QUALITY OF LIFE AMONG LONG-TERM SURVIVORS OF BREAST CANCER: DIFFERENT TYPES OF ANTECEDENTS PREDICT DIFFERENT CLASSES OF OUTCOMES

CHARLES S. CARVER*†, ROSELYN G. SMITH, VIDA M. PETRONIS[†] and MICHAEL H. ANTONI
University of Miami, Coral Gables, FL 33124-0751, USA

SUMMARY

Quality of life (QOL) has many aspects, both in the short-term and in the long-term. Different aspects of QOL may have different types of precursors: demographic, medical, and psychosocial. We examined this possibility in a group of long-term breast cancer survivors. Early-stage breast cancer patients ($N = 163$) who had provided information about medical, demographic, and psychosocial variables during the year after surgery completed a multidimensional measure of QOL 5–13 years later. Initial chemotherapy and higher stage predicted greater financial problems and greater worry about appearance at follow-up. Being partnered at diagnosis predicted many psychosocial benefits at follow-up. Hispanic women reported greater distress and social avoidance at follow-up. Initial trait optimism predicted diverse aspects of better psychosocial QOL at follow-up, but not other aspects of QOL. Thus, different aspects of QOL at long-term follow-up had different antecedents. Overall, psychological outcomes were predicted by psychosocial variables, presence of a partner at diagnosis, and ethnicity. Financial outcomes, in contrast, were predicted by medical variables, which otherwise predicted little about long-term QOL. This divergence among aspects of QOL should receive closer attention in future work. Copyright © 2005 John Wiley & Sons, Ltd.

INTRODUCTION

Though curing cancer remains the focal goal of cancer research, attention is increasingly paid to the importance of patient quality of life (QOL). There is now a great deal of information on physical, emotional, social, and sexual well-being among cancer patients, most concerning the period around diagnosis and the subsequent year. With better detection and treatment, however, half of all cancer patients now survive 5 years or more after treatment (Parker *et al.*, 1997). This has led to interest in long-term QOL among cancer survivors (Bloom, 2002; Deimling *et al.*, 2002; Ferrell *et al.*,

1995; Ganz *et al.*, 2002, 1998; Gotay and Muraoka, 1998; Schag *et al.*, 1994; Tomich and Helgeson, 2002). Also promoting interest in long-term QOL is evidence that cancer treatments themselves may have long-term physical effects that can adversely influence QOL (American Society of Clinical Oncology, 1996; Bloom, 2002; Deimling *et al.*, 2002; Dorval *et al.*, 1998; Ganz, 2001; Ganz *et al.*, 2002; Gotay and Muraoka, 1998; Moinpour *et al.*, 1989; Mosconi *et al.*, 2002; Nayfield *et al.*, 1992; Steer *et al.*, 2002; Tomich and Helgeson, 2002).

Long-term cancer survivors are concerned with some of the same issues as were salient at the time of diagnosis and treatment, but new issues also emerge (Ganz, 2001). Pain and fatigue remain important (Berglund *et al.*, 1991; Bjordal *et al.*, 1995; Dow *et al.*, 1996), as do sexual disruption (Dorval *et al.*, 1998; Ganz *et al.*, 1998; Litwin *et al.*, 1995; Schag *et al.*, 1994; Wei *et al.*, 2002), appearance and body-image concerns

*Correspondence to: Department of Psychology, University of Miami, Coral Gables, FL 33124-0751, USA.
E-mail: Ccarver@miami.edu

[†]Now at Loyola University, New Orleans, LA, USA

(Ferrell et al., 1995), and emotional distress (Deimling et al., 2002; Gotay and Muraoka, 1998; Wyatt and Friedman, 1996). Issues that emerge more over the longer term include concerns about insurability, worry about the future health of one's children, worry about the family's future in the event of a recurrence (Dow et al., 1996; Ferrell et al., 1995; Schag et al., 1994; Wyatt and Friedman, 1996), and late effects of cancer treatment, such as cardiac toxicity or development of second cancers (Burstein and Winer, 2000; Partridge et al., 2001; Tucker, 1993).

What variables influence QOL among long-term survivors? A good deal of the emerging literature focuses on normative consequences of being a cancer survivor versus never having had cancer (Ganz et al., 1998; Gotay and Muraoka, 1998). However, some studies have examined why some people fare better than others. Most of these studies focus on medical variables (e.g. extent of surgery and adjuvant therapy), and most focus on physical or performance aspects of QOL. Examples are studies of adjuvant chemotherapy as a predictor of later organ toxicities (Burstein and Winer, 2000; Ganz, 2001) and studies of chemotherapy's effect on later cognitive function (Phillips and Bernhard, 2003) and on physical and role function (Ganz et al., 2002).

