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Perceived Social Support Change in Patients with Early-stage Breast Cancer and Controls

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Abstract

Objective—To identify variables associated with levels of and change in social support in a cohort of early-stage breast cancer patients and age-matched controls.

Methods—Telephone interviews measuring perceived social support and other demographic and psychosocial variables were conducted at 4–6 weeks and 6, 12, and 24 months after surgery (patients) or a normal/benign screening mammogram (controls). A latent trajectory model was used to model the intercept (starting point) and slope (changing) aspects of social support.

Results—Participants included 542 controls and 541 patients (77% White, 23% African American; mean age 57.7 [$SD = 10.6$]). Most participants reported high social support. Patients reported significantly higher levels of social support at baseline than controls. For patients, social support had a significant negative slope that significantly varied between individuals; the intercept of social support also varied significantly. Predictors of lower social support intercept in patients included not being married/partnered, being White, having lower perceived general health, and having higher negative affect (modeled as a latent variable defined by anxiety and depression symptom severity). Patients who were African American (vs. White) or had mastectomy (vs. lumpectomy) had steeper social support declines, and participants with both these characteristics had lower starting points as well as steeper declines. Social support among controls did not change significantly.

Conclusions—Clinicians might consider psychosocial interventions for patients reporting low social support around the time of diagnosis and surgical treatment, and for patients at risk for steeper declines in support, such as African Americans and women undergoing mastectomy.

Keywords

breast cancer; social support; anxiety; depression

In patients with breast cancer, higher levels of social support have been linked to positive outcomes, such as improved overall health status (Ganz et al., 2003), higher quality of life (Høyer et al., 2011), and better adjustment to a cancer diagnosis (Helgeson & Cohen, 1996), as well as fewer psychosocial problems (Patten, Williams, Lavorato, & Bulloch, 2010;

Helgeson, Snyder, & Seltman, 2004; Simpson, Carlson, Beck, & Patten, 2002). High social support is associated with lower risk of recurrence (Epplein et al., 2011) and longer survival (Chou, Stewart, Wild, & Bloom, 2010; Epplein et al., 2011). In patients with breast cancer, psychosocial variables such as perceived social support are often more strongly correlated with psychosocial distress than clinical variables related to disease and treatment (Andreau et al., 2011; Helgeson, Snyder, & Seltman, 2004; Schmidt & Andrykowski, 2004).

The construct of social support has been measured in a variety of ways (e.g., as perceived availability of support, social network size, and actual receipt of certain types of support), and these different measures can be poorly correlated with each other (Mickelson & Kubzansky, 2003; Uchino, 2009). The current study focuses on perceived social support, which has been strongly linked to positive psychosocial and health outcomes (Uchino, 2009). Previous studies have identified a variety of demographic and psychosocial predictors of perceived social support including age (Sammarco, 2009; Schroevers, Helgeson, Sanderman, & Ranchor, 2010) and income (Mickelson & Kubzansky, 2003). Findings on race have been mixed, with some researchers finding that social support differs by race (Lincoln, Chatters, & Taylor, 2003) and others finding that racial differences in social support were accounted for by income and education (Mickelson & Kubzansky, 2003). In addition, psychological symptoms and social support have been closely linked, with some researchers finding that low social support is a strong predictor of future depression (Patten, Williams, Lavorato, & Bulloch, 2010) and others finding that more severe psychological symptoms are a strong predictor of lower future social support (Simpson, Carlson, Beck, & Patten, 2002). Previous research also has indicated that perceived social support in patients with breast cancer tends to decrease over time (Den Ouden, Van Heck, Van der Steeg, Roukema, & DeVries, 2010; Courtens, Stevens, Crebolder, & Philipsen, 1996; Bloom & Kessler, 1994; Levy et al., 1992).

The question remains whether such decreases in perceived social support are of concern. It is plausible that social support might be transiently higher in breast cancer patients at the time of initial detection and treatment (e.g., as friends and relatives rally to support the patient), resulting in perceived social support that is higher than that of controls (Schroevers, Ranchor, & Sanderman, 2003) but that support would decline over time. This decline in social support might leave breast cancer patients with similar quality of life to controls many years after cancer is detected (e.g., Helgeson & Tomich, 2005). However, it is also possible that even years after detection and initial treatment, breast cancer survivors need more social support than women without breast cancer. Although cross-sectional findings about perceived social support are generally consistent with the conclusion that more perceived social support is associated with better outcomes, some researchers have concluded that women with breast cancer both need and seek less support in the years after their diagnosis (Danahauer, Crawford, Farmer, & Avis, 2009; Badger, Braden, Longman, & Mishel, 1999), which might suggest that decreases in social support are unrelated to decreases in functioning and quality of life.

