Impacts of self-care education on adverse events and mental health related quality of life in breast cancer patients under chemotherapy

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ABSTRACT

Objective: As a consequence of its high incidence, breast cancer has become a severe health risk in women. Chemotherapy is one of the main treatments for breast cancer, but causes a decline in life quality of patients. Self-care is a non-medical intervention and has been reported to improve the life quality of colorectal cancer patients. We aim to explore whether self-care is also effective in breast cancer.

Materials and methods: 85 breast cancer patients under chemotherapy participated in this research, among whom 44 patients received the self-care education. The physical and mental conditions of patients before and after chemotherapy were evaluated by Anxiety Inventory, Rotterdam Symptom checklists and QLQ-C30.

Results: The result showed that the occurrence rates of symptoms were significantly reduced after self-care measures. Anxiety Inventory and Rotterdam Symptom checklists indicated that self-care measures could improve both the physical and mental conditions of patients. The Global Quality of Life (QoL) from QLQ-C30 questionnaire further confirmed the effectiveness of self-care measures in breast cancer patients.

Conclusions: Based on the results, self-care measures are effective in improving the physical and mental conditions of breast cancer patients under chemotherapy. Self-care measures play an important role in improving patients' life quality.

1. Introduction

Cancer is among the top 10 causes of mortality all over the world, and the number of patients diagnosed with cancer is increasing rapidly.[1] Each year in China, based on the statistical data, the number of newly diagnosed cancer patients is over 1.6 million and the number of deaths caused by cancer is over 1.2 million.[2] Breast cancer is one of the most lethal cancers in women. As the most widespread cancer in Chinese females, nearly 12.2% newly diagnosed breast cancer cases and 9.6% deaths caused by breast cancer occur in China.[2]

There are several different breast cancer therapeutic strategies, such as surgery, radiotherapy, chemotherapy, hormonal therapy and targeted therapy.[3] Chemotherapy generates several side effects in physiological state such as pain, insomnia, nausea, loss of appetite, fatigue and hair loss.[4] During the chemotherapy process, cancer patients also suffer psychological pressures, including sadness, depression, hopelessness, anxiety and worry.[5] The damages of these side effects as a result of chemotherapy in both physiological and psychological states are correlated with the time of chemotherapy, relapse occurrence and cancer stage.[6] Overall speaking, the cancer patients' quality of life

(QoL) is reduced by the side effects of chemotherapy.

For the breast cancer patients, chemotherapy is a common therapeutic strategy in suppressing the recurrence and metastasis of tumor.[7] Several different studies have reported that, compared with patients who avoid chemotherapy, patients undergo chemotherapy experience a lower QoL since the physiological and psychological pressures are enhanced.[8–10] As a non-pharmacological treatment, self-care is a process aiming to improve the physiological and psychological states of the patients via giving educational programs to the patients.[11] Based on the self-care theory of Orem, self-care is a self-regulated function based on its ability to perform acts of care. It is defined that self-care is a strategy which can improve the health and quality of life by coping with stressful life events.[12] The knowledge of disease and self-care method from self-care education program can increase the ability of patients with chronic diseases to cooperation of care.[13] It is reported that self-care education program can efficiently reduce the occurrence rates of nausea and emesis, as well as improve the QoL in colorectal cancer patients under chemotherapy.[14] We therefore attempted to investigate the effectiveness of self-care measures in improving the QoL of breast cancer patients under chemotherapy.

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2. Methods

2.1. Participants

85 breast cancer patients were recruited from Cangzhou Central Hospital. All the participants received chemotherapy and were chosen according to the following standards: 1. treated with modified radical surgery after diagnosis of breast cancer; 2. the chemotherapy scheme was combined with cyclophosphamide, fluorouracil injection and hydrochloride epirubicin injection; 3. expected survival time longer than 1 year; 4. older than 18 years; 5. with normal hearing ability; 6.had reading ability to do the questionnaire, consented to the interview, and signed the informed consent form. The experimental protocols were approved by the Ethics Committee of Cangzhou Central Hospital.

2.2. Self-care education

The self-care education was a 12-session course using tools such as picture, video and brochure. The self-care education for reducing the physiological and psychological pressures after chemotherapy also included self-care training. The self-care education included teaching the muscular progressive relaxation technique, listening to music before, during and after the chemotherapy, and the training about nutrition. We designed six training sessions for the patients with duration of 45–60 min. The six training sessions were finished within 2 months.