In the very few studies of long-term emotional and psychological well-being published thus far, medical variables have played a small role. Ganz et al. (2002) found that having had chemotherapy predicted poorer scores at 5–10 year follow-up on a 1-item 'ladder of life,' but not on other measures of mental health (SF-36 mental health index) or depression (the CES-D). Kornblith et al. (2003) found that distress 20 years after diagnosis did not relate to medical variables from early in treatment, but it did relate to current interference with functioning due to treatment-related lymphedema and numbness.

In contrast to the limited effect of initial medical variables, there is emerging evidence that psychosocial variables play a major role in predicting emotional aspects of long-term QOL, just as they do in the shorter term. One study (Helgeson et al., 2004) assessed breast cancer patients repeatedly during the 4.5 years after surgery, separated the cohort statistically into groups with differing emotional trajectories, then compared them on variables collected at baseline. The most distressed group had lower social support and personal resources initially (two aggregated indices) than

the least distressed group. In contrast, demographic and disease variables played very little role.

Another study (Carver et al., 2005) examined a sample of breast cancer patients whose personality and psychosocial adjustment were assessed during the year after surgery, and who then completed the same measures 5–13 years later. Initial reports of psychosocial well-being were strong predictors of follow-up well-being on the same measures. Initial trait optimism and marital status predicted follow-up adjustment, controlling for earlier adjustment. In contrast, initial medical variables played virtually no role.

It is apparent from the preceding description that different researchers have focused on very different aspects of QOL. Why is this? Deciding how to measure QOL is not as easy as it might seem. After a period when QOL was viewed almost entirely in functional terms, several multi-scale inventories were developed to assess QOL after treatment (Borghede and Sullivan, 1996; Cella et al., 1993; Osoba et al., 1997; Ringdal and Ringdal, 1993; Schag et al., 1991; Schag and Heinrich, 1990; Schipper et al., 1984). A key principle behind those measures is that QOL is manifest in diverse ways, all of which may matter. Avis and colleagues extended this logic to the assessment of long-term QOL (Avis et al., 2005), in a measure termed Quality of Life in Adult Cancer Survivors (QLACS). Using semi-structured interviews with 58 long-term survivors (5 years or more post-diagnosis), they identified and clarified relevant domains and generated a pool of self-report items. The items then were administered to a second sample of 242 long-term survivors (along with other measures), to create a final version and establish its psychometric properties.

The work reported here builds on two points made above. First, we examine medical variables, demographic variables, and personal resource variables that were assessed early in the experience of having cancer as predictors of differential levels of QOL among long-term survivors. Second, we tested whether a multi-dimensional measure of QOL provides a more differentiated—and thus clearer—picture of sources of variability in QOL. In so doing, this study tests the value of assessing diverse aspects of QOL. The sample studied here was the one studied by Carver et al. (2005). However, QOL was examined here by the QLACS, a far more wide-ranging inventory than the measures used in that earlier report. Given the

existing literature, we expected that psychosocial variables would be key predictors of psychosocial outcomes years later. We expected the role of earlier medical variables to bear more on such pragmatic matters as financial well-being.

METHOD

Participants

Three past projects (recruitment 1988–1995) enrolled patients at diagnosis and followed them for 1 year. Another project (recruitment 1994–1996) enrolled patients at either 3, 6, or 12 months post-surgery for a single assessment. The follow-up reported here (data collection in 2001) had not been envisioned earlier. Its recruitment began with letters to prior participants indicating the desire to study quality of life of long-term breast cancer survivors. Women who chose to participate were sent questionnaires and an informed consent form, which they completed and returned by mail (each received $40). Both the original studies and the follow-up were approved by the university's IRB.

Given the long time since initial participation, many participants were hard to locate. We successfully found and recruited 20, 22, and 20 women from the three prospective studies and 101 from the cross-sectional study (from starting samples of 70, 68, 64, and 236, respectively). These women are treated here as a single sample of 163 (Ns for specific analyses vary, due to occasional missing responses). Medical and demographic

characteristics are in Table 1 (these data were collected during the initial studies, with the exception of time since treatment).

Although the women who were re-recruited constitute only 37% of participants in the original studies, most women we located participated (10 additional women were contacted but declined; 45 were confirmed to have died; the rest could not be located). Those lost to follow-up for any reason were compared to participants on available medical variables, demographics, and psychosocial predictors. Those re-recruited did not differ from those lost to follow-up on any medical variable. However, those who completed follow-ups were more likely to have been partnered at the time of treatment, $\chi^2(1) = 5.26$, $p < 0.04$, more educated (14.18 vs 13.18 years), $F(1,458) = 9.05$, $p < 0.01$, and less likely to be Hispanic, $\chi^2(1) = 7.53$, $p < 0.01$. Not surprisingly, participants in the early studies were more likely to be lost to follow-up than participants in the more recent study, $\chi^2(3) = 11.63$, $p < 0.01$. Those lost to follow-up did not differ on an initial index of distress, trait optimism, or cancer-related confidence from those retained. In total, although there are a few differences to be kept in mind, the participants analyzed here do not differ greatly from those lost to follow-up.

