Changes in Female Support Network Systems and Adaptation After Breast Cancer Diagnosis: Differences Between Older and Younger Patients

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Purpose: This study evaluates the changes in social networks of older and younger breast cancer patients over a 6-month period following their first diagnosis and how such modifications are associated with changes in the patients' mood state. **Design and Methods:** Newly diagnosed breast cancer patients were interviewed shortly after their diagnosis and again 6 months later. Female support network members enumerated by patients were interviewed once within 3 months of the patients' initial interview. **Results:** Findings based on information for 149 network members of 26 patients indicate that members in older (≥51 years) patients' networks were less likely to be dropped at follow-up (odds ratio [OR] = 0.21, p = .04) compared with those in younger patients' networks. Network members who provided more support were less likely to be dropped by younger patients (OR = 0.42, p < .01). Decrease in network size was associated with decrease in mood disturbances among younger patients (Profile of Mood State–Bipolar: β = 0. 35, p ≤ .01). **Implications:** Reducing the number of network members after cancer diagnosis may not necessarily lead to psychological distress, providing support for self-regulation of social network resources among cancer patients. Older patients' network members were more embedded in patients' networks, making it more stable over time. Identifying important network members (e.g., frequent support providers for younger patients and family members for older patients) and facilitating positive social interactions between these network members and patients may be beneficial.

Key Words: Social relationships, Social support, Cancer survivor, Social selectivity, Psychological adaptation

Breast cancer is one of the leading causes of death among women in the United States (Surveillance, Epidemiology, and End Results [SEER] Program, 2007; www.seer.cancer.gov). The age-adjusted breast cancer incidence and mortality rates are much higher among women who are 50 years or older (335.5 per 100,000 and 73.3 per 100,000 respectively in 2005) compared with those who are younger than 50 years (42.8 per 100,000 and 5.2 per 100,000 respectively; Ries et al., 2007). Recent medical advances have resulted in earlier detection and hence improved treatment outcomes. Cancer diagnosis, however, can lead to increased psychological and social distress due to the stressful nature of treatment and recovery as well as the uncertainty associated with their outcomes (Mosher & Danoff-Burg, 2005). Thus, understanding the factors that are associated with psychological well-being of cancer patients during the postdiagnosis period can help guide intervention efforts to minimize distress among them.

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It is unclear whether emotional responses to breast cancer diagnosis differ between older and younger individuals. Several studies have reported moderate associations between younger age and higher emotional distress, whereas others showed no or reverse associations (see Mosher & Danoff-Burg, 2005, for a review). Although observed inconsistency in findings has been attributed to the methodological weaknesses of these previous studies, variations in these reports suggest the value of evaluating age differences in the psychological and social implications of a breast cancer diagnosis. It has been shown that younger breast cancer patients are more likely to use "fighting spirit" as a coping mechanism and less likely to feel hopelessness or helplessness and fatalism than older patients (Schnoll, Harlow, Stolbach, & Brandt, 1998). This suggests that older and younger patients use different coping styles that may explain some of the observed age differences in psychological distress. If such differences exist, it is important that intervention efforts to facilitate psychological adaptation of patients consider these differences and develop strategies that match their needs.

Individuals are embedded in a web of social ties. These social connections can influence individual well-being by creating a positive social environment and by buffering the negative impacts of stressful life events (Cohen et al., 2000). Some characteristics of cancer patients' social networks have been found to be associated with their health outcomes. For example, breast cancer patients who were socially isolated had a significantly elevated mortality risk compared with those who were more socially integrated and had more close relatives and friends (Kroenke, Kubzansky, Schernhammer, Holmes, & Kawachi, 2006). Having more support providers was also associated with better survival (Weihs, Enright, & Simmens, 2008). These findings suggest that the structural characteristics of social networks may impact cancer patients' overall health outcomes through social integration or social support.

