group after the intervention was significantly lower than the pre-intervention and control groups, while the EORTC QLQ-C30 score was considerably higher than that of the control group, indicating that the network-based positive psychological nursing model is beneficial for alleviating cancer-related fatigue and improving the quality of life of patients. This improvement may be attributed to the study group receiving online guidance on diet, exercise, sleep, and other aspects of life, which promoted recovery in nutrition, physical strength, and other aspects, resulting in the elimination or reduction of fatigue symptoms and an improvement in their quality of life. Additionally, the improvement of negative emotions such as anxiety and depression also contributed to the improved quality of life of patients. Kleckner et al. [33] examined 33 cancer patients and observed that Mediterranean dietary intervention can improve cancer-related fatigue by promoting energy metabolism, which aligns with this study. However, several studies did not align with the findings from our study. For example, Dun et al. [34] reported that sleep interventions effectively improve cognitive and somatosensory fatigue in cancer patients but have no significant effect on behavioral or emotional fatigue. Additionally, Abbott and Hooke [35] observed that chemotherapy patients who participated in sports activities did not experience substantial deterioration of cancer-related fatigue over 3 months. The reason for the analysis is that these interventions focused only on sleep or exercise. Conversely, this study combines a comprehensive intervention approach, addressing multiple aspects such as cognition, psychology, diet, exercise, and sleep, which effectively improved cancer-related fatigue and enhanced quality of life of patients.

The side effects caused by chemotherapy often lead to poor treatment compliance among patients. Newly discharged

patients, who may not have experienced adverse reactions or have only mild symptoms, tend to be less responsive to the prevention and precautions instructed by medical staff, resulting in low self-management efficiency [36, 37]. In our study, the C-SUPPH score of patients in the study group was significantly higher than both their pre-intervention and the control group. Furthermore, treatment compliance was substantially better in the study group than in the control group, suggesting that the network-based positive psychological nursing model is effective in improving patients' self-management efficacy and treatment compliance. This improvement can be due to the networkbased positive psychological nursing intervention primarily performed through the WeChat platform. This approach meets the needs for both in-hospital and out-of-hospital nursing guidance, improving communication efficiency between virtual and real life. It ensures that patients can receive coordinated and continuous nursing service support, with convenient, real-time and diversified communication options (video, pictures, and sound). Patients can access professional data in the group space online at any time, even if they have poor understanding or low education levels.

Additionally, nursing staff can grasp patients' situations in real-time, allowing for timely guidance. This improves patients subjective initiative and relevant knowledge, ultimately promoting their self-management efficiency and treatment compliance. Currently, internet-based nursing interventions have been shown to improve treatment compliance in patients with anxiety disorder [38], knee osteoarthritis [39], bipolar disorder [40], and other diseases. This study has confirmed their positive effect on improving treatment compliance in chemotherapy patients for the first time.

However, our study still has some limitations: (1) Due to limitations in sample size and follow-up duration, only 101 patients were followed up during chemotherapy. (2) The HAMA, HAMD, RPFS, C-SUPPH, EORTC QLQ-C30 scales and treatment compliance survey questionnaires used in this study are all retrospective. They may be influenced

by subjective factors, introducing recall bias during completion. (3) Although baseline data such as patient age, tumor type, clinical stage, lesion diameter, surgical method, and educational level were considered, factors such as patient occupation and economic status were not included. Future research should expand the sample size and followup duration and include factors such as occupation and economic status. These observations confirm the universal significance of the research results and lay the foundation for the application and promotion of network-based positive psychological care models.

# Conclusions

Overall, the network-based positive psychological care model has been found to effectively alleviate negative emotions and cancer-related fatigue in post-operative chemotherapy patients with cervical cancer, thereby improving their quality of life. Additionally, this nursing model enhances the self-management efficiency and treatment compliance of patients, making it a promising approach for clinical practice. However, it is crucial to note that the workload of positive psychological nursing interventions based on online platforms is relatively large, which poses a significant challenge to the work ability and professional knowledge of medical staff. To address this issue and to enhance the motivation and engagement of medical staff, hospitals can consider salary adjustments, performance, and promotion opportunities.

# Availability of Data and Materials

The data analyzed was available on the request for the corresponding author.

# **Author Contributions**

XN designed the research study, performed the research, analyzed the data and drafted the manuscript. The author has read and approved the final manuscript and agreed to be accountable for all aspects of the work.

# **Ethics Approval and Consent to Participate**

This is a retrospective study, which was conducted by Shenzhen Hospital of Southern Medical University is exempt from ethics approval. Informed consent forms were provided to all participants who voluntarily agreed to participate in this study after being informed about its purpose and procedures. The study protocol followed the ethical guidelines outlined in the Declaration of Helsinki of the World Medical Congress.

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# **Conflict of Interest**

The author declares no conflict of interest.

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