Medical and demographic predictor variables

The medical variables tested as predictors of long-term QOL were those that were collected in the earlier studies, regarding variations in both

Table 1. Demographic and medical variables ($N = 163$)

Age at diagnosis (S.D.)	54.18 (10.61)
Years education at diagnosis	14.18 (3.44)
Ethnicity	114 (70%) non-Hispanic White, 32 (20%) Hispanic, 17 (10%) African American
Marital status at diagnosis	117 (72%) married/partnered, 46 (28%)single
Employed at diagnosis	87 (53%) yes
Stage at diagnosis	5 (3%) stage 0, 101 (62%) stage I, 57 (35%) stage II
Nodes (among those positive)	2.77 (2.45)
Procedure	77 (47%) mastectomy, 86 (53%) lumpectomy
Radiation	81 (50%) yes
Chemotherapy	50 (31%) yes
Tamoxifen	92 (56%) yes
Reconstruction	41 (25%) yes
New cancer or recurrence	21 (13%) yes
Years since surgery (S.D.)	7.40 (2.18) [range 5–13]

Note: All measures other than years since surgery were collected at earlier participation.

diagnosis and treatment. They included disease stage, number of positive nodes, and extent of surgery (mastectomy vs lumpectomy). Each potential type of adjuvant therapy was coded dichotomously (yes vs no): chemotherapy, radiation, and anti-hormonal treatment. We also collected several kinds of demographic information on participants in the initial research. These included age, education, ethnicity (which we coded as Black, Hispanic, and non-Hispanic White), marital status (which were coded as partnered vs not), and employment status (coded dichotomously).

Psychosocial predictor variables

The earlier projects had focused on psychosocial adjustment to breast cancer as a function of personality and attitude variables. The protocols included measures of trait optimism and confidence about remaining cancer-free. One of the projects ($N = 101$) also included a measure of perceived social support. These variables, assessed years earlier, are examined here as predictors of facets of long-term QOL. The measures are described in the following paragraphs.

Optimism: Generalized optimism versus pessimism was assessed in the longitudinal studies by the Life Orientation Test, or LOT (Scheier and Carver, 1985) and in the cross-sectional study by its revised version, the LOT-R (Scheier *et al.*, 1994). The LOT is eight items; the LOT-R is six items. High scores represent optimism, with a continuous distribution of scores. Items include 'In uncertain times, I usually expect the best,' and 'If something can go wrong for me, it will.' Response choices ranged from *I agree a lot* (1) to *I disagree a lot* (4). These scales are widely used in research in health settings (Carver *et al.*, 1993; Scheier *et al.*, 2001), and they are highly correlated ($r = 0.95$, Scheier *et al.*, 1994). Alpha in the longitudinal samples combined was 0.86, in the cross-sectional sample was 0.74. To combine samples, we standardized LOT scores across the longitudinal studies, and separately standardized LOT-R scores in the cross-sectional study. The standard scores were then used in the data analysis.

Cancer-related confidence: The question 'To what extent do you believe that you will remain free of cancer in the future?' was answered on a nine-point scale, with nine labeled *absolutely sure I won't get cancer again*, 5 *I don't know*, and 1 *not at*

all confident—*I expect to get cancer again*. Single-items are as informative as scales when the quality assessed is easy for respondents to understand (Burisch, 1984a,b; Helgeson, 1992), and this concept appears easy to understand. The longitudinal subsample responded at 3 months post-surgery; the cross-sectional subsample responded at whichever time they completed the other measures (3, 6, or 12 months post-surgery).

Social support: An abbreviated version of the Interpersonal Support Evaluation List, or ISEL (Cohen *et al.*, 1985) was completed by participants in one of the earlier studies. This measure evaluates perceptions of the availability of several different kinds of support, including both instrumental ('If I were sick, I could easily find someone to help me with my daily chores') and emotional ('When I feel lonely, there are several people I can talk to') aspects of support. Six items were selected from the larger item set as representative of the constructs it was designed to measure. Responses were made on a four-point scale ranging from *definitely true* to *definitely false*.

QOL at long-term follow-up

QLACS. The measure of long-term QOL was the QLACS (Avis *et al.*, 2005). The QLACS is a multi-dimensional measure consisting of 47 items that measure 12 QOL domains (four items for each, with one exception that has three items). Seven of the scales are generic in content (thus being applicable to non-cancer samples) and five are cancer-specific. The generic scales reflect extent of negative feelings, positive feelings, cognitive problems, sexual problems, physical pain, fatigue, and social avoidance. The cancer-specific scales assess extent of appearance concerns, financial problems, distress regarding recurrence, distress regarding family (three items), and benefits from having had cancer.