The available literature has not, to our knowledge, considered that perceived social support may have a trajectory over time. That is, at any given time point, a person's level of perceived social support may be a combination of her long-term tendency toward a certain average level of perceived social support as well as her more recent downward or upward trajectory of support, if any. A level of social support at one time may be a point on a line (trajectory), which may or may not be stable. Measurement of perceived social support at one or two time points, as is often done, cannot distinguish between these features of the construct. It is possible that many years after diagnosis, perceived social support reported by patients and controls does not differ, whereas the slope that brought patients to that point could be quite different from the slope shown by controls. Furthermore, it could be that

patients' slope predicts future negative outcomes that are independent of their current level of perceived social support. A steeper *drop* in support might be more important than the level of support at any given point.

Examination of the social support trajectory can be undertaken using a latent trajectory model, which requires at least three waves of data and allows researchers to distinguish between systematic change in a construct over time (i.e., the slope) and general tendencies toward a certain level on a construct (i.e., the intercept, which is typically expressed in terms of the participant's starting point) (Curran & Hussong, 2003). We propose that a clear understanding of how perceived social support changes for women with breast cancer is only possible through separating and examining these two parts of the construct of social support. Similarly, we propose that it is particularly important to understand what predicts *change* in perceived social support for breast cancer patients over and above their general tendencies for perceived support. We also contend that longitudinal changes in social support in patients with breast cancer must be analyzed in conjunction with data from same-age women without breast cancer in order to determine which predictors are specific to women with breast cancer.

We used longitudinal data from a cohort of 1096 early-stage patients with breast cancer and age-matched controls to analyze the degree of change (slope) and the starting point level (intercept) of perceived social support measured four times over the course of two years. Quality of life research using similar methods has analyzed breast cancer patients as a heterogeneous group with different trajectories of depressive symptoms (Helgeson, Snyder, & Seltman, 2004; Dunn et al., 2011). However, rather than attempt to find empirically derived groups of patients, we used latent trajectory modeling (Curran & Hussong, 2003) to examine predictors of women's social support trajectories. A latent trajectory model can be used to derive the estimated underlying trajectory of change in longitudinal data collected over several time points (Curran & Hussong, 2003). Including age-matched controls helped us determine whether slope and intercept of social support differed for breast cancer patients compared to controls, as well as which psychosocial, demographic, and clinical variables contribute to social support slope and intercept. We tested four hypotheses:

Hypothesis 1: Social support is higher in patients than controls at baseline and decreases over time in patients but not controls.

Hypothesis 2: Predictors of slope and intercept of social support differ from each other, and they differ between patients and controls. Because this is, to our knowledge, the first analysis of change in social support to examine slope and intercept separately, we expected that some predictors for slope might differ from predictors previously noted in the literature; thus we did not predict in which direction variables might influence social support.

Hypothesis 3: Decrease in social support among patients is related to poorer psychosocial adjustment, as measured by higher levels of depressive symptoms.

Hypothesis 4: Predictors of social support slope in patients exert indirect effects on depressive symptom severity through the slope of social support.

Methods

Participants and procedures

From October 2003 to July 2007, we prospectively identified and enrolled newly diagnosed ductal carcinoma *in situ* (DCIS) or early-stage (I and IIA) invasive breast cancer patients from two universities in a Midwestern metropolitan area for a quality-of-life study. Because a diagnosis of early-stage breast cancer is confirmed by surgical pathology, we recruited

patients as soon after their definitive surgical treatment as possible; we planned to conduct the baseline interview with patients about 4–6 weeks after definitive surgical treatment, due to the logistics and time required to identify eligible patients and ensure eligibility, obtain surgeons' approval to contact their patients, mail recruitment letters, obtain consent, and schedule interviews with interested patients. Controls were recruited concurrently following a normal or benign finding on screening mammography at the Breast Health Center of one of the hospital cancer centers. All participants were age 40 or older (the age recommended for screening mammography), and controls were frequency matched to patients by age group (40–49, 50–69, 70). Women who did not speak English, had a prior history of breast cancer, had received neoadjuvant chemotherapy, or demonstrated cognitive impairment on the Orientation-Memory-Concentration Test administered to women 65 years of age (Katzman et al., 1983) were ineligible. Institutional Review Boards at both sites approved the study. Participants received \$20 for each interview.

