

Supporting Breast Self-Examination in Female Childhood Cancer Survivors: A Secondary Analysis of a Behavioral Intervention

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This article has been chosen for a podcast conversation with Cheryl L. Cox, PhD, RN, the primary author. Dr. Cox shares the development of her interest in the subject of the article, the need to focus on survivors of childhood cancer, and the developing specialty of cancer survivorship. To access the podcast, visit www.onsforum.org.

Purpose/Objectives: To identify intervention targets that will increase the frequency of breast self-examination (BSE) in female survivors of childhood cancer.

Design: Secondary data analysis of longitudinal clinical trial data.

Setting: Outpatient clinic in a children's research hospital.

Sample: 149 female survivors (aged 12–18 years) a median of 11 years after diagnosis of leukemia or lymphoma (59%) or solid tumor (41%).

Methods: Paired t tests, Wilcoxon signed rank tests, repeated measures analysis of variance, and analysis of covariance.

Main Research Variables: BSE frequency, health risk perceptions, motivation, and fears or worries.

Findings: Baseline BSE frequency was the strongest influence on follow-up BSE. Baseline and follow-up age and school grade influenced follow-up BSE. Other influential variables included motivation for behavior change, motivation to commit to health promotion, concern about appearance, and an interaction between the intervention and mother's highest grade level. When baseline BSE frequency and school grade were statistically controlled, diagnosis and significant interactions between grade level and the follow-up measures of the mother's education, general fears about cancer, fears about cancer returning, and perceptions of susceptibility to late treatment effects were significant influences on BSE after intervention.

Conclusions: Survivors least likely to perform BSE are fearful about cancer and are not motivated to change health behaviors.

Implications for Nursing: Nurses should explore survivors' fears about cancer and late treatment effects to address misconceptions, use modeling techniques with return demonstrations to ensure competency in BSE, and tailor risk information to each survivor's background (socio-economic status, age, development) and cognitive (disease and treatment knowledge, risks) and affective (fears) characteristics to increase BSE motivation.

Key Points . . .

- ▶ Young female childhood cancer survivors are at increased risk of breast cancer as a result of treatment, and interventions that increase the frequency of breast self-examination (BSE) may extend life.
- ▶ General fears about cancer and fear of cancer returning predicted decreased BSE frequency in older survivors.
- ▶ Nursing interventions aimed at promoting BSE in young female survivors should take into account the positive and negative effects of fear on BSE frequency.

risk for developing breast cancer than women in the general population (Bhatia et al., 2003), with a cumulative risk over 25 years of follow-up at 9.9% overall and 12.2% for those treated with supradiaphragmatic irradiation (Taylor, Winter, Stiller, Murphy, & Hawkins, 2006). The Childhood Cancer

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Female survivors of childhood cancer are at significant risk for developing breast cancer. Survivors who receive mantle, abdominal, or craniospinal radiation and fail to enter puberty or enter premature menopause face an increased risk for developing breast cancer (National Research Council, 2003). Childhood Hodgkin survivors are at greater

Survivors' Study reported that more than 30% of female survivors of childhood cancers other than Hodgkin disease have had a diagnosis of secondary breast cancer (Kenney et al., 2004). Most of the cases (17%) were in survivors of bone and soft-tissue sarcomas.

Breast self-examination (BSE) is no longer recommended for the general population for two reasons: No conclusive scientific evidence from randomized, controlled trials shows that BSE saves lives or enables women to detect breast cancer at an earlier stage, and some data show that BSE greatly increases the number of benign lumps detected, resulting in increased anxiety, physician visits, and unnecessary biopsies (Harris & Kinsinger, 2002; Thomas et al., 2002). However, because mammography is limited in its ability to evaluate the premenopausal breast, the Children's Oncology Group (2004) recommended a breast cancer surveillance program that includes monthly BSE beginning at puberty for patients at high risk for developing breast cancer, concurrent with biannual clinician breast examinations and annual mammography.