Responses are made on a seven-categeory scale, in which respondents indicate how often they felt a certain way in the past 2 weeks. The anchors (never, seldom, sometimes, about as often as not, frequently, very often, always) were chosen to yield approximately equal percentage intervals from one category to the next. The Flesch Reading Ease score is 74.4, which is equivalent to a Flesch-Kincaid reading level of 4.8 (Flesch, 1948). Scores for each scale are the sum (after reversing one item) of item responses (1 = never through

7 = always). Higher scores represent more problems or poorer QOL. In the Avis et al. sample, Cronbach's alpha exceeded 0.71 for each scale (see Avis et al., 2005, for extensive information concerning convergent validity). In the sample examined here, the subscales correlated an average of 0.29 with each other (range = 0.71–0.06) and were examined separately.

RESULTS

Demographic and medical variables

Associations of long-term QOL with demographic variables are in Table 2. Greater education at treatment predicted lower levels of fatigue, financial problems, and distress about the family's future at follow-up, but also greater pain and less reported benefit from having had cancer. Relationship status at treatment played an important role in predicting follow-up QOL. Being partnered predicted lower emotional disruption, social avoidance, fatigue, and distress both about recurrence and about the family's future at follow-up.[1] Age at treatment also predicted several long-term outcomes (and tended to relate to a range of others): women who were older at treatment reported lower levels of pain, worry about their appearance, and financial difficulty than did women who were younger at treatment. Compar-

ison of Hispanic women ($N = 32$) versus all others ($N = 128$) found that Hispanic women reported elevations in several kinds of problems: negative feelings, social avoidance, distress about the family's future, and distress about the possibility of recurrence. The passage of time also played a role in several outcomes. Greater time since treatment related to lower levels of negative feelings, social avoidance, and financial difficulty.

Associations with medical variables are in Table 3. Medical variables were most strongly implicated in follow-up financial problems and worries about appearance. Financial problems were predicted by higher stage at diagnosis, experience of adjuvant chemotherapy, and (inversely) by antihormonal treatment. Worries about appearance were predicted by higher stage, having had a more disfiguring surgery, and having had chemotherapy. Adjuvant chemotherapy tended to relate to several outcomes, but beyond the two already named, only its association with distress about recurrence was significant. Also shown in the final column of Table 3 is the fact that having had cancer again since the original treatment ($N = 21$) did not relate significantly to any QOL outcome.

Psychosocial variables

Prediction of QOL at long-term follow-up by earlier trait optimism, confidence about remaining free of cancer, and perceptions of available social

Table 2. Correlations of QLACS Scales at long-term follow-up with time since initial treatment, and demographic measures collected during initial participation

	Time since treatment	Education	Employed vs not	Hispanic vs others	Partnered vs not	Age
QLACS Scales:						
Negative feelings (160)	−0.22**	—	—	0.28***	−0.23**	−0.14
(Lack of) positive feelings (159)	−0.12	—	—	0.11	−0.23**	−0.14
Cognitive impairment (156)	−0.12	−0.11	—	0.15	−0.15	−0.10
Pain (161)	—	0.17*	−0.17*	—	0.12	−0.16*
Sexual impairment (144)	—	—	—	—	—	−0.14
Social avoidance (143)	−0.17*	—	−0.14	0.22**	−0.28**	−0.14
Fatigue (160)	—	−0.16*	—	0.14	−0.16*	—
Financial problems (158)	−0.18*	−0.19*	—	0.15	−0.15	−0.24**
(Lack of) benefits (158)	—	0.23**	—	—	−0.13	—
Distress, family (157)	—	−0.18*	—	0.25**	−0.23**	—
Distress, recurrence (158)	—	—	—	0.28***	−0.25**	−0.10
Appearance worries (150)	—	—	−0.14	0.14	−0.11	−0.24**

Note: QLACS Scales are coded so that high values imply poorer quality of life; Ns for specific dependent variables are in parentheses; for visual clarity correlations below 0.10 are not printed.
*p < 0.05; **p < 0.01; ***p < 0.001.

Table 3. Correlations of QLACS Scales at Long-Term Follow-up with Medical Variables Assessed During Initial Participation and Renewed Cancer Experience

	Stage	Procedure	Radiation	Chemo	Hormonal	Renewed cancer
QLACS Scales:						
Negative feelings (160)	—	—	—	0.10	−0.12	—
(Lack of) positive feelings (159)	—	—	—	—	−0.24**	—
Cognitive impairment (156)	−0.10	—	—	0.15	−0.17*	—
Pain (161)	—	—	—	—	—	—
Sexual impairment (144)	—	—	—	0.15	−0.15	—
Social avoidance (143)	—	—	—	0.10	—	—
Fatigue (160)	0.10	0.11	—	0.14	−0.12	—
Financial problems (158)	0.23**	0.11	—	0.20*	−0.27**	—
(Lack of) benefits (158)	−0.12	—	—	−0.10	−0.14	—
Distress, family (157)	0.12	0.20*	−0.14	0.10	—	—
Distress, recurrence (158)	0.13	—	—	0.20*	—	—
Appearance worries (150)	0.23*	0.21*	−0.14	0.44***	−0.12	—

Note: All QLACS Scales are coded so that high values imply poorer quality of life; Ns for specific dependent variables are in parentheses; for visual clarity correlations below 0.10 are not printed.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

support are shown in Table 4. Initial optimism related significantly to many aspects of long-term QOL, but not cognitive impairment, pain, or financial problems. Social support also related to diverse follow-up outcomes, though somewhat fewer than optimism. Initial confidence about cancer related to three QLACS scales.

