Bernadine Cimprich,
PhD, RN
David L. Ronis, PhD
Gloria Martinez-Ramos, MA

Age at Diagnosis and Quality of Life in Breast Cancer Survivors

PURPOSE: The purpose of the study was to determine the relationship between life-stage variables (ie, age at diagnosis and years of survival) and quality-of-life (QOL) outcomes in long-term survivors of breast cancer.

DESCRIPTION OF STUDY: In this cross-sectional study, 105 long-term survivors of breast cancer participated in a mailed survey assessing QOL. Participants were selected from a cancer center tumor registry using a stratified random-sampling procedure that was based on age at diagnosis. The Quality of Life-Cancer Survivors scale was used to assess QOL outcomes in the physical, psychological, social, and spiritual domains.

RESULTS: Long-term survivors of breast cancer who had received diagnoses at an older age (> 65 years) showed significantly ($P < .05$) worse QOL outcomes in the physical domain, while those who had received diagnoses at a younger age (27–44 years) showed worse QOL outcomes in the social domain than other age groups. A nonlinear relationship was observed, with long-term survivors who had received diagnoses in middle age (45–65 years) showing better QOL outcomes in the physical domain and in overall QOL. Age at diagnosis and years of survival were significant predictors of QOL outcomes.

CLINICAL IMPLICATIONS: These findings indicate that the life stage at diagnosis can help to predict long-term QOL outcomes in breast cancer survivors. Educational strategies to help oncology professionals develop a better understanding of the impact of age at diagnosis may be important in developing tailored interventions that respond to the specific needs of breast cancer survivors at each life stage.

KEY TERMS: Age at diagnosis; Breast cancer; Cancer survivor; Life stage; Quality of life; Years of survival

Breast cancer survivors represent one of the largest groups of long-term cancer survivors, comprising about 20% of the more than 8 million cancer survivors in the United States.[1] Although the majority of women who receive diagnoses of breast cancer live 5 or more years past the diagnosis,[2] relatively little is known about the long-term impact of breast cancer diagnosis and treatment on quality of life (QOL) in breast cancer survivors.[3] Breast cancer affects women in all adult life stages,[2] and the incidence of breast cancer increases with age. Yet, a life-stage perspective has seldom been used to understand the long-term impact of breast cancer and its treatment on recovery and QOL outcomes. The purpose of this preliminary study was to examine how the younger, middle, or older life stage at diagnosis of breast cancer might influence the current QOL in long-term survivors of breast cancer.

Life-Stage Perspective

The developmental life stage, or the point in the life cycle, in which cancer occurs has been recognized as a significant factor in children and very young adults. Rowland[4] has proposed a theoretical perspective related to adult developmental life stages and adjustment to cancer that provides a useful context for examining the impact of breast cancer and its treatment on long-term QOL outcomes. From this perspective, adult developmental life

Bernadine Cimprich, PhD, RN, Associate Professor, University of Michigan, Ann Arbor, Michigan.

David L. Ronis, PhD, Associate Research Scientist, University of Michigan, and Research Health Science Specialist, Department of Veteran Affairs, Ann Arbor, Michigan.

Gloria Martinez-Ramos, MA, Doctoral Candidate, Sociology, University of Michigan, Ann Arbor, Michigan.

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Address for correspondence: Bernadine Cimprich, PhD, RN, 400 N. Ingalls, Ann Arbor, MI, 48109-0482.

stages encompass certain biologic, personal, and social life goals and tasks that may be disrupted by the diagnosis of breast cancer. As proposed by Rowland,[4] the adult developmental stages that are pertinent to the diagnosis of breast cancer include the mature adult (31–45 years), the adult in middle age (46–65 years), and the aging adult (> 65 years). It is important to note that considerable individual variability exists and that age ranges are not absolute but provide a useful approximation of the adult life stage.