Female childhood cancer survivors underuse BSE (Diller et al., 2002; Yeazel et al., 2004) and professional screening (i.e., provider breast examination, mammography, and routine health screens) (Oeffinger et al., 2004), which is cause for concern. To better understand what factors support or impede childhood cancer survivors' BSE practices, a secondary data analysis of clinical trial data was conducted. The original study (Hudson et al., 2002) targeted 14 health risk and health promotion behaviors in adolescent childhood cancer survivors. The analyses in the current study were guided by a conceptual framework of health behavior previously applied to childhood cancer survivors (Cox, 2003). Relationships between the concepts identified by the model were tested for their relevance to BSE practices in female childhood cancer survivors. The ultimate goal was to identify female survivors who were least likely to perform BSE as well as new patient populations for interventions to increase and sustain BSE in young survivors.

Background

Among female survivors of childhood cancer, the risk factors for developing breast cancer include primary cancer diagnosis at an older age (10–16 years), radiation therapy, treatment with selected chemotherapeutic agents, primary cancer with a higher rate of early cell proliferation, a primary diagnosis of bone or soft-tissue sarcoma (Metayer et al., 2000; Neglia et al., 2001; Wong et al., 1997), and a longer follow-up period (Bhatia & Sklar, 2002; Kenney et al., 2004). A family history of breast cancer and history of thyroid disease also are acknowledged risk factors (Kenney et al.; Metayer et al.; Neglia et al.; Wong et al.).

The effectiveness of mammography reportedly is limited in dense premenopausal breast tissue and exposes survivors to additional radiation (Esserman, 2002). Survivors may lack insurance coverage for mammography or may underuse preventive health care in general. For example, a study found that older survivors of childhood cancer were less likely than younger survivors to have a general physical examination, a cancer-related visit, or a visit to a cancer center, and the likelihood decreased as time after the cancer diagnosis increased (Oeffinger et al., 2004).

Wolden et al. (2000) reported that in 65 survivors of Hodgkin lymphoma, 63% of breast cancers were discovered by patient BSE and only 30% by mammography. In a study of breast cancer detection methods in 1,619 women in the United States younger than 45 years, 71% of the cancers were identified by BSE, 9% by clinical breast examination, and 20% by routine mammography (Coates et al., 2001). Among 1,752 women with stage I or II breast cancer, BSE was the initial method of detection for 260 (15%) (Diratzouian, Freedman, Hanlon, Eisenberg, & Anderson, 2005). For women younger than 40 years, BSE was the sole method of detection in 40% of 1,752 cases, and the rate of 10-year locoregional control and overall survival was equivalent to that of patients whose cancer was detected by mammography (Diratzouian et al.).

Little to no documentation of the factors that predict childhood cancer survivors' BSE exists, and much of the literature for the general population is dated. In the general adult population, however, factors associated with not performing BSE include fear of disease diagnosis (Byrd, Chavez, & Wilson, 2007; Gullatte, Phillips, & Gibson, 2006), embarrassment about self-examination (Champion, 1991), older age, forgetfulness, more education, limited time (Sadler et al., 2007; Sensiba & Stewart, 1995), and African American or Hispanic ethnicity (Mandelblatt, Traxler, Lakin, Kanetsky, & Kao, 1993; Vernon et al., 1992). Among childhood cancer survivors, those expressing little concern about future health issues were less likely to perform BSE (Yeazel et al., 2004). Factors associated with performing BSE in the general population include valuing the potential efficacy of BSE as a risk reducer, belief that early detection is important, knowledge about breast cancer, confidence in the ability to perform the examination and detect a lump, and supportive partners or family members (Champion; Dundar et al., 2006; Lierman, Kasprzyk, & Benoliel, 1991; Sensiba & Stewart).

Theoretical Framework

The Interaction Model of Client Health Behavior (IMCHB) (Cox, 1982, 2003) (see Figure 1) guided this secondary analysis of clinical trial data. Many variables examined in the original clinical trial corresponded with the concepts and variables identified in the model; other behaviors included in the original clinical trial were successfully modeled and previously reported (Cox, McLaughlin, Rai, Steen, & Hudson, 2005; Cox, McLaughlin, Steen, & Hudson, 2006). The objectives were to examine the extent to which the connections suggested by the model could be supported in relationship to female childhood cancer survivors' BSE frequency and to use the model to identify suitable targets for interventions that would increase BSE frequency in young survivors.