Comparison of Tables 3 and 4 suggests complementary patterns: medical variables predicted financial problems and appearance worries more consistently than did psychological variables, whereas the reverse was true for such outcomes as current emotions, worries about the family and recurrence, sexual and social disruption, and the experience of benefit from having had cancer.

Multivariate analyses

Multivariate analyses were conducted using the significant correlates of each QLACS subscale as simultaneous predictors of that outcome. These analyses tested whether the various correlates made independent contributions to prediction (multi-collinearity was not a problem; tolerances exceeded 0.75 in all cases). Recall that social support had been assessed in only one subsample initially; thus inclusion of social support in a regression model reduces the available sample by approximately a third. For this reason, QLACS scales that related significantly to social support (Table 4) were tested in multivariate equations

Table 4. Correlations between personality measures collected during initial participation and QLACS Scales at long-term follow-up

	Optimism	Cancer confidence	Social support[a]
QLACS Scales:			
Negative feelings	−0.36***	−0.12	−0.11
(Lack of) positive feelings	−0.37***	−0.27**	−0.22*
Cognitive impairment	−0.15	−0.22*	—
Pain	—	—	0.23*
Sexual impairment	−0.36***	—	−0.25*
Social avoidance	−0.20*	−0.16	−0.20†
Fatigue	−0.22**	—	−0.16
Financial problems	—	—	—
(Lack of) benefits	−0.21*	−0.21*	—
Distress, family	−0.17*	—	−0.26**
Distress, recurrence	−0.22**	−0.14	−0.21*
Appearance worries	−0.20*	—	−0.11

Note: QLACS Scales are coded so that high values imply poorer quality of life; for visual clarity correlations below 0.10 are not printed.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a] This variable is limited to a subset of 101 participants.

without social support, then again in subsidiary analyses that included social support.[2]

Results of these analyses are summarized in Table 5. One point made there is that the predictors as a group accounted for substantially more variance in emotional and behavioral aspects of QOL than in pain, fatigue, or cognitive problems. An exception is financial problems, which are not particularly emotional or behavioral,

Table 5. Results of multivariate tests, entering all significant correlates of QLACS Scales simultaneously

	R^2 for equation	Significant unique effects from the analysis are listed (standardized betas in parentheses); nonsignificant effects and associated betas are in brackets
QLACS Scales:		
Negative feelings	0.24***	Optimism (−0.33***), time (−0.16*), marital (−0.16*), Hispanic (0.17*)
(Lack of) positive feelings	0.28***	Optimism (−0.35***), marital (−0.22**), hormonal (−0.22**), [confidence −0.11]
Cognitive impairment	0.07**	Confidence (−0.20*), [hormonal −0.15]
Pain	0.05*	[education 0.13, employment −0.11, age −0.08]
Sexual impairment	0.20***	Optimism (−0.37***)
Social avoidance	0.16***	Optimism (−0.17*), marital (−0.25**), Hispanic (0.16*)
Fatigue	0.08**	Optimism (−0.19*), [marital −0.12, education −0.11]
Financial problems	0.22***	Stage (0.20*), hormonal (−0.22**), age (−0.24**), education (−0.21**), [time −0.11, chemotherapy −0.03]
(Lack of) benefits	0.12**	Optimism (−0.18*), education (0.24**), [confidence −0.14]
Distress, family	0.15***	Procedure (0.19*), Hispanic (0.19*), [optimism −0.12, education −0.08, marital −0.15]
Distress, recurrence	0.19***	Optimism (−0.19*), marital (−0.19*), Hispanic (0.21**), chemotherapy (0.21**)
Appearance worries	0.27***	Optimism (−0.22**), chemo (0.39***), [age −0.05, stage 0.07, procedure 0.13]

Note: QLACS Scales are coded so that high values imply poorer quality of life.
*$p<0.05$; **$p<0.01$; ***$p<0.001$.

but for which 19% of the variance was accounted for. A second point is that it was rare for there to be only one significant predictor. More typically two or three variables contributed unique variance to a particular aspect of QOL. Further, except for financial problems, prediction usually was shared by psychological variables and demographic or medical variables. Finally, as was true in previous examination of this sample using different outcomes (Carver et al., 2005), the most consistent predictor, though not relating to all facets of QOL, was trait optimism.

