Unmet needs mediate the relationship between symptoms and quality of life in breast cancer survivors

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Abstract
Purpose This study aimed to compare the symptoms, unmet needs, and QoL reported by women at 6 months to <2 years and 2 to 5 years following surgery and adjuvant treatment for breast cancer. It also evaluated the relationships among symptoms, unmet needs, and QoL using structural equation modeling.

Methods In this study, 113 and 137 survivors following breast cancer treatment 6 months to <2 years and 2 to 5 years, respectively, completed the Memorial Symptom Assessment Scale, the Supportive Care Needs Survey-34, and the Medical Outcomes Study 12-item Short Form Health Survey version 2.0 during their medical follow-up.

Results The mean numbers of symptoms and unmet needs were 5.43 and 3.0, respectively, for survivors at <2 years, and 5.24 and 2.42, respectively, for survivors at 2 to 5 years following treatment. The most common reported symptoms were related primarily to physical domains. No significant differences were found between the two survivor groups on the MSAS scores. Survivors at <2 years reported significantly higher scores in Psychological and Health Care System/Information needs \( (p<0.01) \), and lower composite scores in physical and mental QoL \( (p<0.05) \) than those at 2 to 5 years post-treatment. Significant direct and indirect effects were found of symptom burden through unmet needs on survivors’ physical and mental QoL after adjustment for survival time, and the models showed a good fit.

Conclusions Results suggest that breast cancer survivors continue to endure many symptoms independent of the survivorship period. The unmet needs mediate the relationship between symptom burden and survivors’ QoL.

Keywords Breast cancer · Cancer survivorship · Symptoms · Unmet needs · Quality of life

Introduction

The overall 5-year relative survival rates for localized and regional breast cancer have been reaching 98.6 and 83.8 %, respectively [1]. The survival rates are expected to continue to increase, resulting in an increasing population of patients with supportive care and psychosocial needs as they are predisposed to the risk of potentially long-term or late effects of their cancer treatment and psychosocial concerns [1]. Effective and quality long-term survivorship care has gained an ever greater emphasis in clinical practice and research. Nevertheless, survivorship is an evolving concept in the literature, in which medical professionals define a cancer survivor as a patient who has a minimal risk of cancer recurrence (5 years after completing treatment) [2]. The latest model of cancer survivorship incorporating psychosocial concepts has suggested several distinct phases of survival: the time from diagnosis to the end of primary cancer treatment (acute survival), the transition from treatment completion to return to normal (transitional survival) and from observation to surveillance (extended survival), and the period of living with cancer (chronic survival) towards permanent (long-term disease-free survival) [3, 4]. Clinically, the first 5 years post-treatment (transitional and extended survival period) would be a
The morbidities and distress resulting from cancer- and cancer treatment-related symptoms can lead to unmet needs across a range of domains, and vice versa. To date, symptom burden, unmet needs, and QoL have never been evaluated together in the BCS setting. In addition, the correlation and regression modeling used in previous studies did not allow the exploration of all possible relationships among the study variables and their feedbacks (reciprocal relationships). Also, both the independent and dependent variables would not allow multiple indicators of broader constructs. It should also be noted that 5 years post-treatment is a wide time period and we do not know if the women at the first 2 years post-treatment have similar or different symptoms and unmet needs to those between 2 and 5 years post-treatment. This study aimed to compare the symptoms and unmet needs reported by BCS at 6 months to less than 2 years and at 2 to 5 years following primary cancer treatment. It also evaluated the direct and indirect effects (via unmet needs) of the symptom burden on the QoL of BCS after adjustment for time since treatment completion.

Methods

This cross-sectional study was conducted in a regional hospital in Singapore with the approval of the Institutional Review Board (Ref No. 2011/01844). The subjects recruited were aged 21 or above and had completed primary cancer treatment (surgery ± adjuvant cancer therapy) between 2007 and 2011 (6 months to 5 years previously). Those who expressed an interest in participating were recruited for the study at their follow-up appointment, and written informed consent was obtained before enrollment in the study. The enrolled subjects completed the self-reported Memorial Symptom Assessment Scale (MSAS), the Supportive Care Needs Survey (SCNS-34), and the Medical Outcomes Study 12-item Short Form Health Survey version 2.0 (SF-12v2). The details of subject recruitment process, and the preliminary findings related to the prevalence of perceived symptoms and unmet needs have been reported elsewhere [14].