Within each adult life stage, individuals encounter relevant physical, psychological, psychosexual, and social tasks.[4] The mature adult life stage involves the attainment of personal, social, and career goals, which may include raising children and establishing family, career, and social roles. The adult in middle age is characterized by the need for adaptation to a range of physical, emotional, and social life changes. Such adaptations may relate to hormonal changes in menopause, role reversals between parents and children, and the peaking of careers. Finally, the aging adult must deal with possible changes in work roles with retirement, diminished physical ability and performance, and the possible loss of a spouse or friends. Thus, the point in time when breast cancer occurs in the life cycle is an important consideration because specific adult developmental tasks are concurrently being engaged and mastered. A life-changing event, such as the diagnosis of breast cancer, may compromise a woman's ability to deal effectively with relevant life-stage tasks and to master competencies that are necessary for daily life roles. A diagnosis of breast cancer challenges personal relationships, roles, life goals and achievements, body integrity, and identities that are unique to the individual's life stage.[4–6] The interaction of adult life stage and the diagnosis of breast cancer can have both positive and negative psychosocial sequelae that affect recovery and long-term QOL outcomes in survivors of breast cancer.

A life-stage perspective seldom has been used in research examining the impact of cancer and its treatment in adults, although some notable exceptions do exist. In pioneering work using a developmental life-stage perspective, Mages and Mendolsohn[7] first described how cancer affected peoples' lives and adaptation in younger, middle, and older adulthood. Since then, few studies have examined how adult developmental life stage, or the point in life at which cancer occurs, might affect short-term or long-term QOL outcomes in breast cancer survivors.

In a sample of 124 women with breast cancer, Dorval et al[8] found that age at diagnosis, an approximation for life stage, modified the relationship between the extent of surgery (ie, mastectomy or breast conservation) and psychological distress both in the short term (3 and 18 months past the initial treatment) and the long term (about 8 years past the initial treatment). Thus, in women who are younger than 50 years old at diagnosis, breast-conserving surgery was associated with lower distress as compared with mastectomy. In contrast, in women 50 years or older at diagnosis, breast-conserving surgery was associated with higher levels of distress as compared with mastectomy, suggesting unidentified needs in these older women. Vinokur et al[9] also found differences in psychological state (ie, anxiety and depression) that were based on age and number of years of survival (1–10 years) after the breast cancer diagnosis. Women younger than 65 years who were living at least 5 years after receiving their diagnosis had significantly lower anxiety and depression scores and higher positive morale than did women of the same age group who had received a diagnosis more recently. In contrast, in women 65 years or older, there were no differences in anxiety, depression, or positive morale between long-term and short-term survivors. A pattern that emerged in this research was that younger breast cancer survivors who had received a diagnosis more recently tended to be at risk for poorer mental health, whereas older women who had received a diagnosis more recently were at greater risk for physical problems than were those women of similar age but with longer survival time.[9]

In a study of age-related differences in the psychosocial impact of breast cancer, Mor et al[10] found that younger women (< 55 years) experienced the effects of their illness more negatively with greater emotional and financial distress and greater disruptions in daily life after treatment (chemotherapy) than did older women. These age-related differences persisted even after controlling for disease severity, social support, and demographic variables of income, education, and marital status. The authors postulated greater life stage challenges for younger women in adapting to the unexpectedness or the "off-timedness" of the diagnosis, in dealing with possible losses in their careers, or in possibly losing the chance to see their children grow up. More recently, Ferrell et al[11] stratified survivors of breast cancer who were an average of 107 months postdiagnosis into younger, middle, and older age groups to determine age differences in QOL outcomes. In this study, older women reported better QOL outcomes than did younger or middle-age participants. The study, however, did not examine the possible influences of age at diagnosis or years of survival on QOL outcomes.

Theoretical Perspective on Quality of Life

The theoretical model of QOL that serves as the basis for this study was originally developed from research on the impact of cancer and its treatment,[12] and more recently, was adapted by Ferrell et al[13,14] to long-term survivors of cancer, including survivors of breast cancer.[15–18] The theoretical model includes the following four domains of QOL: physical, psychological, social, and spiritual well-being.[13,14] While a common definition of QOL still does not exist, the domains comprising the model posited by Ferrell et al[13] are consistent with the predominant views of the multidimensional nature of QOL in chronic and life-threatening illnesses such as cancer.[3,19,20] Importantly, the model also permits the assessment of positive as well as negative effects of the cancer experience on QOL outcomes.