DISCUSSION

Women who had surgery for early-stage breast cancer 5–13 years earlier completed a measure assessing diverse aspects of long-term QOL, the QLACS (Avis et al., 2005). Medical, demographic, and psychosocial data collected early in the cancer experience (mostly at the time of treatment, and always within the first year after treatment) were tested as predictors of differential QOL at long-term follow-up. Multivariate analyses predicted

from a low of 5% of the outcome variance (frequency of pain) to a high of 28% of the variance (frequency of positive feelings).

Financial problems and appearance worries related to three medical variables each, including (in both cases) stage of disease and having had adjuvant chemotherapy years earlier. It seems clear that the reverberations of having more serious disease and more aggressive treatment continue long after the initial treatments are over. The reverberations are partly financial and partly in the domain of a continuing concern about one's appearance. Chemotherapy also related to distress about the possibility of recurrence. These findings expand on those reported previously (Ganz et al., 2002), in differentiating those aspects of QOL to which the medical variables related and those to which they did not. Although there is a basis for predicting that chemotherapy may create later cognitive problems (Brezden et al., 2000; Phillips and Bernhard, 2003), the association of chemotherapy with self-reported cognitive impairment did not reach significance in this sample ($p = 0.07$).

Several demographic variables also made important contributions to prediction of follow-up

QOL. Although the sample did not have a large minority representation, Hispanic ethnicity played a role in several outcomes. In multivariate tests, Hispanic women reported more frequent negative feelings, more social avoidance, more distress about their family's future, and more distress about the possibility of recurrence than did other women. These findings are consistent with ethnic differences in distress found among a subsample of these women during the year after treatment (Spencer *et al.*, 1999). These differences do not appear to be rooted in differences in socio-economic status (Spencer *et al.*, 1999).

Also important in this study, as in that of Kornblith *et al.* (2003), was education level, which presumably relates to income (which was not itself measured). Greater education predicted less frequent financial problems (even in multivariate models), but it also predicted less frequent feelings of having benefited from having had cancer.

Of particular interest was the long-term impact of marital status at the time of treatment. In multivariate models, women who were partnered when first treated reported less frequent negative feelings, more frequent positive feelings, less social avoidance, and less distress about the possibility of recurrence than women who did not have a partner at the time of treatment. In bivariate tests, they also reported less frequent distress about their family's future and less fatigue. These effects of partner status are conceptually consistent with other evidence that social resources predict better psychological well-being over time (Ganz *et al.*, 2002; Helgeson *et al.*, 2004).

Finally, psychosocial variables themselves played an important role. At the bivariate level, social support related to five of the outcome scales, though none of these held up in multivariate models. The variable that predicted long-term QOL most consistently was personality. At the bivariate level, trait optimism related to better long-term well-being on nine of the 12 QLACS scales, and eight of these held up in multivariate tests. It seems very clear that personality is an important contributor to long-term differences in QOL (Carver *et al.*, 2005; Helgeson *et al.*, 2004), and it would be foolhardy to disregard its contribution.

On the other hand, it is also revealing that optimism did not play a role in prediction of pain, cognitive impairment, or financial problems, even at the bivariate level. This tends to indicate that optimism is not merely a tendency to report the best, no matter what the outcome or context. If so, the associations with optimism would have been uniform. This divergence in prediction also attests once again to the importance of distinguishing among the various facets of QOL (Avis *et al.*, 2005; Cella *et al*, 1993; Osoba *et al.*, 1997; Ringdal and Ringdal, 1993; Schag and Heinrich, 1990; Schag *et al.*, 1991; Schipper *et al.*, 1984).

In summary, researchers and clinicians are increasingly aware of the importance of QOL issues among long-term cancer survivors (Bloom, 2002; Dorval *et al.*, 1998; Ganz, 2001; Ganz *et al.*, 2002; Gotay and Muraoka, 1998; Moinpour *et al.*, 1989; Mosconi *et al.*, 2002; Nayfield *et al.*, 1992). Differentiated QOL assessments such as that provided by the QLACS can help identify long-term sequelae that clinicians should monitor, and can identify areas where particular persons need services or interventions. Furthermore, the pattern of results obtained here indicates that different aspects of QOL are influenced by different sorts of variables. Although it is tempting to assume that medical variables during treatment are the key influences on long-term QOL, that does not seem to be the case. There are certain aspects of QOL for which severity of medical treatment were key determinants: financial well-being and concern about appearance. However, demographic and psychosocial variables were most important with respect to the more subjective, psychosocial aspects of QOL. This differential influence should receive more attention in future work.

ACKNOWLEDGEMENTS

NOTES

1. Approximately 18% of the women who had partners at diagnosis did not have partners at follow-up. The small number involved did not permit reliable comparisons, but the means of this group on the variables just described tended to resemble those of the unpartnered women more than the women with partners. The relative stability of this demographic

variable in this sample also makes it difficult to know whether it was being partnered at the time of diagnosis or at the time of follow-up that was important.