Although the amount of available support resources influences cancer patients' psychological well-being (Compas & Luecken, 2002; Manning-Walsh, 2005), the stressful nature of the illness and time-consuming treatments may result in a reduction of such resources that are available to or accessible by them. Cancer diagnosis has been shown to influence the social relationships patients have with their friends and families (Northouse, 1994). It has been reported that older individuals, in general, may be at higher risk of social isolation be-

cause they are more likely to experience such life events as retirement and death or illness among friends and family than younger individuals (Pillemer & Glasgow, 2000). Therefore, changes in social relationships after cancer diagnosis may have more implications for older patients than younger patients who are likely to have more sources of support. Thus, it is important to understand the stability (or instability) in the social support networks of cancer patients, along with potential differences between patients in different stages of life, to identify effective strategies to facilitate their coping and improved treatment outcomes.

Although research in cancer and social support tends to view changes in social relationships or loss of social support contacts as a negative consequence of cancer diagnosis (Northouse, 1994), social support does not always confer positive adaptation to disease. The negative impact of social support may occur when the function and amount of support provided do not match the function and amount of support desired. For example, older adults who receive high levels of instrumental support report relatively lower well-being (Seeman, Bruce, & McAvay, 1996). It may be that well-intended support undermines older adults' confidence in being independent, suggesting the potential differences in the way older and younger individuals cope. Socioemotional selectivity theory suggests that changes in social relationships may occur as a result of shift in preferences for social ties when individuals perceive time constraints (Carstensen, Fung, & Charles, 2003). It has been shown that people who perceive constraints in future lifetime become more selective about their social ties and prefer to spend time with contacts that provide emotionally meaningful and satisfying experiences (Carstensen, Isaacowitz, & Charles, 1999). Pinquart and Silbereisen (2006) documented that older people preferred to spend time with family members, whereas younger people favored newer social ties with those who share common interests and provide new knowledge. It is possible that such shift in preferences leads to changes in social network membership with a tendency to retain more familiar or meaningful ties.

Cancer patients were found to dramatically restrict their future lifetime perspective immediately after their diagnosis (Pinquart, Nixdorf-Hanchen, & Silbereisen, 2005). Cancer patients in general prefer familiar social ties as compared with healthy individuals (Pinquart & Silbereisen, 2006).

Although younger individuals generally prefer newer social ties and older individuals prefer familiar ties (Pinquart & Silbereisen), younger cancer patients in particular showed stronger preferences for familiar ties than older healthy participants, unless they perceived their treatment as effective (Pinquart et al., 2005). Together, these studies suggest that cancer patients' preferences for social ties change after their diagnosis that, in turn, may lead them to selectively modify their social relationships accordingly. In addition, because of the differences in the life stages in which a cancer diagnosis can occur, there may be differences in the way older and younger cancer patients change their social relationships. This study expands upon the previous studies that documented changes in preferences for social ties among breast cancer patients using relationship categories (e.g., family member, acquaintance) by evaluating the actual changes in social network membership after breast cancer diagnosis and considering the characteristics of individual network members. This report used social network methodology to examine changes in network systems of breast cancer patients over time by obtaining information from patients as well as their support network members. Furthermore, differences in the processes of network regulation between older and younger individuals were explored to gain insights for the development of intervention strategies consistent with the needs of the patients based on the life stage in which they are diagnosed.

The specific objectives of this report were to (a) evaluate changes in support network systems of breast cancer patients between baseline (soon after their diagnosis) and follow-up assessment (6 months later), (b) identify the characteristics of network members (e.g., support provision to patient, embeddedness in patient's network) along with the characteristics of patients' networks (e.g., network size, proportion of family, proportion of female members, density of strong friendship) that predict support network members who were initially selected but not retained at follow-up, and (c) examine the association between changes in network size and changes in patients' mood over a 6-month period following their diagnosis.

