Health-related quality of life in breast cancer patients: A bibliographic review of the literature from 1974 to 2007

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Abstract

Background: Quality of life in patients with breast cancer is an important outcome. This paper presents an extensive overview on the topic ranging from descriptive findings to clinical trials.

Methods: This was a bibliographic review of the literature covering all full publications that appeared in English language biomedical journals between 1974 and 2007. The search strategy included a combination of key words 'quality of life' and 'breast cancer' or 'breast carcinoma' in titles. A total of 971 citations were identified and after exclusion of duplicates, the abstracts of 606 citations were reviewed. Of these, meetings abstracts, editorials, brief commentaries, letters, errata and dissertation abstracts and papers that appeared online and were indexed ahead of publication were also excluded. The remaining 477 papers were examined. The major findings are summarized and presented under several headings: instruments used, validation studies, measurement issues, surgical treatment, systemic therapies, quality of life as predictor of survival, psychological distress, supportive care, symptoms and sexual functioning.

Results: Instruments—Several valid instruments were used to measure quality of life in breast cancer patients. The European Organization for Research and Treatment of Cancer Core Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and its breast cancer specific complementary measure (EORTC QLQ-BR23) and the Functional Assessment Chronic Illness Therapy General questionnaire (FACIT-G) and its breast cancer module (FACIT-B) were found to be the most common and well developed instruments to measure quality of life in breast cancer patients. Surgery—different surgical procedures led to relatively similar results in terms of quality of life assessments, although mastectomy patients compared to conserving surgery patients usually reported a lower body image and sexual functioning. Systemic therapies—almost all studies indicated that breast cancer patients receiving chemotherapy might experience several side-effects and symptoms that negatively affect their quality of life. Adjuvant hormonal therapies also were found to have similar negative impact on quality of life, although in general they were associated with improved survival. Quality of life as predictor of survival—similar to known medical factors, quality of life data in metastatic breast cancer patients was found to be prognostic and predictive of survival time. Psychological distress—distress and depression were found to be common among breast cancer patients even years after the disease diagnosis and treatment. Psychological factors also were found to predict subsequent quality of life or even overall survival in breast cancer patients. Supportive care—clinical treatments to control emesis, or interventions such as counseling, providing social support and exercise could improve quality of life. Symptoms—Pain, fatigue, arm morbidity and postmenopausal symptoms were among the most common symptoms reported by breast cancer patients.
Background

Health-related quality of life is now considered an important endpoint in cancer clinical trials. It has been shown that assessing quality of life in cancer patients could contribute to improved treatment and could even be as prognostic as medical factors could be prognostic [1-4]. Above all, studies of quality of life can further indicate the directions needed for more efficient treatment of cancer patients. Among the quality of life studies in cancer patients, breast cancer has received most attention for several reasons. First, the number of women with breast cancer is increasing. It has been reported that each year over 1.1 million women worldwide are diagnosed with breast cancer and 410,000 die from the disease [5]. Secondly, early detection and treatment of breast cancer have improved and survivors now live longer, so studying quality of life in this context is important. Thirdly, breast cancer affects women's identities and therefore studying quality of life for those who lose their breasts is vital. In addition, it is believed that females play important roles as partners, wives, and mothers within any family. Thus, when a woman develops breast cancer, all members of family might develop some sort of illnesses. In fact, breast cancer is a family disease. Other reasons could be added, but overall it is crucial to recognize that with increasing improvements in medicine and medical practice during recent years studying quality of life for any cancer, for any anatomical site and for either gender is considered highly relevant. A descriptive study of the published papers (230 articles) on non-biomedical outcomes (quality of life, preferences, satisfaction and economics) in breast cancer patients, covering the literature from 1990 to 2000, found that the most frequently reported outcomes were health-related quality of life (54%), followed by economic analyses (38%), and patient satisfaction (14%). Only 9% measured patient preferences [6].

Conclusion: There was quite an extensive body of the literature on quality of life in breast cancer patients. These papers have made a considerable contribution to improving breast cancer care, although their exact benefit was hard to define. However, quality of life data provided scientific evidence for clinical decision-making and conveyed helpful information concerning breast cancer patients’ experiences during the course of the disease diagnosis, treatment, disease-free survival time, and recurrences; otherwise finding patient-centered solutions for evidence-based selection of optimal treatments, psychosocial interventions, patient-physician communications, allocation of resources, and indicating research priorities were impossible. It seems that more qualitative research is needed for a better understanding of the topic. In addition, issues related to the disease, its treatment side effects and symptoms, and sexual functioning should receive more attention when studying quality of life in breast cancer patients.

Over the past 10 years, much clinical effort has been expended in the treatment of breast cancer in order to improve survival. Now the question is: to what extent have studies of quality of life in breast cancer patients added to our information or contributed to improved outcomes in breast cancer care? This is very difficult to answer, but it is possible to try to investigate the contribution of quality of life studies to breast cancer care as a whole. There are several useful review papers on quality of life in breast cancer patients. However, most published papers have either been overviews or systematic literature searches with very focused objectives. The aim of this review is to collect and examine all literature published since the topic first appeared in English language biomedical journals. It is hoped that this extensive review may contribute to existing knowledge, help both researchers and clinicians to have a better profile on the topic, and consequently aid in improving quality of life in breast cancer patients.

Methods

As part of a study on quality of life in breast cancer patients, an extensive literature search was carried out using MEDLINE, EMBASE, the Science Citation Index (ISI), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the PsycINFO, the Allied and Complementary Medicine (AMED), and Global Health databases. The intention was to review all publications that have been appeared in English language biomedical journals between 1974 and 2007. The year 1974 was chosen because the first study on quality of life in breast cancer patients was published then. The search strategy included the combination of key words ‘quality of life’ and ‘breast cancer’ or ‘breast carcinoma’ in titles of publications. It was though that this might help to focus the investigation. It provided the initial database for the review. The initial search was carried out in early 2006 and
updated twice in 2006, twice at the end of January and December 2007, and once for a final check in April 2008.

**Results**

**Statistics**

A total of 971 citations were identified and after exclusion of duplicates, the abstracts of 606 citations were reviewed. Of these, meetings abstracts, editorials, brief commentaries, letters, errata and dissertation abstracts and papers that appeared online and were indexed ahead of publication were also excluded. The remaining 477 papers were examined in this bibliographic review. The statistics are shown in Table 1 and a chronological list of all papers is available [Additional file 1]. Here, the major findings are summarized and presented under the following headings.

**Reviews**

There were several review papers. These were divided into two categories: overviews [7-26], and systematic reviews [27-35]. Whilst there were quite significant numbers of commentaries, some brief, a few systematic reviews with focused objectives were also identified. These are summarized in Tables 2 and 3. Both overviews and systematic reviews touched interesting topics pointed to helpful comments and findings among published papers. For instance, a paper by Rozenberg et al. [26] highlighted that most women affected by breast cancer will not die from it but from other diseases, owing to recent improvements in treatment. They also pointed out that women with breast cancer and three or more co-morbid conditions have a 20-fold higher rate of mortality from causes other than breast cancer and a 4-fold higher rate of all-cause mortality when compared with patients who have none.

| Year | Breast cancer | Quality of life | BC+QOL* | Papers reviewed** |
|------|---------------|----------------|--------|------------------|
| 1974 | 246           | 13             | 1      | 1                |
| 1975 | 312           | 23             | 0      | 0                |
| 1976 | 358           | 34             | 1      | 1                |
| 1977 | 522           | 27             | 0      | 0                |
| 1978 | 527           | 33             | 0      | 0                |
| 1979 | 489           | 34             | 0      | 0                |
| 1980 | 662           | 36             | 1      | 1                |
| 1981 | 634           | 45             | 1      | 0                |
| 1982 | 647           | 71             | 1      | 1                |
| 1983 | 661           | 89             | 2      | 2                |
| 1984 | 830           | 73             | 0      | 0                |
| 1985 | 844           | 97             | 2      | 2                |
| 1986 | 920           | 134            | 1      | 1                |
| 1987 | 961           | 211            | 2      | 2                |
| 1988 | 1125          | 223            | 2      | 2                |
| 1989 | 1333          | 294            | 2      | 2                |
| 1990 | 1470          | 427            | 7      | 6                |
| 1991 | 1423          | 394            | 8      | 7                |
| 1992 | 1805          | 603            | 8      | 8                |
| 1993 | 2088          | 641            | 18     | 17               |
| 1994 | 2342          | 747            | 16     | 15               |
| 1995 | 2444          | 948            | 11     | 10               |
| 1996 | 2926          | 1422           | 16     | 15               |
| 1997 | 3249          | 1756           | 19     | 16               |
| 1998 | 3597          | 2049           | 29     | 25               |
| 1999 | 3872          | 2457           | 39     | 30               |
| 2000 | 5026          | 2639           | 37     | 30               |
| 2001 | 5206          | 2985           | 34     | 27               |
| 2002 | 5720          | 3233           | 42     | 26               |
| 2003 | 6441          | 3900           | 38     | 31               |
| 2004 | 7422          | 4811           | 74     | 47               |
| 2005 | 7862          | 5276           | 73     | 53               |
| 2006 | 7021          | 4592           | 63     | 48               |
| 2007 | 4641          | 2207           | 58     | 51               |

Total 85626  42519  606  477

* Excluding duplicates and papers that appeared online and indexed ahead of publication.
** Excluding all meetings abstracts, editorials, brief commentaries, letters, replies, erratum, and dissertation abstracts. For all citations see Additional file 1.
Table 2: A list of some overview papers on quality of life in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Main focus | Conclusion(s) |
|------------------|------|------------|---------------|
| McEvoy and McCorkle [7] | 1990 | QOL in advanced breast cancer | Efforts to manage advanced breast cancer must include both current medical therapies and attention to the critical factors associated with enhancing their QOL. |
| Kiebert et al. [8] | 1991 | Impact of breast conserving surgery vs. mastectomy on QOL | There were no substantial differences between the two treatment modalities except for body image and sexual functioning in favor of breast conserving surgery. |
| Aareson [9] | 1993 | Assessments of QOL and benefits from adjuvant therapies | Adjuvant therapies could improve QOL in breast cancer patients. |
| Bryson and Plosker [10] | 1993 | Tamoxifen as adjuvant therapy | Tamoxifen has a low cost-utility ratio in postmenopausal women with node-positive, estrogen receptor-positive breast cancer. |
| Stefanek [11] | 1994 | QOL research, provider-patient communication, and psychological distress of spouses and other relatives of breast cancer patients | This review summarizes and critiques publications in three identified areas. |
| Ganz [12] | 1994 | Review of various approaches to the measurement of QOL, the important QOL issues in the treatment of breast cancer, and what is known about QOL of older women with breast cancer | Ongoing and future research using newer approaches to QOL assessment should provide additional information on this important topic. |
| Osoba [13] | 1994 | QOL as a treatment endpoint | Advances in understanding HRQOL in metastatic breast cancer will aid the development of rational treatment policies. |
| Carlson [14] | 1998 | QOL in metastatic breast cancer | Clinician must balance anti-tumor activity, performance status, and the usual toxicity measures as surrogates for QOL associated with each specific therapy. |
| Leedham and Ganz [15] | 1999 | Psychological concerns and mental health | Psychological concerns and mental health are important issues for breast cancer patients and should be recognized and treated when necessary. |
| Rustoen and Begnum [16] | 2000 | Nursing practice | Nurses play an important role in meeting the needs of breast cancer patients. |
| Shapiro et al. [17] | 2001 | Relationship between psychosocial variables and QOL | A broader, more integrative framework that includes psychosocial factors is needed to evaluate breast cancer consequences. |
| Partridge et al. [18] | 2001 | QOL before, during and after high-dose chemotherapy | Resulting transient impaired overall QOL with subsequent improvement over time. |
| Kurtz and Dufour [19] | 2002 | QOL in older patients with metastatic disease receiving either standard treatment or new drugs | Aromatase inhibitors (such as taxanes and orally administered chemotherapy) provide similar or a better QOL as compared to first line endocrine therapy with tamoxifen. |
| Costantino [20] | 2002 | Hormonal treatments in metastatic breast cancer patients | QOL data is useful for both clinicians and patients in evaluating treatment options and developing treatment strategies. |
| Fallowfield [21] | 2004 | Hormonal therapies | Tolerability profiles of available treatment options are highlighted. |
| Sammarco [22] | 2004 | QOL of older breast cancer patients | Outpatient and long-term care should become a key setting for implementation of QOL interventions for women with breast cancer. |
Health-related quality of life in patients undergoing systemic therapy for advanced breast cancer was reviewed by Bottomley and Therasse, covering the literature from 1995 to 2001. They indicated that there were 19 studies. Among these, there were 12 studies on chemotherapy, 6 hormonal trials and 1 on biological therapy (Trastuzumab). They concluded that quality of life data provided invaluable insights into the treatment and care of patients [28].

Table 3: A list of systematic reviews on different aspects of quality of life in breast cancer patients (1974–2006)

| Author(s) [Ref.]       | Year | Main focus                                                                 | Conclusion(s)                                               |
|------------------------|------|-----------------------------------------------------------------------------|-------------------------------------------------------------|
| Irwig and Bennetts [27] | 1997 | A systematic review of quality of life after breast conservation or mastectomy | Apart body image it is unclear whether breast conservation or mastectomy results in better psychosocial outcomes. |
| Bottomley and Therasse [28] | 2002 | Systemic therapy (chemotherapy, hormonal therapy, or biological therapy) in advanced breast cancer (1995–2001) | QOL data provide invaluable insights into the treatment and care of patients. |
| Shimozuma et al. [29]   | 2002 | Systematic overview of the literature (1982–1999)                           | To date there have been almost no appropriate systematic overview guidelines issued for QOL assessment studies related to breast cancer. |
| Goodwin et al. [30]     | 2003 | Randomized clinical trials of treatment (review of literature from 1980–2001) | Until results of ongoing trials in breast cancer are available, caution is recommended in initiating new QOL studies unless treatment equivalency is expected or unless unique or specific issues can be addressed. |
| Rietman et al. [31]     | 2003 | Late morbidity of breast cancer (review of literature from 1980 to 2000)     | Significant relationship between late morbidity and restrictions of daily activities and poorer QOL was reported. |
| Payne et al. [32]       | 2003 | Racial disparities in the palliative care for African-American (review of literature from 1985 to 2000) | Differences in treatment patterns, pain management, and hospice care exist between African-American and other ethnic groups. |
| Fossati [33]            | 2004 | Randomized clinical trials of cytotoxic or hormonal treatments in advanced breast cancer (review of published literature before Dec 2003) | QOL assessments added relatively little value to classical clinical endpoints. |
| Mols et al. [34]        | 2005 | Systematic review among long-term survivors                                 | Focusing on the long-term effects of breast cancer is important when evaluating the full extent of cancer treatment. |
| Grimison and Stockler [35] | 2007 | Adjuvant systemic therapy for early-stage breast cancer (review of literature from 1996 to Feb. 2007) | For the majority of breast cancer patients most aspects of health-related quality of life recover after adjuvant chemotherapy ends without long-term effects except vasomotor symptoms and sexual dysfunction. |
To help the selection of optimal treatment, Goodwin et al. conducted a review of measurements of health-related quality of life in randomized clinical trials in breast cancer patients, covering the literature from 1980 to 2000. They identified a total of 256 randomized trials in breast cancer that included health-related quality of life or psychosocial outcomes. Of these, 66 trials involved randomized of different treatment options, 46 evaluated biomedical interventions and 20 evaluated psychosocial interventions. They concluded that until the results of ongoing trials are available, caution is recommended in initiating new quality of life studies unless treatment equivalence is expected or unless unique or specific issues can be addressed [30]. Similarly, Fossati’s critical review of published literature on randomized clinical trials of cytotoxic or hormonal treatments of advanced breast cancer indicated that quality of life assessments added relatively little value to classical clinical endpoints [33].

Mols et al. reviewed the literature on quality of life among long-term survivors of breast cancer and found that although these patients experienced some specific problems such as a thick and painful arm and problems with sexual functioning, most reported good overall quality of life. The review also indicated that the current medical condition, amount of social support and current income level were strong positive predictors of quality of life, and the use of adjuvant chemotherapy emerged as a negative predictor. The authors concluded that focusing on the long-term effects of breast cancer is important when evaluating the full extent of treatment [34].

