Support Care Cancer (2016) 24:3775–3782
DOI 10.1007/s00520-016-3195-1

ORIGINAL ARTICLE

Differences in quality of life between American and Chinese breast cancer survivors

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Received: 17 July 2015 / Accepted: 28 March 2016 / Published online: 6 April 2016

Abstract

Objective It has been speculated that cancer survivors in Asia may have lower quality of life (QOL) compared with their Western counterparts. However, no studies have made international comparisons in QOL using a comprehensive measure. This study aimed to compare Chinese breast cancer survivors' QOL with US counterparts and examine if demographic and medical factors were associated with QOL across groups.

Method The sample consisted of 159 breast cancer patients (97 Chinese and 62 American) who completed the Functional Assessment for Cancer Therapy Breast Cancer (FACT-B) scale before the start of radiotherapy in Shanghai, China and Houston, USA.

Results Higher income was associated with higher QOL total scores in both Chinese and American cancer patients, but QOL was not significantly associated with other factors including age, education, disease stage, mastectomy, and chemotherapy. Consistent with hypotheses, compared to their US counterparts, Chinese breast cancer survivors reported lower QOL and all four subdimensions including functional well-being (FWB), physical well-being (PWB), emotional well-being (EWB), and social well-being (SWB); they also reported more breast cancer-specific concerns (BCS). Differences were also clinically significant for Functional Assessment for Cancer Therapy General (FACT-G) scale total scores and the FWB subscale. After controlling for demographic and medical covariates, these differences remained except for the SWB and BCS. Furthermore, Chinese breast cancer survivors receiving chemotherapy reported significantly lower FACT-G scores than those who did not, but this difference did not emerge among US breast cancer survivors.

Discussion Chinese breast cancer survivors reported poorer QOL on multiple domains compared to US women. Findings indicate that better strategies are needed to help improve the

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QOL of Chinese breast cancer survivors, especially those who underwent chemotherapy.

Keywords Quality of life · Breast cancer · Culture · Country

Introduction

Cancer is one of the leading causes of mortality worldwide [1]. Asia represents 60 % of the world's population [2]. It is estimated to experience 45 % of all new cancer cases in the world and 50 % of all cancer deaths in 2008 [3]. China is seeing a change in cancer rates [4] and currently observing a country-wide increase [5]. Breast cancer is among the most frequent types of cancer and alone accounted for 1,383,000 new cancer cases and 519,000 cancer-related deaths in 2008 worldwide [1]. Since 1990, rates of breast cancer in China have increased 3 to 4 % annually, compared to a global annual increase of 0.5 % [6]. As the effectiveness of cancer treatments continues to develop in China, the number of breast cancer patients and survivors will continue to rise. As patients live longer, concern for psychological factors and quality of life (QOL) among this population has grown [7]. Although a growing number of studies have reported QOL in Asian populations, they focus on the validation of measurement and one population. Cross-country comparison of QOL can help to understand possible areas of intervention and how to design culturally sensitive interventions. However, no publications have compared the QOL between Asian and Western breast cancer patients. This paper aims to compare differences in QOL between Chinese and US breast cancer patients.

In 1993, the World Health Organization (WHO) defined QOL as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [7]. This broad ranging concept is affected, in a complex way, by a person's physical health, psychological state, level of independence, social relationships, and relationship to their environment [7]. Many methods have been documented in the literature for the purpose of evaluating the QOL in cancer patients. Of the 12 existing measures, the two most commonly used were the European Organization for Research and Treatment of Cancer's quality of life questionnaire (EORTC QLQ-C30) and the Functional Assessment for Cancer Therapy (FACT) scale [8]. The Functional Assessment for Cancer Therapy Breast Cancer (FACT-B) scale was developed as a means to evaluate a spectrum of QOL components in breast cancer patients specifically. The FACT-B is validated for Chinese; however, no studies have directly compared responses on the FACT-B in Chinese populations to responses from US populations.