Older adults are more likely to have already formed preferences for familiar close ties before their diagnosis (Fredrickson & Carstensen, 1990), and younger patients may perceive more restrictions in future lifetime due to likely genetic contribution in the development of their cancer that leads to higher risk of recurrence. The current study tested the hypothesis that network changes would be greater among younger patients because they would show a stronger shift in preference for meaningful social relationships than older patients. It was further hypothesized that changes in social networks reflect patients' efforts to regulate their social relationships as they go through a stressful postdiagnosis period; thus, a reduction in network size would be associated with better psychological state over a 6-month period.

Methods

Population and Procedures

Newly diagnosed breast cancer patients were recruited from the University of Texas M.D. Anderson Cancer Center Breast Cancer Clinic using an age stratification (age 51 years and older or 50 years and younger). This age stratification was used in the main study protocol in an effort to recruit an approximately equal number of pre- and postmenopausal women, without burdening patients with the number of questions that would be needed to more precisely ascertain menopausal status. The age of 51 represents a median age of onset for menopause (Kato et al., 1998). The onset of menopause has been linked to increased risk for breast cancer (Anderson, Reed, Huseby, & Oliver, 1950), suggesting that younger breast cancer patients are more likely to have an increased genetic susceptibility for breast cancer (Schwartz et al., 2008) and may have differential physical and psychological outcomes than those identified at older age. Twenty-nine patients participated in the initial telephone interview that lasted approximately 1 hr. During the interview, patients' adult social support network members (18 years or older) were enumerated by asking "Who do you go to for positive emotional support?" and with a follow-up question, "Is there anyone, other than those you listed as being emotionally supportive, who you would call a friend?" The same enumeration questions were used at 6-month follow-up, and there were no limitations to the number of network members they could select. Contact information for these identified individuals and permission to contact were obtained by the patients at baseline. Identified network members were contacted and interviewed within 3 months after the initial interview with the patient. Although information on both male and female network members was obtained by the patients, only female network

Table 1. Sociodemographic Characteristics of the Patients

	51 years or older (n = 12)	50 years or younger (n = 14)	p
Married/partnered (%)	67	86	.365
Caucasian (%)	83	86	1.000
Living with children (%)	0	71	<.001
Education (%)			.248
College diploma or higher	75	50	
High school diploma/some college	17	50	
Income (%)			.333
≥$50,000	67	79	
$35,001–$50,000	0	14	
≤$35,000	17	7	

members (both family and friends) were interviewed because the main objective of this study was to assess the associations between social network structure and female network members' breast cancer screening behaviors. Patients were interviewed again approximately 6 months after their initial assessments.

Because two patients did not complete their follow-up assessments and one patient did not nominate any network member at baseline, the sample for this current study consisted of 26 patients and their 149 female network members of 161 enumerated members. Twelve patients were 51 years or older ($M = 58.5$, $SD = 6.7$) ranging from 51 to 70 years, and 14 were younger than 51 years ($M = 43.0$, $SD = 5.8$) ranging from 33 to 50 years. Fifty-seven female network members were nominated by older patients and 92 by younger patients. The average proportion of female network members was 0.83 ($SD = 0.17$) for older patients and 0.87 ($SD = 0.15$) for younger patients. The sociodemographic characteristics of the patients are presented in Table 1.

Measures

Characteristics of the Network Members.—Information about the characteristics of network members was obtained from patients at baseline as well as through interviews with network members. After enumerating social network members, patients answered questions regarding each network member including gender and whether the network member was a family member. The extent to which each network member provided *emotional support* to patients was measured by using two items assessing the frequencies with which the patient went to each of them for emotional support during a minor upset and during a major crisis (0 = *never* to 4 = *always*). The sum of the responses to these two items was used as an overall *frequency of emotional support* measure. The *strength of friendship* was evaluated by asking patients to indicate the degrees of friendship they had with each of their social network members (0 = *not friends*, 1 = *acquaintances*, 2 = *friends*, 3 = *good friends*, 4 = *very good friends*). In addition to patients' reports, each network member also indicated whether she knew other network members enumerated by the patient and the strength of friendship with each of these members. The extent to which each network member was embedded in the patient's network was assessed by calculating their *in-degree of strong friendship*: the proportion of high-degree friendship nominations ("very good friends" or "good friends") each network member received from other network members including the patient. Other member-level independent variables included whether she participated in an interview.

