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Perceived needs and health-related quality of life in women with breast cancer undergoing chemotherapy: a cross-sectional study

Minjie Li ,[1,2] Kaina Zhou,[2] Lanting Huo,[2] Xiaole He,[3] Jinghua An,[4] Wen Wang,[2] Xiaomei Li[2]

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[1]The Nursing Department, Shaanxi Provincial People's Hospital, Xi'an, Shaanxi, China
[2]Health Science Center, Xi'an Jiaotong University, Xi'an, Shaanxi, China
[3]Department of Nursing, Huizhou Central People's Hospital, Huizhou, Guangdong, China
[4]College of Nursing, University of Illinois at Chicago, Chicago, Illinois, USA

Correspondence to
Dr Xiaomei Li;
submit2015@163.com

ABSTRACT

Objectives Women with breast cancer have different needs that are various in perceived importance and satisfaction. This study aimed to examine the relationship among perceived needs satisfaction, perceived needs importance with health-related quality of life (HRQoL) in women with breast cancer and determine the intermediary role of perceived needs importance in the relationship between perceived needs satisfaction and HRQoL.

Design Cross-sectional design.

Setting Two tertiary level hospitals in Shaanxi Province, China.

Participants Women newly diagnosed with breast cancer were recruited.

Outcome measures The Needs Self-Rating Questionnaire for Breast Cancer and the Medical Outcomes Study 36-item Short-Form Health Survey V. 2.0 were used for data collection regarding perceived needs satisfaction, perceived needs importance and HRQoL.

Results A total of 359 valid questionnaires were collected. The perceived needs importance was negatively associated with physical component summary (PCS) (b=−0.067, p=0.024) and mental component summary (MCS) (b=−0.185, p<0.001). On the contrary, perceived needs satisfaction was positively associated with PCS (c′=0.005, p=0.843), although not statistically significant. Perceived needs satisfaction was positively associated with MCS (c′=0.194, p<0.001) and perceived needs importance (a=0.458, p<0.001). Furthermore, the perceived needs importance suppressed the relationship between perceived needs satisfaction and PCS (a*b=−0.031; 95% CI −0.058 to −0.004) and the relationship between perceived needs satisfaction and MCS (a*b=−0.085; 95% CI −0.138 to −0.043).

Conclusion For women with breast cancer, higher perceived needs satisfaction is associated with higher HRQoL. However, higher perceived needs importance would be conversely associated with lower HRQoL by suppressing the positive association of perceived needs satisfaction with HRQoL. Healthcare providers should pay more attention to those who have high perceived needs importance but low perceived needs satisfaction and fulfil the important needs.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ First study to explore the suppression effect of perceived needs importance in the relationship between perceived needs satisfaction and health-related quality of life.
⇒ The cross-sectional design cannot prove causality accurately.
⇒ Convenience sampling method might cause selection bias.

BACKGROUND

Breast cancer ranks first in incidence rate and second in mortality rate globally.[1] In China, breast cancer accounts for 22.3% of all new cancer cases and 13.8% of all cancer deaths in female population, reflecting a rapidly increasing trend since 1990s.[2 3] The treatment of breast cancer primarily involves surgery and adjuvant therapy, which results in patients' physical and psychosocial problems, such as lymphoedema, hair loss, fatigue, depression and anxiety, thereby leading to a significant impairment in health-related quality of life (HRQoL) of women with breast cancer.[4] Therefore, the gap between actual health status and optimal HRQoL needs should be addressed, and it can be viewed from the perspective of satisfaction and importance.