Despite the lack of studies comparing Chinese to US populations, there is reason to expect that Chinese cancer survivors may have lower QOL than Americans. For example, Asian American breast cancer survivors have reported lower QOL than their European counterparts [9, 10]; Chinese American survivors are more likely to experience poorer socioeconomic well-being than non-Hispanic White survivors [11]. Qualitative evidence has also shown that Chinese survivors describe more distress than Americans [12]. Based on these findings, we hypothesized that Chinese survivors may have lower QOL compared with the US population.

QOL has become a consistent index of adjustment and an end point in clinical trials in the West [8], but little research has characterized QOL issues in Chinese breast cancer patients. One study with newly diagnosed Chinese breast cancer patients found that income, time since diagnosis, marital status, and education were all independently associated with overall QOL [13]. Other studies with Chinese and US women have observed that younger age was associated with worse QOL in breast cancer patients [14–19]. Chinese breast cancer survivors reported that women who underwent breast conservation therapy had better body image compared to women who had mastectomy alone [20], consistent with results from studies with US women [21]. Patients who undergo chemotherapy have been found to report lower quality of life [22], and this may be especially true for Chinese cancer patients. Other factors, e.g., stage of the disease, were also found to be associated with Chinese cancer survivors' QOL [23–25]. The present study therefore investigated how demographic and disease-related factors were associated with QOL in both countries.

This study was a secondary analysis of existing data from two intervention studies [26, 27]. The primary goal of this study was to compare Chinese breast cancer survivors' QOL with US counterparts. The second goal was to examine how demographic and medical factors were associated with QOL across groups. We hypothesized that Chinese women would have lower QOL compared with the US women (i.e., hypothesis 1). Based on the literature reviewed above, we also hypothesized that lower income and education, younger age, later stage of diagnosis, and more aggressive treatment would be associated with worse QOL (i.e., hypothesis 2), independent of ethnicity. We finally explored whether medical factors differentially influenced QOL depending on ethnicity (Chinese vs. US). We hypothesized that having undergone chemotherapy prior to the start of radiotherapy (assessment point) and later stage of diagnosis would have a greater influence on QOL among Chinese than among US breast cancer survivors (i.e., hypothesis 3).

Methods

Participants

A total of 159 patients (97 Chinese and 62 American) participated in the study. Participants were recruited from two

comparable intervention studies conducted in Shanghai, China and Houston, USA. All the participants who enrolled in these studies were included in this study and met all inclusion and exclusion criteria of parent studies, which were the same criteria for this study. Detailed information on the study methods has been published previously [26, 27]. Eligible Chinese patients were identified by physicians and research nurses at the breast cancer clinic. These patients were scheduled for radiotherapy at Fudan University Shanghai Cancer Center (FUSCC) in Shanghai, China. Eligible US patients were identified through the Cardiac Arrest Registry to Enhance Survival (CARES) database, which is an institutional database that keeps track of patient schedules at MD Anderson Cancer Center. These patients were undergoing radiotherapy in the Department of Radiology Oncology, at MD Anderson Cancer Center. Inclusion criteria were (1) women 18 years or older, (2) with stage 0–III breast cancer, and (3) completed surgery and/or chemotherapy and had not started radiotherapy. Additional inclusion criteria were reading, writing, and speaking fluency in Chinese for Chinese women or English for US women. The study excluded patients with any major psychiatric diagnoses or metastatic disease.

Procedures

Patients were recruited and provided written informed consent prior to the start of radiotherapy. All patients had completed surgery and/or chemotherapy prior to consent. In the Qigong intervention study, 123 Chinese patients were approached, 100 patients consented and were randomized, and 96 completed the survey, yielding a response rate of 96 %. In the Yoga intervention study, 137 of the US patients were approached, 81 consented, 71 were randomized, and 61 completed the survey, resulting in a response rate of 75.3 %. After patients consented to the study and before they were randomized to the experimental or control groups, a 45-min battery of questionnaires was given at baseline to measure QOL and demographic information, and medical data was extracted from patient charts and electronic medical record. The MD Anderson Institutional Review Board approved both studies, and the Fudan University IRB approved the Chinese study.