The model has three primary elements: singularity (the intrapersonal and contextual characteristics that uniquely define individual patients relative to their health, disease, and treatment), interaction (the therapeutic content and process between clinicians and patients that can support or negate behavior change), and health outcomes (behavior or behavior-related health outcomes). The model's working hypothesis is that the likelihood of positive patient health outcomes increases as the intervention and interaction with the provider are tailored to the background, cognitive, affective, and motivational uniqueness of each patient.

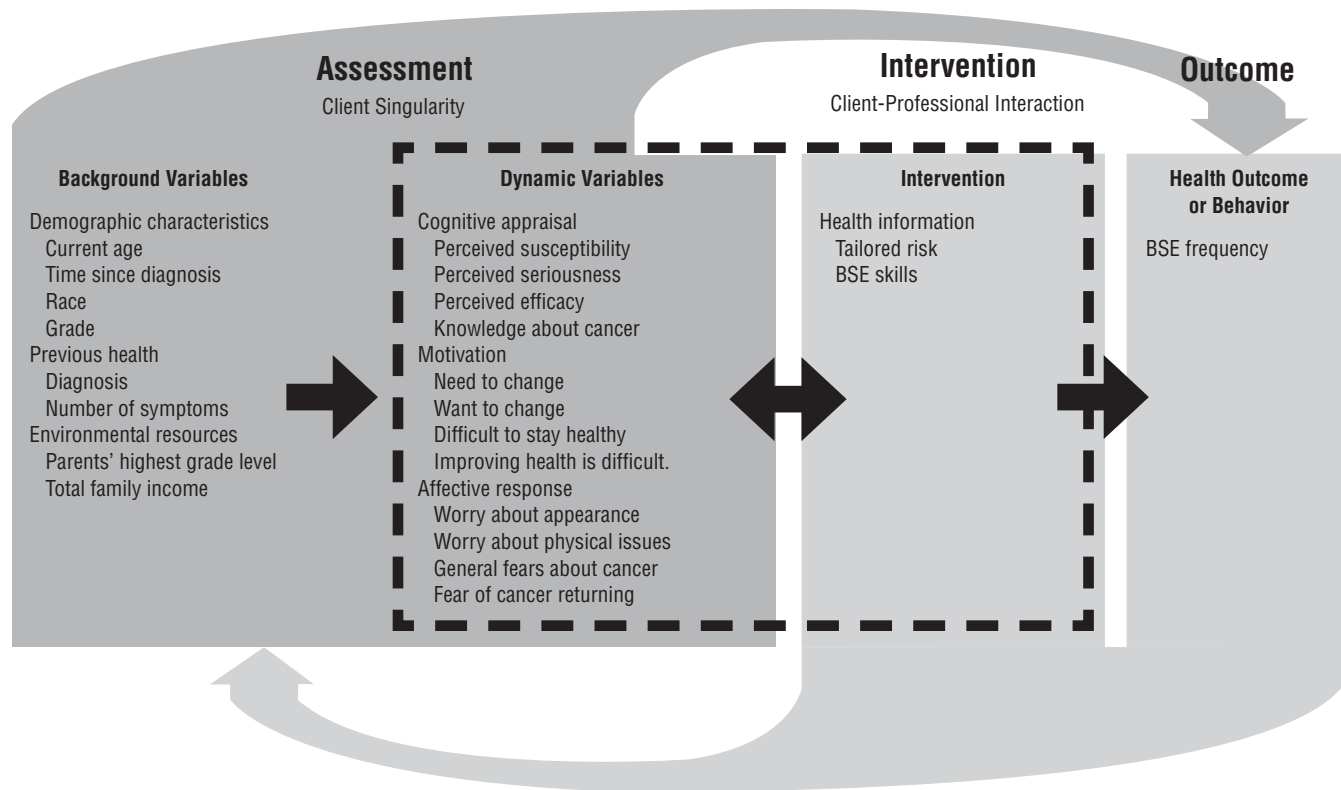


Figure 1. The Interaction Model of Client Health Behavior Applied to Breast Self-Examination (BSE) in Childhood Cancer Survivors

Note. From “A Model of Health Behavior to Guide Studies of Childhood Cancer Survivors,” by C.L. Cox, 2003, *Oncology Nursing Forum*, 30(5), p. E93. Copyright 2003 by Oncology Nursing Society. Adapted with permission.