In recent studies of short-term and long-term survivors of breast cancer, both positive and negative QOL outcomes have been documented (see Gotay and Muraoka[3] for a recent review). Positive outcomes such as gains in hopefulness and having a clearer purpose in life have been reported.[13,16] Breast cancer survivors also have reported a number of unresolved psychological issues such as fear of cancer recurrence, intrusive recall of highly threatening past events (such as being told the diagnosis), changes in body image, physical changes such as fatigue, and concerns about fertility, sexuality, and family distress.[13,16] Most research on survivors of breast cancer, however, fails to establish how age at diagnosis and other life-stage variables might affect QOL outcomes. Thus, the purposes of this preliminary study were the following: 1) to determine any differences in the QOL in long-term survivors of breast cancer, based on younger, middle, and older age at diagnosis, and 2) to determine the combined predictive value of age at diagnosis, years of survival, and selected demographic and treatment variables on QOL outcomes in long-term survivors of breast cancer.

Methods

Sample

After approval of the study by the Human Subjects Institutional Review Board, the participants were drawn randomly from the tumor registry of a Midwestern comprehensive cancer center. Potential participants met the following criteria: 1) they had received a diagnosis of primary breast cancer between 1936 (the inception of the registry) and 1993, and were at least 5 years past the diagnosis; 2) there was no documented recurrent disease or other cancer diagnosis; and 3) the tumor registry had made contact with them in the previous year, increasing the likelihood that the women were still alive and could be reached by mail. To achieve relatively equal numbers of women who had received diagnoses at younger, middle, or older ages, a stratified random-sampling procedure was used based on the age at diagnosis. Three age strata were formed to approximate adult life stages that were relevant to the diagnosis of breast cancer, as described by Rowland[4]: younger, less than 45 years old; middle, 45 to 65 years old; and older, more than 65 years old. For this preliminary study, a sample of 202 subjects was randomly selected from the three age strata (about 67 subjects per group). A letter then was sent to physicians of record to inform them that their patients had been randomly selected for the study. As a result, it was determined that in eight of the women recurrent disease had developed or they had died. Thus, there were 194 potential participants.

Procedure

The potential participants were contacted by mail and were invited to participate in the study. A modified Dillman[21] mail survey procedure was used. The mailed packet included a cover letter, the survey instrument, and a prepaid return envelope. The details of the study, including information on the random selection process, confidentiality, and voluntary nature of participation, were described in the letter. The letter explained that the individual would indicate her consent to participate in the study by returning the completed questionnaire. A follow-up letter was sent to thank responders and to encourage nonresponders to participate. A second mailing of the survey was sent to nonresponders. The overall response rate was 57% (110 responders). Responses also were received from the relatives of 20 subjects indicating that the patient was unable to complete the survey because of other chronic illness or dementia. A comparison of responders versus nonresponders showed significant differences in current age, with nonresponders being significantly older (mean age, 70.1 vs 64.5, respectively; t = 2.86, df = 187; P = .005). Five responders returned incomplete surveys and, thus, were excluded from this analysis, providing a final total of 105 participants.

Instrument

To assess QOL outcomes, participants completed a 41-item questionnaire, The Quality of Life-Cancer Survivors (QOL-CS) instrument.[13] The QOL-CS taps the following four domains of QOL: physical well-being (eight items); psychological well-being, including cancer-related fears and distress (18 items); social well-being (eight items); and spiritual well-being (seven items). The physical well-being and symptom domain include intermediate and late effects associated with the diagnosis and treatment, such as issues of functional ability, fatigue, pain, sexual intimacy, and fertility. Three items were added to the physical subscale to assess arm swelling, arm or shoulder tenderness, and breast/chest wall pain in this sample of breast cancer survivors. Psychological well-being encompasses emotional and cognitive sequelae, life enjoyment and satisfaction, as well as distress associated with cancer diagnosis and treatment and fears of recurrence and metastasis. Social well-being taps interpersonal and family relationships; social, home, and work roles; and financial burden. Finally, the model encompasses a spiritual domain, which often is overlooked in studies of QOL. The spiritual domain assesses changes in spiritual life and activities, the search for meaning and purpose in life, uncertainty, the sense of hopefulness, and the extent to which positive life changes occurred as a result of the cancer experience. Participants rate each item "based on your life at this time" on a 10-point scale with polar opposite phrases at either end (eg, "worst" or "best"). Variant response items were transposed so that 10 always represented the best outcome and 0 represented the worst outcome. Scores then were scaled by averaging the responses to the items to form total and subscale scores. The instrument has reported validity and reliability in a study of cancer survivors.[13] In this study, the Cronbach alpha coefficient was .92 for the total instrument, the reliability coefficients for the subscales were the following: physical, .87; psychological, .90, social, .80, and spiritual, 0.75. These indicate satisfactory reliability.