Characteristics of the Patients and Their Networks.—An indicator variable was created for patients who were diagnosed at an *older age* (ages 51 years or older). *Network size* indicates the number of support network members patients enumerated including their male support providers. *Density of strong friendship* was calculated by obtaining a proportion of strong friendship ties (very good friends or good friends) out of all possible ties among all network members. In addition, *proportion of family members* and *proportion of female members* were calculated for each network. Patients' future time perspective was based on patients' report of whether *fear of future* due to cancer was the most difficult problem they had during the

Table 2. Social Network Characteristics of the Patients and their Network Members

	51 years or older[a]		50 years or younger[b]	
	M (SD)	Range	M (SD)	Range
Network member–level variables				
Frequency of emotional support	5.61 (1.72)	2–8	5.67 (2.17)	0–8
Strength of friendship baseline	3.61 (0.67)	1–4	3.29 (0.91)	1–4
In-degree of strong friendship	0.48 (0.30)	0–1	0.28 (0.23)	0–1
Patient-level variables				
Network size (includes male ties)	5.58 (3.26)	2–13	7.64 (3.94)	1–15
Density of strong friendship	0.64 (0.25)	0.23–1	0.47 (0.27)	0.13–1
Proportion of family members	0.45 (0.32)	0–1	0.18 (0.19)	0–0.5
Proportion of female members	0.83 (0.17)	0.5–1.0	0.85 (0.15)	0.5–1.0
Network member–level variables (%)				
Not enumerated at follow-up	4		16	
Family member	44		18	
Interviewed	65		67	
Patient-level variables (%)				
Fear of future	58		64	

Notes: [a]*n*s = 57 (female network members) and 12 (patients).
[b]*n*s = 92 (female network members) and 14 (patients).

6 months prior to initial assessment (as opposed to limitation in physical mobility, pain/symptoms, or problems with family or friends related to cancer).

Reliability assessment based on classical test theory approaches is not appropriate in the context of network measurements due to the dependencies among the responses nested within patient (Marsden, 1993). However, a meta-analytic study indicates average reliability indexes of 0.83 for sociometric data, with higher reliability indexes exhibited for data regarding emotional relationships obtained via telephone interview (Kogovsek & Ferligoj, 2005), the approach used in the current study. Additionally, the aggregated sociometric data, such as network size, in-degree, and density, has been shown to be reliable indexes of network structure (Marsden).

Analyses

First, change in social network composition was assessed by examining the number of network members patients dropped or added at the 6-month follow-up assessment. Second, a hierarchical logistic regression model was fitted to evaluate the independent variables (see Table 2 for variables used in this model) that predict network members who were selected by the patients at the initial assessment but *not retained 6 months later*. A hierarchical logistic regression model was used to account for the clustering of the data within patient and to obtain more accurate estimations of confidence intervals and *p* values (Hogan & Blazar, 2000), using HLM 6.04 (Raudenbush, Bryk, & Congdon, 2007). The network member–level independent variables (Level 1) considered were *frequency of emotional support* provision to the patient, *strength of friendship* reported by the patient at baseline, *in-degree of strong friendship* ties (extent to which each network member received high-degree friendship from other network members), whether she was *interviewed*, and whether she was a *family member* of the patient. The patient-level variables (Level 2) include *density of strong friendship* ties, *proportion of females* and *proportion of family members* in the network, and *fear of the future*. Support *network size* was used as a covariate. All variables considered at both levels as well as covariates were added to the unconditional model first. The final model was derived by removing nonsignificant independent variables based on the results of Wald statistics at a Type I error rate of 0.05. For the variables that showed significant interaction effects, their nonsignificant main effects were retained in the model.