2. Adding social support to the multivariate equation (and thus reducing the sample by a third) increased *R*-squares in two cases, but not in the others. In no case, however, did social support make a unique contribution to prediction.

REFERENCES

American Society of Clinical Oncology. 1996. Outcomes of cancer treatment for technology assessment and cancer treatment guidelines. *J Clin Oncol* **14**: 671–679.

Avis NE, Smith KW, McGraw S, Smith RG, Petronis VM, Carver CS. 2005. Assessing quality of life in adult cancer survivors (QLACS). *Qual Life Res* **14**: 1007–1023.

Berglund G, Bolund C, Fornander T, Rutqvist LE, Sjoden PO. 1991. Late effects of adjuvant chemotherapy and postoperative radiotherapy on quality of life among breast cancer patients. *European J Cancer* **27**: 1075–1081.

Bjordal K, Mastekaasa A, Kaasa S. 1995. Self-reported satisfaction with life and physical health in long-term cancer survivors and a matched control group. *European J Cancer* **31**: 340–345.

Bloom JR. 2002. Surviving and thriving? *Psycho-Oncology* **11**: 89–92.

Borghede G, Sullivan M. 1996. Measurement of quality of life in localized prostatic cancer patients treated with radiotherapy: Development of a prostate cancer-specific module supplementing the EORTC QLQ-C30. *Qual Life Res* **5**: 212–221.

Brezden CB, Phillips KA, Abdolell M *et al*. 2000. Cognitive function in breast cancer patients receiving adjuvant chemotherapy. *J Clin Oncol* **18**: 2695–2701.

Burisch M. 1984a. Approaches to personality inventory construction: A comparison of merits. *Am Psychol* **39**: 214–227.

Burisch M. 1984b. You don't always get what you pay for: Measuring depression with short and simple versus long and sophisticated scales. *J Res Pers* **18**: 81–98.

Burstein HJ, Winer EP. 2000. Primary care for survivors of breast cancer. *New England J Med* **343**: 1086–1094.

Carver CS, Pozo C, Harris SD *et al*. 1993. How coping mediates the effect of optimism on distress: A study of women with early stage breast cancer. *J Pers Soc Psychol* **65**: 375–390.

Carver CS, Smith RG, Antoni MH, Petronis VM, Weiss S, Derhagopian RP. 2005. Optimistic personality and psychosocial well-being during treatment predict psychosocial well-being among long-term survivors of breast cancer. *Health Psychol* **24**(5): 508–516.

Cella DF, Tulsky DS, Gray G *et al*. 1993. The Functional Assessment of Cancer Therapy (FACT) Scale: Development and validation of the general measure. *J Clin Oncol* **11**: 570.

Cohen S, Mermelstein R, Kamarck T, Hoberman HM. 1985. Perceived stress in a probability sample of the United States. In *The Social Psychology of Health*, Spacapan S, Oskamp S (eds). Sage: Beverly Hills, CA; 31–67.

Deimling GT, Kahana B, Bowman KF, Schaefer ML. 2002. Cancer survivorship and psychological distress in later life. *Psycho-Oncology* **11**: 479–494.

Dorval M, Maunsell E, Deschenes L, Brisson J, Masse B. 1998. Long-term quality of life after breast cancer: Comparison of 8-year survivors with population controls. *J Clin Oncol* **16**: 487–494.

Dow KH, Ferrell BR, Leigh S, Ly J, Gulasekaram P. 1996. An evaluation of the quality of life among long-term survivors of breast cancer. *Breast Cancer Res Treat* **39**: 261–273.

Ferrell BR, Dow KH, Leigh S, Ly J, Gulasekaram P. 1995. Quality of life in long-term cancer survivors. *Oncological Nurs Forum* **22**: 915–922.

Ferrell BR, Dow KH, Grant M. 1995. Measurement of the quality of life in cancer survivors. *Qual Life Res* **4**: 523–531.

Flesch R. 1948. A new readability yardstick. *J Psychol Res* **30**: 77–91.

Ganz P, Desmond KA, Leedham B, Rowland JH, Meyerowitz BE, Belin TR. 2002. Quality of life in long-term, disease-free survivors of breast cancer: A follow-up study. *J Nat Cancer Inst* **94**: 39–49.

Ganz PA. 2001. Late effects of cancer and its treatment. *Semin Oncol Nurs* **17**: 241–248.

Ganz PA, Rowland JH, Desmond K, Meyerowitz BE, Wyatt GE. 1998. Life after breast cancer: Understanding women's health-related quality of life and sexual functioning. *J Clin Oncol* **16**: 501–514.

Gotay CC, Muraoka M. 1998. Quality of life in long-term survivors of cancer. *J Nat Cancer Inst* **90**: 656–667.