Data Analysis

Descriptive statistics were used to characterize the demographic and medical characteristics of the sample. One-way analysis of variance (ANOVA) with post hoc comparisons using the Scheffé method was used to examine differences in QOL mean scores of long-term survivors of breast cancer based on age at diagnosis (ie, younger, middle, and older). Multiple regression analyses were used to examine the predictive value of age at diagnosis, years of survival, and pertinent demographic and treatment variables on the total QOL score as well as the four subscales.

Results

Sample Characteristics

The mean age of subjects in the sample was 64.5 years, ranging from 34 to 89 years. The age at diagnosis ranged from 27 to 79 years (mean 53 years), and the time since diagnosis (ie, years of survival) ranged from 5 to 50 years (mean 11.5 years). The majority of the sample was White (91%), currently married (56%), and had some college education (65%). Income was reported by 84% of the responders. Of these, 44% reported an annual income of $30,000 or less, while 32% reported an income of $60,000 or more. To permit an examination of differences in characteristics by age at diagnosis, the sample was stratified into the following three age groups at diagnosis: younger (42 subjects), 27 to 44 years old; middle (35 subjects), 45 to 65 years old; and older (28 subjects), 66 to 79 years old. There were no significant differences among the age groups based on race, education, or marital status. There was a significant difference in reported income ($P < .05$), with women in the older age group at diagnosis having a lower annual income than women in the middle or younger age groups at diagnosis (Table 1).

An examination of medical characteristics as shown in Table 2 indicated that 58% (62 subjects) of the women reported having had a mastectomy (simple or modified radical), while 41% (43 subjects) reported having breast-conserving surgery. Fifty-one percent of the sample had been treated with radiation therapy, 37% with chemotherapy, and 28% had received antiestrogen therapy with tamoxifen. Based on age group at diagnosis, there were significant treatment differences involving the extent of surgery and treatment with chemotherapy and radiation therapy. Thus, more women in the younger group at diagnosis reported having had a mastectomy (83%) and receiving chemotherapy (60%) than did women in the other two age groups. In contrast, more women in the older age group at diagnosis reported receiving radiation therapy (75%) than did those in the other two age groups.

Overall Quality of Life

Table 3 presents QOL-CS scores for the total sample and the three age-at-diagnosis groups. The overall mean QOL-CS score for the total sample was 7.34, with scores ranging from 2.07 to 9.76. Overall, the highest mean scores (ie, best outcomes) for the total sample were observed in

Table 1. ***Demographic Characteristics of Total Sample and Age at Diagnosis Groups****

Characteristics	*Total Sample (N = 105)*	*Younger (n = 42)*	*Middle-Aged (n = 35)*	*Older (n = 28)*	*P Value*
Current age (yr)	64.5 (1.29)	53.2 (1.72)	67.1 (1.21)	78.1 (0.90)	<.001†
Age at diagnosis (yr)	53.0 (1.36)	38.7 (0.80)	56.3 (1.01)	70.4 (0.74)	<.001†
Survivor years	11.5 (0.73)	14.5 (1.55)	10.9 (0.78)	7.8 (0.46)	.001†
Race					
White	96 (91%)	35 (83%)	34 (97%)	27 (96%)	.29‡
Non-White	9 (9%)	7 (17%)	1 (3%)	1 (4%)	
Education					
High school or less	36 (34%)	9 (21%)	15 (43%)	12 (43%)	.43‡
College (full or partial)	41 (39%)	21 (50%)	11 (31%)	9 (32%)	
Advanced degree	27 (26%)	12 (29%)	9 (26%)	6 (21%)	
Not reported	1 (1%)			1 (4%)	
Marital status					
Married	56 (53%)	24 (57%)	22 (63%)	10 (36%)	.08‡
Not married§	49 (47%)	18 (43%)	13 (37%)	18 (64%)	
Income					
≤30,000	40 (38%)	11 (26%)	14 (40%)	15 (54%)	.02‡
30,000–60,000	20 (19%)	8 (18%)	5 (14%)	7 (25%)	
>60,000	28 (27%)	19 (45%)	7 (20%)	2 (7%)	
Not reported	17 (16%)	4 (1%)	9 (26%)	4 (14%)	

*Values given as mean (SEM) or no. (%).

