

## ORIGINAL RESEARCH

# Clinical value of multidisciplinary collaborative nursing model for breast cancer and its preventive effects on postoperative lymphedema

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**Abstract**

This study aimed to investigate the clinical effects of a multidisciplinary collaborative nursing model and its influence on postoperative complications in breast cancer patients. A total of 100 breast cancer patients were divided into a control and a research group, depending on the nursing plan. The former received usual care, while the latter was given multidisciplinary collaborative nursing. The mental state, quality of life, nursing satisfaction and the occurrence of postoperative complications were compared between the groups. After the intervention, the Self-Rating Anxiety Scale (SAS) and Self-Rated Depression Scale (SDS) scores and the scores of five other parameters for assessing the quality of life of the patients were found to be significantly increased in the research group compared with the control group. The nursing satisfaction was significantly higher (92.00% vs. 74.00%) and the occurrence of postoperative complications was significantly lower (10.00% vs. 44.00%) in the research group than in the control group, respectively. The developed multidisciplinary collaborative nursing model was a safe and effective nursing regimen with high nursing satisfaction and good compliance, which improved the mental state and quality of life and reduced the risk of postoperative complications for patients with breast cancer.

**Keywords**

Breast cancer; Multidisciplinary collaborative nursing; Mentality; Quality of life; Postoperative complications

## 1. Introduction

According to the 2022 National Cancer Center Cancer Report, the incidence of cancer has been continuously increasing in China, with lung cancer ranking first among males and breast cancer among females, creating a continuous rise in incidental deaths [1, 2]. Recently, with the increasing number of research in clinical and nursing treatments and care, several milestones have been achieved. However, there is a distinct gap in the five-year survival rate of breast cancer in China compared with developed countries (90.9% vs. 82.0%), despite breast cancer having a good prognosis, which we believe might be related to the rate of early diagnosis and the variable treatments and care of the advanced cases [3, 4]. In addition to the physical and psychological sufferings caused by breast cancer, the patients' quality of life could be significantly impaired due to adverse events associated with chemotherapeutic agents, changes in body shape, and the occurrence of postoperative complications, contributing to a poorer overall treatment efficacy [5, 6]. In the past few years, various nursing protocols have been proposed and shown varying degrees of clinical effects.

Multidisciplinary collaborative nursing model refers to a multidisciplinary intervention program incorporating interven-

tions from multiple aspects, such as psychology, nutrition and rehabilitation, to improve nursing care. Previous studies have shown that this regimen is effective in the clinical care of various diseases and in improving patients' outcomes [7–9]. However, few studies have focused on the postoperative care of breast cancer. Therefore, this present study aimed to explore the effects of the multidisciplinary nursing model after breast cancer surgery on the patients' mental status, living standards, and the occurrence of adverse reactions such as lymphedema.

## 2. Materials and methods

### 2.1 Objects' general information

Breast cancer cases were screened from January 2019 to March 2022 and included in this study if they met the following inclusion criteria: (1) patients with clinical indications and pathological results meeting breast cancer diagnosis. For instance, if there was an obvious mass in the breast or an axillary lymph node, the nature of the lesion, including its size, location and pathology, was confirmed by breast color ultrasound and pathological biopsy, followed by radical mastectomy [10]; (2) had a stable postoperative condition and an expected survival

>90 days; (3) with high compliance and barrier-free communication to independently complete questionnaires; (4) had complete relevant clinical data and provided signed informed consent, and; (5) without serious organ dysfunctions. Overall, 100 cases were screened from the total surveyed population and divided using the random number method into two groups, a control and a research group, with 50 cases in each group. The general data such as age, Body mass index (BMI) and Tumor Node Metastasis (TNM) stage were relatively similar between the two groups, as shown in Table 1.

## 2.2 Research and nursing protocols

In the control group, the 50 patients received usual nursing care after radical breast cancer mastectomy. The main members of the nursing team were specialists and nurses responsible for routine postoperative medication guidance and wound care, dietary arrangements, scientific rehabilitation exercises, and health education and guidance after hospital discharge.