Measures

QOL was measured by FACT-B version 4. This measure is validated for both Chinese and US breast cancer patients [28, 29]. Participants respond on a Likert scale ranging from 0 (not at all) to 4 (very much). The instrument has a total of 36 statements asking respondents to rate how true each statement is for the last 7 days. One of the items in the social well-being subdimension asked about sexual satisfaction and was largely skipped by Chinese participants; therefore, this item was excluded from the analysis in this paper. The FACT-B consists of the Functional Assessment for Cancer Therapy General (FACT-G) scale [28], with the addition of breast cancer-specific questions. The FACT-G has four subscale scores: physical well-being (e.g., "I have nausea."), functional well-being (e.g., "I am able to work, including work at home."), emotional well-being (e.g., "I feel nervous."), and social/family well-being (e.g., "I am satisfied with family communication about my illness."). Responses are summed for a total score, with greater scores indicating higher QOL. The BCS subscale addresses breast cancer-specific concerns (e.g., "One or both of my arms are swollen or tender."), with higher scores on this dimension indicating fewer concerns and better QOL. In this current study, for group comparison, we reported the FACT-G subscale and total scores and BCS subscale separately so that future studies with non-breast and breast cancer survivors can compare the FACT-G score with our report. Prior literature demonstrates that the alpha coefficients of the whole scale are 0.92 and 0.90 and for each subscale ranges from 0.82 to 0.88 and from 0.82 to 0.85 in US and Chinese samples, respectively.

Data analyses

In the preliminary analyses, descriptive statistics were computed within each of the cultural samples and cultural group. Comparisons of all the variables were conducted with ANOVAs or chi-squared tests. Correlation coefficients of all variables were computed with Pearson correlations, Spearman correlations, or cross-tabulations. For all the analyses below, we first used the FACT-G total score and the BCS score as the dependent variable. When group differences emerged in the FACT-G total score, each subscale of FACT-G was used as a dependent variable to further illustrate cultural differences in a particular domain of QOL.

To test hypothesis 1, ANOVAs were performed with cultural groups as an independent variable. To rule out the possibility that the findings were confounded with demographic and cancer-related characteristics, ANCOVAs were conducted controlling for all the demographic and medical variables including age, disease stage, surgery type (mastectomy vs. conservation breast surgery), chemotherapy (yes vs. no), income, and education. When statistically controlling for income, we used the relative income compared with the mean within the group, rather than the absolute value to adjust for country-related differences in income. To test hypothesis 2, regression analyses were used with QOL and subscales as dependent variables and with all demographic and medical variables (age, disease stage, surgery type, chemotherapy, income, and education) entered as independent variables. To test hypothesis 3, ANCOVAs were conducted to examine how disease stage and chemotherapy would separately interact with cultural groups in predicting QOL when controlling for all demographic and medical variables. For significant interaction

effects, we conducted simple effect analyses to illustrate how these variables would be differently associated with QOL within each of the two cultural samples [30].

Results

Sample characteristics and country comparisons are shown in Table 1. Compared with the US sample, the Chinese sample was younger, poorer, less educated, and had a higher percentage of women that had undergone chemotherapy, even though there were no disease stage differences. ANOVAs for hypothesis 1 showed that Chinese breast cancer survivors reported lower scores for FACT-G total, all FACT-G subscales, and BCS than their US counterparts (Table 2). ANCOVA analyses revealed that after controlling for covariates including age, disease stage, mastectomy, chemotherapy, income, and education, the above cultural differences remained significant except for BCS and the social well-being (SWB) subscale.