Helgeson VS. 1992. Moderators of the relation between perceived control and adjustment to chronic illness. *J Pers Soc Psychol* **63**: 656–666.

Helgeson VS, Snyder P, Seltman H. 2004. Psychological and physical adjustment to breast cancer over 4 years: Identifying distinct trajectories of change. *Health Psychol* **23**: 3–15.

Kornblith AB, Herndon JE II, Weiss RB *et al*. 2003. Long-term adjustment of survivors of early-stage breast carcinoma, 20 years after adjuvant chemotherapy. *Cancer* **98**: 679–689.

Litwin MS, Hays RD, Fink A *et al*. 1995. Quality-of-life outcomes in men treated for localized prostate cancer. *J Am Med Assoc* **273**: 129–135.

Moinpour CM, Feigl P, Metch B, Hayden KA, Meyskens Jr FL, Crowley J. 1989. Quality of life end points in cancer clinical trials: Review and recommendations. *J Nat Cancer Inst* **81**: 485–495.

Mosconi P, Apolone G, Barni S, Secondino S, Sbanotto A, Filiberti A. 2002. Quality of life in breast and colon cancer long-term survivors: An assessment with the EORTC QLQ-C30 and SF-36 questionnaires. *Tumori* **88**: 110–116.

Nayfield SG, Ganz PA, Moinpour CM, Cella DF, Hailey BJ. 1992. Report from a National Cancer Institute (USA) workshop on quality of life assessment in cancer clinical trials. *Qual Life Res* **1**: 203–210.

Osoba D, Aaronson N, Zee B, Sprangers M, te Velde A. 1997. Modification of the EORTC QLQ-C30 (version 2.0) based on content validity and reliability testing in large samples of patients with cancer. *Qual Life Res* **6**: 103–108.

Parker SL, Tong T, Bolden S, Wingo PA. 1997. Cancer statistics 1997. *CA: Cancer J Clin* **47**: 5–27.

Partridge AH, Burstein HJ, Winer EP. 2001. Side effects of chemotherapy and combined chemohormonal therapy in women with early-stage breast cancer. *J Nat Cancer Inst Monogr* **30**: 135–142.

Phillips KA, Bernhard J. 2003. Adjuvant breast cancer treatment and cognitive function: Current knowledge and research directions. *J Nat Cancer Inst* **95**: 190–197.

Ringdal GI, Ringdal K. 1993. Testing the EORTC Quality of Life Questionnaire on cancer patients with heterogeneous diagnoses. *Qual Life Res* **2**: 129–140.

Schag CAC, Heinrich RL. 1990. Development of a comprehensive quality of life measurement tool CARES. *Oncology* **4**: 135–138.

Schag CAC, Ganz PA, Heinrich RL. 1991. Cancer Rehabilitation Evaluation System-Short Form CARES-SF: A cancer specific rehabilitation and quality of life instrument. *Cancer* **68**: 1406–1413.

Schag CAC, Ganz PA, Wing DS, Sim MS, Lee JJ. 1994. Quality of life in adult survivors of lung, colon and prostate cancer. *Qual Life Res* **3**: 127–141.

Scheier MF, Carver CS. 1985. Optimism, coping and health: Assessment and implications of generalized outcome expectancies. *Health Psychol* **4**: 219–247.

Scheier MF, Carver CS, Bridges MW. 1994. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test. *J Pers Soc Psychol* **67**: 1063–1078.

Scheier MF, Carver CS, Bridges MW. 2001. Optimism, pessimism, and psychological well-being. In *Optimism and Pessimism: Implications for Theory, Research, and Practice*, Chang EC (ed.). American Psychological Association: Washington, DC; 189–216.

Schipper H, Clinch J, McMurray A, Levitt M. 1984. Measuring the quality of life of cancer patients: The Functional Living Index-Cancer: Development and validation. *J Clin Oncol* **2**: 472–483.

Spencer SM, Lehman JM, Wynings C et al. 1999. Concerns about breast cancer and relations to psychosocial well-being in a multiethnic sample of early stage patients. *Health Psychol* **18**: 159–168.

Steer CB, Marx GM, Galani E, Harper PG, Khayat D. 2002. Quality of life: It's never too late. *J Clin Oncol* **20**: 2915–2917.

Tomich PL, Helgeson VS. 2002. Five years later: A cross-sectional comparison of breast cancer survivors with healthy women. *Psycho-Oncology* **11**: 154–169.

Tucker MA. 1993. Secondary cancers. In *Cancer: Principles and Practice of Oncology* (4th edn), Lippincott; Philadelphia, PA; 2407–2416.

Wei JT, Dunn RL, Sandler HM et al. 2002. Comprehensive comparison of health-related quality of life after contemporary therapies for localized prostate cancer. *J Clin Oncol* **20**: 557–566.

Wyatt G, Friedman LL. 1996. Long-term female cancer survivors: Quality of life issues and clinical implications. *Cancer Nurs* **19**: 1–7.