Measures

Clinical, psychosocial, and demographic information—Following informed consent, we abstracted clinical data about breast cancer stage (determined by surgical pathology) and type of surgical treatment and adjuvant therapy (radiation therapy, chemotherapy, endocrine therapy) from patients' medical records. Computer-assisted telephone interviews collected demographic and psychosocial variables from patients and controls at four interviews: T1 (4–6 weeks), T2 (6 months), T3 (12 months), and T4 (24 months) after definitive surgery (patients) or normal/benign mammogram (controls).

Social support—The Medical Outcomes Study Social Support questionnaire (MOS-SS; Sherbourne & Stewart, 1991) measured perceived social support. This measure contains 19 Likert-scaled items, the mean of which was transformed into a standardized score from 0–100 (RAND Health, 2010). Sherbourne and Stewart (1991) reported that the scale demonstrated high convergent and discriminant validity among a sample of patients with chronic conditions. The items showed excellent internal consistency (Cronbach's $\alpha = .97$ at every interview).

Depression—The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) measured depressive symptoms. The CES-D, which has demonstrated good concurrent and construct validity, yields scores of severity of depressive symptoms over the past week and has been shown to be reliable in patient populations and the general population (Radloff, 1977; Radloff, 1986). Scores range from 0 to 60, with 16 indicating the need for further clinical evaluation. Cronbach's α ranged from .91 to .92 over the four interviews. Participants who scored 16 or higher at any interview were referred to counseling.

Anxiety—The 21-item Beck Anxiety Inventory (BAI, Beck, Brown, Epstein, & Steer, 1988) measures severity of anxiety symptoms during the previous week. The creators of the scale report good discriminant validity in distinguishing between anxiety and depression (Beck, Brown, Epstein, & Steer, 1988). Cronbach's α in this sample was .86 at baseline.

Comorbidities—An adapted version (Katz, Chang, Sangha, Fossel, & Bates, 1996) of the Charlson comorbidity index (Charlson, Pompei, Alex, & MacKenzie, 1987), an interview-based measure, was used to assign a weighted score (range 0 – 31) based on the number and severity of comorbid conditions.

General health and bodily pain—Subscales from the RAND 36-Item Health Survey (Ware & Sherbourne, 1992; Hays, Sherbourne, & Mazel, 1993) measured perceived general

health and bodily pain. The five-item general health subscale measures both physical and mental components of health, although validity tests have shown it is more strongly associated with physical than with mental health (McHorney, Ware, & Raczek, 1993). The two-item bodily pain scale is strongly correlated with physical health and very weakly correlated with mental health (McHorney, Ware, & Raczek, 1993). For both scales, higher scores indicate better health perceptions. At T1, Cronbach's alpha was .81 for the pain scale and .76 for the general scale.

Data Analytic Plan

All data analyses involving latent trajectory modeling were performed using Mplus version 4.2 (Muthén & Muthén, 1998–2006). We used the robust maximum likelihood estimator (referred to as MLM in Mplus) because this estimator is robust to violations of multivariate normality. Social support scores were not univariate normal (most participants reported at least moderate social support), and thus we knew that the data could not be multivariate normal.

Missing data—In regard to the variables analyzed, 8% of participants had missing data. Having missing data was significantly related to race and levels of anxiety, depressive symptoms, and social support at T1 (each $p < .05$). It appeared quite plausible that women with lower levels of social support would be less likely to provide answers about social support or even participate in the follow-up interviews. Under these conditions, multiple imputation procedures are of questionable validity (because data are not likely to be missing at random), whereas listwise deletion is also of concern because it results in 8% of participants being removed for analyses. We therefore conducted analyses both with and without multiple imputation. Missing data for the supplemental analyses were handled by multiple imputation performed in Amelia II (Honaker, King, & Blackwell, 2006–2008). Diagnostics indicated adequate multiple imputation, although some results of these diagnostics converged with our concerns that data were not missing at random. For example, distributions of estimated data for the social support variables at T2–T4 were clearly made up of lower values of social support than the observed data. Results using the multiply imputed data produced occasional small discrepancies (e.g., parameters that were significant in the complete data showing a trend toward significance in the multiply imputed or vice versa). No differences were noted beyond such minor changes in p values; these analyses are therefore not reported.