†Based on one-way ANOVA.

‡Based on chi-square analyses.

§Includes divorced, widowed, separated, and single.

Table 2. ***Medical Characteristics of Total Sample and Age at Diagnosis Groups****

Characteristics	*Total Sample (N = 105)*	*Younger (n = 42)*	*Middle-Aged (n = 35)*	*Older (n = 28)*	*P Value*†
Type of surgery					
Breast conserving	43 (41)	7 (17)	14 (40)	22 (79)	<.001
Mastectomy‡	62 (59)	35 (83)	21 (60)	6 (21)	
Radiation therapy					
Yes	54 (51)	18 (43)	15 (43)	21 (75)	.01
No	51 (49)	24 (57)	20 (57)	7 (25)	
Chemotherapy					
Yes	39 (37)	25 (60)	12 (34)	2 (7)	<.001
No	66 (63)	17 (40)	23 (66)	26 (93)	
Antiestrogen therapy					
Yes	29 (28)	11 (26)	8 (23)	10 (36)	.51
No	76 (72)	31 (74)	27 (77)	18 (64)	

*Values given as no. (%), unless otherwise indicated.

†Based on chi-square analyses.

‡Modified radical and simple mastectomy.

the social well-being and physical well-being domains, with mean scores of 8.28 and 7.99, respectively. Mean scores for the psychological and spiritual well-being subscales were in the moderate range of 6.77 and 6.61, respectively.

Age at Diagnosis and Quality of Life

To test differences in the mean QOL scores among younger, middle, and older age groups at diagnosis, one-way ANOVA using the Scheffé method for post hoc comparisons was performed. There were significant differences among the groups in the mean scores of two subscales, physical well-being, F (2, 104) = 5.02; $P = .008$), and social well-being, F (2, 104) = 3.82; $P = .025$). Post hoc comparisons showed that the group of patients who had received diagnoses at an older age scored significantly ($P < .05$) lower, on average, on physical well-being than did those in the middle-age group. Conversely, the younger age-at-diagnosis group scored significantly lower on social well-being compared with those in the older age group. There were no significant differences in mean scores on the psychological and spiritual subscales based on the age group at diagnosis.

Age at Diagnosis and Specific Quality of Life Items

An examination of specific items in each domain using one-way ANOVA and the Scheffé method for post hoc comparisons provided further information about similarities and differences in QOL outcomes based on age at diagnosis (ie, younger, middle, and older). In the physical domain, older women reported significantly $P < .05$) lower mean scores (ie, poorer outcomes) in relation to fatigue (mean 5.14), aches or pains (mean 5.11), sleep changes (mean 5.67), and constipation (mean 7.21) compared with women in the younger or middle aged groups. On the other hand, women who had received diagnoses at a younger age reported significantly ($P < .05$) lower mean scores related to menstrual and fertility problems (mean 7.23) compared with women

Table 3. ***Quality of Life-Cancer Survivors Mean Scores of Total Sample and Age at Diagnosis Groups***

	Total Sample (N = 105)		*Younger (n = 42)*		*Middle-Aged (n = 35)*		*Older (n = 28)*		
Scores	*Mean*	*SEM*	*Mean*	*SEM*	*Mean*	*SEM*	*Mean*	*SEM*	*P Value**
Overall QOL-SC	7.34	0.12	7.11	0.21	7.69	0.20	7.25	0.21	.10
Subscales									
Physical	7.99	0.15	8.06	0.22	8.49	0.25	7.27	0.33	.008
Psychological	6.77	0.16	6.40	0.28	7.20	0.24	6.78	0.28	.12
Social	8.28	0.16	7.79	0.29	8.44	0.25	8.81	0.20	.03
Spiritual	6.61	0.21	6.64	0.34	6.76	0.35	6.35	0.41	.74

*Based on one-way ANOVA.

in the older group. Responses on other items in this domain, including the three items added to assess arm swelling, arm or shoulder tenderness, and breast or chest wall pain, were not significantly different based on age at diagnosis.