Grimison and Stockler reviewed quality of life in early-stage breast cancer patients receiving adjuvant systemic therapy, review of clinical randomized trials covering the literature from 1996 to 2007, and concluded that the long-term effects of chemotherapy-induced menopause and hormonal therapy on quality of life were poorly recognized. They found that vasomotor symptoms and altered sexual function were common, distressing and inadequately treated [35].

**Two historical papers**
The first paper on quality of life in breast cancer patients was published in 1974. In this historical paper advanced breast cancer patients receiving adrenalectomy with chemotherapy were assessed for objective and subjective response rates, survival and quality of life. The results showed that in 64% of the patients the subjective palliation involved a return to essentially normal living during the period of improvement [36]. The second historical paper on the topic was appeared two years later, in 1976; Priestman and Baum used a linear analogue self-assessment (LASA) to measure the subjective effects of treatment in women with advanced breast cancer [37]. The results showed that this technique might be used to monitor the subjective benefit of treatment and to compare the subjective toxicities of different therapeutic regimens. The results also suggested that the subjective toxicity of cytotoxic therapy was not related to the patient’s age and diminished with successive courses of drugs. However, not until the late 1980s and early 1990s was the literature gradually supplemented with papers using relatively standard and established instruments to measure quality of life in breast cancer patients.

**Instruments used**
Broadly, quality of life measures can be classified as: general, disease specific, and site-specific. Although the early studies did not use standard measures, several valid instruments for measuring quality of life in breast cancer patients have been developed in recent years. The most commonly-used instruments were: the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire and its Breast Cancer supplement (EORTC QLQ-C30 and QLQ-BR23); the Functional Assessment of Chronic Illness Therapy General Questionnaire and its Breast Cancer Supplement (FACT-G and FACT-B formerly FACT questionnaires); the Breast Cancer Chemotherapy Questionnaire (BCQ): the Hospital Anxiety and Depression Scale (HADS); and the Medical Outcomes Study Short Form Survey (SF-36). Table 4 lists a number of most important instruments used in studies of quality of life in breast cancer patients. Almost all these instruments proved to be valid and were found to be very popular among researchers and clinicians.

**Validation studies**
Development of instruments for measuring quality of life in breast cancer patients, or cultural adaptation and validation studies of the existing instruments, was the major theme in a number of papers. These are presented in Table 5[38-59]. A paper by Levine et al. in 1988 was the first validation study in this field. It reported a quality of life measure in breast cancer patients called the Breast Cancer Chemotherapy Questionnaire (BCQ). This is a 30-item questionnaire that focuses on loss of attractiveness, fatigue, physical symptoms, inconvenience, emotional distress and feelings of hope and support from others [35]. A few studies reported translation and validation findings for the instruments used to assess quality of life among breast cancer patients in different cultures (for example see [48,54,56]).

**Measurement issues**
Papers that dealt with issues of quality of life measurement in breast cancer patients encompassed a variety of topics, mainly focusing on methodological and practical concerns in such assessment, especially in clinical settings. Most authors have tried first to convince clinicians to
assess quality of life, and secondly to show how quality of life data could contribute to care and management of breast cancer patients. Table 6 presents a summary of the results [60-84].

**Surgical treatment**

Breast cancer surgery including conservative surgery followed by irradiation, and modified radical mastectomy or radical mastectomy followed by immediate reconstruction is associated with different side-effects including pain, and fatigue and thus affecting quality of life in breast cancer patients. A list of studies on surgery and quality of life in breast cancer patients is given in Table 7 [85-113].

The most important topic in studies of breast cancer surgery and quality of life relates to the type of surgery. Recent findings suggest that partial and total mastectomy appear to be equivalent treatments in terms of patients’ long-term quality of life. However, both short-term and long-term distress levels after partial and total mastec-

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**Table 4: A list of instruments used to measure quality of life in breast cancer patients (1974–2007)**

| Types of measures          | Measures full name                                      | Abbreviation |
|----------------------------|---------------------------------------------------------|--------------|
| General measures           | Short Form Health Survey                                   | SF-36        |
|                            | Spitzer Quality of Life Index                              | QLI          |
|                            | Sickness Impact Profile                                    | SIP          |
|                            | Ferrans and Powers Quality of Life Index                   | QLI          |
| Cancer specific measures   | European Organization for Research and Treatment of Cancer Core quality of Life questionnaire | EORTC QLQ-C30 |
|                            | Functional Assessment of Chronic Illness Therapy General Questionnaire | FACIT-G (formerly FACT) |
|                            | Functional Living Index-Cancer                             | FLI-C        |
|                            | Ferrans and Powers Quality of Life Index-Cancer            | QLI-C        |
| Breast cancer specific measures | European Organization for Research and Treatment of Cancer Breast Cancer Quality of Life Questionnaire | EORTC QLQ-BR23 |
|                            | Functional Assessment of Chronic Illness Therapy-Breast    | FCIT-B       |
|                            | Breast Cancer Chemotherapy Questionnaire                   | BCQ          |
|                            | The Satisfaction with Life Domains Scale for Breast Cancer | SLDs-BC      |
| Psychological measures     | General Health Questionnaire-28                           | GHQ-28       |
|                            | Hospital Anxiety and Depression Scale                     | HADS         |
|                            | Beck Depression Inventory                                  | BDI          |
|                            | Center for Epidemiologic Studies Depression Scale          | CES-D        |
|                            | State-Trait Anxiety Inventory                              | STAI         |
|                            | Profile Mood State                                         | PMS          |
|                            | Mental Adjustment to Cancer Scale                          | MACS         |
|                            | Psychosocial Adjustment to Illness Scale                   | PAIS         |
| Symptom measures           | Functional Assessment of Chronic Illness Therapy-Fatigue   | FACIT-F      |
|                            | Piper Fatigue Scale                                        | PFS          |
|                            | Multidimensional Fatigue Inventory                         | MFI          |
|                            | Functional Assessment of Chronic Illness Therapy-B plus Arm Morbidity Subscale | FACIT-B + 4 |
|                            | Hot Flash Related Interference Scale                       | HFREDIS      |
|                            | Shoulder Disability Questionnaire                          | SDQ          |
|                            | Brief Pain Inventory                                       | BPI          |
|                            | McGill Pain Questionnaire                                  | MPQ          |
|                            | Memorial Symptom Assessment Scale                          | MSAS         |
|                            | Rotterdam Symptom Checklist                                | RSC          |
| Other measures             | Functional Assessment of Chronic Illness Therapy-Spiritual | FACIT-SP     |
|                            | Body Image Scale                                           | BIS          |
|                            | Body Image After Breast Cancer Questionnaire               | BIBCQ        |
|                            | Watts Sexual Functioning Questionnaire                     | WSFQ         |
|                            | Social Support Questionnaire                               | SSQ          |
|                            | Life Satisfaction Questionnaire                            | LSQ          |
|                            | Satisfaction With Life Scale                               | SWLS         |
Table 5: A summary of validation studies of quality of life instruments in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Instrument | Main focus |
|-----------------|------|------------|------------|
| Levine et al. [38] | 1988 | The Breast Cancer Chemotherapy Questionnaire (BCQ) | Development an outcome measure in clinical trials of adjuvant chemotherapy |
| Ciampi et al. [39] | 1988 | A 27 item Linear Analog Self Assessment | Factor analysis indicating disease and treatment-related, physical, emotional and social health summary scores |
| Tamburini et al. [40] | 1991 | Two simple index | To assess the impact of therapy on QOL in patients receiving chemotherapy for operable breast cancer |
| Osoba et al. [41] | 1994 | The European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-C30) | Evaluation of psychometric properties and responsiveness |
| Carlsson and Hamrin [42] | 1996 | The Life Satisfaction Questionnaire (LSQ-32) | Development a tool to measure life satisfaction in breast cancer patients |
| Sprangers et al. [43] | 1996 | The European Organization for Research and Treatment of Cancer Breast Cancer Specific Quality of Life Questionnaire (EORTC QLQ-BR23) | Development of a breast cancer specific QOL measure |
| Brady et al. [44] | 1997 | The Functional Assessment of Cancer Therapy Breast Cancer Specific Questionnaire (FACT-B) | Development of a breast cancer specific QOL measure |
| de Haes and Olschewski [45] | 1998 | The Rotterdam Symptom Checklist (RSC) | Cross cultural validation |
| McLachlan et al. [46] | 1998 | The EORTC QLQ-C30 | Validation as a measure of psychological function |
| Fallowfield et al [47] | 1999 | An endocrine symptom subscale for the FACT-B (FACT-B plus ES) | Validation in women undergoing hormonal therapy for breast cancer |
| Montazeri et al. [48] | 2000 | The EORTC QLQ-BR23 | Validation of the Iranian version |
| Mihailova et al. [49] | 2001 | The EORTC QLQ-C30 and the QLQ-BR23 | Validation of the Bulgarian version |
| Coster et al. [50] | 2001 | The Impact of Arm Morbidity (FACT-B+4) | Development a QOL scale to assess the impact of arm morbidity post-operatively |
| Carpenter [51] | 2001 | The Hot Flash Related Daily Interference Scale | Development of a tool for measuring the impact of hot flashes on QOL |
| Pandey et al. [52] | 2002 | The FACT Breast Cancer Specific Questionnaire (FACT-B) | Validation of the Malayalam version |
| Chie et al. [53] | 2003 | The EORTC QLQ-C30 and the EORTC QLQ-BR23 | Validation of the Taiwan Chinese version |
| Lee et al. [54] | 2004 | The Functional Assessment of Cancer Therapy-General (FACT-G) | Validation of the Korean version |
| Yun et al. [55] | 2004 | The EORTC QLQ-BR23 | Cross-cultural application in Korea |
| Parmar et al. [56] | 2005 | The EORTC QLQ-C30 | Validation of the Indian version |
| Avis and Foley [57] | 2006 | The Quality of life in Adult Cancer Survivors (QLACS) | Evaluation in long term breast cancer survivors |
| Wan et al. [58] | 2007 | The FACT-B | Validation of the simplified Chinese version |
| Wan et al. [59] | 2007 | The EORTC QLQ-BR53 | Psychometric properties of the simplified Chinese version |
| Author(s) [Ref.] | Year | Main focus | Conclusion(s)/Recommendation |
|------------------|------|------------|------------------------------|
| Baum et al. [60] | 1990 | The issue of measuring QOL in advanced breast cancer | Efforts are being made to find out ways to measure QOL in advanced breast cancer patients. |
| Sutherland et al. [61] | 1990 | Ratings of the importance of QOL variables | Breast cancer patients give different weights to different QOL variables. |
| Gelber et al. [62] | 1992 | Explaining about the QOL adjusted Time Without Symptom and Toxicity | Integration of two methods (QOL and symptom free duration) could provide a new tool. |
| Ganz et al. [63] | 1992 | The influence of multiple variables on the relationship of age to QOL | The casement plot methodology should be employed for simultaneous evaluation of multiple variables. |
| Gelber et al. [64] | 1993 | Description of survival estimates with applications to QOL evaluation (Quality adjusted Time Without Symptoms of disease and Toxicity of treatment) | Estimation showed that patients continued to benefit greatly from long-term-duration chemotherapy between 5 and 10 years following treatment. |
| Hyden et al. [65] | 1993 | Pitfalls in collecting QOL data | Several recommendations were made: (a) build support for QOL assessment among the group’s leadership, (b) involve physicians and oncology nurses in the study design, (c) identify a QOL liaison at each participating institution, and (d) aggressively monitor the quality and timeliness of data submission. |
| Fallowfield [66] | 1993 | Measurement issues | Some recommendations for selecting well validated measures. |
| Gerard et al. [67] | 1993 | Framing and labeling effects in measuring quality adjusted life years | A significant difference was found in the particular values of descriptions that were written in the third person that differed in terms of whether the word “cancer” was used. |
| Hurny et al. [68] | 1994 | Timing of baseline QOL assessment | Timing is an important consideration in QOL assessment. |
| Fallowfield [69] | 1995 | Discussion on some instruments used to measure QOL | Monitoring QOL in breast cancer should be a mandatory part of follow-up in clinical trials. |
| Hietanen [70] | 1996 | Measurement and practical aspects of QOL assessment | Main factors affecting QOL in the treatment of breast cancer. |
| Bernhard et al. [71] | 1997 | The International Breast Cancer Study Group (IBCSG) approach | Confirmation of the feasibility, validity and clinical relevance of quality of life assessment. |
| Bernhard et al. [72] | 1998 | Factors affecting baseline QOL assessment | Cultural and biomedical factors are influencing baseline QOL data and should be considered when evaluating the impact of treatment. |
| Bernhard et al. [73] | 1998 | Practical issues and factors associated with missing data | The factors most highly associated with missing data were institution and chemotherapy compliance. |
| Ganz et al. [74] | 1998 | Compliance with QOL data collection | Educational level of a trial participants might contribute to it compliance. |
| Coates and Gebski [75] | 1998 | Approaches to missing data | Missing data cannot be assumed to be similar to those available. Optimal assessment requires careful prospective attention to complete data collection. |
| Jansen et al. [76] | 2000 | Response shift | Significant recalibration effects were observed. |
| Curran et al. [77] | 2000 | Summary measures and statistics | Different techniques in analysis might result in different conclusions. |
| Perez et al. [78] | 2001 | The application of a time trade-off utility measure | The utility measure and a QOL measure showed fair to moderate concordance. |
Table 6: A list of quality of life studies that covered measurement issues in breast cancer patients (1974–2007) (Continued)

| Authors         | Year | Description                                                                 | Findings                                                                 |
|-----------------|------|------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Nagel et al.    | 2001 | A cluster analytic approach to analyze quality of life data                 | QOL scores could identify clinically meaningful subgroups of patients.   |
| Mosconi et al.  | 2001 | A general introduction to the debate on the methodological issues involved in QOL evaluation | Open questions regarding the use of QOL measures in surgical, adjuvant therapy and metastatic studies. |
| Efficace et al. | 2002 | Evaluating reliability, validity and cultural relevance of QOL measures in clinical trials | Suggestions for selecting future measures for use in breast cancer population of patients. |
| Wilson et al.   | 2005 | Comparing two QOL measures (the Rand 36-item and the Functional Living Index-Cancer) | Neither questionnaire can be replaced by each other in studies of QOL in breast cancer patients. |
| Carver et al.   | 2006 | Assessment of demographic, medical and psychological variables on outcome   | Different aspects of QOL at long-term follow-up had different antecedents. |
| Perry et al.    | 2007 | Benefits, acceptability and utilization of QOL assessment in women with breast cancer | Summarized the benefits, challenges, and barriers of QOL measurement for female breast cancer patients. |

Breast cancer patients usually receive systemic therapies (chemotherapy, hormonal therapy and biological treatments) after surgery. Several studies evaluated quality of life in breast cancer patients receiving systemic therapies. A list of studies reporting on the topic is given in Table 8[36,37,114-169].

Chemotherapy has considerable effect on quality of life of breast cancer patients. In a study of postoperative adjuvant chemotherapy in primary node positive breast cancer patients (one or more axillary node), women receiving a single agent or a multi-drug regimen indicated that the treatment was 'unbearable' [114] or in a study of patients with early breast cancer receiving preoperative chemotherapy almost all patients considered chemotherapy the most 'burdensome' aspect of the treatment [116].