Regression analyses for hypothesis 2 for the combined populations revealed that after controlling for other demographic and medical variables, income was positively associated with FACT-G total scores ($\beta = 0.31$, $p = 0.001$) and three subscales of FACT-G, including physical well-being (PWB; $\beta = 0.21$, $p = 0.03$), SWB ($\beta = 0.38$, $p < 0.001$), and functional well-being (FWB; $\beta = 0.29$, $p = 0.002$). FACT-G was not significantly associated with other factors including age, education, disease stage, mastectomy, and chemotherapy. However, age was positively associated with BCS ($\beta = 0.18$, $p = 0.04$), and having chemotherapy was negatively associated with PWB ($\beta = -0.21$, $p = 0.04$), after controlling for the other demographic and medical variables.

Analyses for hypothesis 3 found significant interactions between cultural group and chemotherapy predicting FACT-G total scores, $F(1, 138) = 6.63$, $p = 0.01$, $\eta_p^2 = 0.046$, even

Table 1 Demographic and cancer-related characteristics of the samples

	Total $N = 159$, n (%)	Chinese $N = 97$, n (%)	American $N = 62$, n (%)	F/χ^2	df	p
Age				15.53	2	<0.001
25–45 years	54 (34.0)	38 (39.2)	16 (25.8)			
46–55 years	61 (38.4)	43 (44.3)	18 (29.0)			
56–68 years	44 (27.7)	16 (16.5)	28 (45.2)			
Annual personal income				15.66	2	<0.001
Below average	9 (5.7)	6 (6.2)	3 (4.8)			
Average	50 (31.4)	43 (44.3)	7 (11.3)			
Above average	65 (40.9)	33 (34.0)	32 (51.7)			
Missing	35 (22.0)	15 (15.5)	20 (32.3)			
Educational attainment				35.11	2	<0.001
High school or lower	51 (32.1)	44 (45.4)	7 (11.3)			
College	80 (50.3)	47 (48.4)	33 (51.3)			
Graduate degree	25 (15.7)	4 (4.1)	21 (33.9)			
Missing	3 (1.9)	2 (2.1)	1 (1.6)			
Disease stage				1.11	3	0.78
0–I	47 (29.5)	28 (28.9)	19 (30.7)			
II	62 (39.0)	35 (36.1)	27 (43.5)			
III	40 (25.2)	24 (24.7)	16 (25.8)			
Missing	10 (6.3)	10 (10.3)	0 (0)			
Mastectomy				2.16	1	0.14
Yes	79 (49.7)	53 (54.6)	26 (41.9)			
No	79 (49.7)	44 (45.4)	35 (56.5)			
Missing	1 (.6)	0 (0)	1 (1.6)			
Chemotherapy				15.73	1	<0.001
Yes	22 (13.8)	92 (94.8)	45 (72.6)			
No	137 (86.2)	5 (5.2)	17 (27.4)			

The cutoff points of average and below average income are retrieved from government reports for each cultural sample, which are $8000 and $1500 (currency rate, 6.34 Yuan = US$1) in the Chinese sample and are $50,000 and $20,000 in the US sample

Table 2 Mean, standard deviation, and comparison of quality of life between Chinese and US breast cancer patients

	Chinese (N = 97)	American (N = 62)	F	df	p	η_p^2
FACT-G (26 items)	72.45 (15.31)	83.30 (12.25)	22.10	1	<0.001	0.123
PWB (7 items)	19.73 (5.27)	22.52 (4.13)	12.46	1	0.001	0.073
SWB (6 items)	19.29 (4.07)	21.34 (3.58)	10.54	1	0.001	0.063
EWB (6 items)	17.68 (4.46)	19.92 (3.27)	11.58	1	0.001	0.069
FWB (7 items)	15.75 (5.19)	19.53 (5.27)	19.84	1	<0.001	0.112
BCS (9 items)	22.30 (4.88)	24.13 (4.67)	5.51	1	0.020	0.034