Instruments

The MSAS, comprising 32 items, was used to measure the symptom prevalence, frequency, and severity. The score for that symptom was determined as the average of the scores on the severity, frequency, and distress scales if a symptom is being experienced. The scoring of the MSAS yields several subscale scores, including a Physical Symptom subscale score (PHYS), a Psychological Symptom subscale score (PSYCH), and a Global Distress Index (GDI), as well as a total MSAS score (TMSAS) [15]. In the current study, Cronbach’s alphas were from 0.72 to 0.78.

The SCNS-34, consisting of 34 items with five domains, was used to measure the patients’ perceived level of unmet needs. They are Physical/Daily Living needs, Psychological needs, Patient Care/Support needs, Sexuality, and Health Care System/Information needs domains. The need for help for each item is rated using a 5-point scale. A score of 3 or above indicates an unmet need for that particular item [16]. Cronbach’s alphas in our study were from 0.70 to 0.91.

The SF-12v2 was used to measure QoL. It contains eight domains: physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, energy/vitality, social functioning, role limitations due to emotional problems, and mental health. Two summary component measures are obtained: the Physical Component Summary (PCS) and the Mental Component Summary (MCS) [17, 18]. We used Singapore population norms and weights to compute the PCS and MCS [19]. Cronbach’s alphas for PCS and MCS in our sample were 0.79 and 0.81, respectively.

Statistical analysis

Data were analyzed using SPSS and AMOS software version 22.0 for Windows. The Student t test was used to compare the MSAS, SCNS-34, and SF-12v2 subscale and total scores between BCS at 6 months to <2 years and at 2 to 5 years. All tests of significance were two-sided and a p value <0.05 was considered statistically significant. In this study, both symptom burden and unmet needs were hypothesized to have a direct effect on QoL, and symptom burden was also hypothesized to have an indirect effect on QoL mediated by unmet...
needs. The hypothesized direct and indirect effects among the latent variables of symptom burden, unmet needs, and QoL were evaluated using structural equation modeling in two stages, to determine how well the subscale/domain scores could be combined as measured indicators for the latent variables using confirmatory factor analysis, and to examine the structural relationships among the latent variables. The structural model consisted of one exogenous latent variable (symptom burden) and two endogenous latent variables (unmet needs and QoL), and was tested separately for physical and mental QoL. Standardized path estimates were estimated for each latent variable. All analyses were adjusted for the number of months since treatment completion. All models were estimated using the Maximum Likelihood method. Model fit was evaluated based on \( \chi^2 \) statistics, the ratio of the \( \chi^2 \) to degrees of freedom (CMIN/DF), CFI, and RMSEA. For this study, an acceptable cut-off for CMIN/DF ranged from 1.0 to \(<2.0\), while the CFI, TLI, and RMSEA were \(>0.95\), \(>0.95\), and \(<0.05\), respectively [20].

**Results**

**Subjects’ characteristics**

A total of 468 eligible subjects were identified, of which 250 (53.4 %) agreed to participate and to sign the informed consent form. Reasons for refusing to participate in the study included “no answer to the invitation despite repeated telephone calls” \((n=123)\), “cancellation of follow-up appointment” \((n=25)\), and “refusal to participate” \((n=70)\). Among the study subjects, the mean age was 54.7±8.2 years and two thirds had been diagnosed with stage 1 or stage 2 breast cancer \((n=175, 70 \%)\). It is of note the age and stage at diagnosis of the study sample are comparable to those of the total breast cancer population in Singapore [22]. The mean duration of the time since completion of the primary cancer treatment was 28.9±17.8 months, with 45 and 55 % having completed 6 months to \(<2\) years and 2 to 5 years, respectively (Table 1).