Modeling strategy—We tested latent trajectory models, which include intercept and slope latent factors. Model 1 tested Hypotheses 1, concerning the overall level of social support and the systematic changes in social support over time across patients and controls. To accomplish this, we estimated intercept and slope factors for social support in a multiple group model (patients vs. controls). To test Hypothesis 2, we tested predictors of the intercept and slope terms: first in Model 2 with patients alone, because some important predictors were not relevant to controls (i.e. breast cancer stage and treatment), and then in Model 3 with patients and controls, to determine whether any other predictors found differed between patients and controls. To test Hypothesis 3, we examined patients alone in Model 4, which included the intercept and slope model for social support (Model 2) with the addition of depressive symptom severity at T1 and T4 in order to test whether the intercept and slope of social support estimated across the four time points predicted depression at T4 above and beyond depression at T1 and whether depression at T1 predicted the intercept and slope of social support. To test Hypothesis 4, we added predictors of the slope to Model 4.

We used the following fit indices to evaluate global fit: (a) Tucker-Lewis incremental fit index (TLI; Tucker & Lewis, 1973), (b) comparative fit index (CFI; Bentler, 1990), (c) root

mean square error of approximation (RMSEA; Steiger & Lind, 1980), and (d) standardized root mean square residual (SRMR; Bentler, 1995; Jöreskog & Sörbom, 1981). The magnitudes of these indices were evaluated with the aid of recommendations by Hu and Bentler (1999). For the TLI and CFI, values of .90 and above were considered adequate, whereas values of .95 or above were considered very good; for the RMSEA and SRMR, values of .08 and below were considered adequate and .05 or below very good. Chi-square difference tests (using the appropriate adjustment for the MLM estimator as described in the Mplus manual) were used to test whether nested models were significantly different and whether parameters differed across groups. When models were not nested, we evaluated comparative model fit using the Akaike Information Criterion (AIC; Akaike, 1974) and the Bayesian Information Criterion (BIC; Schwarz, 1978), using both indices (e.g., as recommended by Kuha, 2004). Lower values of both indices are preferred.

Results

Baseline Characteristics and Differences

Out of 1718 women invited to participate, 1096 women (63.8%) were enrolled, and interviews were completed a mean 6.7 ($SD = 2.2$) weeks, 6.2 months ($SD = 0.4$), 12.3 months ($SD = 0.4$), and 24.4 months ($SD = 0.5$) following patients' definitive surgical treatment or controls' screening mammogram. Retention was high, with 1011 (92%) completing all interviews. Because we were interested in the effect of race on social support, we excluded from analysis 13 patients (1.2%) who self-identified as a race other than White or African American, leaving 541 patients and 542 controls with at least partial data for analysis. See Table 1 for more information about the sample.

Model 1: Estimation of Slope and Intercept across Patients and Controls

In Model 1, we estimated intercept and slope factors in a multiple-group context. To test Hypothesis 1, that social support is higher in patients than controls at baseline and decreases over time in patients but not controls, we tested whether the patient intercept would have a significantly higher mean than the control intercept; whether patients would show decreasing social support whereas controls would not; and whether the patient slope would have a significant negative mean but the control slope would not have a significant mean, reflecting no systematic change over time. Social support was modeled across the four time points as having a latent intercept and a latent linear slope with parameters set at 0, 1, 2, and 3. An alternative model was tested in which slope was parameterized to reflect the intervals between interviews more accurately, with parameters set to 0, 1, 2, and 4, where the value of 3 is implied for an 18-month measurement that did not occur; this model was rejected based on inferior fit including inferior AIC and BIC values. The original Model 1 fit well globally (CFI = .99, TLI = .99, RMSEA = .04, SRMR = .04). Patients showed significant (each $p < .04$) means and variances for both intercept ($M = 86.92$, Variance = 191.37) and slope ($M = -0.47$, Variance = 7.45) of social support. In support of Hypothesis 1, the mean of the intercept for controls was somewhat lower ($M = 82.53$, Variance = 253.46, each $p < .001$) than for patients, and the slope for controls had neither a significant mean nor a significant variance ($M = 0.30$, Variance = 3.37, each $p > .15$).

The differences across groups in the means of the intercept and slope were tested by constraining each pair across groups and performing a chi-square difference test, which indicated a significant difference for the intercept, $\Delta\chi^2(1, n = 995) = 16.42, p < .001$, as well as for the slope, $\Delta\chi^2(1, n = 995) = 5.08, p = .024$. The trajectories of patients tended to start with higher social support than controls; within patients there was also a systematic tendency toward decreasing social support over time not seen in controls. In other words, the

typical line for patients started higher but declined; the typical line for controls started lower, but remained stable or increased.