Last, a multiple regression model was fitted to evaluate the association between the change in support network size (size at follow-up minus size at baseline) and patients' affective state controlling for baseline levels. Patient's *affective state* was assessed using the Profile of Mood State–Bipolar (POMS-BI). This scale contains six subscales

(agreeable–hostile, clearheaded–confused, composed–anxious, confident–unsure, elated–depressed, and energetic–tired), which were summed to create a total score; ranging from 0 to 216, with higher values representing more mood disturbance. The reliability and validity of this scale in evaluating cancer patients' mood states have been well established (Lorr & McNair, 1988). The moderating effect of the sampling stratification variable, age group, was evaluated. This analysis was conducted using SPSS 14.0 (SPSS, 2005).

Results

Characteristics of Social Networks and Changes in Network Composition

Descriptive statistics of the characteristics of patients' social network systems as well as network members are shown in Table 2. Older patients reported stronger friendship with their network members than younger patients ($t = 2.46$, $p = .02$). The network members of older patients received strong friendship nominations from about a half of the ties within the networks they belong to ($M = 0.48$, $SD = 0.30$), whereas network members of younger patients received such nominations from less than one third of the ties ($M = 0.28$, $SD = 0.23$). On average, younger patients enumerated 7.6 network members and older patients enumerated 5.6 members. Older patients had significantly larger proportions of network members who were family members compared with younger patients ($t = -2.57$, $p = .02$). On average, more than 80% of network members were women in both older and younger patients' networks.

The average number of members who were enumerated by patients at baseline but not retained at follow-up was 0.17 ($SD = 1.06$), ranging from 0 to 1, for older patients and 1.29 ($SD = 2.09$), ranging from 0 to 7, for younger patients. At follow-up, both older and younger patients added an average of one network member ranging from 0 to 3 in both groups. Seven older patients (58%) and 9 younger patients (65%) added at least one new social tie. The change in social network size (number added minus number dropped) ranged from –1 to 2 with an average of 0.75 ($SD = 1.06$) among older patients and –6 to 3 with an average of –0.29 ($SD = 2.09$) among younger patients. About 8% of older and 36% of younger patients showed a decrease, and 50% of older and 29% of younger patients showed an increase in network size. The average proportion of network members patients did not

Table 3. Factors Predicting Network Members Dropped at Follow-Up Assessment

	Odds ratio (95% confidence interval)	p
Intercept	0.44 (0.19–1.00)	.05
Older	0.19 (0.06–0.66)	.01
Network size	1.19 (0.99–1.44)	.07
Proportion of family members	0.17 (0.02–1.56)	.11
Proportion of female members	0.02 (0.00–1.06)	.05
Interview	0.02 (0.00–0.10)	.00
Frequency of Emotional Support	0.45 (0.32–0.63)	.00
× Older	6.17 (3.04–12.54)	.00
× Proportion of Family Members	0.13 (0.05–0.32)	.00

Note: Network size was used as covariate. The main effect of *proportion of family members* was retained in the model because it had significant interaction effect with *frequency of emotional support* variable.

retain at follow-up was 9% ($SD = 29\%$) among older patients and 14% ($SD = 22\%$) among younger patients.