**Symptoms by post-treatment period**

A total of 222 \((89 \%)\) of the 250 survivors reported having at least one symptom \((89 \%\) of survivors in each group); of these, 53, 33, and 14 % reported experiencing 1–5, 6–10, and \(>10\) simultaneous symptoms, respectively. The mean number is \(5.43±4.3\) \((range 0–23\) and \(5.24±5.0\) \((range 0–27)\) symptoms per survivor in the \(<2\) years and 2 to 5 years post-treatment groups, respectively \((p>0.05)\). The most commonly reported symptoms were related primarily to physical domains: lack of energy \((49 \% vs. 36 \%, p=0.039)\), numbness/tingling in the hands/feet \((39 \% vs. 42 \%, p>0.05)\), pain \((35 \% \text{ in both groups, } p>0.05)\), and difficulty sleeping \((33 \% \text{ vs. 26 \%, } p>0.05)\) being reported by survivors at \(<2\) years and 2 to 5 years post-treatment, respectively. Worrying was relatively less prevalent but still common in both groups \((31 \% \text{ vs. } 25 \%, \text{ respectively, } p>0.05)\). As shown in Table 2, the survivors in both groups reported the highest mean ratings of the MSAS PSYCH score followed by the GDI. There was a trend in survivors at \(<2\) years post-treatment to have higher MSAS PSYCH, PHYS, and GDI scores \((mean 0.29 \text{ to } 0.46)\) than those at 2 to 5 years post-treatment \((mean 0.25 \text{ to } 0.37)\); however, the differences were not significant \((p>0.05)\).

**Unmet needs by post-treatment period**

Of the 250 survivors, 123 \((49 \%)\) reported at least one unmet need \((52 \% \text{ for survivors at } <2\text{ years post-treatment vs. } 47 \% \text{ at } 2 \text{ to } 5 \text{ years post-treatment})\). Of these, 66, 16, and 18 % reported 1–5, 6–10, and \(>10\) needs, respectively. The survivors at \(<2\) years and at 2 to 5 years post-treatment reported on average \(3.14±5.3\) \((\text{range } 0–23)\) and \(2.24±4.1\) \((\text{range } 0–25)\) unmet needs, respectively \((p>0.05)\). The survivors in both groups endorsed “fears about the cancer spreading” \((22 \% \text{ vs. } 18 \%, \text{ respectively})\) in the Psychological domain most frequently. As shown in Table 2, the survivors in both groups rated the levels of unmet needs similarly, with the highest mean ratings of unmet needs in the Health Care System/Information domain followed by Patient care/Support needs, while the Sexuality domain revealed the lowest level of unmet needs. The mean scores for the Health Care System/Information \((mean 26.15 \text{ vs. } 20.34, \text{ respectively; } p=0.004)\) and Psychological needs \((mean 15.13 \text{ vs. } 9.34, \text{ respectively; } p=0.002)\) were significantly higher in survivors at \(<2\) years post-treatment compared with those at 2 to 5 years post-treatment, with an effect size of the differences of 0.18 and 0.20, respectively, indicating a small effect size. Scores for the Patient Care/Support needs were similar, with mean scores of 15.13 and 14.56, respectively \((p>0.05)\), which suggests that the level of unmet Patient Care/Support needs for help do not differ upon the time that has elapsed since their completion of cancer treatment.

**QoL by post-treatment period**

As shown in Table 2, there was a trend in survivors at \(<2\) years post-treatment to have lower domain and composite scores \((mean 44.3 \text{ to } 54.2)\) than those at 2 to 5 years post-treatment \((mean 48.7 \text{ to } 56.2)\), with general health (GH), role-physical (RF), vitality (VT), mental health (MH), social functioning (SF), PCS, and MCS scores being significantly different \((p<0.05 \text{ for VT, SF, PCS, and MCS; } p<0.01 \text{ both for RF and MH})\), with an effect size of the differences of 0.13 to 0.21 indicating a small effect size.
As shown in Table 3 and Fig. 1a, the direct effect indicated that an increase in symptom burden by 1 SD was significantly associated with an increase in unmet needs by 0.71 SD ($b=0.71$) and a decrease in physical QoL by 0.30 SD ($b=-0.30$). Higher unmet needs were significantly associated with a poor physical QoL ($b=-0.38$). The indirect effect revealed that an increase in symptom burden by 1 SD was significantly associated with a decrease in physical QoL by 0.27 through increasing unmet needs. Total effects were significant ($b=-0.57$), and the model showed a good fit (CMIN/DF=1.877; CFI=0.991; TLI=0.980; RMSEA=0.049).