Perceived needs satisfaction reflects the perceived degree to which general healthcare needs and condition-specific need are met,[5] reflecting the service quality of healthcare system. HRQoL is an outcome that has been frequently studied and previous findings support the association between higher perceived needs satisfaction and better HRQoL in patients with cancer.[6–8] If patients are satisfied with their healthcare, and they perceive that their symptoms or sufferings have been alleviated by healthcare

professionals, then they may have a better health status. However, the influence of perceived needs satisfaction on the quality of life might be affected by the perceived importance of each need by the patients.[9]

The perceived importance of needs indicates the value a person attaches to the outcome of fulfilling such needs.[10] Identifying the important needs of patients with breast cancer is an essential step towards providing tailored supportive care and optimising resources allocations.[5] Better care service from healthcare providers usually results in higher needs satisfaction, which might make patients attach more importance to the corresponding need as medical staff emphasise on such needs. Studies also showed that higher perceived needs satisfaction is related with better health.[6–8] In contrast, a study has shown that higher perceived needs importance is associated with higher anxiety scores and poorer functional status,[11] which indicates that perceived needs importance might affect the internal mechanism between perceived needs satisfaction and health status that are not clear.

According to Costanza and colleagues,[9] the contribution of each fulfilled need to HRQoL varies on the basis of their importance. However, limited evidence supports such claim, and empirical data underpinning the role of perceived needs importance in the relationship between perceived needs satisfaction and HRQoL in patients with breast cancer are warranted. In addition, the relationship among perceived needs importance, perceived need satisfaction and HRQoL in Chinese patients with breast cancer lacks evidence.

According to MacKinnon and colleagues,[12] in mediation context, when the relationship between independent and dependent variables is reduced because of a third variable, this third variable is considered as a mediator. The mediator explains part of the relationship between the independent and dependent variables, and the statistical removal of it could decrease the magnitude of the relationship between the independent and dependent variables.[12] However, the statistical removal of a third variable also could increase such magnitude, which is called suppressor.[12]

If the perceived needs importance is established as a mediator, then interventions targeting the improvement of perceived needs satisfaction may boost perceived needs importance to improve patients' health status. By contrast, if perceived needs importance is established as a suppressor, then clinicians may stratify patients with breast cancer based on their perceived need importance levels and achieve highly perceived importance of needs preferentially because their high perceived need importance is negatively associated with health status. Comprehensive understanding of the perceived importance of needs, perceived needs satisfaction and HRQoL can help healthcare providers identify the important needs and achieve such needs preferentially. Since then, the study aims to examine the relationship among perceived need satisfaction, perceived need importance and HRQoL and examine the role of perceived need importance in the relationship between perceived need satisfaction and HRQoL among women with breast cancer in Mainland China.

METHODS

Study design and settings

A cross-sectional study was conducted in Shaanxi Provincial Tumor Hospital and First Affiliated Hospital of Xi'an Jiaotong University in Xi'an, Shaanxi Province.

Sample size and sampling

Convenience sampling was adopted, and data were collected in patients with newly diagnosed breast cancer from the breast surgery departments of the two hospitals. The inclusion criteria were as follows: (1) patients aged between 18 and 75 years old; (2) female patients with primary breast cancer, confirmed by pathology, (3) had undergone breast cancer surgery (with neoadjuvant chemotherapy or adjuvant chemotherapy), (4) could speak Chinese and (5) able to provide informed consent. The exclusion criteria were as follows: (1) female who have recurrent breast cancer or (2) other severe diseases (eg, other cancer diagnosis or cognitive disorders).

The sample size was estimated using the metric of 5–10 participants per item in the questionnaire survey.[13] The instrument with the most items was the 36-item Short-Form Health Survey V.2.0 (SF-36v2). Thus, the estimated sample size ranges from 180 to 360 patients. Providing sample loss, we enlarged the estimated sample size by 20% and the final sample size estimation was 216 to 432 participants.[13]

Patient and public involvement

Patients or the public were not involved in our study's design, conduct, reporting or dissemination plans.

Measures

A set of questionnaires in Chinese was used in the study, consisting of demographic and clinical characteristic questionnaire, Needs Self-Rating Questionnaire for Breast Cancer (NSQ-BC) and SF-36v2.