The side-effects of chemotherapy on quality of life in breast cancer patients were the topic of many investigations. In these studies, investigators looked at the issue from different perspectives. For instance, using a decision-analytic approach to evaluate tradeoffs between efficacy and quality of life in the choice of three adjuvant treatments (chemotherapy, surgical ovarian suppression, and medical ovarian suppression) in pre-menopausal women with newly-diagnosed, hormone-responsive early breast cancer, Elkin et al. concluded that when different treatments have similar efficacy, there may be a subgroup of women for whom quality of life considerations dominate.
Table 7: A list of studies of surgical treatment and quality of life in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Treatment (assessment time) | Conclusion(s) |
|------------------|------|-----------------------------|---------------|
| de Haes et al. [85] | 1985 | MAS vs. tumorectomy (11 months after surgery) | No differences expect worse body image in MAS patients. |
| de Haes et al. [86] | 1986 | MAS vs. tumorectomy (11 and 18 months after surgery) | Overall QOL improved over time in both groups; poor body image in MAS. |
| Ganz et al. [87] | 1992 | MAS vs. BCS after one year | No significant differences in QOL and both groups improved; BCS patients did not experience significantly better QOL but had fewer problems with clothing and body image. |
| Shimozuma et al. [88] | 1994 | Surgery-any | Hospitalization had a strong negative relation to overall QOL; type of surgery had no significant association with QOL. |
| Neises et al. [89] | 1994 | MAS or BCS | Older women suffer as much as younger patients after MAS. |
| Fallowfield [90] | 1994 | Surgery and tamoxifen vs. tamoxifen alone | At 2 years similar psychological health; no evidence of impaired QOL for elderly women after surgery. |
| Shimozuma et al. [91] | 1995 | MRM or BCS (before surgery and 3 times up to 2 years after) | No significant differences in overall QOL; patients with BCS need more psychological support. |
| Hart et al. [92] | 1997 | MAS + prostheses or MAS + reconstruction or MAS alone | No one technique is necessary for all women to optimize QOL; women should choose and make their own decisions. |
| Dorval et al. [93] | 1998 | Partial or total MAS (3 and 18 months after) | Both appeared to be equivalent in long-term QOL. Younger women might benefit more from partial MAS. |
| Curran et al. [94] | 1998 | MRM vs. BCS | Significant benefit in body image and satisfaction in BCS group; no difference in fear of recurrence. |
| Wapnir et al. [95] | 1999 | Lumpectomy with axillary dissection (LAD) or mastectomy | No major differences except for dressing, comfort with nudity and sexual drive in favor of ALD. |
| Shimozuma et al. [96] | 1999 | MRM or BCS (1 year after) | At one year good QOL, with no relationship to the type of surgery. |
| Pusic et al. [97] | 1999 | Lumpectomy + irradiation or MAS + reconstruction or MAS alone | Postoperative QOL varied with age; for age less than 55 QOL was lowest for MAS, over 55 was lowest for lumpectomy. |
| Amichetti et al. [98] | 1999 | BCS + irradiation in non-infiltrating breast cancer | Good QOL and body image and lack of negative impact on sexuality. |
| King et al. [99] | 2000 | MAS or BCS (3 months and 1 year after) | Most symptoms declined over time but arm and menopausal symptoms persisted; worse QOL in younger patients. |
| Kenny et al. [100] | 2000 | MAS or BCS + irradiation (1 year after) | Better body image and physical function in BCS; more impact on younger women regardless of treatment type. |
| Nissen et al. [101] | 2001 | MAS or MAS + reconstruction or BCS (6 times assessment up to 2 years after) | QOL other than body image were not better in BCS or MAS + reconstruction than in who had MAS alone; MAS + reconstruction was associated with greater mood disturbance and poorer QOL. |
| Janni et al. [102] | 2001 | MAS or BCS (median 46 months follow-up) | Surgical modalities had no long-term impact on overall QOL, but certain body image related problems in MAS was observed. |
| Girotto et al. [103] | 2003 | MAS + reconstruction in older women | Improved QOL in older patients especially improved mental health. |
| Cocquyt et al. [104] | 2003 | Skin-sparing MAS or BCS | Both yielded comparable QOL, but cosmetic outcome was better after skin-sparing MAS. |
the choice. However, they stated that small differences in the relative efficacy of these therapies have a substantial impact on treatment choice [156].

To improve clinical outcomes an international randomized controlled trial compared dose-intensive chemotherapy with standard systemic chemotherapy in patients with locally advanced breast cancer and showed that a dose-intensive regimen only has a temporary effect on health-related quality of life, thus enabling more research on intensive treatment for patients with locally advanced breast cancer, as it might also offer a survival benefit [158].

However, recent studies focusing on adjuvant hormonal therapies (tamoxifen or aromatase inhibitors such as anastrozole, letrozole, exemestane) and quality of life in postmenopausal early-stage breast cancer patients reported more encouraging results. Most studies found that overall quality of life was improved in patients receiving either anastrozole or tamoxifen but patients reported different side effects [151,166]. A trial comparing tamoxifen with exemestane showed that quality of life did not change significantly in either groups, but there were improvements in endocrine-related symptoms [164].

In summary, as noted by Grimison and Stockler, for the majority of breast cancer patients most aspects of health-related quality of life recover after adjuvant chemotherapy ends without long-term effects except vasomotor symptoms and sexual dysfunction. However, tamoxifen and aromatase inhibitors cause long-term effects due to vasomotor, gynecological and sexual problems [35].

Table 7: A list of studies of surgical treatment and quality of life in breast cancer patients (1974–2007) (Continued)

| Study                        | Year | Intervention | Findings |
|------------------------------|------|--------------|----------|
| Engel et al. [105]           | 2004 | MAS or BCS (5 years follow-up) | MAS patients had lower body image, role and sexual functioning; BCS should be encouraged in all ages. |
| Ganz et al. [106]            | 2004 | Lumpectomy + chemotherapy or MAS + chemotherapy or Lumpectomy alone or MAS alone in non-metastatic breast cancer patients | At the end of primary treatment all treatment groups reported good emotional functioning but decreased physical health especially among women who had MAS or received chemotherapy. |
| Dubernard et al. [107]       | 2004 | SLNB         | Axillary procedure affected only QOL related to arm morbidity. |
| Elder et al. [108]           | 2005 | MAS + immediate breast reconstruction (before and 12 months after) | After 12 months good QOL comparable with aged-matched women from the general population. |
| Barranger et al. [109]       | 2005 | SLNB vs. ALND in breast-sparing treatment | SLNB was associated with significantly lower mid term morbidity. |
| Fleissig [110]               | 2006 | SLNB vs. ALND | Regarding arm functioning and QOL the use of SNB was recommended in patients with node negative breast cancer. |
| Pandey et al. [111]          | 2006 | MAS or BCS   | No significant change in overall QOL after surgery; poorer QOL in MAS patients. |
| Rietman et al. [112]         | 2006 | SLNB or ALND (before and after 2 years) | Less treatment related upper limb morbidity, perceived disability in activities of daily life and worsening of QOL after SLNB compared with ALND. |
| Parker et al. [113]          | 2007 | MAS or MAS+ reconstruction or BCS (short- and long-term effects on aspects of psychosocial adjustment and QOL | Overall, the general patterns of psychosocial adjustment and QOL were similar among the three surgery groups. |

Abbreviations:
MRM: modified radical mastectomy, MAS: mastectomy, BCS: breast conservation surgery, SNLB: sentinel lymph node biopsy, ALND: axillary lymph node dissection

Quality of life as predictor of survival
Until recently, only a few studies had reported a relationship between quality of life and survival in breast cancer patients [115]. A study using the Daily Diary Card to measure quality of life in advanced breast cancer showed that the instrument offered accurate prognostic data regarding subsequent response to treatment and survival duration [170]. Similarly, Seidman et al. evaluated quality of life in two phase II clinical trials of metastatic breast cancer and found that baseline scores of two validated quality of life instruments independently predicted the overall likelihood of tumour responses [171].
Table 8: A list of studies on systemic therapies and quality of life in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Treatment/patients                                                                 | Conclusion(s)                                                                 |
|------------------|------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Moore et al. [36] | 1974 | Adrenalectomy + chemotherapy in advanced breast cancer                             | In most patients the subjective palliation involved a return to normal living. |
| Priestman and Baum [37] | 1976 | Chemotherapy in advanced breast cancer                                            | Toxicity is not related to the patients’ age and diminished with successive courses of drugs. |
| Palmer et al. [114] | 1980 | A single agent vs. five drug combination in node positive primary breast cancer    | Better QOL in single agent group.                                              |
| Coates et al. [115] | 1987 | Intermittent vs. continuous chemotherapy in metastatic breast cancer              | Continuous chemotherapy was better; changes in the QOL were independent prognostic factor of survival. |
| Kiebert et al. [116] | 1990 | Peri-operative chemotherapy vs. no chemotherapy in early stage breast cancer      | No differences 1 year after; patients considered chemotherapy most burdensome aspect of treatment. |
| Gelber et al. [117] | 1991 | Single cycle of combination chemotherapy vs. longer duration chemotherapy for pre-menopausal or chemo-endocrine therapy for postmenopausal women | Better QOL in longer duration chemotherapy or chemo-endocrine therapy.          |
| Berglund et al. [118] | 1991 | Late effects of adjuvant chemotherapy vs. postoperative radiotherapy in pre- and post-menopausal breast cancer | Chemotherapy patients had higher overall QOL.                                  |
| Richards et al. [119] | 1992 | A (weekly for 12 courses vs. every three weeks for 4 courses) in advanced breast cancer | Similar survival but higher psychological distress in the three weeks group.     |
| Hurny et al. [120] | 1992 | CMF (6 cycles vs. 3 cycles) in operable breast cancer                             | QOL improved with increasing time from the study entry.                        |
| Campora et al. [121] | 1992 | Adjuvant chemotherapy vs. palliative chemotherapy in metastatic breast cancer     | No significant difference between groups.                                      |
| Fraser et al. [122] | 1993 | CMF vs. E in advanced breast cancer                                               | Similar survival and no significant difference in overall global QOL.          |
| Twelves et al. [123] | 1994 | Iododoxorubicin in advanced breast cancer                                         | Little evidence of benefit in terms of physical symptom relief, level of activity, psychological symptoms or global QOL. |
| Bertsch and Donaldson. [124] | 1995 | Vinorelbine vs. melphalan                                                         | Vinorelbine was better in some aspects of QOL.                                |
| Swain et al. [125] | 1996 | AC + G-CSF in node positive breast cancer                                         | Tolerable physical symptoms and emotional distress.                           |
| McQuellon et al. [126] | 1996 | High-dose chemotherapy + ABMT                                                    | No significant difference between pre- and post-treatment QOL.                |
| Larsen et al. [127] | 1996 | High-dose chemotherapy + ASCT                                                     | Resulting in poor physical and emotional health.                              |
| Hurny et al. [128] | 1996 | 6 cycles of CMF vs. 3 cycles CMF in node-positive operable breast cancer          | Worse QOL during treatment but not after treatment completion.                |
| Griffiths and Beaver [129] | 1997 | High-dose chemotherapy in advanced breast cancer                                 | No significant deterioration in QOL.                                          |
| Lindley et al. [130] | 1998 | Systemic adjuvant therapy                                                        | 2–5 years after treatment good QOL. Small to modest gain was acceptable to women. |
| Ganz et al. [131] | 1998 | TAM or chemotherapy alone or chemotherapy + TAM, or no adjuvant therapy           | No significant differences in global QOL among treatment groups; those who received chemotherapy had more sexual problems and those who received TAM had more vasomotor symptoms. |
| Study                          | Year | Treatment Details                                                                 | QOL Evaluation                                                                 |
|-------------------------------|------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Bernhard et al. [132]         | 1999 | Formestane vs. megestrol acetate in postmenopausal advanced breast cancer while on TAM | No significant difference in QOL; baseline QOL was strong predictive for QOL under treatment but not for time to treatment failure. |
| Fairclough et al. [133]       | 1999 | CAF vs. dose intensive a 16-week multi-drug regimen                               | Negative impact of the dose intensive 16-week regimen was observed, although Q-TwiST analysis showed a small gain for this regimen. |
| Osoba and Burchmore [134]     | 1999 | Trastuzumab (Herceptin) in metastatic breast cancer who may or may not have had prior chemotherapy | Trastuzumab was associated with an amelioration of the deleterious effects of chemotherapy alone; the drug was not associated with worsening of QOL. |
| McLachlan et al. [135]        | 1999 | Chemotherapy in metastatic breast cancer                                           | QOL maintained or improved; patients did not want to trade quantity for QOL.     |
| Macquart-Moulin et al. [136]  | 2000 | High-dose chemotherapy + G-CSF + ASCT in inflammatory breast cancer               | QOL deterioration disappeared after treatment and returned to baseline after one year. |
| Riccardi et al. [137]         | 2000 | Doubling E within FEC vs. FEC in metastatic breast cancer                          | No significant difference in response or improvement of baseline QOL.           |
| Kramer et al. [138,139]       | 2000 | Paclitaxel vs. A in advanced breast cancer                                        | QOL appeared to be prognostic for survival and response to treatment.          |
| Joly et al. [140]             | 2000 | CMF + irradiation vs. irradiation in pre-menopausal breast cancer                 | Similar QOL was observed.                                                      |
| Hakamies-Blomqvist et al. [141]| 2000 | T vs. sequential MF in metastatic breast cancer                                   | Difference in QOL was minor favoring MF.                                       |
| Broeckel et al. [142]         | 2000 | Adjuvant chemotherapy treated breast cancer (after 3 to 36 months)               | Younger age, unmarried status, time since diagnosis and chemotherapy completion related to greeter depressive symptoms. |
| Carlson et al. [143]          | 2001 | High-dose chemotherapy + ASCT in metastatic breast cancer                          | Anxiety and depression continued to increase, loss of sexual interest, worrying and joint pain were reported. |
| Osoba et al. [144]            | 2002 | Chemotherapy + Trastuzumab (Herceptin) vs. Chemotherapy alone in metastatic breast cancer | More improved global QOL with chemotherapy + Herceptin.                         |
| Modi et al. [145]             | 2002 | Paclitaxel in metastatic breast cancer                                             | QOL benefit in tumor response patients.                                         |
| Heidemann et al [146]         | 2002 | Mitoxantrone vs. FEC in metastatic breast cancer                                  | No significant difference in survival or response but a QOL scores favored mitoxantrone. |
| Genre et al. [147]            | 2002 | High-dose-intensity AC (21 vs. 14 days)                                           | Shortening cycles had a high negative impact on QOL.                            |
| de Haes et al. [148]          | 2003 | Goserelin vs. CMF in peri-and pre-menopausal node-positive early breast cancer     | Better QOL in favor of goserelin.                                               |
| Brandberg et al. [149]        | 2003 | Tailored FEC vs. induction FEC followed with high-dose CTCb + peripheral SCT     | No significant overall differences were found between groups.                   |
| Land et al. [150]             | 2004 | CMF vs. AC in axillary node negative and estrogen receptor negative breast cancer | Overall QOL was equivalent between two groups.                                  |
| Fallowfield et al. [151]      | 2004 | ANA vs. TAM alone or in combination in postmenopausal early breast cancer         | Similar overall QOL impact but some small differences in side effects profiles. |
| Bottomely et al. [152]        | 2004 | AT vs. AC in metastatic breast cancer                                             | No significant differences in QOL between two groups.                           |
Table 8: A list of studies on systemic therapies and quality of life in breast cancer patients (1974–2007) (Continued)

| Study Reference       | Year | Therapy Description                                                                 | Findings                                                                 |
|-----------------------|------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Bernhard et al. [153] | 2004 | TAM for 5 years or three prior cycles of CMF followed by 57 months TAM in estrogen receptor-negative and estrogen receptor-positive breast cancer | At completion there were no differences by treatment groups.            |
| Tong et al. [154]     | 2005 | Capecitabine, idarubicin and cyclophosphamide (all oral regimen, XIC) in metastatic breast cancer | No significant decrease in global QOL scores.                           |
| Galalae et al. [155]  | 2005 | Radiotherapy and adjuvant chemotherapy vs. radiotherapy and hormonal therapy vs. radiotherapy alone after conserving surgery | Adjuvant chemotherapy lowered QOL vs. hormones or radiotherapy alone.   |
| Elkin et al. [156]    | 2005 | Ovarian suppression vs. chemotherapy in premenopausal hormone-responsive breast cancer | Assuming equal efficacy ovarian suppression was superior. Efficacy would have impact on treatment choice. |
| Conner-Spady et al. [157] | 2005 | High-dose chemotherapy + ABST in breast cancer with poor prognosis | Impaired QOL in short term but improved after 2 years.                   |
| Bottomley et al. [158] | 2005 | Dose-intensives chemotherapy (CE + filgrastim) vs. CEF in locally advanced breast cancer | Groups did not differ in progression free survival; lower QOL in intensified group at short term but no difference at long term. |
| Ahles et al. [159]    | 2005 | Standard-dose systemic chemotherapy vs. local therapy only in long-term breast cancer survivors | Lower overall QOL in chemotherapy group.                                |
| Peppercorn et al. [160] | 2005 | High-dose chemotherapy + ABMT vs. intermediate-dose chemotherapy in patients with stage II and III breast cancer | Patients who received more intensive therapy experienced transient declines in QOL; by 12 months after, QOL was comparable between the 2 arms, regardless of therapy intensity, and many QOL areas were improved from baseline. |
| Semiglazov et al. [161] | 2006 | CMF + mistletoe lectin (PS76A2) vs. CMF + placebo PS76A2 improved QOL during and after chemotherapy. |                                                                                     |
| Martin et al. [162]   | 2006 | FAC vs. TAC or TAC + G-CSF in node negative breast cancer | Lower QOL in patients treated with TAC. Addition of G-CSF improves QOL. |
| Hurria et al. [163]   | 2006 | Anthracyclin-based chemotherapy or CMF in older women with breast cancer | QOL maintained in both group.                                           |
| Fallowfield et al. [164] | 2006 | EXE vs. TAM after 2–3 years of TAM in postmenopausal primary breast cancer | Temporary decrease in overall QOL for EXE but no other differences.      |
| Groenvold et al. [165] | 2006 | CMF vs. ovarian ablation | CMF had more negative impact on QOL.                                   |
| Cella et al. [166]    | 2006 | ANA vs. TAM alone or in combination in postmenopausal breast cancer | ANA and TAM had similar impact on QOL.                                  |
| Liu et al. [167]      | 2006 | DPPE + A vs. A in patients with advanced or metastatic breast cancer | Patients on A alone had fewer disease and treatment adverse events and better QOL. |
| Karamouzis et al. [168] | 2007 | Chemotherapy vs. supportive care in metastatic patients | QOL was better in patients receiving chemotherapy than those under supportive care. |
| Hopwood et al. [169]  | 2007 | Adjuvant radiotherapy | QOL and mental health were favorable for most patients about to start radiotherapy but younger age and receiving chemotherapy were significant risk factors for poorer QOL. |