The direct effect indicated that an increase in symptom burden by 1 SD was significantly associated with an increase in unmet needs by 0.61 SD ($b=0.61$) and a decrease in mental QoL by 0.54 SD ($b=-0.54$). Higher unmet needs were significantly associated with poor mental QoL ($b=-0.23$). The indirect effect showed that an increase in symptom burden by 1 SD was significantly associated with a decrease in mental QoL by 0.14 through increasing unmet needs. Total effects were significant ($b=-0.674$), and the model demonstrated a good fit (CMIN/DF=1.292; CFI=0.997; TLI=0.994; RMSEA=0.034) (Table 3 and Fig. 1b).
Table 2  MSAS subscales/total, SCNS domains, and SF-12 domains/composite scores by years of post-treatment (N=250)

<table>
<thead>
<tr>
<th></th>
<th>N=250</th>
<th>&lt;2 years post-treatment (n=113)</th>
<th>2 to 5 years post-treatment (n=137)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSAS subscales</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS</td>
<td>Mean±SD</td>
<td>Mean±SD</td>
<td>Mean±SD</td>
</tr>
<tr>
<td></td>
<td>0.27±0.31</td>
<td>0.30±0.30</td>
<td>0.25±0.32</td>
</tr>
<tr>
<td>PSYCH</td>
<td>0.41±0.55</td>
<td>0.46±0.57</td>
<td>0.37±0.53</td>
</tr>
<tr>
<td>GDI</td>
<td>0.40±0.47</td>
<td>0.45±0.46</td>
<td>0.36±0.47</td>
</tr>
<tr>
<td>TMSAS</td>
<td>0.28±0.28</td>
<td>0.29±0.27</td>
<td>0.27±0.29</td>
</tr>
<tr>
<td>Total number of symptoms</td>
<td>5.33±4.73</td>
<td>5.43±4.36</td>
<td>5.24±5.04</td>
</tr>
<tr>
<td><strong>SCNS domains</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical and daily living</td>
<td>7.74±12.11</td>
<td>9.20±13.77</td>
<td>6.53±10.46</td>
</tr>
<tr>
<td>Psychological</td>
<td>11.96±14.40</td>
<td>15.13±16.82</td>
<td>9.34±11.46</td>
</tr>
<tr>
<td>Patient care and support</td>
<td>14.82±13.36</td>
<td>15.13±12.76</td>
<td>14.56±13.89</td>
</tr>
<tr>
<td>Sexuality</td>
<td>2.63±7.90</td>
<td>2.14±5.87</td>
<td>3.04±9.26</td>
</tr>
<tr>
<td>Health care system and information</td>
<td>22.96±15.84</td>
<td>26.15±15.75</td>
<td>20.34±15.49</td>
</tr>
<tr>
<td>Total number of unmet needs</td>
<td>2.65±4.67</td>
<td>3.14±5.28</td>
<td>2.24±4.08</td>
</tr>
<tr>
<td><strong>SF-12 domains</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General health</td>
<td>46.8±13.6</td>
<td>44.3±13.8</td>
<td>48.7±13.2</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>52.0±9.8</td>
<td>50.9±10.5</td>
<td>53.0±9.2</td>
</tr>
<tr>
<td>Role-physical</td>
<td>51.2±6.8</td>
<td>49.7±7.9</td>
<td>52.5±5.5</td>
</tr>
<tr>
<td>Role-emotional</td>
<td>51.9±5.8</td>
<td>51.7±6.0</td>
<td>52.1±5.6</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>54.6±10.3</td>
<td>54.2±11.0</td>
<td>54.9±9.7</td>
</tr>
<tr>
<td>Vitality</td>
<td>52.0±5.8</td>
<td>49.6±15.5</td>
<td>54.1±13.7</td>
</tr>
<tr>
<td>Mental health</td>
<td>54.5±11.7</td>
<td>52.3±13.1</td>
<td>56.2±10.1</td>
</tr>
<tr>
<td>Social functioning</td>
<td>54.0±10.4</td>
<td>52.5±12.0</td>
<td>55.2±8.8</td>
</tr>
<tr>
<td>Physical composite score</td>
<td>50.6±8.5</td>
<td>49.4±9.3</td>
<td>51.7±7.7</td>
</tr>
<tr>
<td>Mental composite score</td>
<td>53.5±9.7</td>
<td>51.9±10.4</td>
<td>54.8±9.0</td>
</tr>
</tbody>
</table>

PHYS Physical Symptom subscale, PSYCH Psychological Symptom subscale, GDI Global Distress Index, TMSAS total MSAS