Model 2: Prediction of Slope and Intercept among Patients

Hypothesis 2, involving predictors of the intercept and slope of social support, was tested first by examining all predictors in the patient model (Model 2) and then by examining the predictors applicable to both patients and controls in the model with both groups (Model 3). Model 2 (see Figure 1) included predictors suggested by the literature or hypothesized to be related to social support: (a) negative affect, modeled as a latent variable estimated by scores on the CES-D and BAI; (e.g. Simpson, Carlson, Beck, & Patten, 2002) (b) race (White = 1 or African American = 2) (e.g. Lincoln, Chatters, & Taylor, 2003); (c) age (e.g. Sammarco, 2009); (d) employment status (not currently employed = 0 vs. working at least part-time = 1); (e) marital status (not married/partnered = 0, vs. married/partnered = 1) (e.g. Sherbourne & Stewart, 1991); (f) type of surgery (lumpectomy = 0, mastectomy = 1, or bilateral mastectomy = 2); (g) cancer stage at diagnosis (DCIS = 0 vs. Stage I/IIA = 1); (h) RAND general health subscale (e.g. Sherbourne & Stewart, 1991); (i) RAND pain subscale (e.g. Sherbourne & Stewart, 1991); (j) comorbidity; (k) insurance type (private insurance = 1 vs. no private insurance = 2) (used as a proxy for income; e.g. Mickelson & Kubzansky, 2003) and (l) education (less than grade 12 = 1, grade 12 or GED = 2, beyond grade 12 = 3) (e.g. Mickelson & Kubzansky, 2003). To minimize both the number of variables not shared by patients and controls and the potential problem of multicollinearity, clinical variables were used sparingly. Because adjuvant treatments (i.e., radiation therapy, chemotherapy, and endocrine therapy) were significantly associated with diagnostic group and type of surgery (each $p < .05$), and because many patients had not started adjuvant treatment at T1, adjuvant treatment variables were not included in the model.

All predictors were entered in the same model; as such, reported effects reflect the unique effect of each predictor with all other predictors held constant. The overall prediction model had good to excellent fit (CFI = .97, TLI = .94, RMSEA = .06, SRMR = .02). Table 2 displays the standardized coefficients of the predictors for intercept and slope in this model. Four variables significantly predicted social support intercept in patients: negative affect, perceived general health, marital status, and race. Lower overall levels of social support were predicted for patients who were White, who were not married/partnered, reported worse general health, and who had higher negative affect. The effect for race was counter to the zero-order relationship between race and social support, which at baseline was nonsignificant and in the opposite direction. The effect for race found here was therefore partially due to holding other factors constant. For example, the percentage of Whites who were married/partnered at baseline (67%) was significantly greater than the percentage of African Americans who were married/partnered (32%) ($p < .001$).

Only two variables significantly predicted social support slope in patients: African Americans and mastectomy patients (and especially bilateral mastectomy patients) were observed to have steeper social support declines.

Model 3: Patients and Controls Prediction Model

Because the predictors for the intercept and slope of social support might be different for patients and controls (Hypothesis 2), we fitted multiple-group models in which predictors for both patients and controls were tested (thus surgery type and cancer stage were omitted from these models). In the initial model, only the estimates for the intercept and slope parameters were constrained across groups; all other parameters, including mean and variance of all latent variables as well as all other regression parameters, were allowed to

vary. We then constrained parameters of interest across groups to determine whether the groups significantly differed for that parameter.

The initial model fit well (CFI = .98, TLI = .95, RMSEA = .05, SRMR = .02). The effects for controls are provided in Table 2 alongside effects for patients from Model 2. The intercept of social support was predicted by marital status and negative affect for the controls and patients (higher social support was associated with being married/partnered and having lower negative affect), whereas the intercept was predicted by perceived general health and race for patients only (higher social support was associated with higher general health and with being African American). The slope of social support was not predicted by any variable for controls. Parameters that were significant in at least one group were constrained, one at a time, across the two groups to conduct a series of chi-square difference tests. The prediction of the intercept by marital status and general health did not differ significantly between patients and controls, $\Delta\chi^2(1, n = 957) < 1.50, ps > .22$. All other observed differences were statistically significant at $p < .05$. Negative affect significantly predicted the intercept in both groups, but this association was stronger for controls than for patients. The prediction of the slope and intercept by race were each significant only in patients and were significantly different from the nonsignificant estimates for controls.