Abbreviations
C: Cyclophosphamide, M: Methotrexate, F: 5-fluorouracil, A: Doxorubicin, E: Epirubicin, T: Docetaxel, TAM: Tamoxifen, ANA: Anastrozole, EXE: Exemestane, QOL: Quality of life, DPPE: Tesmilifene, Granulocyte colony stimulating factor: G-CSF, CTCb: Cyclophosphamide, thiopeta, and carboplatin
Studies have shown that baseline quality of life predicts survival in advanced breast cancer but not in early stage of disease [172]. Two recently published papers also confirmed that baseline quality of life is not a prognostic factor in non-metastatic breast cancer patients. One of these two studies, using Cox survival analysis, indicated that neither health-related quality of life nor psychological status at diagnosis or 1 year later was associated with medical outcome in women with early-stage breast cancer [173]. The other study with a sample of 448 locally advanced breast cancer patients, reported that baseline health-related quality of life parameters had no prognostic value in a non-metastatic breast cancer population [174]. However, other studies have demonstrated that some aspects of quality of life data including physical health [175], pain [139,176], and loss of appetite [177] were significant prognostic factors for survival in women with advanced breast cancer. In addition, one study demonstrated that baseline physical aspects of quality of life and its changes were related to survival, but psychological and social aspects were not [178].

**Psychological distress**

Women with breast cancer might develop psychological distress including anxiety and depression during diagnosis and treatment and after treatment. The psychological impact of breast cancer has received considerable attention. Since this is a separate topic, the focus here is on psychological distress as it relates to quality of life studies in breast cancer patients. Table 9 summarizes the papers on the topic [179-210].

Psychological distress in breast cancer patients is mostly related to depression, anxiety, and low emotional functioning and almost all studies have shown that psychological distress contributed to impaired quality of life especially emotional functioning, social functioning, mental health and overall quality of life. The diagnosis of the disease, importance of fears and concerns regarding death and disease recurrence, impairment of body image, and alteration of femininity, sexuality and attractiveness are factors that can cause unexpected psychological distress even years after diagnosis and treatment [211-213].

Studies have shown that psychological factors predict subsequent quality of life [200] or even overall survival in breast cancer patients [214]. A study showed that patients with lower coping capacity reported higher prevalence of symptoms, experienced higher levels of distress, and experienced worse perceived health, which in turn decreased their quality of life [215]. Furthermore, it has been shown that psychological adjustment such as the ability to cope with the disease, treatment and effects of treatment could improve outcome. The relationship between positive thinking and longer survival and a better quality of life is well documented [216].

**Supportive care**

A variety of topics were covered to address supportive care issues in breast cancer patients. These ranged from papers on controlling emesis to papers that reported issues related to counseling, social support and exercise to improve quality of life [217-253]. The results are summarized in Table 10.

**Symptoms**

There were studies on breast cancer symptoms and their relationship to quality of life. Most of these studies were related to fatigue, lymphedema, pain, and menopausal symptoms. The results are summarized in Table 11[254-280].

Fatigue is the least definable symptom experienced by patients with breast cancer and its effect on impaired quality of life cannot be explained precisely. A recent publication studying 1,588 breast cancer patients showed that fatigue (as measured by the EORTC QLQ-C30 fatigue subscale) independently predicted longer recurrence-free survival when biological factors were controlled in the analysis. When combined with the biological model, fatigue still remained a significant predictor of recurrence-free survival [214].

**Sexual functioning**

Breast cancer could be regarded as a disease that relates to women’s identities. In this respect, sexual functioning is an important issue, especially in younger breast cancer patients. Among quality of life studies in breast cancer patients only six papers focused especially on sexual functioning [281-286]. The findings indicated that disrupted sexual functioning or unsatisfactory sexual life was related to poorer quality of life at younger age, treatment with chemotherapy, total mastectomy, emotional distress consequent on an unsatisfactory sexual life, and difficulties with partners because of sexual relationships.

**Discussion**

This bibliographic review has provided an extensive list of studies that focused on quality of life in breast cancer patients. The article might be criticized on the grounds that it included every paper on the topic and that it provides more enumeration than insight. However, this was not an in-depth review but rather, as indicated in the title, a bibliographic investigation and descriptive in nature. The benefit of such an approach is that it reveals how much effort has been made in this area and shows the achievements of a journey that was started more than 30 years ago. If quality of life has now become an important part of breast cancer patients’ care, it is due to all these
| Author(s) [Ref.] | Years | Main focus | Results/conclusion(s) |
|------------------|-------|------------|-----------------------|
| Ferrero et al. [179] | 1994 | Mental adjustment to cancer in newly-diagnosed non-metastatic breast cancer (an exploratory study) | Strong association between mental adjustment to cancer and reported vague physical symptoms; fighting spirit and denial was associated with better QOL and helpless/hopeless and anxious preoccupation and fatalism were negatively correlated with well-being. |
| Ganz et al. [180] | 1996 | Psychosocial concerns 2 and 3 years after primary treatment | Problems associated with physical and recreational activities, body image, and sexual functions were observed, although many positive aspects from cancer experience were reported. |
| Maunsell et al. [181] | 1996 | Brief psychological intervention vs. Brief psychological intervention + psychological distress screening | Distress screening did not improve QOL. Minimal psychological intervention at initial treatment alone was recommended. |
| Andrykowski et al. [182] | 1996 | Psychological adjustment in women with breast cancer or benign breast problems | Breast cancer patients reported poorer physical health but greater positive psychosocial adaptation and improved life outlook, no difference in psychological distress between two groups. |
| Marchioro et al. [183] | 1996 | Evaluation of the impact of a psychological intervention vs. standard care in non-metastatic breast cancer patients | Cognitive psychotherapy and family counseling improved both depression and QOL indexes. |
| Weitzner et al. [184] | 1997 | QOL and mood in long-term breast cancer survivors | Psychological measures were found to be more robust predictors of QOL than the demographic variables; long-term survivors continue to experience significant depression and lower QOL. |
| Kissane et al. [185] | 1998 | Psychological morbidity in early-stage breast cancer | 45% (135/303) had psychiatric disorder, 42% had depression, anxiety or both; QOL was substantially affected. |
| Bloom et al. [186] | 1998 | Intrusiveness of illness in young women with newly-diagnosed breast cancer | Intrusiveness of illness mediated the effect of disease and treatment factors on QOL; neither time post-diagnosis nor type of treatment affected the psychological component of QOL. |
| Longman et al. [187] | 1999 | Psychological adjustment over time | Over time depression burden and anxiety burden persist and each was negatively associated with overall and present QOL. |
| Cotton et al. [188] | 1999 | Relationship among spiritual well-being, QOL, and psychological adjustment | Spiritual well-being was correlated with both QOL and psychological adjustment, but relationship was found to be more complex and indirect than previously considered. |
| Ashing-Giwa [189] | 1999 | Psychological outcome in long-term survivors of breast cancer (focus on African-American) | Patients relied on spiritual faith and family support to cope; socio-cultural contexts of the women’s lives need to be considered when studying QOL. |
| Lewis et al. [190] | 2001 | Cancer-related intrusive thoughts and social support | In women with social support cancer-related intrusive thoughts had no significant negative impact on QOL, but in women with low social support there was negative effect on QOL. |
| Amir and Ramati [191] | 2002 | Post-traumatic distress disorder (PTSD), QOL, and emotional distress in long term survivors of breast cancer and a control group | Higher PSTD, emotional distress and lower QOL in breast cancer mainly due to chemotherapy and disease stage. |
| Ganz et al. [192] | 2003 | Psychosocial adjustment 15 months after diagnosis in older women with breast cancer | Psychosocial adjustment at 15 months was predicted by better mental health, emotional social support and better self-rated interaction with health care providers. |
| Bordeleau et al. [193] | 2003 | Randomized trial of group psychological support vs. control in metastatic breast cancer | Supportive-expressive group therapy did not appear to influence QOL. |
| Badger et al. [194] | 2004 | Depression burden and psychological adjustment | Depression burden had negative effect on psychological adjustment and QOL. |
| Reference | Year | Description | Findings |
|-----------|------|-------------|----------|
| Schreier and Williams [195] | 2004 | Anxiety in women receiving either radiation or chemotherapy for breast cancer | No significant differences for total QOL or any subscales by treatment; trait anxiety was higher for chemotherapy patients; state anxiety was high and did not decrease over the course of the treatment for either group. |
| Kershaw et al. [196] | 2004 | Coping strategies in advanced breast cancer patients and their family caregivers | Patients use more emotional support, religion and positive reframing strategies while family use more alcohol or drug. In both active coping was associated with higher QOL. |
| Lehto et al. [197] | 2005 | Psychological stress factors as predictors of QOL in patients receiving surgery alone vs. adjuvant treatment | Psychosocial factors were strongest predictors of QOL but not cancer type or treatment; non-cancer related stresses showed strongest QOL decreasing influence. |
| Roth et al. [198] | 2005 | Affective distress in women seeking immediate vs. delayed breast reconstruction after mastectomy | Women seeking immediate breast reconstruction showed relatively higher psychological impairment and physical disability. |
| Okamura et al. [199] | 2005 | Psychiatric disorders and associated factors after first breast cancer recurrence | Patients’ psychiatric disorders were associated with lower QOL. |
| Golden-Kreutz et al. [200] | 2005 | Traumatic stress, perceived global stress, and life events | Initial stress at diagnosis predicted both psychological and physical health at follow-up. |
| Deshields et al. [201] | 2005 | Emotional adjustment (at 4 points in time) | Primary psychological changes occur quickly after treatment conclusion and then it appeared to become stabled. |
| Laidlaw et al. [202] | 2005 | Self-hypnosis or Japanese healing or. control | Positive change in anxiety level, a general increase in mood and a better QOL were observed. |
| Schou et al. [203] | 2005 | Dispositional optimism and QOL. | Optimism was predictive for better emotional and social functioning one year after surgery, at time of diagnosis and throughout post-diagnosis dispositional optimism was associated with better QOL and fewer symptoms. |
| Grabsch et al. [204] | 2006 | Psychological morbidity in advanced breast cancer | 42% (97/227) had a psychiatric disorder, 36% depression or anxiety or both. QOL was substantially affected. |
| Antoni et al. [205] | 2006 | Stress management after treatment for breast cancer | Stress management skill taught had beneficial effects on reduced social disruption, and increased emotional well-being, positive states of mind, benefit finding, positive lifestyle change, and positive affect. |
| Wonghongkul et al. [206] | 2006 | Uncertainty appraisal coping | Social support was used most to cope and confront-coping used the least; year of survival, uncertainty in illness and harm appraisal influenced QOL. |
| Yen et al. [207] | 2006 | Depression and stress in breast cancer versus benign tumor | Stress from health problem was the most significant predictor for QOL among malignant group. |
| Costanzo et al. [208] | 2007 | Adjustment to life after treatment | While breast cancer survivors demonstrated good adjustment on general distress following treatment, some women were at risk for sustained distress. |
| Wong and Fielding [209] | 2007 | Change in psychological distress and change in QOL | The magnitude of change in psychological distress significantly impacted physical and functional, but not social QOL in breast cancer patients. |
| Meneses et al. [210] | 2007 | Psycho-educational intervention and QOL | Breast cancer education intervention is an effective intervention in improving QOL during the first year of breast cancer survivorship. |
Table 10: A list of quality of life studies covering supportive care topics in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Intervention | Results/conclusion(s) |
|------------------|------|--------------|-----------------------|
| van Holten-Verzantoort et al. [217] | 1991 | Pamidronate vs. control to reduce skeletal morbidity | Less short-term mobility impairment and bone pain in treatment group but not at long term. |
| Young-McCaughan and Sexton [218] | 1991 | Aerobic exercise | Higher QOL in women who exercised. |
| Soukop et al. [219] | 1992 | Ondansetron vs. metoclopramide to control emesis | Ondansetron was significantly superior. |
| Kornblith et al. [220] | 1993 | Megestrol acetate in dose-response trial to prevent appetite loss | Lower dose was optimal achieving fewest side effects and a better QOL. |
| Clavel et al. [221] | 1993 | Ondansetron to control emesis (review of five randomized trials) | Ondansetron provided significant QOL benefits compared with metoclopramide and alizapride. |
| Ashbury et al. [222] | 1998 | One-on-one peer support (Reach to Recovery programme) | Patients were satisfied and the programme had incremental benefits to QOL of patients. |
| Lee [223] | 1997 | Social support (Reach to Recovery programme) | Social support plays a vital role in promoting overall QOL. |
| Wengstrom et al. [224] | 1999 | Nursing intervention vs. control | No measurable effect on side effects or QOL but proved to have a positive effect in minimizing stress. |
| Lachaine et al. [225] | 1999 | Ondansetron or metoclopramide to control emesis | Emesis control was significantly better in ondansetron; global QOL decreased more with metoclopramide. |
| Ritz et al. [226] | 2000 | Advanced nursing care (APN)+ standard care vs. standard care | APN improved some QOL indicators. |
| Molenaar et al. [227] | 2001 | Decision support to help patients to choose mastectomy or breast conservation | Decision-making improved as evaluated in terms of satisfaction and QOL. |
| Sammarco [228] | 2001 | Perceived social support and uncertainty in younger breast cancer survivors | Significant positive correlation between perceived social support and QOL, and significant negative correlation between uncertainty, and QOL. |
| Michael et al. [229] | 2002 | Social networks | Pre-diagnosis level of social integration was important factor in future QOL, and explains more of the variance than treatment or tumour characteristics. |
| Olsson et al. [230] | 2002 | Erythropoietin (randomized to two different doses epoetin-beta) for treatment of anemia | Global QOL was significantly improved and there was no difference between two study arms. |
| O'Shaughnessy [231] | 2002 | Effects of epoetin-alfa to prevent neuronal apoptosis vs. placebo | Improved cognitive function, mood and QOL in treatment group. |
| Graves et al. [232] | 2003 | 8-week intervention based on social cognitive theory vs. standard care | Women in intervention group improved more on QOL, mood, self-efficacy, and outcome expectations. |
| Courneya et al. [233] | 2003 | Exercise training (randomized trial) | Exercise training had beneficial effects on QOL. |
| Turner [234] | 2004 | Seated exercise | Reduced fatigue and improved QOL observed. |
| Headley et al. [235] | 2004 | Effect of seated exercise vs. control | Women with advanced breast cancer randomized to the seated exercise had a slower decline in total physical well-being and less increase in fatigue. |
| Weinfurt et al. [236] | 2004 | Zoledronic acid or pamidronate disodium for metastatic bone lesion | Overall increase in QOL was observed. |
efforts. Furthermore, this approach might help potential investigators to formulate new questions or conduct more focused studies on the topic in the future. It should be admitted that investigations of this type have limitations and are inconclusive. Since in this review the search strategy was limited to the keyword 'quality of life' and 'breast cancer' in titles, perhaps many other papers were missed even from enumeration. However, an up