2.3. Data collection

Rotterdam Symptom Scale was a questionnaire which could reflect the discomfort levels of the participants in both psychological and physiological dimensions. The psychological dimensions included 8 items and the physiological dimensions included 22 items. The severity of discomfort in this questionnaire was divided into 5 different degrees: never, occasionally, sometimes, frequently, corresponding to score of 1–5. Higher score of each item showed a more severe discomfort. Based on the Rotterdam checklist scores for each symptom, participants could be divided into two groups. Patients whose score of a symptom was 1 or 2 were designated into the no symptom group. Patients whose score was 3–5 were deemed as having symptom.

The State-Trait Anxiety Inventory (STAI) questionnaire contained 20 different items. 10 of the items indicated positive emotions and the other 10 indicated negative emotions. The severity of anxiety in this questionnaire was divided into 4 different degrees: not at all, mild, moderate, and very obvious, corresponding to score of 1–4. Higher score showed a more severe anxiety.

QoL was assessed by Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 (version 3.0). The QLQ-C30 questionnaire was composed of 5 functioning scales, 3 symptom scales, 6 single-item scales, and a global QoL scale. The score of each scale was from 0-100. Higher scores in functioning scales indicated higher QoL, higher scores in symptom scales and single-item scales indicated lower QoL.

2.4. Statistical analysis

SPSS17.0 statistical software was employed to analyze data in this work. The student's t-test was employed to show the significance of differences between the intervention group and the control group. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Research design

Research framework of this study was shown in Fig. 1. 115 breast cancer patients participated in the evaluation for eligibility. Based on several different reasons, 17 patients were excluded from the research.
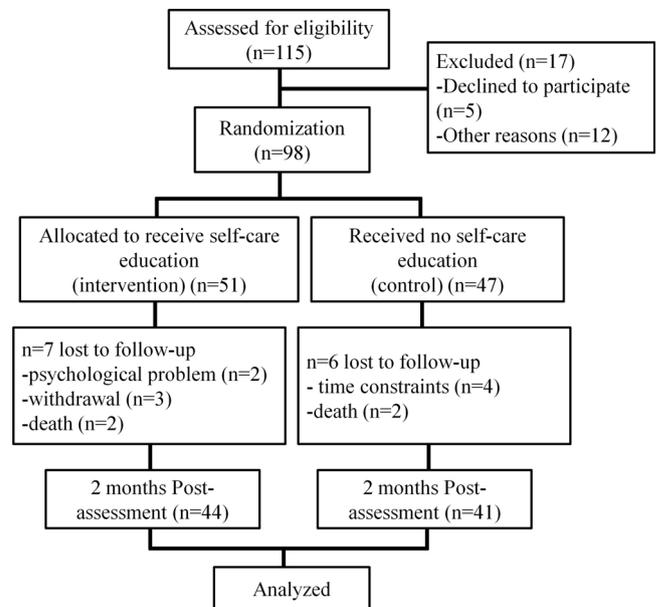

Fig. 1. Research framework of this study.

Finally, 98 patients were recruited to this research and randomly divided in to two groups. Patients (51) in one group received self-care education, and patients (47) in the other group received no self-care education. In the whole experiment, 13 patients quit the study for different reasons (Fig. 1). At last, the intervention group included 44 patients and the control group included 41 patients. All the data analyzed in this research were collected from 44 intervention group patients and 41 control group patients.

3.2. Characteristics of participants

Demographic and clinical characteristics of the study participants were shown in Table 1. All the patient in the experiment were women with average age of 55.4 (± 10.4) and 54.9 (± 12.4). The average weight of each group was 54.6 (± 13.3) kg and 52.5 (± 12.7) kg, with BMI at 23.8 (± 4.8) kg/m^2 and 22.9 (± 5.2) kg/ m^2. 81.2% of the patients were married, 74.1% had less than two children, and 56.5% were not employed. Clinical data indicated that nearly 52.9% of the participants had stage II breast cancer and 58.8% had been diagnosed for more than 1 year. Most of the patients had no relapse occurrence (n = 79, 92.9%) and no psychiatric history (n = 80, 94.1%). The two groups of participants in this analysis had average of 54.7 (± 16.4) days and 60.2 (± 13.1) days after breast surgery, and the average days after the first chemotherapy were 20.8 (± 14.1) and 22.6 (± 16.1), respectively. More than half (61.36% and 56.10%, respectively) of the patients in each group used the anthracycline therapy. The p values calculated by t-test demonstrated that the demographic and clinical characteristics of the participants in the intervention group and the control group showned no significant differences ($p > 0.05$).