In addition to the conventional postoperative nursing model, the 50 patients in the research group were treated based on a multidisciplinary collaborative nursing model composed of nursing team personnel, including psychological communicators (from the Psychological department), nutrition physicians (from the Nutrition department), and rehabilitation physicians (from the Rehabilitation department) as well as care under experienced relevant physicians and nurses. After establishing the multidisciplinary team, the team members discussed and clarified the specific tasks and arrangements before study initiation, then underwent professional training. Meanwhile, pre-arranged planning and relevant problem-solution strategies were defined based on the possible adverse events during the treatment process. The cooperation between team members was enhanced by regularly scheduled seminars every week so that the staff of each department was up-to-date on the patient's real-time condition. (1) In addition to completing the patient's daily information (*i.e.*, complications of diabetes), the medical staff closely monitored the levels of various indicators and psychological states. In the case of postoperative hypoproteinaemia (decreased levels of albumin and hemoglobin) or harmful influences on wound healing and rehabilitation because of bone marrow suppression due to chemotherapy, corresponding countermeasures were timely formulated. For instance, personalized diet plans were established by nutrition physicians based on the patient's conditions, such as blood glucose instability and BMI. Nutritional proprietary Chinese medicines were provided according to the patient's corporeity and will, and the principle of personal voluntariness was obeyed during the entire process. (2) The occurrence of postoperative complications, especially lymphedema and subcutaneous effusion, was carefully observed. The rehabilitation physicians correctly guided patients to complete regular postoperative upper limb movements after surgery and meticulously assigned exercises according to the patient's postoperative recovery, such as avoiding lifting weights within 24 hours, shaking elbows in small ways within 2 days, and completing activities such as bathing independently within 4 days after surgery, and were performed under the strict supervision of the nursing staff. The conditions of recovery were recorded. (3) Patients who

suffered from extensive physical and psychological distress due to pathological pain, side effects of chemotherapeutics such as hair loss, and the loss of the breast(s) after surgery, common reasons of patients who underwent radical mastectomy have anxiety and depression, which resulted in delaying postoperative rehabilitation were given counseling. For the issues related to self-appearance, they were advised to wear wigs or were given prosthetic breast(s) by nursing staff. The patients were allowed consultation from the Plastic Surgery department if necessary. In addition, periodical mutual assistance was conducted as postoperative rehabilitation and enhancing communications between patients. The psychological state of the patients was regularly assessed *via* questionnaire surveys, and personalized psychological interventions were formulated based on the different degrees of anxiety and depression. (4) The nursing results were regularly summarized. Based on each patient's problems and probable reasons, the nursing plans were modified so that the whole process was gradually individualized and optimized. (5) In the later stage, good connections were maintained between the follow-up team members and patients. Follow-up visits were performed based on the place of residence and actual external factors and were strictly and regularly performed. Timely and effective measures and interventions were formulated if different complications happened during the follow-up process. We performed follow-up visits every 3 months within two years and every 6 months within 3–5 years after the surgery [10].

## 2.3 Observational index

Patients' mental state and quality of life were assessed before and 3 months after the intervention, their satisfaction with the nursing model was surveyed using questionnaires, and the occurrence of adverse events such as postoperative lymphedema was recorded and analyzed.

## 2.4 Assessment of mental state

Mental status was assessed using the Self-Rating Anxiety Scale (SAS) and the Self-Rated Depression Scale (SDS), comprising a total of 20 tests, each of which used a 4-level (1 to 4) scoring system to assess the frequency of the patient's symptoms, with low to high scores representing no symptoms, short duration, considerable duration, and most or all of the time, respectively. The total score of the 20 tests was counted, and the severity of symptoms was positively related to the score, using a determined cut-off value of 50 points. Patients were graded as normal if they obtained <50 scores, mild anxiety for those scoring 50–60 points, moderate anxiety for those with 61–70 points, and severe anxiety for those scoring >70 points. Depression was assessed based on a determined cut-off value of 53. Mild depression was indicated for patients with 53–62 points, moderate depression for those with 63–72 points, and severe depression for those scoring >72 points.

## 2.5 Quality of life and nursing satisfaction survey

The quality of life before and after treatment was evaluated using Functional assessment of cancer therapy (FACT-B) (Chi-

nese version V4.0) of breast cancer patients. The evaluation was composed of 36 items based on several aspects, including physiological (7 items), social/familial (8 items in total), emotional (6 items), functional (7 items) and additional concerns (9 items), using a five-level scoring of 0–4, with 0 indicating no such performance and 4 as quite, and the total score was summarized. The satisfaction survey was carried out using questionnaires.

## 2.6 Postoperative complications

Follow-up visits were performed on-site if the patients could come to the hospital; otherwise, by phone. The occurrence of postoperative complications was recorded and compared between the two groups.

## 2.7 Statistics

Raw data were summarized and analyzed using Statistical Package for the Social Science (SPSS) v23.0 software (IBM Corp., Armonk, NY, USA). An Independent sample t-test was used for the quantitative data such as mental state and quality of life. The Chi-square test was used for the enumeration of data. A  $p$  value  $< 0.05$  was considered statistically significant.