Perceived needs importance and perceived needs satisfaction

NSQ-BC is a well-organised instrument for measuring the perceived needs importance and perceived needs satisfaction of patients with breast cancer across a range of domains.[14] NSQ-BC has been validated in patients with breast cancer in China and received satisfactory Cronbach's α for perceived needs importance (0.73) and perceived needs satisfaction (0.71).[15] It has 28 items with five domains: physical needs (five items), psychological/mental needs (six items), self-esteem/respect needs (five items), information needs (eight items) and rehabilitation needs (four items). Discriminant and convergent validity were acceptable.[14] A five-point rating scale (perceived needs satisfaction dimension: 1=totally unmet to 5=totally met; perceived needs importance dimension: 1=completely unimportant to 5=very important) was

used to assess the status of perceived needs satisfaction and perceived needs importance from the perspective of patients.

Health-related quality of life

Quality of life was measured by using SF-36v2, which is a widely used generic HRQoL questionnaire. The domain scores were summarised in two composite scores PCS for physical health and MCS for mental health. The Chinese version of SF-36 has a good reliability with Cronbach's alpha coefficients of 0.91, which is suitable for Chinese breast cancer patients.[16]

Data collection

The study was conducted in China, and eligible participants voluntarily agreed to participate in this study from January to December 2016. Informed consents were obtained from patients, and they were well informed of the purpose of the research, and they can withdraw from the study at any time. The researcher gave the questionnaires to the participants and instructed them to fill the questionnaire by themselves in their bedside. If patients did not understand the meaning of an item, then the interviewer will explain with the same phrases. After data collection, participants will receive a small gift as a reward.

Statistical analyses

Statistical analyses were conducted using IBM Statistical Product and Service Solutions (SPSS) statistics program V.21.0. Descriptive statistics were performed to examine demographic characteristics. Mean value is used in place of the missing data value for the same variable. A series of three-step hierarchical multiple regression was performed to determine the significance of perceived needs satisfaction and perceived needs importance in relation to PCS and MCS. The intermediary role of perceived needs importance was tested using PROCESS procedure (V.3.4) in SPSS.[17] The model was adjusted for demographic and clinical characteristics.

RESULTS

Demographic characteristics

Among the 432 recruited participants, a total of 359 effective questionnaires were finally retrieved with most drop outs not interested in and provided incomplete response. The mean age of participants was 49.7 (SD: 9.8) years. The majority of participants were married (95.8%), and they reported no history of other chronic diseases (80.2%). Most of the participants (62.7%) underwent modified radical mastectomy (online supplemental table 1).

Perceived needs importance and perceived needs satisfaction

Scores on perceived needs importance were higher than the scores on those on perceived needs satisfaction in all five subscales and total score of the two dimensions (online supplemental table 2).

HRQoL

High scores (better HRQoL) were reported for vitality, bodily pain and physical functioning. The PCS score was higher than the MCS score (online supplemental table 3). In addition, the HRQoL of patients with breast cancer was lower than that of normal population in all of the domains with mean score of 50.[18]

Hierarchical multiple regression

Table 1 shows the hierarchical multiple regression results for the PCS. After adjusting the sociodemographic and clinical characteristics, a statistically significant increase in R^2 (0.014) and a significant effect of perceived needs importance on PCS were observed in step 3. The low value of Akaike's information criterion (AIC) in model 3 indicated that the model, which included perceived needs importance, was superior to models 1 and 2.[19] In steps 2 and 3, perceived needs satisfaction was not significantly associated with the PCS after controlling for covariates and perceived needs importance.

In step 2, perceived needs satisfaction was included, which showed additional 3.0% (ΔR^2=0.030) of the variance in MCS (table 2). In step 3, perceived needs importance was included in the model, which accounted for a significant increase in R^2 (0.050) with a positive correlation between perceived needs satisfaction and MCS. The decrease in AIC in model 3 indicates that the model with perceived needs satisfaction was superior to models 1 and 2.