3.3. The occurrence rates of symptoms are altered after self-care measures

In the Rotterdam Symptom checklist, the participants scoring 3–5 were considered as suffering from the relevant symptoms. The occurrence rate of each symptom was shown by the percentage of patients scoring 3–5 in each group (Table 2). The 7 different symptoms in Rotterdam checklist were: loss of appetite, lack of energy, nausea, acid reflux, mouth ulcers, cough and back pain. Before receiving the self-care education, the occurrence rate of symptoms had no significant difference ($P > 0.05$) between the control and experimental groups. The comparison between intervention group and control group after

Table 1
Demographic and clinical characteristics of the breast cancer study participants.

Characteristics	Study group		p
	Intervention (n = 44)	Control (n = 41)	
Age (years)	55.4 ± 10.4	54.9 ± 12.4	0.73
Female gender	44 (100%)	41 (100%)	1
Body weight (kg)	54.6 ± 13.3	52.5 ± 12.7	0.46
BMI	23.8 ± 4.8	22.9 ± 5.2	0.44
Marital status			0.43
Married	35 (79.55%)	34 (82.93%)	
Single	9 (20.45%)	7 (17.07%)	
No. of children			0.75
≤ 2	31 (70.45%)	32 (78.05%)	
> 2	13 (29.55%)	9 (21.95%)	
Work conditions			0.45
No	28 (63.64%)	20 (48.78%)	
Yes	16 (36.36%)	21 (51.22%)	
Time of having breast cancer			0.79
≤ 1year	17 (38.64%)	18 (43.90%)	
> 1 year	27 (61.36%)	23 (56.10%)	
Breast cancer stages			0.21
I	7 (15.91%)	4 (9.76%)	
II	22 (50%)	23 (56.09%)	
III	12 (27.27%)	9 (21.95%)	
IV	3 (6.82)	5 (12.2%)	
Relapse occurrence			0.89
No	40 (90.91%)	39 (95.12%)	
Yes	4 (9.09%)	2 (4.88%)	
Psychiatric history			0.71
No	42 (95.45%)	38 (92.68%)	
Yes	2 (4.55%)	3 (7.32%)	
Days since surgery	54.7 ± 16.4	60.2 ± 13.1	0.28
Days since first chemotherapy	20.8 ± 14.1	22.6 ± 16.1	0.22
Chemotherapy protocol			0.47
Taxane-containing therapy	14 (31.82%)	12 (29.27%)	
Anthracycline therapy	27 (61.36%)	23 (56.10%)	
Others	3 (6.82%)	6 (14.63%)	

Values were expressed as n (percentage) or mean ± SD.
BMI: body mass index.

Table 2
Incidences of adverse event symptoms reported for patients included in the trial.

Symptoms		N	Study group		P value (t test)
			Pre-intervention	Post-intervention	
Loss of appetite	Intervention	44	29 (65.91%)	23 (52.27%)	**0.031**
	Control	41	26 (63.41%)	29 (70.73%)	0.14
	p-value (t test)		0.39	**0.001**	
Lack of energy	Intervention	44	31 (70.45%)	25 (56.82%)	**0.013**
	Control	41	30 (73.17%)	35 (85.37%)	**0.029**
	p-value (t test)		0.48	**0.009**	
Nausea	Intervention	44	28 (63.64%)	29 (65.91%)	0.51
	Control	41	28 (68.29%)	33 (80.49%)	**0.028**
	p-value (t test)		0.26	**0.022**	
Acid reflux	Intervention	44	17 (38.64%)	19 (43.18%)	0.14
	Control	41	15 (36.59%)	22 (53.66%)	**0.037**
	p-value (t test)		0.95	**0.019**	
Mouth ulcers	Intervention	44	13 (29.55%)	15 (34.10%)	0.093
	Control	41	14 (34.15%)	20 (48.78%)	**0.034**
	p-value (t test)		0.12	**0.023**	
Cough	Intervention	44	20 (45.45%)	22 (50%)	0.076
	Control	41	18 (43.90%)	23 (56.10%)	**0.038**
	p-value (t test)		0.44	0.16	
Back pain	Intervention	44	18 (40.91%)	14 (31.82%)	**0.041**
	Control	41	17 (41.46%)	21 (51.22%)	**0.035**
	p-value (t test)		0.28	**0.001**	