FWB functional well-being, *PWB* physical well-being, *EWB* emotional well-being, *SWB* social well-being, *BCS* breast cancer-specific concerns

after controlling for demographic and other medical covariate variables. Simple effect analysis demonstrated that Chinese breast cancer survivors receiving chemotherapy (M = 71.55, SD = 14.52) reported significantly lower FACT-G than those who did not (M = 86.20, SD = 12.44), F(1, 138) = 7.73, p = 0.006, but such difference did not emerge among American breast cancer survivors, F(1, 138) = 1.94, *ns* (see Fig. 1). Subscale analyses revealed that cultural group × chemotherapy interaction effect were significant on PWB, F(1, 138) = 4.00, p = 0.047, η_p^2 = 0.028, and EWB, F(1, 138) = 5.95, p = 0.016, η_p^2 = 0.041. Chinese breast cancer survivors who had chemotherapy (M_{PWB} = 19.44, SD = 5.21) reported significantly lower PWB than those who did not (M_{PWB} = 25.00, SD = 3.32), F(1, 138) = 11.63, p = 0.001. However, US breast cancer survivors who had chemotherapy (M = 20.50, SD = 2.71) reported better EWB than those who did not (M = 18.50, SD = 3.*87*), F(1, 138) = 4.87, p = 0.03.

Because the Chinese sample had a significantly higher percentage (94.8 %) undergoing chemotherapy compared with the US sample (72.6 %) and only five Chinese women did not receive chemotherapy, we also compared QOL among those with chemotherapy controlling for other covariates. Chinese breast cancer survivors receiving chemotherapy had significantly lower FACT-G, F(1, 119) = 11.97, p = 0.001, η_p^2 = 0.091, PWB, F(1, 119) = 5.81, p = 0.018, η_p^2 = 0.047, EWB, F(1, 119) = 9.17, p = 0.003, η_p^2 = 0.072, and FWB, F(1, 119) = 9.53, p = 0.003, η_p^2 = 0.074, than did their US counterparts, and no group differences emerged for SWB, F(1, 119) = 3.05, ns, or BCS, F(1, 119) = 1.38, ns.

The cultural group × disease stage interaction was significant for FACT-G even after controlling for demographic and other medical variables, F(2, 136) = 4.32, p = 0.05, η_p^2 = 0.06; see Fig. 2. Simple effect analysis revealed that Chinese breast cancer survivors with stage II (M = 66.58, SD = 2.40) had significantly lower FACT-G than those with stages 0–I (M = 78.86, SD = 12.30), F(2, 136) = 7.50, p = 0.001, but such difference did not exist in the US sample, F(2, 136) = 1.73, ns. The Chinese breast cancer survivors scored lower on FACT-G compared to the US women if they were at stage II, F(1, 136) = 12.86, p < 0.001, and stage III, F(1, 136) = 5.05, p = 0.03, but not at stages 0–I, F(1, 136) = 0.52, ns. Subscale analyses showed that cultural group interacted with disease stage on EWB, F(2, 136) = 3.78, p = 0.03, η_p^2 = 0.05, only. Simple effect analyses demonstrated that Chinese survivors at stage II (M = 15.97, SD = 4.49) displayed significantly lower EWB than those at stages 0–I (M = 19.54, SD = 3.04), F(2, 136) = 7.59, p = 0.001, but such difference did not exist in the US sample. No significant group and disease stage interaction merged for BCS.