Factors Associated With Changes in Network Membership

The results of the hierarchical logistic regression model predicting network members who were selected by the patients at baseline but not selected 6 months later are shown in Table 3. This table contains odds ratios along with their 95% confidence intervals. The results indicate that older patients were less likely to drop network members. Similarly, patients who had a smaller proportion of female network members were less likely to have network members who were not retained. Network members who participated in interviews were more likely to be retained at follow-up. Interaction effects were found for social support and patients' age group as well as proportion of family members. Those who provided support more frequently were less likely to be dropped at follow-up especially in the networks of younger patients and in the networks that contained higher proportion of family members. (We examined whether this effect, interaction between proportion of family member and support, was an artifact of a network member being a family member by testing an interaction between the variables of support and family member. In other words, we evaluated the relative

Table 4. Mood States of the Patients (N = 26)

	51 years or older		50 years or younger	
	M (SD)	Range	M (SD)	Range
POMS-BI baseline	152.50 (40.66)	77–209	158.14 (34.37)	62–211
POMS-BI follow-up	157.00 (40.87)	88–203	158.86 (39.61)	40–201

Note: POMS-BI = Profile of Mood State–Bipolar.

importance between network composition [proportion of family] and network member characteristic [family member]. This interaction effect was not significant [t ratio = 0.52, p = .60], suggesting that network composition, proportion of family members, was more important than the network member being a family.)

Association Between Change in Network Size and Change in Patients' Affective State

As shown in Table 4, the average mood disturbance scores (POMS-BI) showed an increasing trend among older patients, whereas it remained about the same among younger patients. The result of the multiple regression analysis presented in Table 5 showed that an increase in network size was associated with an increase in POMS-BI total score. There was a significant interaction effect between patients' age group and change in network size indicating that the association between increase in network size and increase in mood disturbances was observed primarily in younger patients.

Discussion

Changes in Social Networks After Breast Cancer Diagnosis

The results of this study suggest that changes occur in the support networks of breast cancer patients during a 6-month period following their diagnosis and treatment. Older patients were significantly more likely to retain the network members they initially enumerated over a 6-month period compared with younger patients. More changes were observed in younger patients' networks, providing support to the first hypothesis. It has been reported that younger cancer patients mobilize their psychological resources (e.g., optimism, purpose of life) more than older patients after their diagnosis (Pinquart, Frohlich, & Silbereisen, 2007). The findings of this study suggest that differing approaches to regulating their

social relationships may also exist between older and younger patients. It may be that older patients already had network members who provided the types of support they needed before the diagnosis of cancer. In contrast, younger patients may have needed to actively elicit support from network members who are less experienced with providing support to peers with serious health problems. This may partly explain the previously reported age differences in psychological reactions to breast cancer among patients (Mosher & Danoff-Burg, 2005). If younger patients were not able to elicit needed support from some network members, this may have led them to drop these members as "emotional support providers" 6 months later and to place more focus on members who provide meaningful interactions.

Older patients reported having more family members in their support networks than younger patients, and their network members were more embedded in their networks compared with network members of younger patients. These findings support evidence that older individuals are more likely to have preformed preferences for familiar social ties than younger patients whose networks are less stable (Fredrickson & Carstensen, 1990). Family network members are more likely to be committed or may even feel obligated to provide support than friends whose social relationships are somewhat more voluntary. This may explain the small changes observed in the networks of older patients in this study.

Characteristics of the Network Members and Changes in Their Prominence to the Patients

Younger patients had more network members on average soon after their diagnosis and reported more reduction in members 6 months later. Although younger patients may have been trying out different social relationships that bring new experiences (Pinquart & Silbereisen, 2006) before or soon after their diagnosis, it appears that they selected to retain members who provided support

Table 5. Predicting Affective State (POMS-BI) at Follow-Up Assessment

	Coefficient	*t*	*p*
POMS-BI baseline	0.95	10.23	.00
Older	0.04	0.36	.73
Network size change	0.46	4.30	.00
Older × Network Size Change	–0.26	–2.30	.03

Note: POMS-BI = Profile of Mood State–Bipolar.

more frequently as they went through the challenges associated with breast cancer diagnosis. The strength of friendship at baseline was not associated with whether network members were retained at follow-up, further highlighting the relative importance of support providers. Network members of younger patients may be less skilled at providing effective support; thus, members who are able to provide the types of support patient seek are especially important. Network members who participated in interviews were more likely to be retained regardless of the age group of the patients, suggesting the importance of network members who are actively involved in patients' lives. Existence of actively engaged network members may indicate the presence of readily accessible support resources. Identifying network members who are actively involved in patients' lives can be beneficial as these individuals may be more open to participating in network-based interventions that aim to enhance the social environment of patients.