In the psychological domain, there were some notable similarities and differences in specific items based on age at diagnosis. Overall, across all age groups (younger, middle, and older) women reported having moderate fears about future diagnostic tests (mean range 5.95–7.00), the recurrence of disease (mean range 5.19–6.06), and the development of a second cancer (mean range 4.96–5.97). However, women who had received diagnoses at a younger age reported significantly ($P < .05$) greater distress at diagnosis (mean 1.37) and treatment (mean 2.24) than did women in the older age group (mean for diagnosis 3.50; mean for treatment distress 4.07; $P < .05$). Of interest, women who had received a diagnosis at a younger age also reported significantly ($P < .05$) lower scores in relation to changes in self-concept (mean 5.70) than did those women who received diagnosis in middle age (mean 7.74) or older age (mean 8.54), and also reported significantly worse outcomes related to changes in appearance (mean 5.91) as compared with those women in the older age group (mean 8.08). Women in the older age-at-diagnosis group reported feeling less useful in life (mean 6.52; $P < .05$) compared with women in the younger (mean 8.12) or middle (mean 8.37) age groups. Interestingly, the middle-age-at-diagnosis group tended to have higher mean scores on most items in this subscale, signifying better psychological outcomes compared with the other age groups, and also scored significantly higher in happiness (mean 8.69; $P < .05$) than did the younger age group (mean 7.43).

In the social domain, younger women reported significantly greater impact on sexuality (mean 6.03) than did women in the other two age groups (Middle, mean 8.77; Older, mean 10; $P < .05$) and also greater family distress (mean 4.74) than those in the older age group (mean 7.00; $P < .05$). In contrast, women who had received a diagnosis at an older age reported experiencing the least impact of breast cancer on sexuality or interference with employment.

In the spiritual domain, there were significant differences based on age at diagnosis in relation to the extent that the illness resulted in positive changes in life. Of interest, the older age group reported significantly fewer positive changes (mean 3.29) as a result of the illness than the younger age group (mean 5.93). In addition, older women reported significantly greater uncertainty about the future (mean 5.59) than did women in the middle-age group (mean 7.58).

An examination of scatter plots of the QOL scores by age at diagnosis (continuous variable) suggested the presence of a nonlinear trend. Multiple regression analyses subsequently confirmed a significant ($P < .0001$) nonlinear relationship in the physical well-being subscale (Fig. 1). Similarly, the nonlinear relationship for the total QOL score approached statistical significance ($P = .06$). Specifically, women who were in middle age at diagnosis reported better physical well-being than did either younger or older women at diagnosis, and this same trend was observed in the overall QOL scores.

Figure 1 Scores on current physical well-being by age at diagnosis. The smoothed curve is based on regression analysis.

Demographic and Treatment Variables and Quality of Life

To further determine the predictive value of age at diagnosis and the pertinent demographic and treatment variables, multiple regression analyses were conducted using the total QOL score and subscale scores as dependent variables. The demographic variables in the regression model were age at diagnosis (linear and nonlinear terms), years of survival, current marital status (married vs not married, including divorced, widowed, or single), and educational level. Age at diagnosis served as a primary variable of interest in the regression analysis. In addition, other demographic variables (ie, years of survival, current marital status, and educational level) were included in the regression model as possible covariates because small zero-order correlations were observed with the QOL scores. Specifically, years of survival were positively correlated ($r = .18$; $P = .06$) with total QOL scores. There was a significant relationship between current marital status ($r = .21$; $P = .02$) and the physical subscale scores, with married status associated with better physical well-being. Educational level was inversely correlated ($r = -.20$; $P = .05$) with total QOL scores. Income was not included because of missing data. The treatment variables were the type of surgery (mastectomy vs breast-conserving surgery) and whether the participant had received radiation therapy, chemotherapy, or antiestrogen therapy (ie, tamoxifen). The final regression model accounted for 20% of the variance in the total QOL score $F(9, 103) = 2.65$; $P = .009$), with age at diagnosis (linear and nonlinear terms) and years of survival explaining most of the variance in the total score (Table 4). A greater number of years of survivorship was associated with better outcomes. The model also accounted for a significant portion of the variance (20–23%) in physical, psychological, and social well-being subscales, with age at diagnosis alone explaining more of the variance in physical well-being and years of survival explaining more of the variance in psychological and social well-being. Education added a small portion to the regression model for the social well-being subscale ($P = .048$). The variables included in the model that