Mediation analysis

The mediating role of perceived needs importance in the relationship between perceived needs satisfaction and health status (PCS and MCS) was examined by PROCESS. Perceived needs satisfaction was significantly associated with perceived needs importance (a=0.458, p<0.001). The results of mediation analysis revealed that perceived needs importance played a suppressive mediating role between perceived needs satisfaction and MCS because the indirect (a×b) and direct (c′) effects have opposite signs (figure 1). Therefore, a higher level of perceived needs satisfaction was associated with greater perceived needs importance, and a higher level of perceived needs importance was associated with worse health status. Thus, the indirect effect of perceived needs satisfaction mediated by perceived needs importance was negatively associated with PCS (b=−0.067, p=0.024; a×b=−0.031, boot 95% CI −0.058 to −0.004) and MCS (b=−0.185, p<0.001; a×b=−0.085, boot 95% CI −0.138 to −0.043). This result showed that when controlling for perceived needs importance, the relationship between perceived needs satisfaction and health status became stronger, indicating that perceived needs importance suppressed the effect of perceived needs satisfaction on PCS/MCS.

Figure 2 shows the fitting curve of the perceived needs importance on PCS/MCS in low and high perceived needs satisfaction groups of patients with breast cancer to elaborate the suppression effect. Perceived needs satisfaction

Table 1 Hierarchical multiple regression examining the PCS

	Step 1 (model 1)			Step 2 (model 2)			Step 3 (model 3)		
	B	SE	P value	B	SE	P value	B	SE	P value
Intercept	43.622	4.056	<0.001	45.960	4.551	<0.001	49.879	4.843	<0.001
Age	−0.010	0.045	0.831	−0.013	0.045	0.767	−0.015	0.045	0.733
Education	−0.885	0.385	0.022	−0.860	0.386	0.027	−0.751	0.387	0.053
Marital status	−3.169	1.817	0.082	−3.056	1.819	0.094	−2.962	1.808	0.102
Monthly income	0.443	0.569	0.437	0.423	0.570	0.458	0.415	0.566	0.464
Residence (ref: rural)	1.077	0.970	0.268	1.173	0.973	0.229	1.239	0.968	0.201
Chronic disease (ref: no)	1.568	0.888	0.078	1.626	0.889	0.068	1.654	0.884	0.062
Cancer stage	−0.549	0.531	0.302	−0.640	0.537	0.234	−0.612	0.534	0.252
Months after surgery	0.207	0.049	<0.001	0.205	0.049	<0.001	0.203	0.048	<0.001
Surgery (ref: modified radical surgery)									
Total resection	1.168	0.865	0.178	1.122	0.866	0.196	1.087	0.861	0.207
Breast reservation	0.879	1.309	0.502	0.895	1.309	0.494	1.143	1.305	0.382
Other	0.365	2.925	0.901	0.552	2.928	0.850	0.974	2.916	0.739
Work status (ref: yes)									
No work	0.848	0.844	0.316	0.863	0.844	0.307	0.701	0.842	0.406
Retirement	0.166	1.080	0.878	0.167	1.079	0.877	−0.256	1.089	0.814
Perceived needs satisfaction				−0.025	0.023	0.259	0.005	0.026	0.843
Perceived needs importance							−0.067	0.030	0.024
ΔR^2	0.092*			0.003			0.014*		
AIC	1114.787			1115.452			1112.314		

*P<0.05.
AIC, Akaike's information criterion; PCS, physical component summary.

was grouped into low and high perceived needs satisfaction groups based on the upper and lower 27% points of perceived needs satisfaction, which was traditionally adopted to test discrimination.[20] Figure 2A shows that at the beginning, patients with breast cancer who have high perceived needs satisfaction had lower PCS than those who have low perceived needs satisfaction. However, with the increase in perceived needs importance, this disparity became smaller until the PCS in the high perceived needs satisfaction group became larger than that in the low perceived needs satisfaction group. Figure 2B shows that with the increase in perceived needs importance, the disparity of MCS in low and high perceived needs satisfaction groups increased. This result also indicated that the role of perceived needs importance in the association of perceived needs satisfaction with PCS/MCS was not a mediator but a suppressor.[12]

Discussion

In this study, the scores in perceived needs satisfaction were all lower than those in perceived needs importance, indicating that the needs of patients with breast cancer were not met. In addition, the HRQoL of patients with breast cancer was impaired by the disease, which was consistent with a previous study.[21] Regression analysis showed an increased coefficient in the relationship between perceived needs satisfaction and PCS/MCS after considering perceived needs importance, although the association with PCS was not significant.