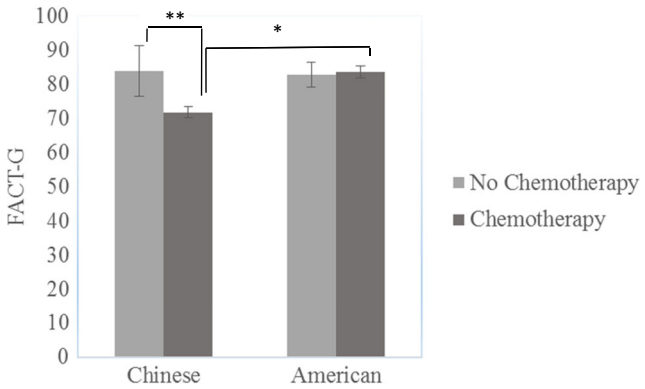

Fig. 1 Interaction effects between chemotherapy and cultural group on FACT-G. *p < 0.05, **p < 0.01

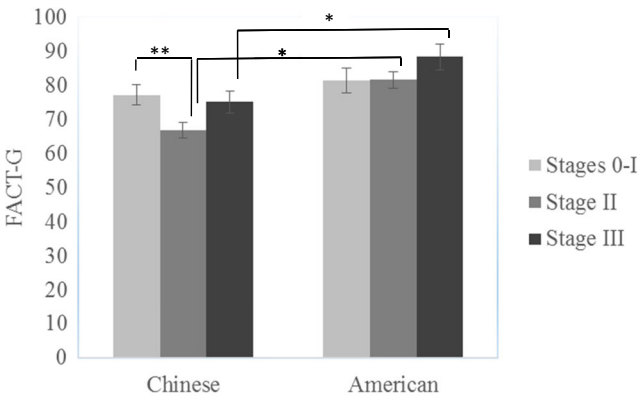

Fig. 2 Interaction effects between cancer stage and cultural group on FACT-G. *p < 0.05, **p < 0.01

Discussion

Although the rates of breast cancer have been rising in Asian populations [5], there has been a lack of understanding of the QOL among Asian cancer survivors. Furthermore, previous studies have not compared Asian breast cancer survivors' QOL with Westerners. Studies that have been conducted separately, either in the USA or China, are difficult to compare as a result of inconsistencies in the time points assessed, tools used for assessment, and the population of breast cancer patients examined. This is the first study that has compared responses on the FACT-B in Chinese and US women with breast cancer. Both populations were obtained from a similar group of patients and examined at the same time point (before the start of radiotherapy).

This study revealed that Chinese breast cancer survivors had lower overall FACT-G total scores compared to US women. Furthermore, Chinese women reported lower levels of functional, physical, social, and emotional well-being and more breast cancer concerns than US women. A difference in FACT-G total scores of 5–7 points is indicative of clinically significant QOL changes/differences [31]. On average, Chinese women were 11 points lower on the FACT-G total score compared to the American, which is considered a clinically significant difference. Moreover, the differences remained pronounced in multiple domains of QOL including functional, physical, and emotional well-being even after controlling for age, disease stage, mastectomy, chemotherapy, income, and education. The more salient differences emerged for the functional well-being subscale ($\eta_p^2 = 0.112$), where differences were also clinically significant (>3).

The Chinese sample was poorer, younger, less educated, and more likely to have undergone chemotherapy compared with the US sample. The finding that Chinese women were younger on average than US women is consistent with prior research showing that Chinese women are being diagnosed with breast cancer at a younger age than US women [32]. Even after statistically controlling for these variables, the Chinese women still had worse quality of life. This suggests that perhaps symptom control strategies were not as aggressive for the Chinese as the US women. Nevertheless, it is still possible that income and greater use of chemotherapy could be reasons for country differences in QOL. Those who have undergone chemotherapy have been found to report lower quality of life [22]. It could be possible that Chinese patients undergo more aggressive treatment or take drugs that have more adverse side effects. Yet, symptom control strategies may also be different, and these data were not collected. Further investigation is needed.

The interaction effect also provided some possible explanations. Chinese patients who underwent chemotherapy were at later cancer stages and had a much worse quality of life compared to their US peers, whereas Chinese patients who did not receive chemotherapy and were at an early cancer stage were similar to their US peers. These findings suggest that more attention needs to be paid to improve QOL among those with chemotherapy and those at more advanced cancer stages. We did not find surgery type to be differentially linked to QOL. Future studies need to investigate symptom control strategies that may have contributed to the country differences in QOL.