Table 4. ***Multiple Regression Analyses of Total Quality of Life Score****

Variables	*b (SE)*	β	*P Value*
Age at Dx	0.158 (.075)	1.738	.038
Age at Dx^2	−0.001 (.001)	−1.610	.057
Survivor years	0.051 (.019)	0.303	.007
Current marital status	0.350 (.263)	0.139	.187
Type of surgery	−0.502 (.390)	−0.196	.201
Chemotherapy	−0.191 (.279)	−0.074	.495
Education	−0.187 (.096)	−0.187	.054
Radiation therapy	−0.475 (.336)	−0.189	.161
Antiestrogen therapy	0.044 (.278)	0.016	.874

*Multiple $R = .45$; $R^2 = .203$; adjusted $R^2 = .13$; $F(9,103) = 2.653$; $P = .009$. Dx = diagnosis.

were not significant in predicting QOL were current marital status, type of surgery, and treatment with chemotherapy, radiation therapy, or antiestrogen therapy. None of the selected demographic or treatment variables were significant in predicting spiritual well-being.

Discussion

An adult life-stage perspective seldom has been used to understand the long-lasting impact of age at diagnosis, or the point in life at which breast cancer occurs, on QOL outcomes. The findings from this study indicate that age at diagnosis, which is an approximation of life stage, can be a significant predictor of long-term QOL in survivors of breast cancer. Overall, significant differences based on age at diagnosis were observed in certain QOL domains. Women who had received diagnoses at an older age (ie, > 65 years) reported significantly poorer physical well-being than did women who had received a diagnosis at a younger age (ie, < 46 years) or in middle age (ie, 46–65 years). In contrast, women who had received a diagnosis at an older age reported better social well-being than did women in the younger group, but not women in the middle-aged group. At the same time, there were no significant differences in overall scores of psychological or spiritual well-being based on age at diagnosis.

Of interest, a nonlinear trend was observed in this sample, so that women who had received a diagnosis at middle age showed better outcomes in relation to physical well-being than did women who had received a diagnosis at an older or younger age. Although not quite reaching statistical significance, a similar nonlinear trend was observed in relation to overall QOL, with women who had received a diagnosis at middle age tending to report better overall QOL than did those who had received a diagnosis at younger or older ages.

The findings also indicate that life stage at diagnosis may be related to positive and negative outcomes within each QOL domain. When viewed across domains, patterns that were likely related to life stage at diagnosis begin to emerge. Thus, women who had received diagnoses of breast cancer at an older age reported poorer status in relation to fatigue, aches and pains, and overall physical health, feeling less useful in life and more uncertain about the future, and making fewer positive life changes as a result of the diagnosis and treatment of cancer. These findings are similar to those of Mages and Mendolsohn[7] who found that survivors of cancer in older life stages experienced a hastening of the aging process with less energy and a greater sense of uselessness. On the other hand, social issues were not dominant and overall social well-being was better in the older age-at-diagnosis group. Women who had received diagnoses at a younger age reported significantly worse status in relation to reproductive issues (ie, fertility and menstrual changes) and psychological distress related to diagnosis and treatment, changes in appearance and self-concept, family distress, and impact on sexuality. At the same time, in the spiritual realm, the younger women also reported making more positive life changes as a result of the diagnosis and treatment of breast cancer. Women who had received diagnoses at midlife showed fewer significant differences across QOL domains when compared with women in the other two age groups. Women who had received diagnoses at midlife also tended to have better physical status than did younger or older women, more happiness than younger women, and better overall QOL. Taken together, these findings in long-term survivors of breast cancer who were 5 to 50 years past diagnosis (mean 11.5 years.) suggest positive outcomes and vulnerabilities as well as possible unresolved issues that may be unique to a woman's life stage at the diagnosis of breast cancer.