The positive effect of perceived needs satisfaction on mental health has been confirmed by other studies, that is, patients with breast cancer, who have significantly more intense unmet needs have poorer mental quality of life.[22] This effect was also consistent with another study, which showed that unmet physical and psychological needs have a significantly negative association with HRQoL.[23] Improved mental health may result from increasing knowledge in illness and treatment, emotional support and attention from doctors and nurses during therapy and caring.[24] Enhancing patient's knowledge will improve their decision making, dispel myths and misconceptions regarding treatment and reduce their stress and fear in their health.[25 26] Emotional support and attention may result in less chronic sufferings and help patients with the adjustment process, thereby enhancing their HRQoL.[8]

However, the result was inconsistent with previous studies, that is, perceived needs satisfaction was positively associated with PCS.[6 22 27] The reason could be that the physical health of patients with breast cancer undergone surgery has been severely undermined in this study. Meeting their needs cannot obtain significant effects

Table 2 Hierarchical multiple regression examining the MCS

	Step 1 (model 1)			Step 2 (model 2)			Step 3 (model 3)		
	B	SE	P value	B	SE	P value	B	SE	P value
Intercept	34.380	6.017	<0.001	24.335	6.654	<0.001	35.194	6.937	<0.001
Age	0.077	0.067	0.249	0.093	0.066	0.158	0.088	0.064	0.171
Education	−0.534	0.572	0.351	−0.643	0.564	0.255	−0.342	0.554	0.537
Marital status	2.030	2.695	0.452	1.542	2.660	0.563	1.800	2.590	0.488
Monthly income	0.948	0.845	0.262	1.035	0.833	0.215	1.013	0.811	0.212
Residence (ref: rural)	2.780	1.439	0.054	2.367	1.423	0.097	2.550	1.386	0.067
Chronic disease (ref: no)	−0.637	1.317	0.629	−0.884	1.300	0.497	−0.806	1.266	0.525
Cancer stage	−0.472	0.788	0.549	−0.085	0.785	0.914	−0.008	0.764	0.992
Months after surgery	0.108	0.072	0.135	0.117	0.071	0.101	0.109	0.069	0.115
Surgery type (ref: modified radical surgery)									
Total resection	−0.952	1.283	0.459	−0.752	1.266	0.553	−0.848	1.233	0.492
Breast reservation	−2.602	1.942	0.181	−2.670	1.913	0.164	−1.983	1.869	0.290
Other	6.585	4.339	0.130	5.780	4.281	0.178	6.949	4.177	0.097
Work status (ref: employed)									
Unemployed	0.299	1.252	0.812	0.232	1.234	0.851	−0.218	1.206	0.857
Retirement	−1.735	1.601	0.280	−1.740	1.578	0.271	−2.912	1.559	0.063
Perceived needs satisfaction				0.109	0.033	0.001	0.194	0.037	<0.001
Perceived needs importance							−0.185	0.042	<0.001
ΔR^2	0.057			0.030*			0.050*		
AIC	1387.607			1378.252			1359.462		

*P<0.05.
AIC, Akaike's information criterion; MCS, mental component summary.

between perceived needs satisfaction and PCS in a short time when collecting data.

This study is the first to report that perceived needs importance plays a suppressive role in the relationship between perceived needs satisfaction and HRQoL. According to MacKinnon *et al*,[12] the results of third role analysis revealed that perceived needs importance played a suppressive role between perceived needs satisfaction and PCS/MCS. In this study, after controlling for perceived needs importance, the regression coefficient increased from negative to positive between perceived needs satisfaction and PCS but not statistically significant. As shown