Values were expressed as n (percentage).

receiving the self-care education indicated that except for cough, all the other symptoms showed significantly decreased incidences in the intervention group (*P* < 0.05). After the self-care measures, the incidences of loss of appetite, lack of energy and back pain showed significant decrease when compared with the rates before treatment in the intervention group. On the other hand, the occurrence rates of these symptoms were elevated without the self-care measures in the control group. These data demonstrated that the self-care measures could decrease the incidences of these symptoms in breast cancer patients.

3.4. Self-care measures influence the scores in Rotterdam symptom checklist and anxiety inventory

Participants in the two groups were all evaluated with Rotterdam Symptom checklist and Anxiety Inventory. In Table 3, before the self-care measures, the scores of anxiety, psychological dimension, physiological dimension and symptom questionnaire had no significant differences between the intervention and control group. After the self-care measures, when compared with the control group, scores of each category showed significant decrease in the intervention group. Meanwhile, it was observed that scores of each category were significantly elevated without the self-care measures in the control group, but decreased or slightly increased in the intervention group.

3.5. Self-care measures improve the life quality of breast cancer patients

To evaluate the life quality of breast cancer patients, we employed the EORTC QoL questionnaire QLQ-C30 version 3.0. As shown in Table 4, before the self-care measures, the scores of all the scales in QLQ-C30 had no significant differences between the intervention and control group. After the self-care measures, the role and emotional in 5 functioning scales, the fatigue and nausea/vomiting in 3 symptom scales, the insomnia in 3 single-item scales, the total symptom scales, and the Global QoL all showed significant decrease in the intervention group when compared with the control group. These data further confirmed that the self-care measures could effectively improve the QoL of breast cancer patients.

4. Discussion

As a type of carcinoma generated from breast tissue, breast cancer has become a severe health problem all over the world.[15] Based on the global statistical data, breast cancer is one of the major causes of death in females.[16] Plenty of studies in the past decades have demonstrated that breast cancer is a multistage carcinoma and can be categorized into several different subtypes.[17] The major strategy for reducing the incidence of breast cancer is combined with precaution, early diagnosis and treatment.[18] The mortality rate of breast cancer can be reduced efficiently with the help of early diagnosis and targeted treatment. Common therapeutic strategies of breast cancer include surgery, radiotherapy, chemotherapy, hormonal therapy and targeted therapy.[1]

In China, chemotherapy is a popular treatment for breast cancer. In invasive breast cancer patients, about 81.4% of them have been treated by chemotherapy.[19] A complete cycle of chemotherapy is approximately 4 months to one year.[20] But 12.1% breast cancer patients treated by chemotherapy in China have been treated less than the minimum recommended standard of four cycles.[19] During the treatment of chemotherapy, several different side effects are encountered in both physiological and psychological states of patients, which negatively influence the QoL. There are 6 common physiological side effects in breast cancer patients, including pain, insomnia, nausea, loss of appetite, fatigue and hair loss.[4] As shown in many other studies, after chemotherapy, nearly 99% of breast cancer patients are tired, approximately 60% of patients have medium to serious fatigue,[21] nearly 65% of

Table 3
Anxiety and Rotterdam checklists for patients included in the trial.

Outcomes		N	Study group		P value (t test)
			Pre-intervention	Post-intervention	
Anxiety scores	Intervention	44	42.3 (5.6)	38.7 (6.4)	**0.042**
	Control	41	41.8 (4.8)	48.2 (7.1)	**0.001**
	p-value (t test)		0.41	**0.001**	
Physiological dimension	Intervention	44	41.8 (6.2)	43.7 (5.3)	0.19
	Control	41	40.6 (5.5)	49.9 (8.7)	**0.019**
	p-value (t test)		0.62	**0.033**	
Psychological dimension	Intervention	44	16.1 (3.4)	12.2 (2.9)	**0.044**
	Control	41	16.7 (4.1)	20.4 (5.1)	**0.039**
	p-value (t test)		0.26	**0.026**	
Symptom questionnaire scores	Intervention	44	58.9 (15.6)	56.3 (17.5)	0.082
	Control	41	56.7 (14.7)	72.8 (20.2)	**0.001**
	p-value (t test)		0.54	**0.001**	

Values were expressed as mean (SD).