The findings of a relationship between age at diagnosis and QOL are generally in keeping with those of Mages and Mendolsohn,[7] who identified similar dominant issues and vulnerabilities in survivors who had received diagnoses of cancer at younger and older life stages and who also identified a significant variance in responses in the midlife group. The findings also are in keeping with those of Dorval et al,[8] who found that age at diagnosis mediated the distress related to the extent of surgery, suggesting that age at diagnosis as an approximation of life stage can have a significant influence on specific QOL outcomes. Vinokur et al[9] observed that younger women are more vulnerable to the psychological impact of breast cancer during the early phases of recovery, whereas older women seem more vulnerable to the physical impact of breast cancer. The findings of this study further suggest that such age-related vulnerabilities may have a long-term impact on QOL in survivors of breast cancer.

Another finding of this study was that years of survivorship significantly predicted overall QOL, as well as psychological and social well-being. Thus, even within this group of long-term survivors who were at least 5 years past diagnosis, women with more years of survival after diagnosis of breast cancer reported better overall QOL, and better psychological and social well-being. Vinokur et al[9] found that the recency of diagnosis independently, as well as in combination with age and extent of disease, influenced both physical and psychological outcomes in survivors of breast cancer. Thus, patients with breast cancer who had received diagnoses less that 5 years before the assessment reported greater problems in physical and mental health status than did those who were more than 5 years past diagnosis. Ferrell et al,[13] using the same instrument as that used in the current study, observed more positive ratings in QOL scores in cancer survivors who were more than 5 years past the initial diagnosis compared with those who had received diagnoses less than 5 years previously. Carter[22] proposed phases of the survival process that include coming to terms with the diagnosis of breast cancer and "moving on." The findings from the present study further suggest an ongoing integration of the experience over many years of survivorship, leading to improved QOL and adjustment outcomes.

There are several considerations related to the study sample and design that limit the interpretation of the findings. First, it is possible that only those women who were experiencing a sufficiently high QOL responded to the survey. More older women and those who had received diagnoses at an older age did not respond to the survey. The investigators learned from family members that some of the nonrespondents were frail, suffered from dementia, or were chronically ill and residing in nursing homes. Thus, the findings may reflect the experiences of survivors of breast cancer with better overall health and QOL. Although potential participants were randomly chosen from the tumor registry of a large Midwestern university medical center that has a comprehensive cancer treatment program, it is still possible that the characteristics of women treated for breast cancer at a university medical center may differ in some ways from those undergoing treatment in other settings. Finally, because of the cross-sectional design, the investigators could not answer questions about the improvement or decline in QOL outcomes over time.

For the most part, studies of long-term survivors of breast cancer either have not examined the relationships among life stage variables, such as age at diagnosis, and QOL outcomes or have not reported their findings in published reports. The findings of this study indicate that age at diagnosis can have a significant long-term impact on QOL. Future research is needed to confirm these observations in larger and more diverse samples and to further determine how life stage might affect recovery and adjustment in breast cancer survivors over time.

Clinical Implications

There is recent recognition of the need for improved supportive care services to address physical and psychosocial issues and concerns of breast cancer survivors that persist even years after the completion of treatment.[8] Discerning how the life stage at diagnosis might affect responses to illness and treatment is an important first step in developing tailored services to improve QOL for breast cancer survivors. In this regard, the findings of this study suggest that certain patterns of physical and psychosocial vulnerabilities that have been observed in long-term survivors of breast cancer may be unique to younger, middle, or older age at diagnosis. Mullan[23] has proposed that cancer survivorship begins at diagnosis and is an ongoing process through the acute treatment, transitional, and long-term or permanent survival stages. Thus, an important implication of the findings of this study is the need to assess age-related issues and concerns that might affect recovery, adjustment, and QOL from the time of diagnosis. Supportive-care services then can be tailored to address and to anticipate the specific age-related physical and psychosocial needs of breast cancer survivors at every stage of survivorship. Attention to life-stage issues and concerns by cancer-care providers from the earliest patient contact can serve to improve long-term QOL in breast cancer survivors. To accomplish these goals, oncology healthcare professionals will need to be educated on the characteristics of each life stage, and interventions based on theory will need to be tested in the clinical arena.

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