The finding that support providers were more important to younger patients than to older patients may seem counterintuitive. However, older individuals sometimes perceive the receipt of support as a sign of dependency on others (Seeman et al., 1996). Studies have shown the relative importance of companions or confidantes rather than support providers to older adults' psychological well-being (Rook, 1990). It is important that health professionals be aware of such possible effects of support provision to older patients when assisting them and their family members as they go through the treatment and recovery process.

The findings of this study suggest that facilitating positive social interactions between patients and their family members may be especially important for older patients. Positive social interactions within families may be achieved by raising family members' awareness of their important roles in patients' social networks and facilitating communication between patients and their family members to determine the types of social interactions desired by patients. Because interactions are likely to involve the provision of care or tangible support, providing education to family members in effective support or care provision or how to manage difficult illness-related situations within the family may be helpful.

Changes in Social Network Systems and Psychological Adjustment

Decrease in support network size was associated with decrease in mood disturbances among younger patients over the 6-month study period, suggesting that reduction in network size may be beneficial to the psychological adaptation of the patients. This finding provides support to the second hypothesis and underscores the possibility that changes in support network systems may reflect patients' adaptation strategy to regulate social relationships. It may be beneficial to inform newly diagnosed breast cancer patients, especially those diagnosed at a younger age, of possible changes in their social relationships as they go through treatment and recovery and that such changes are not always detrimental to their well-being. It should be noted, however, that there may be a nonlinear association between the network size and the psychological well-being. For example, if patients possess a very small support network at the time of diagnosis, losing valuable support resources is not likely to be beneficial for their psychological well-being. Such possible associations need to be investigated employing a larger sample.

The moderating effect of age group on the association between change in network size and psychological outcomes of breast cancer diagnosis found in this study is consistent with a previous report (Mosher & Danoff-Burg, 2005). Although the results of this study suggest psychological benefits of changes in social network systems, older patients reported little change in their network systems. This may have resulted in observed nonsignificant association among older patients. The average mood disturbance level increased among older patients, whereas it remained about the same among younger patients. As discussed earlier, older patients have stable social network systems with a high proportion of family members and members who are more embedded within their networks, and it may be difficult for them to become

selective about their social relationships. It is possible that stability of older patients' social networks inhibits their ability to adjust social relationships in a potentially psychologically adaptive manner. Furthermore, network members of older patients may have more difficulty coping with patients' cancer diagnosis as they are closer and more likely to be emotionally invested in their relationships. This potential impact of stable social network systems on the psychological adaptation of older adults who experience life-threatening illnesses needs further investigation.

Limitations

Perceived fear of future reported by patients was not associated with the changes in their social networks. Although this measure was used as a proxy for the concept of perceived future lifetime, the fact that it is not a direct measure of this construct may have contributed to its nonsignificant role in the explored models. This was also a dichotomous variable, which may have not been sensitive enough to assess the varying extent to which patients may have felt fear of future. Similarly, although it was thought that younger patients would have more restricted future lifetime because of their likely genetic predispositions for breast cancer, patients' perceptions about their own hereditary risk were not assessed in this study. Investigating the association between hereditary risk and perceived restricted future lifetime as well as the extent to which these perceptions influence changes in social networks may help us understand how cancer patients regulate their social relationships.