Methods

Design

This is a secondary analysis of a longitudinal, randomized, controlled trial of the ability of a multicomponent risk-counseling intervention to increase health protective and risk reduction behaviors in adolescent survivors of childhood cancer (Hudson et al., 2002). The original and current studies were approved by an institutional review board, and consent was provided by parents or guardians and patients. The outcome measures in the primary study included survivors' knowledge of their disease and treatment, perceptions of the risks caused by cancer treatment, and the frequency of health risk and protective behaviors at baseline (T_0) and one year later (T_1). Participants in both study groups were exposed to the BSE component of the intervention, making the study design for BSE a pre- and postintervention evaluation.

Intervention

The intervention, detailed extensively elsewhere (Cox et al., 2005, 2006; Hudson et al., 2002), consisted of targeted late effects screening from treatment exposure, a thorough clinical assessment, and personalized counseling (based on diagnosis and treatment history) about the risk of late effects, provided by physicians or nurse practitioners. The intervention approach is consistent with the tenets of the IMCHB in that health information was tailored to the survivor's specific

risks and levels of understanding about the disease and treatment. Relative to BSE, survivors (intervention and standard care groups) were given instruction in BSE that included practice on clinical latex breast models that reflected normal, variant, and abnormal breast tissue.

Sample

The sample in the primary study consisted of survivors seen for follow-up at a clinic in a children's research hospital. Eligibility criteria were ages 12–18 years, disease in continuous remission two or more years after completion of cancer treatment, cognitive function sufficient to understand the intervention counseling and complete the self-report written questionnaires, and English as the primary language. The group was stratified by gender and age (younger adolescents, aged 12–15 years versus older adolescents, aged 16–18 years). Questionnaires were completed by survivors during follow-up visits to the clinic.

Measures

Cognitive appraisal: The research team developed specific items to address health knowledge about cancer treatment and its associated risks, health perceptions based on previous work by Janz and Becker (1984) (susceptibility, seriousness, efficacy), and health behavior practices.

Personal health knowledge: Survivors' health knowledge was assessed by “yes” or “no” responses to 30 questionnaire

items regarding treatment and risks (e.g., Did you receive surgery as a part of your treatment for cancer?). The accuracy of patients' responses was verified in medical records. Possible scores ranged from 0–37, with higher scores reflecting greater knowledge.

Perceived susceptibility: An 11-item subscale assessed perceived susceptibility by asking survivors to indicate how likely it would be to experience a given health issue secondary to cancer treatment. Responses were rated on a five-point scale, ranging from 1 (very unlikely) to 5 (very likely) (Cronbach alpha at $T_0 = 0.85$, $T_1 = 0.83$). Total potential scores ranged from 11–55.

Perceived seriousness: An 11-item subscale assessed perceived seriousness by asking survivors to indicate how serious it would be to develop a given health issue because of cancer treatment. Responses were rated on a four-point scale, ranging from 1 (not serious) to 4 (very serious) (Cronbach alpha at $T_0 = 0.92$, $T_1 = 0.91$). Total scores could range from 11–44.

Perceived efficacy: A nine-item subscale assessed survivors' beliefs that selected health practices can reduce the risk of treatment-related health issues on a four-point Likert scale from 1 (strongly disagree) to 4 (strongly agree) (Cronbach alpha at $T_0 = 0.75$, $T_1 = 0.79$). Total scores could range from 9–36.

Health practices: A four-point Likert scale assessed the frequency of BSE (1 = never, 2 = 1–3 times per year, 3 = 4–6 times per year, 4 = monthly).

Symptoms: A perceived symptoms questionnaire kept as part of survivors' medical records and completed at the same time as the study questionnaire contained 19 items representing the full array of symptoms (e.g., shortness of breath, fatigue, chest pain) that might be associated with the survivors' cancer or treatment. The number of survivors' perceived symptoms at T_0 and T_1 was recorded.

Motivation: Four single questionnaire items assessed health motivation; the first two items had “yes” or “no” response options: “I need to change my health behaviors to be healthy,” and “I want to change my health behaviors to be healthy.” Two additional items were scored on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree): “It is a lot of trouble to stay healthy” and “Improving your health is hard work.” The items were treated as individual items, not as scales.