| Study | Year | Intervention | Outcome |
|-------|------|--------------|---------|
| Diel et al. [237] | 2004 | Ibandronate vs. placebo in breast cancer with metastatic bone pain | A significant improvement in QOL was observed in intervention group; fatigue and pain were also reduced. |
| Body et al. [238] | 2004 | Ibandronate vs. placebo in breast cancer with metastatic bone pain | Oral ibandronate had beneficial effects on bone pain and QOL and was well tolerated. |
| Wardley et al. [239] | 2005 | Zoledronic acid in community setting vs. hospital setting in breast cancer patients with bone metastases | No difference between settings; safety and QOL benefits were observed. |
| Yoo et al. [240] | 2005 | Muscle relaxation training and guided imagery vs. control | Less anticipatory and post-chemotherapy nausea and vomiting and higher QOL in intervention group. |
| Manning-Walsh [241] | 2005 | Relationships between persona land religious support and symptom distress and QOL | Personal support was positively related to QOL and had partial mediated effects on symptom distress but religious support was not. |
| Gordon et al. [242] | 2005 | Home-based physiotherapy or group-based exercise or no intervention | Physiotherapy was found beneficial for functioning, physical and overall QOL. |
| Kendall et al. [243] | 2005 | Influence of exercise (13.2 years following diagnosis) | High level of functioning was observed; those whose exercise increased, maintained a better QOL. |
| Chang et al. [244] | 2005 | Effect of weekly epoetin alfa on maintaining hemoglobin levels, and reduction of transfusion vs. standard care | Epoetin alfa improved QOL, maintained hemoglobin levels and reduced of transfusion. |
| Hudis et al [245] | 2005 | Effect of weekly epoetin alfa on hemoglobin levels | Epoetin alfa improved hemoglobin levels, and QOL in mildly anemic patients. |
| Badger et al. [246] | 2005 | Telephone interpersonal counseling (TPC) vs. usual care | TIP-C was partially effective in symptom management and improved QOL. |
| Cheema and Guial [247] | 2006 | Full-body exercise training (before and after evaluation study) | Significant improvements were observed in upper- and lower-body strength, endurance, and QOL. |
| Sutton and Erlen [248] | 2006 | Mutual dyadic support intervention | Most dyadic relationships were supportive, some reciprocal and some experienced conflicts. |
| Round et al. [249] | 2006 | Recovery advice to prevent treatment problems | Recovery advice given to women neither was supported nor refuted to be able improve QOL. |
| Giese-Davis et al. [250] | 2006 | Peer counseling intervention (newly diagnosed and peer counselors) | Significant improvement in newly diagnosed was observed in trauma symptoms, emotional well-being, and self-efficacy but increased emotional suppression and declined QOL in peer counselors. |
| Moadel et al. [251] | 2007 | Effects of yoga on QOL | Yoga was associated with beneficial effects on social functioning among breast cancer survivors. |
| Hartmann et al. [252] | 2007 | Effects of a step-by-step inpatient rehabilitation programme and QOL | Although not generally superior to conventional inpatient rehabilitation programmes, the step-by-step rehabilitation provided marked benefits for patients with cognitive impairments. |
| Kim et al. [253] | 2007 | Effect of complex decongestive therapy (CDT) on edema and QOL in breast cancer patients with unilateral lymphedema | CDT for upper limb lymphedema resulted in significant improved edema and QOL. |
Table 11: A list of studies of quality of life and common symptoms in breast cancer patients (1974–2007)

| Author(s) [Ref.] | Year | Main focus | Results/conclusion(s) |
|------------------|------|------------|-----------------------|
| Hann et al. [254] | 1998 | Fatigue following radiotherapy | Women experienced fatigue but not worse than expected. |
| Carpenter et al. [255] | 1998 | Hot flushes | 65% (n = 114) reported hot flushes, with 59% of women with hot flushes rating the symptom as severe; hot flushes were most severe in women with a higher body mass index, those who were younger at diagnosis, and those receiving tamoxifen. |
| Hann et al. [256] | 1999 | Fatigue after high-dose therapy and autologous stem cell rescue | Fatigue was related to medical and psychosocial factors. |
| Velanovich and Szymanski [257] | 1999 | Lymphedema | Lymphedema occurred in a minority of patients and negatively affected QOL. |
| Bower et al. [258] | 2000 | Fatigue, occurrence, and correlates | About one-third (n = 1957) reported more severe fatigue which was associated with higher level of depression, pain, and sleep difficulties. |
| Kuehn [259] | 2000 | Surgery related symptoms following ALND | Shoulder-arm morbidity following ALND was found to be the most important long-term sources of distress. |
| Stein et al. [260] | 2000 | Hot flushes | Hot flushes have a negative impact on QOL that may be due to fatigue and interference with sleep. |
| Beaulac et al. [261] | 2002 | Lymphedema in survivors of early-stage breast cancer | MAS or BCS patients had similar lymphedema rates (28%–42/151) and had negative impact on long-term QOL in survivors. |
| Kwan et al. [262] | 2002 | Arm morbidity after curative breast cancer treatment | Symptomatic patients and patients with lymphedema had impaired QOL compared to patients with no symptoms. |
| Fortner et al. [263] | 2002 | Sleep difficulties | Most patients had significant sleep problems that frequently being disturbed by pain, nocturia, feeling too hot, and coughing or snoring loudly; patients having significant sleep problems had greater deficits in QOL. |
| Engel et al. [264] | 2003 | Arm morbidity | Up to 5 years after diagnosis 38% (n = 990) were still experiencing arm problems and for these patients QOL was significantly lower than patients without arm morbidity; extent of axilla, younger age, and operating clinic significantly contributed to arm morbidity. |
| Caffo et al. [265] | 2003 | Pain after surgery | Pain distressed 40% of patients (n = 529) regardless of treatment type and had negative effect on patients' QOL. |
| Rietman et al. [266] | 2004 | Impairments and disabilities (2.7 years after surgery) | Pain was the most frequent assessed impairment after breast cancer treatment with strong relationship to perceived disability and QOL. |
| Schults et al. [267] | 2005 | Menopausal symptoms | Menopausal signs and symptoms may not be different or the breast cancer survivors and they should not be confused with the QOL/psychosocial issues of the cancer survivors. |
| Ridner [268] | 2005 | Lymphedema | Survivors with lymphedema reported poorer QOL; a symptom cluster including limb sensation, loss of confidence in body, decreased physical activity, fatigue and psychological distress was identified. |
| Conde et al. [269] | 2005 | Menopausal symptoms | Prevalence of menopausal symptoms was similar in women with and without breast cancer; sexual activity was less frequent in breast cancer patients. |
| Burckhardt et al. [270] | 2005 | Pain | Widespread pain significantly caused more experience of pain severity, pain impact and lower physical health than regional pain. |
| Mills et al. [271] | 2005 | Fatigue | Pre-chemotherapy and chemotherapy induced inflammation were related to fatigue and QOL. |
coming complementary review by the author will focus on these missing papers.

A number of studies that covered measurement issues and introduced instruments used to measure quality of life in breast cancer patients. Hopefully there is now sufficient evidence to use these valid instruments and to adopt the practices that are needed to assess quality of life in research or clinical settings. Since 1974, when the first study on quality of life in breast cancer patients was published, there has been quite impressive progress and improvement, indicating that measuring quality of life in breast cancer patients is both crucial and scientific. Now several valid instruments that capture quality of life dimensions in cancer patients in general and in breast cancer patients in particular are available. The EORTC QLQ-C30, EORTC QLQ-BR23, FACIT-G and FACIT-B are among the most acceptable instruments to patients and health professionals. They have been used in many studies, so it is possible to compare results between studies with similar objectives. It seems that it is time to stop developing new instruments, since there are enough valid and comprehensive measures to assess quality of life in breast cancer patients. New instruments might cause confusion and may be regarded as a waste of resources, so any such developments would need robust justification. Depending on the objectives of any single study, one might use other existing valid measures such as the Satisfaction with Life Domains Scale for Breast Cancer (SLDS-BC), which can briefly and rapidly assess quality of life across the breast cancer continuum of care [287]; the Body Image After Breast Cancer Questionnaire (BIBCQ); which is a valid measure for assessing the long-term impact of breast cancer on body image [288]; and the Fallowfield’s Sexual Activity Questionnaire (FSAQ), which is a useful tool for measuring sexual activity in women with cancer [289].

There were some important technical issues that should be addressed. Some believe that if we perform complex analyses of quality of life data or if we use several instruments in a single study then we might achieve more scientific results. There is evidence that this could merely lead to misleading findings and might be a source of suffering for the patients [84]. The recommendation is to analyze data in a simple way and avoid complexity. The presentation of data should be straightforward and easy to follow; otherwise those who are critical of such findings might conclude that these are manipulations of data, or they might ask whether these numbers and statistics reflect

### Table 11: A list of studies of quality of life and common symptoms in breast cancer patients (1974–2007) (Continued)

| Study | Year | Title | Quality of Life Measures |
|-------|------|-------|-------------------------|
| Massacsi [272] | 2006 | Effects of endocrine related symptoms in breast cancer who had switched from tamoxifen to anastrozole | Endocrine related symptoms improved but higher rate of mild arthritic and bone pain were reported. |
| Land et al. [273] | 2006 | Tamoxifen or raloxifene related symptoms | No significant differences between groups; tamoxifen group reported better sexual function, more gynecological problems and vasomotor symptoms while raloxifene group reported more musculoskeletal problems and weight gain. |
| Heidrich et al. [274] | 2006 | Symptoms, and symptom beliefs in older breast cancer patients vs. older women without breast cancer | Symptom experience and QOL of older breast cancer survivors were similar to those of older women with other chronic health problems. |
| Gupta et al. [275] | 2006 | Menopausal symptoms | 96% reported vasomotor, 83% psychological and 90% somatic symptoms (n = 200) which negatively correlated not only their own but also with their partners’ QOL. |
| Byar et al. [276] | 2006 | Fatigue | Fatigue was associated with other physical and psychological symptoms and higher fatigue compromised QOL. |
| Arndt et al. [277] | 2006 | Fatigue | Fatigue emerged as the strongest predictor of QOL. |
| Pyszal et al. [278] | 2006 | Disability, and psychological distress in breast cancer survivors with and without lymphedema | Patients with arm lymphedema were more disabled, experienced a poorer QOL and had increased psychological distress in comparison to those without lymphedema. |
| Dagnelie et al. [279] | 2007 | Fatigue | Of all QOL domains/subscales, fatigue is by far the predominant contributor to patient-perceived overall QOL in breast cancer patients preceding high-dose radiotherapy. |
| Janz et al. [280] | 2007 | Relationship between symptoms and post-treatment QOL | Five most common symptoms were: systemic therapy side effects, fatigue, breast symptoms, sleep difficulties, and arm symptoms. Fatigue had the greatest impact on QOL. |

ALND: axillary lymph node dissection, ASCT: autologous stem cell transplantation, SLNB: sentinel lymph node biopsy.
what really happens to breast cancer patients or the clinical teams that care for them. Do these figures convey difficulties that exist in treating breast cancer patients or help to manage their symptoms?

The present review covered several topics and provided tables to indicate areas that need more attention. It appears that the most common and important disease- and treatment-related side-effects and symptoms in breast cancer patients including arm morbidity, pain, fatigue and postmenopausal symptoms, are among neglected topics. As noted by Cella and Fallowfield, recognition and management of treatment-related side-effects for breast cancer patients receiving adjuvant endocrine therapy is an important issue since such side-effects negatively affect health-related quality of life and adherence to therapy. These authors argue that adverse events constitute the main reason for non-adherence to endocrine treatment, and across all adjuvant endocrine trials regardless of the treatment, vasomotor symptoms such as hot flushes are the most common side effects. Other frequently reported side-effects such as vaginal discharge, vaginal dryness, dyspareunia, and arthralgia vary in prevalence between tamoxifen and aromatase inhibitors [290]. It has been recommended that currently in assessing quality of life in breast cancer patients priorities should be given to cognitive functioning, menopausal symptoms, body image and long-term effects of new therapies that might cause musculoskeletal and neurological side-effects [35]. In addition, sexual functioning seems important area that needs more attention, especially for younger breast cancer survivors. It is argued that younger survivors may need interventions that specifically target their needs related to menopausal symptoms and problems with relationships, sexual functioning and body image [291].

There were few qualitative studies. Since these could provide more insight into quality of life in breast cancer patients, we need more such studies to collect data and indicate how breast cancer patients interpret life after diagnosis and during and after treatment. Breast cancer survivors even might rate their quality of life more favorably than outpatients with other common medical conditions and identify many positive aspects from the cancer experience [180]. However, it is not only the study of quality of life in newly diagnosed breast cancer patients that is necessary; studying quality of life in long-term survivors is equally important. As suggested, when assessing quality of life in breast cancer patients, the stage of disease should also be considered. There are differences in quality of life between patients with non-invasive breast cancer, newly diagnosed breast cancer and advanced local breast cancer, and disease-free breast cancer survivors, women with recurrence breast cancer, and women with advanced metastatic breast cancer [292].

Conclusion
There was quite an extensive body of the literature on quality of life in breast cancer patients. These papers have made a considerable contribution to improving breast cancer care, although their exact benefit was hard to define. However, quality of life data provided scientific evidence for clinical decision-making and conveyed helpful information concerning breast cancer patients’ experiences during the course of the disease diagnosis, treatment, disease-free survival time, and recurrences; otherwise finding patient-centered solutions for evidence-based selection of optimal treatments, psychosocial interventions, patient-physician communications, allocation of resources, and indicating research priorities were impossible. It seems that more qualitative research is needed for a better understanding of the topic. In addition, issues related to the disease, its treatment side effects and symptoms, and sexual functioning should receive more attention when studying quality of life in breast cancer patients.

Competing interests
The author declares that they have no competing interests.

Authors’ contributions
The author carried out this review and wrote the manuscript, and prepared all the tables and the additional file.

Additional material

Additional file 1
Quality of life in breast cancer patients. This is a chronological list of all papers that were published since 1974 to the end of year 2007 in the English biomedical journals. The list is organized for each year and only contains papers that used the word quality of life and breast cancer or breast carcinoma in their titles. The papers are sorted alphabetically.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1756-9966-27-32-S1.doc]

Acknowledgements
The author wishes to thanks Dr. Elena Elkin, Dr. Lonneke van de Poll-Franse, and Dr. Su Wilson for their helpful comments on early version of the manuscript and also Mrs. T. Rostami for her secretarial assistance. This was a piece of pure academic research work and the author did not receive any financial support or grant for the study.