Higher income was associated with higher QOL total score in both Chinese and US samples, a finding consistent with previous studies in Caucasian populations [10, 15, 33]. Past research also suggests that younger age and less education are associated with poor QOL [22, 34, 35]. We only found an association between younger age and worse QOL in the US breast cancer survivors. This may be a result of the small sample size, relative homogeneity of the samples, the fact that the Chinese women were significantly younger and less educated than the US women, and confounded by other medical and demographic facts known to be associated with QOL. Studies in Chinese populations have inconsistently found associations with stage of disease and some subscales of the FACT-G [13, 36]. In some studies, FACT total score included the breast cancer concern subdimension, and others did not include this subdimension. In order to easily make the comparisons between this study and other studies reported FACT scores, we calculated the FACT-G total separately from the BCS scale and reported the four subdimensions and breast cancer concerns separately so that future studies can make comparisons with our findings.

Comparison of responses on the FACT-B in Asian and US breast cancer patients has not been previously conducted. The FACT-B has been used in many studies in US breast cancer patients, and even with the differences in the time QOL was assessed across studies [15, 19, 37], scores on the FACT-B subscale scores were similar to our US sample. A previous study validated the FACT-B in Chinese breast cancer inpatients at an Oncological Hospital in Yunnan providence [29]. The women in that study scored lower in all FACT-B scales compared to Chinese women in our study. The women in our study were treated in Shanghai at one of the best hospitals in China. If the women in our study have better QOL than Chinese women treated in other regions, the differences between Chinese women from regional hospitals and US women may even be larger.

Several caveats of the current study are worth mentioning. The study examined the country difference in QOL with two convenience samples, which limits the generalizability. However, the Chinese women in our study reported higher QOL than Chinese women in two other studies, suggesting that the major conclusion of the study that Chinese women had worse QOL could be generalized to Chinese women from other regions within China. Second, the small sample size limited our analyses of interactions between covariates and

cultural groups. There were a smaller number of breast cancer survivors without chemotherapy in the analysis for cultural group by chemotherapy interaction. In addition, a limited number of covariates were examined. Other covariates that have been shown to be associated with QOL in both Chinese and US populations need to be included as well; these factors include marital status, time since diagnosis, comorbidity factors, and social support [23–25, 36]. Other factors have also been shown to influence QOL, such as pain, fatigue, and anxiety [18]. Future studies should examine the relationship between these factors and QOL in both groups. We were also not able to extract medical data related to symptom control strategies used for the women, such as medications for nausea and vomiting, fatigue, and sleep disturbances. Differences in symptom control strategies may explain some of the QOL differences. Finally, although the FACT-B is validated in Chinese, it may not be completely comparable across populations and contain questions that introduce bias into study results. Future studies using a mixed paradigm with both qualitative and quantitative data may shed light into the cultural equivalence of the questions.

In sum, this study demonstrated that Chinese breast cancer survivors had worse QOL compared with US counterparts, and these differences were clinically significant. Treatment and cancer stage may have contributed to group differences. However, extra efforts are needed to help improve QOL of Chinese breast cancer patients. Future studies are warranted to further understand what contributed to country differences in QOL and how to design better behavioral and medical interventions to improve women's lives in countries where QOL needs to be improved.

Acknowledgments Support was provided in part by the US National Cancer Institute (NCI) grants CA108084 and CA121503 (principal investigator, Lorenzo Cohen) and the American Cancer Society MRSGT-10-011-01-CPPB (principal investigator, Qian Lu). Partial support for Lorenzo Cohen was provided by the Richard E. Haynes Distinguished Professorship in Clinical Cancer Prevention. Jennifer McQuade is supported by an institutional T32 training grant and an ASCO Young Investigator Award.

Compliance with ethical standards

Financial disclosures There are no financial disclosures from any authors.

Conflict of interest The authors declare that they have no conflict of interest.

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