The majority of the participants in this study were educated middle-class Caucasian women; thus, the generalizability of these results to other subgroups of the population is limited. The main objective of this study was to evaluate whether a social network approach can be used to examine the association between breast cancer diagnosis and the cancer preventive behaviors among patients' female network members. Therefore, male network members were not interviewed and their roles in the support networks were not evaluated. Male network members, especially spouses, are likely to play an important role in the psychological well-being of the breast cancer patients (Segrin et al., 2005). Marital status of the patients was considered as a potential proxy for the impact of male network members; however, no significant

associations between this variable and outcomes were identified possibly due to low variability as a large proportion of the patients were married or partnered. In addition, how the role of children in psychological adaption of cancer patients differ between older and younger patients should be investigated. Information on family relationships (e.g., daughter, sister) was not obtained in this study. Previous studies show that a breast cancer diagnosis causes a significant disruption in patients' relationship with their children especially among younger patients (Lewis, 1999). Whereas older adults may be able to obtain support from their adult children, younger patients are likely to face additional challenges with their younger children who are also less likely to be able to provide effective support. In this study, younger patients may not have been able to enumerate their children as network members due to their younger age, whereas older patients most likely included their adult children. Obtaining information on family relationships and including younger children in the assessment of patients' networks will allow such investigation. More detailed examination of the roles of male and younger network members by including them in future studies would be beneficial. Future studies should also consider the stages of cancer at diagnosis and effectiveness of the treatments as they are likely to play roles in patients' adaptation and social relationship regulation.

Research Implications

This was an exploratory study that involved a small number of cancer patients; thus, replication of this study using different groups of breast cancer patients will be beneficial. Future studies involving a larger number of patients and their network members will allow the assessment of the associations between characteristics of the social network or its network members and psychological adjustment of the patients. Such studies will help identify individual and network factors that are directly or indirectly associated with psychological adaptation of the patients. In addition, a larger sample size will allow for the stratification of patients into three age groups that are more consistent with a life course perspective. Although age stratification was dichotomized based on the average age of menopause, it is likely that larger differences in coping and adaptation strategies will be observed among women at the lower and upper

ends of the age groups and smaller differences are expected among those in the middle range (e.g., ages between 45 and 55 years). This study did not have sufficient sample size for such stratification, and findings should be interpreted while considering this oversimplified age group variable. This study provides the basis for a larger scale study that will allow more refined examination of differences between older and younger patients.

This study considered emotional support network systems of cancer patients because the main objective was to evaluate the role of close intimate social ties on the screening behaviors of the network members. In a previous study, provision of emotional and tangible support was found to be associated with psychological adaptation among breast cancer patients, whereas provision of informational support appeared to increase anxiety (Koehly et al., 2008), suggesting the relative importance of emotional support. Frequency of emotional support provision was associated with whether a network member was retained at follow-up in this study. It is possible that other types of social support also influence patients' selection of network members after cancer diagnosis. Future studies that consider various types of support will enhance our understanding of the selectivity of social network members among cancer patients.

Conclusions

This study documented the changes in the social network systems of newly diagnosed breast cancer patients. More changes occurred in younger patients' networks than in older patients', suggesting the use of distinct processes of social relationship regulation. The results also provide support to the view that changes in network systems may occur due to patients' adaptation strategies and that older patients may have more difficulty modifying their social relationships. Health professionals should be aware that newly diagnosed cancer patients may experience changes in their social relationships and that this does not always confer negative psychological implications. This study demonstrates the importance of considering social contexts of cancer patients and provides basis for additional studies using social network methodology to examine psychological adaptation and outcomes of major illnesses. It is likely that patients facing other life-threatening illnesses also experience changes in their social relationships and such

changes impact their psychological adaptation. The importance of social network characteristics on the health outcomes of individuals with Type 2 diabetes (Eller, Landgraf, & Mielck, 2008) and those affected by stroke (Lynch et al., 2008) has been documented. The differential implications of other major illnesses on social relationships and health outcomes between younger and older individuals should be investigated so that intervention strategies appropriate for the life stage of the patients can be determined.

Conflict of Interest

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of Health and Human Services, nor the U.S. Government.

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