References
1. Montazeri A, Gillis CR, McEwen J: Measuring quality of life in oncology: is it worthwhile? Part I. Meaning, purposes, and controversies. Eur J Cancer Care 1996, 5:159-167.
2. Montazeri A, Gillis CR, McEwen J: Measuring quality of life in oncology: is it worthwhile? Part II. Experiences from the treatment of cancer. Eur J Cancer Care 1996, 5:168-175.
3. Montazeri A, Milroy R, Hole D, McEwen J, Gillis CR: How quality of life data contribute to our understanding of cancer patients’
experiences? A study of patients with lung cancer. Quality of Life Research 2003, 12:157-166.
4. Montazeri A, Poustchi H, McEwen J, Gilliss CR: Quality of life in patients with lung cancer: as an important prognostic factor. Lung Cancer 2001, 31:233-240.
5. Stewart BW, Paul Kleihues P: World Cancer Report. Lyon, France, International Agency Research on Cancer; 2003.
6. Mandelblatt J, Armetta C, Yabroff KR, Liang W, Lawrence W: Descriptive review of the literature on breast cancer outcomes: 1990 through 2000. J Natl Cancer Inst Monographs 2004, 33:8-44.
7. McEvoy MD, McCorkle R: Quality of life issues in patients with disseminated breast cancer. Cancer 1990, 66:1416-1421.
8. Kleiberg GM, de Haes JC, Velde CJ van de: The impact of breast conserving treatment and mastectomy on the quality of life of early stage breast cancer patients: a review. J Clin Oncol 1991, 9:1059-1070.
9. Quality of survival of quality of life and benefits from adjuvant therapies in breast cancer. Recent Results Cancer Res 1993, 127:201-210.
10. Bryson HM, Plokker GL: Tamoxifen: a review of pharmacoeconomic and quality of life consideration for its use as adjuvant therapy in women with breast cancer. Pharmacoeconomics 1993, 4:40-66.
11. Stefanek ME: Quality of life and other psychological issues in breast cancer. Curr Opin Oncol 1994, 6:583-586.
12. Ganz PA: Breast cancer in older women: quality of life considerations. Cancer Control 1994, 1(4):372-379.
13. Osoba D, Zee B, Pater J, Warr D, Kaizer L, Latreille J: Psychometric properties and responsiveness of the EORTC quality of life questionnaire (QLQ-C30) in patients with breast, ovarian, and lung cancer. Qual Life Res 1994, 3:353-364.
14. Carlson BWV: Quality of life issues in the treatment of metastatic breast cancer. Oncology (Williston Park) 1998, 12(3 Suppl 4):27-31.
15. Leedham B, Ganz PA: Psychosocial concerns and quality of life in breast cancer survivors. Cancer Invest 1999, 17:342-346.
16. Rustoen T, Begnum S: Quality of life in women with breast cancer: a review of the literature and implications for nursing practice. Cancer Nurs 2000, 23:416-421.
17. Shapiro SL, Lopez AM, Schwartz GE, Bootzin R, Figueroa AJ, Braden C, Kurkcan BP: Quality of life and breast cancer: relationship to psychological variables. J Clin Psychol 2001, 57:501-509.
18. Partridge AH, Bunnell CA, Winer EP: Quality of life issues among women undergoing high-dose chemotherapy for breast cancer. Breast Dis 2001, 14:41-50.
19. Kurz TJ, Dubou P: Strategies for improving quality of life in older patients with metastatic breast cancer. Drugs Aging 2002, 19:605-622.
20. Costantino J: The impact of hormonal treatments on quality of life of patients with metastatic breast cancer. Clinical Therapeutics 2002, 24(Suppl C):S26-C42.
21. Fallowfield LJ: Evolution of breast cancer treatment: current options and quality-of-life consideration. Eur J Oncol Nurs 2004, 8(Suppl 2):S75-S82.
22. Sammarco A: Enhancing the quality of life of survivors of breast cancer. Am J Long Term Care 2004, 12:40-45.
23. Knobf MT: The influence of endocrine effects of adjuvant therapy on quality of life outcomes in younger breast cancer survivors. Oncologist 2006, 11:96-110.
24. Kayl AE, Meyers CA: Side effects of chemotherapy and quality of life in ovarIan and breast cancer patients. Current Opinion in Obstetric & Gynecology 2006, 18:24-28.
25. Diel IJ: Efficacy of bisphosphonates on bone pain and quality of life in breast cancer patients with metastatic bone disease: a review. Support Care Cancer 2007, 15:745-750.
26. Rozenberg S, Antinome C, Carly B, Pastijn A, Liebens F: Improving quality of life after breast cancer: prevention of other diseases. Menopause Int 2007, 13:71-74.
27. Irwig L, Bennett A: Quality of life after breast conservation or mastectomy: a systematic review. Aust N Z J Surg 1997, 67:750-754.
28. Bottomley A, Therasse P: Quality of life in patients undergoing systematic therapy for advanced breast cancer. Lancet Oncol 2002, 3:620-628.
29. Shimozuma K, Okamoto T, Katsumata N, Koike M, Tanaka K, Osumi S, Saito M, Shikama N, Watanabe T, Mitsuromi M, Yamauchi C, Hiwada A: Systematic overview of quality of life studies for breast cancer. Breast Cancer Res Treat 2002, 9:196-202.
30. Goodwin PJ, Black JT, Bordeleau LJ, Ganz PA: Health-related quality of life measurement in randomized clinical trials in breast cancer. Taking stock. J Natl Cancer Inst 2003, 95:263-281.
31. Rusteman S, Dijkstra PU, Hoekstra HJ, Eisma WH, Szabo BG, Grootenhof JW, Geerzen JH: Late morbidity after treatment of breast cancer in relation to daily activities and quality of life: a systematic review. Eur J Surg Oncol 2003, 29:229-238.
32. Payne R, Medina E, Hampton JW: Quality of life concerns in patients with breast cancer: evidence for disparity of outcomes and experiences in pain management and palliative care among African-American women. Cancer 2003, 97(Suppl 1):311-317.
33. Fossati R, Confalonieri C, Mosconi P, Pistocci V, Apolone G: Quality of life in patients with breast cancer in relation to daily activities and quality of life of early stage breast cancer patients: a review. J Clin Oncol 1991, 9:1059-1070.
34. Quality of survival of quality of life and benefits from adjuvant therapies in breast cancer. Recent Results Cancer Res 1993, 127:201-210.
35. Bryson HM, Plokker GL: Tamoxifen: a review of pharmacoeconomic and quality of life consideration for its use as adjuvant therapy in women with breast cancer. Pharmacoeconomics 1993, 4:40-66.
36. Ganz PA: Breast cancer in older women: quality of life considerations. Cancer Control 1994, 1(4):372-379.
37. Osoba D, Zee B, Pater J, Warr D, Kaizer L, Latreille J: Psychometric properties and responsiveness of the EORTC quality of life questionnaire (QLQ-C30) in patients with breast, ovarian, and lung cancer. Qual Life Res 1994, 3:353-364.
38. Carlson BWV: Quality of life issues in the treatment of metastatic breast cancer. Oncology (Williston Park) 1998, 12(3 Suppl 4):27-31.
39. Leedham B, Ganz PA: Psychosocial concerns and quality of life in breast cancer survivors. Cancer Invest 1999, 17:342-346.
40. Rustoen T, Begnum S: Quality of life in women with breast cancer: a review of the literature and implications for nursing practice. Cancer Nurs 2000, 23:416-421.
41. Shapiro SL, Lopez AM, Schwartz GE, Bootzin R, Figueroa AJ, Braden C, Kurkcan BP: Quality of life and breast cancer: relationship to psychological variables. J Clin Psychol 2001, 57:501-509.
42. Partridge AH, Bunnell CA, Winer EP: Quality of life issues among women undergoing high-dose chemotherapy for breast cancer. Breast Dis 2001, 14:41-50.
43. Kurz TJ, Dubou P: Strategies for improving quality of life in older patients with metastatic breast cancer. Drugs Aging 2002, 19:605-622.
44. Costantino J: The impact of hormonal treatments on quality of life of patients with metastatic breast cancer. Clinical Therapeutics 2002, 24(Suppl C):S26-C42.
45. Fallowfield LJ: Evolution of breast cancer treatment: current options and quality-of-life consideration. Eur J Oncol Nurs 2004, 8(Suppl 2):S75-S82.
46. Sammarco A: Enhancing the quality of life of survivors of breast cancer. Am J Long Term Care 2004, 12:40-45.
47. Knobf MT: The influence of endocrine effects of adjuvant therapy on quality of life outcomes in younger breast cancer survivors. Oncologist 2006, 11:96-110.
48. Kayl AE, Meyers CA: Side effects of chemotherapy and quality of life in ovarian and breast cancer patients. Current Opinion in Obstetric & Gynecology 2006, 18:24-28.
49. Diel IJ: Efficacy of bisphosphonates on bone pain and quality of life in breast cancer patients with metastatic bone disease: a review. Support Care Cancer 2007, 15:745-750.
50. Rozenberg S, Antinome C, Carly B, Pastijn A, Liebens F: Improving quality of life after breast cancer: prevention of other diseases. Menopause Int 2007, 13:71-74.
51. Irwig L, Bennett A: Quality of life after breast conservation or mastectomy: a systematic review. Aust N Z J Surg 1997, 67:750-754.
Montazeri A, Harirchi I, Vahdani M, Khaledi F, Jarvandi S, Ebrahimizadeh M, Haji-Mahmoodi M: The EORTC breast-cancer-specific quality of life questionnaire (EORTC QLQ-BR23): translation and validation study of the Iranian version. Qual Life Res 2000, 9:177-184.

Mihalova Z, Butorin N, Antonov R, Toporov N, Popova V: Evaluation of the Bulgarian version of the European Organization for Research and Treatment of Cancer quality of life questionnaire C30 (version 2) and breast cancer module (BR23) on the psychometric properties of breast cancer patients under adjuvant chemotherapy. Prognostic value of estrogen and progesterone receptors to quality of life. J Balkan Union of Oncol 2001, 4:415-424.

CoSTER S, Poole K, Fallowfield LJ: The validation of a quality of life scale to assess the impact of arm morbidity in breast cancer patients post-operatively. Breast Cancer Res Treat 2001, 68:273-282.

Avison MR, Jaffe N: The hot flush related daily interference scale: a tool for assessing the impact of hot flashes on quality of life following breast cancer. J Pain Symptom Manag 2001, 22:979-989.

Pandey M, Thomas BC, Ramdas K, Eremenco S, Nair K: Quality of life in breast cancer patients: validation of FACT-B Malayalam version. Qual Life Res 2002, 11:87-90.

Chie WC, Chang Kj, Huang CS, Kuo WH: Quality of life of breast cancer patients in Taiwan: validation of the Taiwanese version of the EORTC QLQ-C30 and EORTC QLQ-BR23. Psycho-Oncol 2003, 12:727-735.

Lee EH, Chung M, Kang S, Lee Hj: Validation of the functional assessment of cancer therapy-general (FACT-G) scale for measuring the health-related quality of life in Korean women with breast cancer. Jap J Clin Oncol 2004, 34:399-393.

Yun Yh, Bae Sh, Kang Io, Shin Kh, Lee R, Kwon Si, Park Ys, Lee Es: Cross-cultural application of the Korean version of the European Organization for Research and Treatment of Cancer (EORTC) Breast-Cancer Specific Quality of Life Questionnaire (EORTC QLQ-BR23). Support Care Cancer 2004, 12:61-64.

Farivar V, Badwe RA, Hawaldar R, Rayabhattanavar S, Varghese A, Sharma R, Mitra I: Validation of EORTC quality-of-life questionnaire in Indian women with operable breast cancer. Nat Med J India 2005, 18:172-177.

Avril MF, Lepley KL: Evaluation of the Quality of Life in Adult Cancer Survivors (QLACS) scale for long term cancer survivors in a sample of breast cancer survivors. Health Qual Life Outcomes 2006, 4:92.

Wan C, Zhang D, Yang Z, Tu X, Tang W, Feng C, Wang H, Tang X: Validation of the simplified Chinese version of the FACT-B for measuring quality of life for patients with breast cancer. Breast Cancer Res Treat 2007, 106:413-418.

Wan C, Tang X, Tu XM, Feng C, Messing S, Meng Q, Zhang X: Psychometric properties of the simplified Chinese version of the EORTC QLQ-C30 and QLQ-BR23 for measuring quality of life for breast cancer patients. Breast Cancer Res Treat 2007, 105:178-193.

Baum M, Ebbs SR, Fallowfield LJ, Fraser SC: Measurement of quality of life in advanced breast cancer. Acta Oncol 1999, 38:391-392.

Sutherland Hj, Lockwood GA, Boyd NF: Ratings of the importance of quality of life variables: therapeutic implications. J Clin Epidemiol 1990, 43:661-666.

62. Gelber RD, Goldhirsh A, Hurney C, Bernhard J, Simes Rj: Quality of life in clinical trials of adjuvant therapies. International Breast Cancer Study Group (formerly Ludwig Group). J Natl Cancer Inst Monogr 1992, 1:127-135.

Ganz A, Lee Jl, Sim MS, Polinsky ML, Schag CA: Exploring the influence of multiple variables on the relationship of age to quality of life in women with breast cancer. J Clin Epidemiol 1992, 45:473-485.

64. Gelber RD, Goldhirsh A, Cole BF: Parametric extrapolation of survival estimates with applications to quality of life evaluation of treatments. International Breast Cancer Study Group. Control Clin Trials 1993, 14:485-499.

65. Hayden KA, Moinpour CM, Metch B, Feigl P, O’Bryan RM, Green S, Osborne CK: Pitfalls in quality-of-life assessment: lessons from a Southwest Oncology Group Breast Cancer Clinical Trial. Oncol Nurs Forum 1993, 20:1415-1419.

66. Fallowfield LJ: Quality of life measurement in breast cancer. J R Soc Med 1993, 86(1):10-12.

67. Geard K, Dobson MJ: Rj: Framing and labeling effects in health descriptions: quality adjusted life years for treatment of breast cancer. J Clin Epidemiol 1993, 46:77-84.

68. Hurny C, Bernhard J, Coates A, Castiglione M, Peterson HF, Gelber RD, Rutestam CM, Goldhirsh A, Senn Hj: Timing of baseline quality of life assessment in an international adjuvant breast cancer trial: its effects on patient self-estimation. The International Breast Cancer Study Group. Ann Oncol 1994, 5:65-74.

69. Fallowfield LJ: Assessment of quality of life in breast cancer. Acta Oncol 1995, 34:687-694.

70. Hietanen PS: Measurement and practical aspects of quality of life in breast cancer. Acta Oncol 1996, 35:39-42.

71. Bernhard J, Hurny C, Coates A, Peterson HF, Castiglione-Gertsch M, Gelber R, Goldhirsh A, Senn Hj, Rutestam CM: Quality of life assessment in patients receiving adjuvant therapy for breast cancer: the IBCSG approach. The International Breast Cancer Study Group. Ann Oncol 1997, 8:825-835.

72. Bernhard J, Hurny C, Coates A, Peterson HF, Castiglione-Gertsch M, Gelber RD, Galligioni E, Marini G, Thurlimann B, Forbes JF, Goldhirsh A, Senn Hj, Rutestam CM: Factors affecting baseline quality of life in two international adjuvant breast cancer trials. International Breast Cancer Study Group (IBCSG). Br J Cancer 1998, 78:686-693.

73. Bernhard J, Peterson HF, Coates A, Gusset H, Isley M, Hinkle R, Gelber RD, Castiglione-Gertsch M, Hurny C: Quality of life assessment in breast cancer: the IBCSG approach. The International Breast Cancer Study Group. J Natl Cancer Inst 1998, 90:603-615.

74. Coates A, Gebvki V: Quality of life studies of the Australian New Zealand Breast Cancer Trials Group: approaches to missing data. Stat Med 1998, 17:5330-5340.

75. Jansen ST, Stiggelbout AM, Nooij MA, Noordijk EM, Klevit J: Response shift in quality of life measurement in early stage breast cancer patients undergoing radiotherapy. J Clin Oncol 1998, 16:501-514.

76. Coates A, Sibbald R, Moleman B, Moleman G, Therasse P, Ramirez A, Kooiman M, Eder H, Piccart M: Summary measures and statistics in the analysis of quality of life data: an example from an EORTC/NCIC-SAKK locally advanced breast cancer study. Eur J Cancer 2000, 36:834-844.

77. Pearson DJ, Williams SM, Chrunsen EA, Mantell MC, Campbell AV: A longitudinal study of health related quality of life and utility measures in patient with advanced breast cancer. Qual Life Res 2001, 10:578-593.

78. Nagel GC, Schmidt S, Straus BM, Katenkamp D: The validation of a quality of life and sexual functioning. J Clin Oncol 2000, 18:2031-2040.

79. Bero LA, Gottlieb L, Thomas O, Kopolov M, Stoddard J, Juszczak P: Comparing of 2 quality of life questionnaires in women treated for breast cancer: the RAND-36 Item Health Survey and the Functional Living Index-Cancer. Physical Therapy 2005, 85:851-860.

80. Carver CS, Smith RG, Petrosin VM, Antoni MH: Quality of life among long-term survivors of breast cancer: different types of antecedents predict different class of outcomes. Psycho-Oncol 2006, 15:749-758.