## 3. Results

### 3.1 The comparisons of the scores of SAS and SDS between groups

The mean values of SAS and SDS scores before intervention between the two groups were similar, and the difference was not significant. Compared with before intervention, the scores of the two groups after intervention were significantly lower, of which the SAS and SDS scores of the research group after intervention were significantly lower than the control group (Table 2).

### 3.2 Comparisons in quality of life

We observed no significant difference in the scores between the two groups before the intervention. However, after the intervention, the scores of the research group were significantly higher than those in the control group, and the difference was statistically significant (Table 3).

### 3.3 Comparisons of nursing satisfaction

Here, the questionnaire survey was used to assess the nursing satisfaction between the two treatment groups. The results showed that the nursing satisfaction of the research group was higher than the control group, and the difference was statistically significant ( $\chi^2 = 7.726, p = 0.021$ ) (Table 4).

### 3.4 Differences in postoperative complications

The postoperative complications after intervention were statistically different between the two groups. Of the 50 cases in the control group, 8 had subcutaneous effusion, 8 had lymphedema of the upper limb, and 6 had mild skin flap necrosis, indicating a postoperative complication rate of 44.00%. Comparatively,

in the research group, 3 patients had subcutaneous effusion, 1 case displayed lymphedema of the upper limb, and another 1 had mild skin flap necrosis, suggesting a postoperative complication rate of 10.00%. Altogether, these results indicated that the occurrence of postoperative complications was significantly reduced in the research group ( $\chi^2 = 15.248, p = 0.002$ ).

## 4. Discussion

Based on the global cancer-related report, a large proportion of cancer patients were from China until 2020 [11], ranking first in morbidity and mortality worldwide. Breast cancer incidence ranks first globally among all cancer types and seriously threatens women's lives [12]. Studies have found that menopausal women are at a high risk of breast cancer. Due to the early screening of tumors and implementation of new treatment options, breast cancer is currently a potentially curable disease with good prognosis, but the fatality rate of this disease has not yet declined significantly [13, 14]. The pathogenesis of breast cancer has not been elucidated and could be influenced by genetic factors, gene mutations and unhealthy lifestyles such as high-fat diet and alcohol consumption [15–17]. Surgery remains the preferred option for patients with no contraindications, and the surgical plan depends on the size of the patient's tumor. However, the implementation of surgical protocols and the use of postoperative chemotherapy drugs can cause varying degrees of side effects, such as gastrointestinal responses, including nausea and vomiting, hair loss, bone marrow suppression, and infection [18, 19]. Related studies indicated that anxiety, depression and fear were common among breast cancer patients [20, 21]. In addition to the physical pain and death risks associated with the disease, high costs of treatment also greatly increase patients' burden. Besides appearance issues related to hair loss, mastectomy also plays a detrimental part in their psychological health. All these postoperative adverse events affect patients' quality of life, ultimately reducing the overall efficacy of treatments.

The multidisciplinary collaborative nursing model is a newly established nursing model internationally that is being increasingly used in the clinical care of heart failure, total knee arthroplasty, endometrial cancer, and liver cancer, where it has shown good clinical results [22–27]. In this study, besides medical workers from the galactophore department, professional nursing staff from the departments of nutrition, psychology and rehabilitation also participated in the nursing process to optimize the nursing plan, rationally allocate medical resources and collaborate as a team to ultimately improve the overall nursing effect. Timely communication and guidance were given to the patients during the perioperative period based on their psychological states; personalized diets were formulated based on the patients' actual conditions, such as complications and illness degrees (for example, the levels of hemoglobin and blood glucose), and close attentions were paid to the possible occurrence of complications. In addition, pre-arranged planning, for example, postoperative rehabilitation training, was made for those likely to encounter postoperative adverse reactions such as subcutaneous effusion and lymphedema. Relevant recommendations regarding appearance issues induced by chemotherapy drugs and

**TABLE 1. General information of the 100 investigated breast cancer patients.**

Group	Cases	Age	Body mass index (BMI)	Tumor Node Metastasis (TNM) stage		
				Stage I	Stage II	Stage III
Control	50	49.13 ± 8.50	22.42 ± 4.04	12	23	15
Research	50	48.47 ± 8.47	22.40 ± 3.47	10	27	13
$t/\chi^2$ value		0.386	0.027		0.645	
$p$ value		0.701	0.978		0.724	

**TABLE 2. The comparisons of the scores of SAS and SDS between the two treatment groups ( $\bar{x} \pm s$ ).**

Group	Cases	Time point	SAS (score)	SDS (score)
Control	50	Before intervention	62.76 ± 7.42	61.50 ± 8.18
		After intervention	47.23 ± 7.61	47.12 ± 6.65
Research	50	Before intervention	65.18 ± 6.87	62.12 ± 6.07
		After intervention	34.57 ± 6.45	34.93 ± 5.86
$t$ value			8.977	9.719
$p$ value			0.000	0.000

Note:  $p$  values represent comparisons regarding each above-mentioned indicator after intervention between control and research groups. SAS: Self-Rating Anxiety Scale; SDS: Self-Rated Depression Scale.