Table 4
Quality of Life (QLQ-C30) for patients included in the trial.

Outcomes		N	Study group		P value (t test)
			Pre-intervention	Post-intervention	
Quality of life—EORTC QLQ30 (scale 0–100)					
Global QoL	Intervention	44	59.4 (18.9)	61.3 (21.4)	0.089
	Control	41	60.1 (19.4)	53.9 (23.1)	**0.023**
	p-value (t test)		0.27	**0.011**	
Physical function	Intervention	44	82.2 (20.1)	79.7 (24.2)	0.13
	Control	41	83.7 (18.9)	80.9 (19.7)	0.093
	p-value (t test)		0.32	0.63	
Emotional function	Intervention	44	68.4 (23.5)	74.5 (22.3)	**0.021**
	Control	41	66.9 (20.6)	62.2 (23.8)	0.27
	p-value (t test)		0.26	**0.017**	
Role function	Intervention	44	74.2 (32.7)	71.3 (30.1)	0.096
	Control	41	72.1 (27.4)	64.2 (30.2)	**0.032**
	p-value (t test)		0.54	**0.028**	
Cognitive function	Intervention	44	78.4 (21.1)	76.2 (19.9)	0.41
	Control	41	80.8 (18.7)	77.5 (19.0)	0.38
	p-value (t test)		0.42	0.12	
Social function	Intervention	44	71.6 (21.2)	69.1 (25.1)	0.09
	Control	41	69.8 (24.4)	68.4 (21.7)	0.19
	p-value (t test)		0.18	0.24	
Fatigue	Intervention	44	42.1 (16.1)	37.9 (17.7)	**0.036**
	Control	41	41.2 (14.2)	43.8 (15.6)	0.17
	p-value (t test)		0.45	**0.022**	
Nausea and vomiting	Intervention	44	16.4 (10.6)	8.5 (7.7)	**0.011**
	Control	41	18.1 (13.3)	20.1 (12.8)	0.28
	p-value (t test)		0.17	**0.002**	
Pain	Intervention	44	20.7 (16.4)	23.3 (19.6)	0.72
	Control	41	22.2 (18.3)	23.6 (20.1)	0.51
	p-value (t test)		0.43	0.58	
Diarrhoea	Intervention	44	15.1 (10.8)	13.7 (9.9)	0.24
	Control	41	13.2 (11.7)	16.1 (12.6)	0.22
	p-value (t test)		0.38	0.27	
Dyspnea	Intervention	44	17.4 (12.4)	16.3 (13.6)	0.49
	Control	41	15.8 (10.6)	18.6 (15.8)	0.096
	p-value (t test)		0.36	0.29	
Insomnia	Intervention	44	17.5 (14.2)	5.7 (6.1)	**0.015**
	Control	41	19.3 (15.2)	21.9 (13.7)	0.17
	p-value (t test)		0.41	**0.029**	
Total symptom scales	Intervention	44	15.8 (13.2)	12.8 (10.2)	0.26
	Control	41	16.7 (14.4)	23.1 (17.2)	**0.037**
	p-value (t test)		0.61	**0.022**	

Values were expressed as mean (SD).
QoL: Quality of Life;

patients have insomnia,[22] 47% of patients feel pain with 30% of patients have medium to serious pain,[21] and 6%–74% of patients lose appetite.[6] All these physiological side effects can last for several months or even several years. On the other hand, chemotherapy also affects the psychological states in breast cancer patients. These chemotherapy-related psychological pressures are sadness, depression, hopelessness, anxiety and worry.[5] Recent studies demonstrate that nearly 52% of breast cancer patients have depression, and 20%–30% of them have depressive disorder.[23] Another study even reported that nearly half of breast cancer patients considered suicide after chemotherapy.[24]