81. Perry S, Kowalski TL, Chang CH: Quality of life assessment in women with breast cancer: benefits, acceptability and utilization. Health and Quality of Life Outcomes 2005, 3:S4.

82. de Haes JC, van Oostrom MA, Welvaert K: Quality of life after breast surgery. J Surg Oncol 1985, 28:1032-1034.

83. de Haes JC, van Oostrom MA, Welvaert K: The effect of radical and conserving surgery on the quality of life of early breast cancer patients. Eur J Surg Oncol 1986, 12:337-342.
therapy for breast cancer: results of dose escalation and quality of life. J Clin Oncol 1996, 14:1565-1572.

126. McQuellon RP, Craven B, Russell GB, Grohmann S, Cruz JM, Perry JJ, Haertle DD: Quality of life in breast cancer patients before and after autologous bone marrow transplantation. Bone Marrow Transplant 1996, 18:579-584.

127. Larsen J, Gradulf A, Nordstrom G, Bjorkstrand B, Ljungman P. Health-related quality of life in women with breast cancer undergoing autologous stem-cell transplantation. Cancer Nurs 1996, 19:368-375.

128. Hurny C, Bernhard J, Coates AS, Castiglione-Gertsch M, Peterson HF, Gelber RD, Forbes JF, Rudenstam CM, Simoncini E, Crivellari D, Goldhirsch A, Fey MF, Price KN, Goldhirsch A: Impact of different adjuvant therapy strategies on quality of life in breast cancer survivors. Recent Results Cancer Res 1998, 152:396-411.

129. Bernhard J, Castiglione-Gertsch M, Schmitz SFH, Castiglione-Gertsch M, Cavalli F, Morant R, Ivey MF, Bonnefoi H, Goldhirsch A, Hurny C: Quality of life in the postmenopausal patients with breast cancer after failure of tamoxifen: fornamente versus megestrol acetate as second-line hormonal treatment. Swiss Group for Clinical Cancer Research (SAKK). Eur J Cancer 1999, 35:913-920.

130. Fournier DL, Fetting JH, Cella D, Wonson W, Moinpour CM: Quality of life and quality adjusted survival for breast cancer patients receiving adjuvant therapy. Eastern Cooperative Oncology Group (ECOG). Qual Life Res 1999, 8:723-731.

131. Osoba D, Burchmore M; Health-related quality of life in women with metastatic breast cancer treated with trastuzumab (Herceptin). Semin Oncol 1999, 26(4 Suppl 12):84-88.

132. McLachlan SA, Pintillie M, Tannock IF: Different adjuvant therapy strategies on quality of life in breast cancer patients undergoing AC versus CMF chemotherapy: findings of a multicenter randomized trial. Ann Oncol 2002, 13:1711-1729.

133. Brandberg Y, Michelson H, Nilsson B, Bolund C, Erikstein B, Hietanen P, Kaasa S, Nilsson J, Wilking N, Bergh J; Quality of life in women with breast cancer during the first year after random assignment to adjuvant treatment with narrow-supported high-dose chemotherapy with cyclophosphamide, topotena, and carboplatin or tailored treatment with fluorouracil, epirubicin, and cyclophosphamide: Scandinavian Breast Cancer Group Study 9401. J Clin Oncol 2003, 21:3659-3664.

134. Land SR, Kap Mile JA, Young J, Day R, Tang G, Ganz PA, Fisher B, Wolmark N: Health-related quality of life in axillary node-negative, estrogen receptor-negative breast cancer patients undergoing AC versus CMF chemotherapy: findings from the National Surgical Adjuvant Breast and Bowel Project B-23. Breast Cancer Res Treat 2004, 86:153-164.

135. Fallowfield L, Cella D, Cuzick J, Francis S, Locker G, Howl A; Quality of life of postmenopausal women in the Arimidex, tamoxifen alone or in combination (ATAC) adjuvant breast cancer trial. J Clin Oncol 2004, 22:4261-4271.

136. Bottomley A, Biganzoli L, Cuber T, Coleman RE, Coens C, Efficace F, Calvert HA, Gamucci T, Twelves C, Fargeot P, Piccart M; Randomized controlled trial investigating short-term health-related quality of life with doxorubicin and paclitaxel versus doxorubicin and cyclophosphamide as first-line chemotherapy in patients with metastatic breast cancer: European Organization for Research and Treatment of Cancer Breast Cancer Group, Investigational Drug Branch for Breast Cancer and the New Drug Development Group Study. J Clin Oncol 2000, 18(13):2756-2765.

137. Bernhard J, Zhang J, Coates AS, Gelber R, Castiglione-Gertsch M, Murray E, Forbes JF, Perry L, Collins J, Snyder R, Rudenstam CM, Cricelli D, Veronesi A, Thurlimann B, Fey MF, Price KN, Goldhirsch A, Hurny C; Quantifying trade-off: quality of life and quality-adjusted survival in a randomized trial of chemotherapy in postmenopausal women with lymph node-negative breast cancer. Br J Cancer 2004, 91:1893-1901.

138. Tong DK, Cheng CW, Ching CS, Ngor WL, Chow LW; Phase II study of ‘all-or-none’ regimen of capecitabine, idarubicin and

http://www.jecrc.org/content/27/1/32
cy clophosphamide for metastatic breast cancer: safety, efficacy and quality of life. Oncology 2005, 68:520-525.

155. Galanis RM, Michel J, Siebmann JU, Kuchler T, Eif K, Kimmig B: Significant negative impact of adjuvant chemotherapy on health-related quality of life (HR-QOL) in women with breast cancer treated by conserving surgery and postoperative 3-D radiotherapy. A prospective measurement. Strahlenther Onkol, (Strahlentherapie und Onkologie) 2005, 181:645-651.

156. Elkin EB, Weinstein MC, Kuntz KM, Bunnell CA, Weeks JC: Adjuvant ovarian suppression versus chemotherapy for premenopausal, hormone-responsive breast cancer: quality of life and efficacy tradeoffs. Breast Cancer Res Treat 2005, 93:25-34.

157. Conner-Spady BL, Cumming C, Nabholz JM, Jacobs P, Stewart D: A longitudinal prospective study of health-related quality of life in breast cancer patients following high-dose chemotherapy with autologous blood stem cell transplantation. Bone Marrow Transplantation 2005, 36:251-259.

158. Michalek J, Efface FE, Coates C, Gotay C, Welniacka-Jaskiewicz M, Maurici L, Dyczka C, Cufer T, Lichinetti MR, Schornagel JH, Bonnefoi H, Shepherd L: Health-related quality of life in survivors of locally advanced breast cancer: an international randomized controlled phase III trial. Lancet Oncol 2005, 6:279-284.

159. Ashis TA, Saykin AJ, Jurfsten CT, Cole B, Mott LA, Titus-Ernstoff L, Skalla K, Bakitas M, Silverfarb PM: Quality of life of long-term survivors of breast cancer patients treated with standard-dose chemotherapy or low-dose chemotherapy. J Clin Oncol 2005, 23:3993-4005.

160. Peppercorn J, Hernndon J II, Kornblith AB, Peters W, Ashes T, Vredenburgh J, Schwartz G, Shapil E, Hurd DD, Holland J: Winer E: Quality of life among patients with stage II and III breast carcinoma randomized to receive high-dose chemotherapy with autologous bone marrow support or intermediate-dose chemotherapy: results from cancer and group B 9066. Cancer 2005, 104:1580-1589.

161. Semiglazov VF, Steypula YY, Dovud A, Schnitker J, Mengs U: Quality of life is improved in breast cancer patients by Standardised Mistletoe Extract PS76A2 during chemotherapy and follow-up: a randomized, placebo-controlled, double-blind, multicentre clinical trial. Anticancer Res 2006, 26:1519-1529.

162. Martin M, Lluch a, Segui MA, Ruzi A, Ramos M, adrover E, Kimmig B: Signifi cant negative impact of adjuvant chemotherapy on health-related quality of life (HR-QOL) in women with breast cancer treated by conserving surgery and postoperative 3-D radiotherapy. A prospective measurement. Strahlenther Onkol, (Strahlentherapie und Onkologie) 2005, 181:645-651.

163. Hurria A, Zuckerman E, Panageas KS, Fornier M, D’Andrea G, Dang HV: Quality of life of patients with advanced breast cancer treated with taxanes plus granulocyte colony stimulating factor. J Natl Cancer Inst 1995, 87:1316-1322.

164. Fallowfield LJ, Bliss JM, Porter LS, Price MH, Snowdon CF, Jones SE, Munoz M, Mel JR: Quality of life in survivors of locally advanced breast cancer: an international randomized controlled phase III trial. Lancet Oncol 2005, 6:279-284.

165. Seidman AD, Portenoy R, Yao TJ, Lepore J, Mont EK, Kortmansky J, Onetto N, Ren L, Grechko J, Beltangdy M, et al: Quality of life in phase II trials—A study of methodology and predictive value in patients with advanced breast cancer treated with paclitaxel plus granulocyte colony stimulating factor. J Natl Cancer Inst 2000, 92:1779-1787.

166. Karamouzis MV, Ioannidis G, Rigatos G: Quality of life in metastatic breast cancer patients under chemotherapy or supportive care: a single institution comparative study. Eur J Cancer Care 2007, 16:433-438.

167. Hopwood P, Haviland J, Mills J, Sumo G, M Bliss J: START Trial Management Group: The impact of age and clinical factors on quality of life in early breast cancer: an analysis of 2208 women recruited to the UK START Trial (Standardization of Breast Radiotherapy Trial). Breast 2007, 16:241-251.

168. Fraser SC, Ramireez AJ, Ebbes SR, Fallowfield LJ, Dobbs HJ, Richards MA, Bates T, Baum M: A daily diary for quality of life measurement in advanced breast cancer trials. Br J Cancer 1993, 67:341-346.

169. Seidman AD, Portenoy R, Yao TJ, Lepore J, Mont EK, Kortmansky J, Onetto N, Ren L, Grechko J, Beltangdy M, et al: Quality of life in phase II trials—A study of methodology and predictive value in patients with advanced breast cancer treated with paclitaxel plus granulocyte colony stimulating factor. J Natl Cancer Inst 1995, 87:1316-1322.

170. Fallowfield LJ, Bliss JM, Porter LS, Price MH, Snowdon CF, Jones SE, Munoz M, Mel JR: Quality of life in survivors of locally advanced breast cancer: an international randomized controlled phase III trial. Lancet Oncol 2005, 6:279-284.

171. Coates AS, Hurny C, Peterson HF, Bernhard J, Casteigne-Gertsch M, Gelberg D, Goldhirsh A: Quality of life scores predict outcome in metastatic but not early breast cancer. International Breast Cancer Study Group. J Clin Oncol 2000, 18:3768-3774.

172. Goodwin PJ, Ennis M, Bordeleau LJ, Pritchard KT, Trudeau ME, Koo J, Hood N: Health-related quality of life and psychosocial status in breast cancer patients. Annals of oncology: analysis of multiple variables. J Clin Oncol 2005, 23:4458-4466.

173. Efficace F, Therasse P, Piccart MJ, van Steen K, Welnicka-Jaskiewicz M, Cufer T, Dyczka C, Lichinetti M, Shepherd L, de Haes H, Srangins MA, Bottomley A: Health-related quality of life parameters as prognostic factors in a nonmetastatic breast cancer patient population: an International multicenter study. J Clin Oncol 2004, 22:3381-3388.

174. Coates A, Gembiski V, Signorini D, Murray P, McNeil D, Byrne M, Forbes JF: Prognostic value of quality of life scores during chemotherapy for advanced breast cancer. Australian New Zealand Breast Cancer Study Group. J Clin Oncol 1992, 10:1833-1838.

175. Loomba L, Gokhale-Bloqvist L, Stjostrom P, Pintozka A, Ottoson S, Mouridsen H, Bengtsson NO, Bergh J, Malmstrom P, Valverve E, Tennvall L, Bloqvist C: Prognostic quality of life scores for patients to progression (TTP) and overall survival time (OS) in advanced breast cancer. Eur J Cancer 2003, 39:1370-1376.

176. Efficace F, Biganzoli L, Piccart M, Coesens C, van Steen K, Cufer T, Coelem RE, Calvert HA, Gamucci T, Twelves C, Fargeot P, Bottomley A: Baseline health-related quality of life data as prognostic factors in breast cancer patients enrolled in the ATAC (Arimidex, Cetreterone acetate and tamoxifen) randomized trial: a report from update of the UK-START trial. J Clin Oncol 2004, 22:3381-3388.

177. Shimozuma K, Sonoo H, Ichihara K, Tanaka K: The prognostic value of quality of life scores: preliminary results of an analysis of patients with breast cancer. Surg Today 2000, 30:235-261.

178. Ferraro J, Brisson J, Deschenes L, et al: Mental adjustment to cancer and quality of life in breast cancer patients—An exploratory study. Psycho-Oncol 1994, 3:223-232.

179. Ganz PA, coscarelli A, Fred C, Kahn B, Polinsky ML, Petersen L: Breast cancer survivors: psychosocial concerns and quality of life. Breast Cancer Res Treat 1996, 40:183-199.

180. Maunsell E, Brisson J, Deschenes L, Frasure-Smith N: Randomized trial of a psychologic distress screening program after breast cancer: effects on quality of life. J Clin Oncol 1996, 14:2747-2755.

181. Andrykowski MA, Curran SL, Studts JL, Cunningham L, Carpenter JS, McGrath PC, Sloan DA, Kenady DE: Psychological adjustment and quality of life in women with breast cancer and benign breast problems—a controlled comparison. J Clin Epidemiol 1996, 49:827-834.

182. Marichian G, Azzarello G, Checchin F, Perale M, Segati R, Sampaoro E, Rosetti F, Franchin A, Pappagallo GL, Vinati O: The impact of a psychological intervention on quality of life in non-metastatic breast cancer. Eur J Cancer 1996, 32:1612-1615.

183. Weitzner MA, Meyers CA, Struebing KK, Saleeba AK: Relationship between quality of life and mood in long-term survivors of breast cancer treated with mastectomy. Support Care Cancer 1997, 5:241-248.

184. Kissane DW, Clarke DM, Ikin J, Bloch S, Smith GC, Vietta L, McKenzie DP: Psychological morbidity and quality of life in Austral-
ian women with early-stage breast cancer: a cross-sectional survey. Med J Australia 1998, 169:192-196.

186. Bloom J, Steen KH, Johnston M, Banks P: Intrusiveness of illness and quality of life in young women with breast cancer. Psycho Oncol 1998, 7:88-90.

187. Longman AJ, Braden CJ, Mishel MH: Side-effects burden, psychological adjustment, and life quality in women with breast cancer: pattern of association over time. Oncol Nurs Forum 1999, 26:909-915.

188. Cotton SP, Levine EG, Fitzpatrick CM, Dold KH, Targ E: Exploring the relationship among spiritual well-being, quality of life, and psychological adjustment in women with breast cancer. Psycho Oncol 2002, 11:492-499.

189. Ashing-Giwa K: Quality of life and psychological outcome in long-term survivors of breast cancer: a focus on African-American women. J Psychosoc Oncol 1999, 17:47-62.

190. Lewis JA, Manne SL, DuHamel KN, Vickburg SMJ, Bovbjerg DH, Currie V, Winkel G, Redl W: Social support, intrusive thoughts, and quality of life in breast cancer survivors. J Behav Med 2001, 24:231-245.

191. Amir M, Ramati A: Post-traumatic symptoms, emotional distress and quality of life in long-term survivors of breast cancer: a feasibility study. J Anxiety Disord 2002, 16:191-206.

192. Ganz PA, Guadagnoli E, Landrum MB, Lash TL, Rakowski W, Silliman RA: Breast cancer in older women: quality of life and psychological adjustment in the 15 months after diagnosis. J Clin Oncol 2003, 21:4027-4033.

193. Endo E, Sashida I, Ennis M, Leszcz M, Speca M, Sela R, Doll R, Chochinov HM, Navarro M, Arnold A, Pritchard KJ, Bezjak A, Liewellyn-Thomas HA, Sawka CA, Goodwin PJ: Quality of life in a randomized trial of group psychological support in metastatic breast cancer: overall effects of the intervention and an exploration of missing data. J Clin Oncol 2003, 21:1944-1951.