**TABLE 3. The comparisons of living quality between the two groups ( $\bar{x} \pm s$ ).**

Group	Cases	Time point	Physiological state	Social/familial state	Emotional state	Functional state	Additional concerns
Control	50	Before intervention	12.60 ± 1.16	17.76 ± 1.54	15.22 ± 1.30	12.09 ± 1.04	16.86 ± 1.90
		After intervention	14.42 ± 1.58	19.11 ± 1.35	16.14 ± 1.16	12.45 ± 1.16	18.98 ± 2.43
Research	50	Before intervention	12.72 ± 1.30	18.17 ± 1.44	15.18 ± 1.29	12.48 ± 1.16	17.18 ± 1.90
		After intervention	17.01 ± 1.52	20.26 ± 1.48	17.99 ± 1.53	13.43 ± 0.98	20.93 ± 2.27
$t$ value			8.385	4.068	6.803	3.843	4.130
$p$ value			0.000	0.000	0.000	0.000	0.000

Note:  $p$  values represent comparisons regarding each above-mentioned indicator after intervention between control and research groups.

**TABLE 4. The comparisons of the nursing satisfaction survey between the two groups.**

Group	Cases	Satisfied	Somewhat satisfied	Dissatisfied	Satisfaction rate
Control	50	12 (24.00)	25 (50.00)	13 (26.00)	74.00%
Research	50	22 (44.00)	24 (48.00)	4 (8.00)	92.00%
$\chi^2$ value					7.726
$p$ value					0.021



surgery were given according to the actual financial situation of the patients. Altogether, various aspects of nursing care were comprehensively considered to maximize the advantages of nursing care from each participating department.

In this present study comprising of breast cancer patients, the postoperative routine nursing model was used in the control group, while the multidisciplinary collaborative nursing model was given to the research group. The anxiety and depression were compared, the living quality from five aspects, including psychological, functional, familial, emotional and additional states, was assessed, the nursing satisfaction survey was calculated, and the treatment outcomes of the two nursing models were evaluated. As for SDS and SAS, patients in the research group had significantly lower scores than the control group, indicating promising effects of the multidisciplinary collaborative nursing model on ameliorating patients' mental state, which may be associated with the personalized nursing intervention of psychologists [28]. As for the quality of life, the multidisciplinary collaboration significantly improved the five functional scores related to living quality, demonstrating a significant improvement in quality of life. As for the satisfaction survey, patients showed more acceptance of the multidisciplinary collaborative nursing model than the traditional nursing model, which could be reflected by the improvements in patients' quality of life and psychological state.

Postoperative lymphedema and subcutaneous effusions are common postoperative complications of breast cancer, which seriously threaten patients' quality of life [29, 30]. The present study demonstrated that scientific health guidance and exercise supervision not only effectively promoted functional recovery but also significantly reduced the incidence of postoperative complications.

Further, we also explored and confirmed the clinical effects of this scheme from three aspects: the mental state of patients, quality of life, and adverse complications after surgery. However, the specific mechanism of these effects and their potential impact on the patients' serological indicators are still unknown. Thus, additional in-depth research with a larger cohort is still required to further confirm the clinical efficacy of the multidisciplinary collaborative nursing model.

## 5. Conclusions

In summary, the multidisciplinary collaborative nursing model showed promising clinical values in the postoperative rehabilitation of breast cancer patients as it not only effectively improved the patients' mental state and quality of life but also significantly reduced the occurrence of postoperative adverse events. This model made the most of inter-departmental collaborations, which made more patients prone to this nursing regimen.

## AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

## AUTHOR CONTRIBUTIONS

ZQZ—perform material preparation and the experiments. ZQZ and YEX—Perform data collection and analysis. YEX—Written the first draft of the manuscript. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. All authors contributed to the study's conception and design.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Jiangsu Food & Pharmaceutical Science College (HEYLL201942). The research protocol conformed to the ethical standards for human medical research of the 1964 Helsinki Declaration. Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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