Model 4: Evaluation of the Meaning of Social Support Slope

To test Hypothesis 3, we used Model 4 to determine whether a negative slope for social support in patients indicated a decreased need for support or a trend toward poor adaptation by testing the relationship between social support and depressive symptoms (using observed CES-D scores). To this model, we added level of depressive symptoms at T1 and T4 and tested whether the intercept and slope of social support estimated across the four interviews predicted depression at T4 above and beyond depression at T1, as well as whether depression at T1 predicted the intercept and slope of social support. Depression predicted the intercept (fully standardized parameter [fsp] = $-.45, p < .001$) but not slope (fsp = $.05, p = .617$) of social support. However, both the intercept (fsp = $-.22, p < .001$) and slope (fsp = $-.31, p = .013$) of social support predicted depression at T4. These predictive paths indicate that higher levels of depressive symptoms at T1 were related to initially lower social support, as estimated by all observations across time. In turn, both the intercept and slope of social support predicted depression at T4, such that lower social support as well as decreases in social support over time predicted higher depression at T4. As hypothesized, decreasing social support over time was related to poorer adjustment as measured by greater severity of depressive symptoms. In a follow-up test, we conducted the same analyses using anxiety symptoms instead of depressive symptoms: Results were substantively identical.

Both surgery type and race predicted slope of social support among patients. Because slope was related to depression at T4, it was plausible that race and surgery type might have an indirect effect on depression at T4 through the slope of social support. In order to test Hypothesis 4, we used bootstrapped confidence intervals to test indirect effects (samples = 5,000) in a model in which race and surgery type predicted social support slope, and social support (as well as the intercept and depressive symptoms at T1) predicted depression at T4. Because the 95% confidence interval did not include 0, both race and surgery type showed indirect effects on depression at T4 via the slope of social support. As hypothesized, predictors of social support slope had indirect effects on later depressive symptoms via systematic change in social support. When we conducted the same tests using anxiety symptoms, indirect effects trended toward significance ($ps < .10$).

Post Hoc Tests

Surgery type effect—If we were correct in our assumption that the three surgery types could be properly arrayed with regard to severity, we would expect similar or weaker effects contrasting the most severe surgery against others (i.e., bilateral mastectomy vs. others) and the least severe surgery against others (i.e., lumpectomy vs. others). When recoded in each of these ways, surgery type still predicted the slope of social support among patients in the same manner as the original ordinal variable (each $p < .04$).

Interaction between surgery type and race in predicting intercept—While constructing supplemental figures, an apparent interaction between surgery type and race in regard to the intercept was observed: African American women who had mastectomy (bilateral or unilateral) appeared to have much lower intercepts than white women in general or black women who had lumpectomy. A post-hoc linear regression in which race, surgery type, and their interaction predicted intercept scores (saved from Mplus analyses) confirmed that race and surgery type showed an interaction effect ($b^* = -.55$, part $r = -.15$, $p = .001$); the intercept was lower for African American women who had mastectomy ($M = 79.60$, $SD = 18.58$) than for all other groups, each of which had a similarly high intercept (range: 87.07 – 90.76). Thus, African American women who had mastectomy had both the lowest intercept *and* the steepest average decline.

Discussion

This study adds to the social support literature by examining variables associated with the intercept and slope of perceived social support in both patients with early-stage breast cancer and controls. Most patients and controls had high scores on perceived social support, well above means published by the developers of the MOS-SS (Sherbourne & Stewart, 1991). Patients reported significantly higher overall social support than did controls, suggesting that a diagnosis of breast cancer may provide a short-term increase in perceived availability of social support, a finding consistent with other studies (Bloom & Kessler, 1994; Courtens, Stevens, Crebolder, & Philipsen, 1996; Schroevers, Ranchor, & Sanderman, 2003). Although we have no way of knowing patients' baseline levels of social support prior to diagnosis, we assume they would have been around the level of women in the control group.

Our results demonstrated that the predictors of the intercept and slope of social support differed for women with breast cancer and controls. Negative affect and marital status contributed to the intercept of social support in both patients and controls, demonstrating the centrality of both of these variables to intercept of perceived social support. Although being African American was associated with higher intercept of social support in patients, it is important to note that a much higher percentage of White patients were married/partnered at baseline compared to African Americans. The effect for race on the intercept was only present when other variables were held constant in our analyses, and thus should not be interpreted as indicating that the intercept was generally higher for these participants: it was not. Being African American was also associated with a steeper *decline* in social support, as was surgery type (see below). Further research is needed to see whether race may serve as a proxy for another variable in predicting decline in social support. For example, neighborhood of residence, rather than race itself, has been associated with health-related disparities (Laveist, Pollack, Thorpe, Fesahazion, & Gaskin, 2011) and might better predict levels of or decline in social support. A spatial analysis could provide further insight into the geographic distribution of social support in this metropolitan area.