As a consequence of being a chronic disease and the side effects caused by chemotherapy in physiological and psychological states, breast cancer has negative effects in the health conditions of the patients. Therefore, it is important for the breast cancer patients to have self-care abilities. Self-care is a non-pharmacological procedure that aims to improve physiological and psychological states of chronic disease patients through some educational process.[25] With the help of self-care education, the clinical conditions of patients can be improved and the expense of hospitalization reduced. The Orem's self-care theory, also called the lack of self-care nursing theory, is a major theory on the importance of self-care in chronic disease patients. The Orem's self-care theory divides the nursing system into three categories: 1. partly compensatory; 2. wholly compensatory; 3. supportive developmental.[26] Among the three categories, supportive developmental (educative) nursing system is mainly focused on improving the self-care abilities of chronic disease patients.[27] In this theory, the self-care ability of patients is related with external variables such as age, revenue, life stage, life experiences, cultural background, available resources and sanitation.[14] Orem's self-care indicates the existence of internal motivations of self-care in all the chronic disease patients. Increasing studies have shown that the self-care measures can improve the health conditions efficiently in patients with chronic diseases, including gastric cancer,[28] colorectal cancer,[29] head and neck cancer[30] and esophageal cancer.[31]

A paper published in 2015 described the levels of self-care behavior in Chinese breast cancer patients receiving chemotherapy, concluding that research into the effects of self-care on breast cancer patients is needed in China and self-care interventions could be revised to assist Chinese women in coping with breast cancer.[32] The purpose of this study is to investigate the effect of self-care measures on the physiological and psychological states of breast cancer patients under chemotherapy. With the help of the Rotterdam Symptom checklist, we examined the occurrence rates of 7 different physiological symptoms after chemotherapy, including loss of appetite, lack of energy, nausea, acid reflux, mouth ulcers, cough and back pain. In the control group, the occurrence rates of all the 7 symptoms were elevated after two months. But in the experimental group, the 2-month self-care measures significantly reduced the numbers of patients suffering from loss of appetite, lack of energy and back pain. The comparison between the experimental group and the control group has shown that there are no significant differences in the occurrence rates of these physiological symptoms before the self-care measures.

After 2 months, the occurrence rates of these symptoms had shown significant reductions in the experimental group except for cough. The score of physiological dimension in Rotterdam Symptom Scale can also reflect the condition of physiological states. In our study, the score of physiological dimension showed a significant decrease in the experimental group patients after being treated with self-care measures, when compared with the control group. QLQ-C30 also indicated that the scores of fatigue, nausea, vomiting and insomnia were significantly decreased after the treatment of self-care measures. These data indicated the beneficial effect of self-care measures on physiological states of breast cancer patients after chemotherapy.

The Anxiety Inventory was employed to measure the psychological states of breast cancer patients. Data acquired from the Anxiety Inventory indicated that the score of anxiety was significantly reduced in the experimental group after the 2-months self-care measures, and the score of anxiety was elevated in the control group. The comparison between the experimental group and the control group indicated a significant reduction in anxiety score in breast cancer patients after the 2-months self-care measures. Therefore, the self-care measures showed a positive function in reducing the anxiety of breast cancer patients after chemotherapy. Meanwhile, the scores of psychological dimensions of Rotterdam Symptom Scale showed a significant decrease in the experimental group patients after being treated with self-care measures, when compared with the control group. The emotional function score in the QLQ-C30 questionnaire showed a great elevation in the experimental group when compared with the control group after the self-care measures. These data have indicated that the self-care measures also play a positive function in the improvement of psychological states in breast cancer patients after chemotherapy.

5. Limitations

We have demonstrated that self-care measures play an important role in improving patient life quality, but limitations of self-care measures also exist. There are many factors influencing one's self-care ability, such as age, growth stage, income, cultural/social awareness, life experiences and available resources.[14] All these external variables indicate that the effects of self-care measures on different patients may be different. Even though the self-care measures improved the QoL of the breast cancer patients, the education of self-care requires long time and many resources, while not all the patients had the chance to receive the self-care education.

6. Conclusion

The results in this work have shown the beneficial effects of self-care measures on breast cancer patients under chemotherapy. The results in this paper have indicated that the self-care education is an efficient strategy in improving the QoL of patients with chronic diseases. In conclusion, self-care measures were effective in improving the physical and mental conditions of breast cancer patients under chemotherapy. Self-care measures play an important role in the improving of patient life quality in clinical settings, which warrants further study into tweaking its effectiveness according to each patient's unique characteristics.

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Disclosure

The authors declare that they have no conflict of interest.

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