*p<0.05; **p<0.01

a Score range 0–4 with higher scores indicating high symptom distress
b Total number of symptom range 0–32
c Score range 0–100 with higher scores indicating more unmet needs
d Total number of unmet needs range 0–34
e Score range 0–100 with higher scores representing better QoL

Table 3  The direct, indirect, and total effects of variables on QoL (N=250)

<table>
<thead>
<tr>
<th></th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
<th>Model fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unmet needs</td>
<td>Physical QoL (SF 12-PCS)</td>
<td>Unmet needs</td>
<td>Physical QoL</td>
</tr>
<tr>
<td>Symptom burden (MSAS)</td>
<td>0.712***</td>
<td>-0.303*</td>
<td>0</td>
<td>-0.267</td>
</tr>
<tr>
<td>Unmet needs (SCNS)</td>
<td>-0.375*</td>
<td>-0.536***</td>
<td>0</td>
<td>-0.138</td>
</tr>
<tr>
<td>Symptom burden (MSAS)</td>
<td>0.609***</td>
<td>-0.226**</td>
<td>0</td>
<td>-0.050</td>
</tr>
</tbody>
</table>

PCS Physical Composite Score, MCS Mental Composite Score

*p<0.05; **p<0.01; ***p<0.001
Discussion

The shift from off-treatment to the first 5 years post-treatment would be a critical juncture of survivorship. Our results suggest that BCS at 6 months to <2 years and at 2 to 5 years post-treatment report multiple symptoms and unmet needs across a range of domains; while some symptoms and unmet needs are shared by both groups, others seem to be specific to an individual group. Our findings confirm the results of earlier studies [9, 21] that lack of energy, numbness/tingling in the hands/feet, pain, and difficulty sleeping are the most common and troublesome symptoms in both groups. Our results also show moderate symptom severity, independent of the length of the survivorship period. A previous longitudinal study has revealed persisting moderately severe symptoms in the year after primary breast cancer treatment [22]. Nevertheless, future longitudinal studies across different phases of cancer survivorship are required to map the trajectory of symptomology as a function of the length of the survivorship period.

It is of note that more BCS at 6 months to <2 years reported lack of energy, whereas more survivors at 2 to 5 years reported numbness/tingling in the hands/feet. Increasingly, fatigue has been shown to affect many patients during and after cancer treatment, and it continues to be a significant problem for cancer survivors many years after treatment [21, 23, 24]. Although the etiology of fatigue in the cancer setting is not fully understood, research points to the complex biobehavioral mechanisms involving dysregulation in proinflammatory

![Diagram](image-url)
cytokine and hypothalamic pituitary-adrenal function [21, 25], and an interaction of metabolic, somatic, emotional, cognitive, and psychosocial factors associated with cancer and its treatment [4, 26]. Numbness/tingling in the hands/feet is a common sensory problem of neurotoxic chemotherapy-induced peripheral neuropathy in the breast cancer setting, which is often partially reversible and can remain for years [21].

Congruent with other studies, the unmet needs reported by BCS in this study were predominantly related to the domains of Health Care System/Information [27, 28] and Patient Care/Support needs [29]. It may be that survivors who have completed primary breast cancer treatments have decreased contact with health care professionals, resulting in increased unmet Health Care System/Information needs. The increased Patient Care/Support needs may have been related to the lack of holistic approach to post-treatment care for BCS [29]. Yoon et al. (2008) revealed that women report an unmet need for symptom management after breast cancer treatment, suggesting the failure of health care professionals to be aware of the problem as the reason for their unmet needs [30]. A qualitative study to understand the needs of BCS who had completed their hospital-based treatment 6–24 months revealed that survivors were seeking ongoing reassurance and emotional support from their doctors and medical staff during their follow-up [29]. The Psychological need for help concerning “fears about the cancer spreading” was rated as high, which is confirmed by another study with breast cancer survivors who were within 1–24 months post-treatment [31]. Of note, persistent fear of recurrence along with the greatest risk of cancer recurrence in the first 5 years after completing treatment has been frequently identified in the literature [2, 10, 30, 32]. Hodgkinson et al. (2007) also indicate that many of the women in the early phases of survival are concerned about possible complications, secondary malignancies, and disease recurrence [2]. A recent study with 396 women followed up from before surgery to 6 months post-operatively also indicates that fear of cancer recurrence may persist well after surgery [33].