We found that mastectomy (and bilateral mastectomy in particular) was associated with a steeper, negative slope of social support. This finding conflicts somewhat with prior research across 15 months (Levy et al., 1992), but is consistent with research that has shown

that declines in quality of life related to surgery type may take several years to manifest themselves (Arndt, Stegmaier, Ziegler, & Brenner, 2008). If future research confirms the association between mastectomy and decreases in social support, that information would be important to communicate when counseling women about what to expect following surgery. Women who undergo mastectomy could perhaps work to strengthen or marshal the support available to them before having surgery. Our post-hoc finding that African American women receiving mastectomy had both the lowest initial levels of perceived social support and the steepest declines suggests that this group may be particularly vulnerable and warrant attention.

One possible explanation for the decline in social support among the patients is that it represents a natural return to baseline levels of social support after an initial boost in support following a breast cancer diagnosis. Our findings argue against this explanation, however, because a negative slope of social support was associated with higher depressive symptoms or anxiety at T4, even controlling for baseline depressive symptoms or anxiety. Whereas a return to baseline levels of social support at some point in the years following a breast cancer diagnosis would be expected, our results indicate that even two years after diagnosis, a decline in social support was problematic for patients and was associated with higher depression and anxiety scores.

Clinicians should consider psychosocial interventions both for patients reporting low initial levels of social support and for patients at risk for steeper declines in support, such as African Americans and women who undergo bilateral mastectomy. Further research is needed to determine the kinds of interventions that would best help to prevent declines in social support, including, for example, support groups for targeted groups of patients, informational support from experts such as doctors (Helgeson, 2003; Helgeson & Cohen, 1996), support for partners of patients to promote intimacy (Belcher et al., 2011), and interventions that provide patients the opportunity to support others or build mutually supportive relationships (Kim, et al., 2011; Belcher et al., 2011). Because negative affect was associated with lower intercept of social support in both patients and controls, it appears that both patients with breast cancer and women in the general population might benefit from screening (and treatment) for anxiety and depression.

Although monitoring levels of social support may be helpful in a clinical context, there is currently no consensus about what levels of social support on the MOS-SS represent clinical significance. Further research is necessary to determine what scores or changes in scores are considered to be “minimally clinically important” for improving psychosocial outcomes in patients with breast cancer and in women in the general population.

Strengths of this study include a large sample measured at multiple points over a two-year period, as well as a high retention rate. The inclusion of controls allowed us to compare patients with breast cancer to same-aged women without breast cancer from the same metropolitan area. Using latent trajectory modeling allowed us to examine both the slope and the intercept of social support. The fact that, in patients, only one of the variables (race) that predicted the intercept also predicted the slope (and then in the opposite direction) suggests that social support does, in fact, have two distinct components, at least in women with breast cancer.

Caution should be used in generalizing these results to other populations. Participants were drawn from two medical centers (one of which was a National Cancer Institute-designated comprehensive cancer center) in a single urban area; there may be differences in social support available to women receiving treatment in community hospitals or in more rural areas. Although Whites and African Americans were well represented, there were very few

participants from other racial or ethnic backgrounds in our larger sample, reflecting the racial/ethnic composition of this Midwestern metropolitan area. We did not measure support received or characteristics of the support network. We also did not collect data about potentially relevant stable personality traits such as neuroticism that may play a role in perceptions of social support (Swickert, Hittner, & Foster, 2010), although we did include the latent variable of negative affect, which is strongly correlated with measures of neuroticism (Watson, 1984).

In conclusion, the current study provides evidence for the hypothesis that perceived social support has two distinct characteristics with distinct predictors. Although the majority of patients and controls demonstrated high levels of perceived support, a smaller group showed lower levels of support, and some patients showed declines in social support that were associated with higher levels of depressive symptoms at T4. In the two years following a diagnosis of early-stage breast cancer, declines in social support can be problematic; our results suggest that over those first two years, breast cancer patients continue to benefit from high levels of social support.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Model used for social support in all models. Use of Time 1 predictors of slope and intercept in Model 2 and Model 3 indicated in dashed box and dashed arrows. Note that one Time 1 predictor (negative affect) was a latent variable and not an observed variable as indicated here. Error terms are not depicted for the sake of simplicity.

Table 1

Baseline characteristics of patients and controls.