Affect: Data from the medical record annual questionnaire, developed in the cognitive appraisal step, were used to examine the impact of affective concerns on the survivors' practice of BSE. Patients were asked four “yes” or “no” questions about whether they had specific worries about physical issues or appearance, general fears about cancer, or fear about cancer returning. Data were treated as single items, not as scales.

Background variables: Each survivor's current school grade and age (demographic), years of formal education for each parent, and the total household income (environmental resources) were included. Data were obtained from the medical record.

Data Analysis

In preliminary analyses, BSE frequency was examined as an ordinal and continuous measure with no differences in outcomes. Because parametric, in contrast to nonparametric, statistics would allow for more definitive analyses to determine the influential factors on the follow-up BSE measure, the

measure was treated as a continuous measure (1–4) in subsequent analyses. Changes in BSE frequency and in the continuous independent variables were examined with the t test for paired samples. Changes in categorical variables were examined with Wilcoxon signed rank tests. Because of the skewed distribution of the categorical variables, they were collapsed into two categories: “Agree” and “strongly agree” responses were combined and compared to the combined “disagree” and “strongly disagree” responses. A mixed between or within subjects repeated measures analysis of variance was used to examine the association of the intervention (within subjects main effect) and the association of each of the IMCHB-derived independent variables (between subjects effects) at T_0 and T_1 with BSE frequency after intervention. Analysis of covariance was used to statistically control for the influence of strongly influential baseline variables when examining the impact of follow-up independent variables, allowing for identification of intrapersonal differences that significantly influenced the impact of the intervention and the identification of factors that distinguished female survivors who were less likely than others to perform BSE. Statistical analysis was performed with SPSS® 15.0 (SPSS, Inc.) (Norusis, 2006).

Results

The typical survivor in the study was Caucasian (84%), 15 years old, in high school (53%), and from a middle-income family (58%). She had been diagnosed with leukemia or lymphoma (59%) approximately 11 years before the study began (see Table 1). Table 2 provides a descriptive summary of the major study variables in the context of the IMCHB.

The frequency of BSE increased between baseline and follow-up ($t = -5.098$, $df = 143$, $p < 0.0001$), with baseline

Table 1. Patient Characteristics at the Time of Study Entry

Characteristic	Median	Range
Age (years)	15.00	11.99–19.11
Time since diagnosis (years)	11.72	2.23–16.89
Characteristic	n	%
Race (N = 148)		
Caucasian	125	84
African American	20	14
Hispanic	3	2
School grade (N = 147)		
5–8	64	44
9–12	79	54
> 12	4	2
Mother's highest grade (N = 146)		
4–12	75	51
13–18	71	49
Father's highest grade (N = 138)		
3–12	66	48
13–18	72	52
Total family income (\$) (N = 149)		
< 35,000	62	42
35,000–60,000	87	58
Primary diagnosis (N = 148)		
Leukemia or lymphoma	87	59
Solid tumor	61	41

Table 2. Distribution of Continuous Study Data

Continuous Variable	Baseline				One Year Later			
	N	\bar{X}	SD	Range	N	\bar{X}	SD	Range
Breast self-examination practice frequency	148	2.56	1.16	1–4	145	3.04	1.09	1–4
Number of symptoms	134	1.22	1.44	0–5	146	0.95	1.31	0–8
Knowledge about cancer diagnosis and treatment	148	23.29	4.08	11–34	138	23.89	3.98	11–36
Perceived susceptibility to late effects	147	25.98	7.02	11–43	141	25.89	7.56	11–47
Perceived seriousness of late effects	145	31.83	8.30	12–44	140	33.45	7.79	11–44
Perceived efficacy of health behaviors	142	26.36	2.80	21–32	141	26.72	2.99	20–32

BSE frequency accounting for 24% of the variance in follow-up BSE. Survivors reported that the number of symptoms ($t = 2.085$, $df = 130$, $p = 0.039$) and general fears about cancer ($Z = -2.065$, $p = 0.039$) decreased. Knowledge about their disease and treatment ($t = -2.252$, $df = 137$, $p = 0.026$), perception of the seriousness of their vulnerability to late effects ($t = -2.048$, $df = 136$, $p = 0.042$), perception that staying healthy is difficult ($Z = -7.950$, $p \leq 0.001$), and perceived need to change health behaviors ($Z = -3.726$, $p \leq 0.001$) increased between baseline and follow-up.