194. Badger TA, Braden CJ, Mishel MH, Longman A: Depression burden, psychological adjustment, and quality of life in women with breast cancer: patterns over time. Res Nurs Health 2004, 27:19-28.

195. Schreier AM, Williams SA: Anxiety and quality of life of women receiving radiation or chemotherapy for breast cancer. Oncol Nurs Forum 2004, 31:127-130.

196. Kershaw T, Northouse L, Kripitrapcha C, Schafener: Mood: Coping strategies and quality of life in women with advanced breast cancer and their family caregivers. Psychon Health 2004, 19:139-155.

197. Lehto US, Ojanen M, Kellokumpu-Lehtinen P: Predictor of quality of life in newly diagnosed melanoma and breast cancer patients. Acta Oncol 2005, 44:5-16.

198. Roth RS, Lowery JC, Davis J, Wilkins E: Psychological distress and fatigue predicted recurrence and survival in primary breast cancer patients. Breast Cancer Res Treat 2007, 105:209-219.

199. Kenne Sarenmalm E, Ohlén J, Jonsson T, Gaston-Johansson F: Coping with recurrent breast cancer: predictors of distress symptoms and health-related quality of life. J Pain Symptom Manage 2007, 34:24-39.

200. Antoni MH, Lechner SC, Kazi A, Wimerly SR, Sifre T, Urcuyo KR, Phillips K, Gluck S, Carver CS: How stress management improves quality of life for breast cancer patients. J Consult Clin Psychol 2006, 74(4):1143-1152.

201. Wongkul T, Dechopram N, Phumivich R, Lomaswat K: Uncertainty appraisal coping and quality of life in breast cancer survivors. Cancer Nurs 2009, 25:205-207.

202. Antoni MH, Lechner SC, Kazi A, Wimerly SR, Sifre T, Urcuyo KR, Phillips K, Gluck S, Carver CS: How stress management improves quality of life for breast cancer patients. J Consult Clin Psychol 2006, 74(4):1143-1152.
226. Ritz Lj, Nissen Mj, Swenson Kk, Farrell Jb, Sperduto Pw, Sladek Ml, Lilly Rm, Schroeder Lm: Effects of advanced nursing care on quality of life and cost outcomes in women diagnosed with breast cancer. Oncol Nurs Forum 2000, 27:923-932.

227. Molenaar S, Sprangers Mag, Rutgers Ejt, Luiten Ejt, Mulder J, Boss Mm, Van Everdingen Jje, Oosterveld P, De Haes Hcj: Decision support for patients with early-stage breast cancer: effects of an interactive breast cancer GDRTM on treatment decision, satisfaction, and quality of life. J Clin Oncol 2001, 19:1676-1687.

228. Sammarco A: Perceived social support, uncertainty, and quality of life of younger breast cancer survivors. Cancer Nurs 2001, 24:212-219.

229. Moxley Yl, Berkman Lf, Colditz Ga, Holmes Md, Kawachi I: Social networks and health-related quality of life in breast cancer survivors: a prospective study. J Psychosomatic Res 2002, 52:285-293.

230. Olsson Am, Svensson Jh, Sundstrom J, Bergstrom S, Edelking T, Persson M, Stromberg M: Etchropoeitin treatment in metastatic breast cancer: effects on Hb, quality of life and need for transfusion. Acta Oncol 2002, 41:517-524.

231. O'Shaughnessy Jja: Effects of epoetin alfa on cognitive function, mood, asthenia, and quality of life in women with breast cancer undergoing adjuvant chemotherapy. Clin Breast Cancer 2002, 3(Suppl 3):S116-S120.

232. Graves Kd, Carter Cl, Anderson Es, Winett Ra: Quality of life pilot intervention for breast cancer patients: use of social cognitive theory. Palliative Supportive Care 2003, 1:121-134.

233. Wardley A, Davidson N, Barrett-Lee P, Hong A, Mansi J, Dodwell D, Body Jj, Diel Ij, Bell R, Pecherstorfer M, Lichinitser Mr, Lazarev Af: Randomized controlled trial of exercise training in postmenopausal breast cancer survivors: cardiopulmonary and quality of life outcomes. J Clin Oncol 2003, 21:1660-1668.

234. Turner J, Hayes S, Reul-Hirche H: Improving the physical status and quality of life of women treated for breast cancer: a pilot study of a structured exercise intervention. J Surg Oncol 2004, 86:141-146.

235. Headley Ja, Owomby Kk, John Ld: The effect of seated exercise on fatigue and quality of life in women with advanced breast cancer. Oncol Nurs Forum 2004, 31:977-983.

236. Weinburg Kp, Castel Ld, Li Y, Timbie Jw, Glendenning Ga, Schulman K: Health-related quality of life among patients with breast cancer receiving zoledronic acid or pamidronate disodium for metastatic bone lesions. Med Care 2004, 42:1869-1876.

237. Diel Ij, Body Jj, Lichinitser Mr, Kreuder Es, Dornoff W, Gorbonova Va, Budde M, Bergstrom B: Improved quality of life after long-term treatment with bisphosphonate ibandronate in patients with metastatic bone disease due to breast cancer. Eur J Cancer 2004, 40:1704-1712.

238. Body Jj, Diel Ij, Bell R, Pecherstorfer M, Lichinitser Mr, Lazarev Af, Tripathy D, Bergstrom B: Oral ibandronate improves bone pain and preserves quality of life in patients with skeletal metastases due to breast cancer. Pain 2004, 113:306-312.

239. Wason Kr, Davidson N, Barrett-Lee P, Hong A, Khundu J, Dodwell D, Murphy R, Mason T, Cameron D: Zoledronic acid significantly improves pain scores and quality of life in breast cancer patients with bone metastases: a randomized, crossover study of community vs hospital bisphosphonate administration. Br J Cancer 2005, 92:1689-1691.

240. Yoo Hj, Ahn Sh, Kim Sb, Kim Wk, Han Os: Efficacy of progressive muscle relaxation training and guided imagery in reducing chemotherapy side effects in patients with breast cancer and in improving their quality of life. Support Care Cancer 2005, 13:826-833.

241. Manning-Walsh J: Social support as a mediator between symptom distress and quality of life in women with breast cancer. J Obstetric, Gynecologic Neonatal Nurs 2005, 34:482-493.

242. Gordon Lg, Battistutta D, Scafati J, Tweeddale M, Newman B: The impact of rehabilitation support services on health-related quality of life for women with breast cancer. Breast Cancer Res Treat 2005, 93:217-226.

243. Kendall Ar, Mahule-Giangreco M, Carpenter Cl, Ganz Pa, Bernstein L: Influence of exercise activity on quality of life in long term breast cancer survivors. Qual Life Res 2005, 14:361-371.

244. Chang J, Couture F, Young S, McWatters K, Lau Cy: Weekly epoetin alfa maintains hemoglobin, improves quality of life, and reduces transfusion in breast cancer patients receiving chemotherapy. J Clin Oncol 2005, 23:2597-25605.

245. Hudis Ca, Vogel Cl, Gralow Jr, Williams D: Weekly epoetin alfa during adjuvant chemotherapy for breast cancer: effect on hemoglobin levels and quality of life. Clin Breast Cancer 2005, 6:132-142.

246. Badger T, Segrin C, Meek P, Lopez Am, Bonham E, Sieger A: Telephone interpersonal counseling with women with breast cancer: symptom management and quality of life. Oncal Nurs Forum 2005, 32:227-229.

247. Cheema Bsb, Gaul Ca: Full-body exercise training improves fitness and quality of life in survivors of breast cancer. J Strength Cond Res 2006, 20:14-21.

248. Sutton Lb, Erlen Ja: Effects of mutual dyad support on quality of life in women with breast cancer. Cancer Nurs 2006, 29:488-498.

249. Round T, Hayes Sc, Newman B: How do recovery advice and behavioral characteristics influence upper-body function and quality of life among women 6 months after breast cancer diagnosis? Clin Breast Cancer 2006, 7:109-115.

250. Giese-Davis J, Bliss-Ilsberg C, Carson K, Star P, Donaghy J, Cordova Mj, Stevens N, Wittenberg L, Batten C, Spiegel D: The effect of peer counseling on quality of life following diagnosis of breast cancer: an observational study. Psycho-Oncol 2006, 15:107-112.

251. Moadel Ab, Shah C, Wylie-Rosett J, Harris Ms, Patel Sr, Hall Cb, Sperduto Pw, Sladek Ml, Strausse J: Randomized controlled trial of yoga among a multiethnic sample of breast cancer patients: effects on quality of life. J Clin Oncol 2007, 25:4387-4395.

252. Hsu Ch, Smith Jm, Muhr A, Field C, Fairey As: Effects of a step-by-step inpatient rehabilitation programme on quality of life in breast cancer patients. A prospective randomized study. Onkologie 2007, 30:177-182.

253. Kim Sj, Yi Ch, Kwon Oy: Effect of complex decongestive therapy on edema and the quality of life in breast cancer patients with unilateral lymphedema. Lymphology 2007, 40:143-151.

254. Hann Dm, Jacobson P, Martin S, et al.: Fatigue and quality of life following radiotherapy for breast cancer: a comparative study. J Clin Psychol Med S 1998, 5:19-33.

255. Carpenter Js, Andrykowski Ma, Cordova M, Cunningham L, Studts J, Mcgrath P, Kenady S, Sloan D, Munn R: Hot flashes in postmenopausal women treated for breast carcinoma: prevalence, severity, correlates, management, and relation to quality of life. Cancer 1998, 82:1682-1691.

256. Hann Dm, Garovoy N, Finkelstein B, Jacobsen Pb, Azzarello Lm, Fields Kk: Fatigue and quality of life in breast cancer patients undergoing autologous stem cell transplantation: a longitudinal comparative study. J Pain Symptom Manage 1999, 17:313-319.

257. Velanovich V, Szymanski W: Quality of life of breast cancer patients with lymphedema: high-dose versus standard-dose chemotherapy. Am J Surg 1999, 177:184-187.

258. Bower Je, Ganz Pa, Desmond Ka, Rowland Jh, Meyestowitz Be, Belin Tr: Fatigue in breast cancer survivors: occurrence, correlates, and impact on quality of life. J Clin Oncol 2000, 18:743-753.

259. Kuehn T, Klauss W, Darsow M, Regele S, Flock F, Maiterth C, Dahlendorf R, Wendt J, Kreienberg R: Long term morbidity following axillary dissection in breast cancer patients: clinical assessment, significance for life quality and the impact of demographic, onologic and therapeutic factors. Breast Cancer Res Treat 2000, 64:275-286.

260. Stein Kd, Jacobsen Pb, Hann Dm, Greenberg H, Lyman G: Impact of hot flashes on quality of life among postmenopausal women being treated for breast cancer. J Pain Symptom Manage 2000, 19:436-445.

261. Beaulac Sm, Mcnair La, Scott Te, et al.: Lymphedema and quality of life in survivors of early-stage breast cancer. Arch Surg 2002, 137:1253-1257.

262. Kwan W, Jackson J, Weir Lm, Dingee C, McGregor G, Olovistoa I: Chronic arm morbidity after curative breast cancer treatment: prevalence and impact on quality of life. J Clin Oncol 2002, 20:4242-4248.

263. Forstner Bv, Stepanski Ej, Wang Sc, Kasprowicz S, Durrenhe S: Sleep and quality of life in breast cancer patients. J Pain Symptom Manag 2002, 24:471-480.

264. Engel J, Kerr J, Schlesinger-Raab A, Sauer H, Holzel D: Axilla surgery severely affect quality of life: results of a 5-year prospect...
tive study in breast cancer patients. Breast Cancer Res Treat 2003, 79:47-57.

265. Caftan D, Amichetti M, Ferro A, Lucenti A, Valduga F, Galligioni E: Pain and quality of life after surgery for breast cancer. Breast Cancer Res Treat 2003, 80:39-48.

266. Rietman J, Dijkstra P, Debreczeni R, Geertzen J, Robinson D, de Vries J: Impairments, disabilities and health related quality of life after treatment of breast cancer: a follow-up study 2.7 years after surgery. Disabil Rehabil 2004, 26:78-84.

267. Schults PN, Klein MJ, Beck ML, Stava C, Sellin RV: Breast cancer: relationship between menopausal symptoms, psychobiological health effects of cancer treatment and physical constraints on quality of life in long-term survivors. J Clin Nurs 2005, 14:204-211.

268. Ridner SH: Quality of life and a symptom cluster associated with breast cancer treatment-related lymph edema. Support Care Cancer 2005, 13:904-911.

269. Conde DM, Pinto-Neto AM, Cabello C, Santos-Sa D, Costa-Paiva L, Burckhardt CS, Carol S, Jones KD: Quality of life and sexual functioning after breast cancer treatment. J Sex Med 2005, 2:267-271.

270. Massacesi C, Sabbatini E, Rocchi MB, Zepponi L, Rossini S, Pilone A, Land SR, Wickerham DL, Costantino JP, Ritter MW, Vogel VG, Lee J, Avis NE, Crawford S, Manuel J: Quality of life among younger women with breast cancer. J Clin Oncol 2005, 23:3322-3330.

271. Heidrich SM, Egan JJ, Hengdonsub P, Randolph SM: Changes in quality of life and sexual function of breast cancer survivors with arm lymphedema. Menopause 2005, 12:433-440.

272. Martinize EZ: Menopause symptoms and quality of life in women aged 45 to 65 years with and without breast cancer. Menopause 2005, 12:436-446.

273. Burchhardt CS, Carol S, Jones KD: Effects of chronic widespread pain on the health status and quality of life of women after breast cancer surgery. Health Qual Life Outcomes 2005, 3:30.

274. Mills PJ, Parker B,Dimsdale JE, Sadler GR, Ancoli-Israel S: The relationship between fatigue and quality of life and inflammation during anthracycline-based chemotherapy in breast cancer. J Pain Symptom Manage 2005, 29:85-96.

275. Massacesi C, Sabbatini E, Rocchi MB, Zepponi L, Rossini S, Pilone A, Burattini L, Pezzoli M: Effects of switching from tamoxifen to anastrozole on tamoxifen-related endocrine symptoms and quality of life. Am J Cancer 2006, 5:433-440.

276. Land SR, Wickerham DL, Costantino JP, Ritter MW, Vogel VG, Lee MK, Pajon ER, Wade JIII, Dakhil S, Lockhart JB, Wolmark N, Ganz PA: Patient reported symptoms and quality of life during treatment with tamoxifen or raloxifene for breast cancer prevention: the NSABP study of tamoxifen and raloxifene (STAR) P-2 trial. JAMA 2006, 295:2742-2751.

277. Heidrich SM, Egan JJ, Hengdonsub P, Randolph SM: Symptoms, symptom beliefs, and quality of life of older breast cancer survivors: a comparative study. Oncol Nurs Forum 2006, 33:315-322.

278. Gupta P, Sturdee DW, Pallin SL, Majumder K, Fear R, Marshall T, Paterson I: Menopausal symptoms in women treated for breast cancer; the prevalence and severity of symptoms and their perceived effects on quality of life. Climacteric 2006, 9:49-58.

279. Byar KL, Berger AM, Bakken SL, Cetak MA: Impact of adjuvant breast cancer chemotherapy on fatigue, other symptoms and quality of life. Oncol Nurs Forum 2006, 33:E18-E26.

280. Aarnis V, Stegmaier C, Ziegler H, Brenner H: A population-based study of the impact of specific symptoms on quality of life in women with breast cancer 1 year after diagnosis. Cancer 2006, 107:2496-2503.

281. Pyszyl A, Malysezek K, Pyszyl K, Andrzejak R, Szuba A: Disability, psychological distress and quality of life in breast cancer survivors with arm lymphedema. Oncology 2006, 69:185-192.

282. Dagnelie PC, Pijs-Johannesma MC, Lambin P, Beijer S, De Ruyscher D, Kempen GI: Impact of fatigue on overall quality of life in lung and breast cancer patients selected for high-dose radiotherapy. Ann Oncol 2007, 18:940-944.

283. Ganzer PA, Rowland JH, Desmond K, Meyerowitz BE, Wyatt GE: Life after breast cancer: understanding women’s health-related quality of life and sexual functioning. J Clin Oncol 1998, 16:501-514.