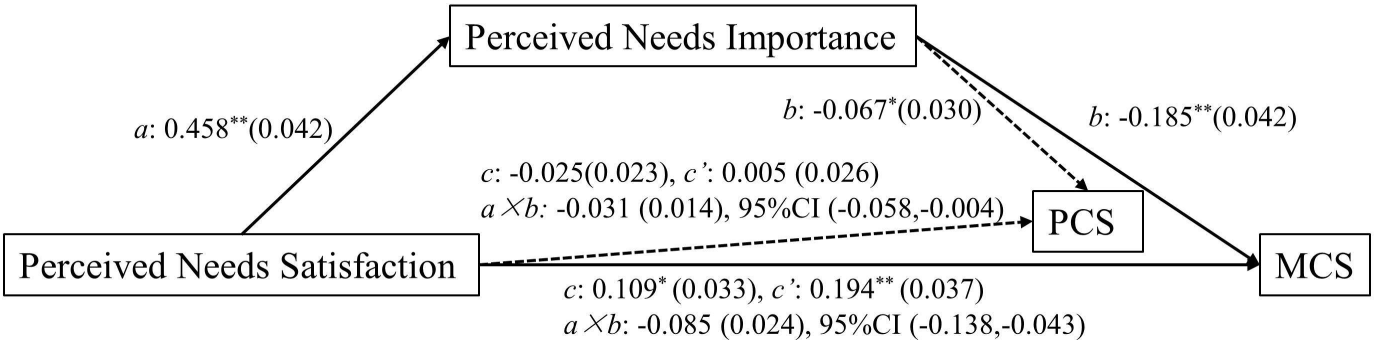

Figure 1 The suppressing effect of perceived needs importance in the relationship between perceived needs satisfaction and PCS/MCS. Notes: models adjusted for age, educational level, marital status, monthly income, residence, work status, chronic disease, cancer stage, months after surgery and the surgery type. Number of bootstrap samples: 5000; *a*: effects of perceived needs satisfaction on perceived needs importance; *b*: effects of perceived needs importance on PCS/MCS after controlling for perceived needs satisfaction and other covariates; *c*: total effects of perceived needs satisfaction on PCS/MCS; *c'*: direct effects of perceived needs satisfaction on PCS/MCS after adjustment for perceived needs importance; *a*×*b*: suppressing effects of perceived needs importance in the relationship between perceived needs satisfaction and PCS/MCS; values in parentheses: SE; *p<0.05; **p<0.01.

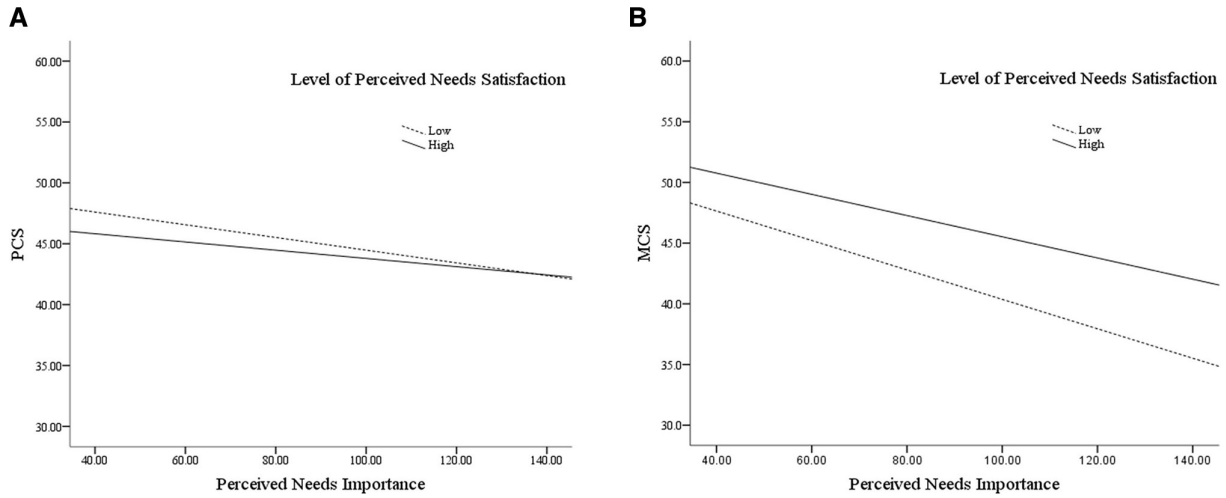

Figure 2 Fitting curve of perceived needs importance on PCS (A) and MCS () in the low and high perceived needs satisfaction levels. MCS, mental component summary; PCS, physical component summary.