Our data reveal that women at the first 2 years post-treatment have significantly more intense unmet needs in Health Care System/Information and Psychological domains, and poorer QoL in all domains except physical functioning, role-emotional, and bodily pain than those at 2 to 5 years post-treatment, and this reflects the need for help and the vulnerability to poor patient-reported health outcomes in the early transitional survivorship. However, because of the cross-sectional nature of the study, we would not be able to determine in what way unmet needs and QoL are being influenced by the survivorship period. Further longitudinal studies are warranted to associate causality with the length of survivorship period and changes along the transitional trajectory experienced by BCS. It is of note that unmet needs in the Patient Care/Support domain are moderately intense in both groups of survivors. Therefore, it is important to have a regular holistic need assessment including the Patient Care/Support domain during the first 5 years post-treatment for BCS.

The significant direct and indirect linkage of symptom burden to BCS’s physical and mental QoL through unmet needs in Physical/Daily Living and Patient Care/Support domains and Psychological and Patient Care/Support domains after adjustment for survival time, respectively, observed in this study confirm our hypotheses and reveal the complex nature of the relationship between symptom burden and QoL. Although survivors’ QoL is affected negatively by the morbidities and distress associated with symptom burden, unmet needs with respect to symptom experience constitute a partial explanation for the variance in poor QoL experienced by BCS. It is likely that symptoms are perceived to exceed the individual’s capacity and confidence level to manage, and the survivors with the worst symptom experiences would expect additional care, support, and treatment pertaining to symptoms from the health care providers. However, gaps may exist between a survivor’s expectation of services and the actual experience of services [29, 34]. A qualitative study to evaluate the perceptions and needs in relation to the healthcare of BCS revealed that survivors were frustrated in their transition experiences by confusion about symptom treatment and the perception of an absence of providers within the health care system devoted to their unique needs [33]. Evidence increasingly suggests that unanticipated persistent and/or late emerging symptoms and side effects of treatment may remind BCS of their disease and invoke fears of the cancer recurring or spreading and feelings of uncertainty about the future [13, 32]. Gray et al. (1998) indicate that uncertainty about how to interpret and handle symptoms appropriately often leads to excessive worry [35]. Taken together, this symptom burden would result in increased unmet needs in Physical/Daily Living, Psychological, and Patient Care/Support domains and compromise BCS’s physical and mental QoL. Previous studies suggest that uncontrolled symptoms may contribute to poor physical and psychosocial QoL in BCS [12], and QoL can be negatively affected by BCS’s negative beliefs about symptom management [36]. This corroborates the findings of So et al., who found a significant negative association between physical and psychological unmet needs and QoL among BCS at 1 year after treatment [37], and Akechi et al., who found a moderate to strong association between patients’ needs and QoL in BCS with a mean duration of 2 years and a half since diagnosis [38].

In conclusion, women continue to endure many symptoms after completing breast cancer treatment, with lack of energy, numbness/tingling in the hands/feet, pain, and difficulty sleeping being the most common symptoms. Symptoms are the priority that needs to be addressed in the endeavor to decrease the impact on need for help and QoL in women who completed surgery±adjuvant cancer therapy 6 months
to 5 years previously. However, this study has some limitations. It employs a cross-sectional design which limits the ability to assess changes in symptomology, unmet needs, and QoL over time. Although structural equation modeling reveals the direct and indirect linkage of symptom burden to BCS’s QoL through unmet needs, these data should not be seen as having causal relationships. In addition, SF-12 is a generic-based QoL measure which may lack sensitivity to tap dimensions of health status pertaining to QoL in cancer survivorship. Nevertheless, the findings provide some insights into symptomology and QoL that contribute to a better understanding of the nature of survivorship beyond the risk of cancer recurrence. Our findings can also help to improve care for BCS, and have implications for the continuous assessment of symptoms and their specific needs following cancer treatment. Survivorship programs embracing symptom management interventions and need-based supportive care services are equally important for women making the transition from the treatment completion phase into the first 5 years after primary treatment of breast cancer. Further work might include combining quantitative and qualitative methodologies to obtain in-depth information about the women’s perceptions and experience of survivorship, as well as to further explore and validate the complex relationship among symptom burden, unmet needs, QoL, and other patient-specific and healthcare-related variables, including coping and patient-provider communication.

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Compliance with ethical standards

Competing interests The authors declare that they have no competing interests.

References

Support Care Cancer