Categorical Variables	N = 1083 (%)	Patients n = 541 (%)	Controls n = 542 (%)	P
Race				
White	837 (77.3)	439 (81.1)	398 (73.4)	.002
African American	246 (22.7)	102 (18.9)	144 (26.6)	
Marital status ¹				
Currently married/partnered	655 (60.9)	323 (60.4)	332 (61.4)	.227
Not currently married/partnered	421 (39.1)	212 (39.6)	209 (38.6)	
Education ²				
Less than high school	73 (6.7)	43 (7.9)	30 (5.5)	.065
High school diploma/GED	230 (21.3)	125 (23.1)	105 (19.4)	
Greater than high school	779 (72.0)	373 (68.9)	406 (75.0)	
Insurance				
Private	899 (83.0)	453 (83.8)	446 (82.3)	.114
Public/uninsured	143 (13.2)	74 (13.7)	69 (12.7)	
Unknown	41 (3.8)	14 (2.6)	27 (5.0)	
Employment Status				
Working at least part-time	586 (54.1)	274 (50.6)	312 (57.6)	.022
Not working	497 (45.9)	267 (49.4)	230 (42.4)	
Breast Cancer Stage				
DCIS	—	179 (33.1)	—	—
Stage I or IIA invasive		362 (66.9)		
Cancer laterality				
Unilateral	—	531 (98.2)	—	—
Bilateral	—	10 (1.8)		
Surgery Type				
Lumpectomy	—	351 (64.9)	—	—
Unilateral mastectomy		160 (29.6)		
Bilateral mastectomy		30 (5.5)		
Continuous Variables	Total Mean (SD)	Patient Mean (SD)	Control Mean (SD)	P
Mean age (SD)	57.7 (10.6)	58.3 (10.6)	57.1 (10.5)	.065
MOS-SS	84.6 (17.9)	86.8 (16.4)	82.4 (18.9)	<.001
CES-D	7.7 (9.0)	8.3 (9.5)	7.1 (8.5)	.023
Beck Anxiety Inventory	6.1 (6.8)	6.3 (7.1)	5.9 (6.5)	.356
Charlson Comorbidity Index	.5 (.9)	.6 (1.0)	.5 (.9)	.486
RAND Pain Subscale	71.9 (24.1)	67.6 (25.2)	76.1 (22.1)	<.001
RAND General Health Subscale	70.1 (21.1)	68.7 (21.6)	73.2 (20.3)	.001

¹Total N = 1076, patient n = 535, and control n = 541 due to missing data.

²Total N = 1082, patient n = 541 and control n = 541 due to missing data.

Table 2

Model results for intercept and slope in patients with breast cancer and controls.

Intercept	Patients			Controls		
	Estimate	z-score	Coefficient	Estimate	z-score	Coefficient
Negative Affect	-.480	-4.222*	-.298	-1.111	-5.821*	-.528
Age	.035	.456	.027	-.142	-1.612	-.089
RAND General Health	.116	2.903*	.183	.052	1.117	.066
Comorbidity	.459	.698	.031	.612	.645	.034
Pain	-.012	-.385	-.023	-.090	-1.881	-.118
Race	3.673	2.148*	.272	-.866	-.398	-.053
Employment	2.233	1.637	.166	-2.571	-1.372	-.158
Marital Status	4.286	2.742*	.318	6.303	3.519*	.386
Insurance Type	-4.850	-1.864	-.360	-2.832	-1.067	-.174
Education	1.468	.979	.109	-.636	-.403	-.039
Surgery Type	.410	.406	.030	—	—	—
Breast Cancer Stage	1.802	1.322	.134	—	—	—
Slope						
Negative Affect	-.026	-.713	-.093	.086	1.874	.287
Age	-.029	-1.105	-.130	-.020	-.816	-.087
RAND General Health	.006	.448	.054	-.007	-.451	-.060
Comorbidity	.233	1.078	.089	-.057	-.181	-.022
Pain	-.008	-.800	-.087	.027	1.886	.247
Race	-1.851	-2.763*	-.778	.899	1.264	.388
Employment	.671	1.497	.282	.311	.602	.135
Marital Status	-.046	-.097	-.020	.257	.490	.111
Insurance Type	.576	.683	.242	-.165	-.219	-.071
Education	.025	.063	.011	.571	1.082	.247
Surgery Type	-.996	-2.750*	-.419	—	—	—
Breast Cancer Stage	-.056	-.133	-.023	—	—	—

Note: The partially standardized coefficient is used for categorical variables and the fully standardized coefficient is used for continuous variables. Patient values are drawn from Model 2 (including all patient variables) whereas control values are from Model 3 (including only those variables available for both patients and controls). For intercept, higher levels of social support were shown by women who were married, who were African American, who had better perceived general health, and who had lower negative affect. For slope, African Americans and bilateral mastectomy patients showed significant declines in social support over time.

* significant at $p < .05$.