in figure 2A, perceived needs importance reversed the negative effect and increased the coefficient of the effect of perceived needs satisfaction on the PCS to a certain extent, but this result was not statistically significant. Further studies on exploring the suppressing effect on PCS were necessary. In addition, an increase in the regression coefficient was observed between perceived needs satisfaction and MCS after including perceived needs importance, which indicated classical suppression.[12]

Figure 2B presents that higher perceived needs satisfaction is associated with higher mental health. However, this positive effect decreased with the increase of perceived needs importance (seen from lower MCS in high perceived needs importance of patients compared with the MCS in low perceived needs importance of patients), and the difference in MCS among the levels of perceived needs satisfaction increased (seen from the larger distance of the MCS from low perceived needs importance to high perceived needs importance) (figure 2B). Compared with patients who have high perceived needs satisfaction, mental health of patients who have low perceived needs satisfaction rapidly decreased with the increase of perceived needs importance (the slope of MCS in the low perceived needs satisfaction level is lower than that in the high perceived needs satisfaction level) (figure 2B). Consistent with the regression analysis results, controlling perceived needs importance increased the magnitude of the effect between perceived needs satisfaction and mental health. The suppressive role of perceived needs importance in the relationship between perceived needs satisfaction and MCS might be attributed to the negative association of perceived needs importance with MCS. Literature has shown that a need is prioritised when it is of great intensity or prevalence and associated with more recent experience and current phase.[6] In this study, patients with breast cancer undergone surgery with adjuvant treatments were usually trapped into symptom burden for pain, drowsiness, appetite loss and restricted upper limb function.[28 29] On the contrary, patients who are under worse circumstances considered their needs more important; thus, high perceived needs importance was negatively associated with HRQoL. Moreover, previous studies[22 30] have suggested that perceived needs satisfaction is positively associated with MCS and perceived needs importance, which is also confirmed in our study. Consequently, high perceived needs importance weakens and suppresses the positive association of perceived needs satisfaction with MCS.

These findings have implications for clinical healthcare. Patients with breast cancer who have high perceived needs importance but low perceived needs satisfaction should be given particular attention from healthcare providers to optimise the worst HRQoL caused by limited budgets and financial pressures. Meanwhile, interventions to improve perceived needs satisfaction are required to eliminate the difference in HRQoL between the high and low perceived needs satisfaction groups.

The present study has several limitations. Although the results suggest that perceived needs importance suppresses the effect of perceived needs satisfaction on HRQoL, the cross-sectional design cannot accurately prove causality. Due to convenience sampling of participants, there might have selection bias. In addition, considering the stages of cancer trajectory, longitudinal studies are recommended for future research to assess the long-term suppression effect of perceived needs importance on the whole treatment.

Conclusion

Perceived needs importance suppresses the effect of perceived needs satisfaction on the physical and mental health status. High perceived needs importance is related to poor physical and mental health status in patients with breast cancer. Compared with that in the high perceived need satisfaction group, the HRQoL in the low perceived needs satisfaction group rapidly decreased with the increase of perceived need importance. Strengthening perceived needs satisfaction in patients with breast

cancer may improve their physical and mental health status. These results have implications on the relationship among needs, health status and clinical healthcare. With regard to needs, perceived needs satisfaction and perceived needs importance should be considered. Healthcare providers should assess the perceived needs importance from the perspective of patients with breast cancer and prioritise the more important need to efficiently promote HRQoL.

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Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by Xi'an Jiaotong university's biomedical research and ethics committees.Reference No.: 2015-170. Participants gave informed consent to participate in the study before taking part.

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ORCID iD

Minjie Li http://orcid.org/0000-0002-0394-730X

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