Selected baseline variables (between subjects effects) were associated with increased BSE after intervention: older age ($F = 13.0$, $df = 1$, $p \leq 0.001$), higher school grade ($F = 27.799$, $df = 1$, $p \leq 0.001$), the perception that a behavior change was needed ($F = 4.247$, $df = 1$, $p = 0.041$), and being less worried about appearance ($F = 5.429$, $df = 1$, $p = 0.021$). Survivors' perception that it is difficult to stay healthy interacted with the main effect (time) ($F = 4.495$, $df = 1$, $p = 0.036$) and was associated with increased follow-up BSE frequency. Survivors' perception that health behaviors were efficacious in modifying the late effects of therapy ($F = 4.582$, $df = 1$, $p = 0.034$) also interacted with the study's main effect and was associated with increased BSE after intervention. In addition to follow-up age ($F = 13.00$, $df = 1$, $p \leq 0.001$) and higher school grade ($F = 14.653$, $df = 1$, $p \leq 0.001$), survivors' perception that it was difficult to stay healthy ($F = 5.460$, $df = 1$, $p = 0.021$) and an interaction between the mother's highest grade level and the main effect at follow-up were strong positive influences on BSE after intervention.

Because school grade, age, and baseline BSE frequency had a large effect on BSE frequency at follow-up in the repeated measures analysis, factors in the univariate analysis of covariance were statistically controlled. The grade variable at the time of follow-up was dichotomized into two categories that correspond to stages of breast development (Marshall & Tanner, 1969; Massachusetts General Hospital, n.d.): grades 6–9 and grades 10 and higher. The grade variable was chosen instead of the age variable because of its stronger influence on follow-up BSE frequency. Baseline BSE frequency was treated as an analysis covariate.

Baseline BSE frequency influenced follow-up BSE frequency independent of any of the between subjects variables; F values ranged from 20.896–30.901, with a consistent p value of less than 0.001. Only one baseline variable, increased perceived susceptibility to late effects, in interaction with being in a lower grade ($F = 3.543$, $p = 0.032$), predicted decreased BSE at follow-up. Follow-up variables that contributed to

increased BSE after intervention included a diagnosis of leukemia or lymphoma ($F = 108.12$, $p = 0.021$) and three interaction terms with grade level: not fearing the return of cancer ($F = 5.028$, $p = 0.027$), not having general fears about cancer ($F = 4.321$, $p = 0.040$), and having a mother with less education ($F = 4.335$, $p = 0.040$).

Discussion

The strongest influence on BSE frequency after intervention was baseline BSE frequency. Survivors of leukemia or lymphoma were significantly more likely than survivors of solid tumors to practice BSE after intervention. Given treatment exposures, leukemia or lymphoma survivors are at a greater risk for developing secondary breast cancer than most solid tumor survivors. Because the intervention was specifically tailored to risk, leukemia or lymphoma survivors were clearly informed of their risk status and performed BSE more often.

Studies of adult survivors of cancer have found that older survivors are more likely to practice BSE than younger survivors (George, 2000; Juon, Kim, Shankar, & Han, 2004; Sensiba & Stewart, 1995). Similarly, childhood cancer survivors in higher school grades performed BSE more often; however, this likely reflects the more prevalent completion of breast development in the older group.

Survivors in higher grades whose mothers had less than a high school education were more likely than others to practice BSE at follow-up. Studies that eliminated the availability of health insurance as a confounder suggest strong links between lower parental education (particularly the mother's education) and positive child health outcomes. Parents with less education tend to perceive the survivor as more vulnerable than parents with more education (Anthony, Gil, & Schanberg, 2003), and perceptions of vulnerability have been found to be associated with greater parental feelings of responsibility for health behavior change, more conscientious attention to preventive health practices, and more frequent provider visits (Birkett, Johnson, Thompson, & Oberg, 2004; Heck & Parker, 2002; Spurrier et al., 2000). Furthermore, parents in lower socioeconomic groups give more credit to messages about health risks than parents in higher socioeconomic groups (Lytle, Birnbaum, Boutelle, & Murray, 1999). In the current study, care was provided to survivors without regard to health insurance coverage, potentially demonstrating stronger links between parental education level and BSE frequency.

In contrast to reports in the adult survivor literature (Brain, Norman, Gray, & Mansel, 1999; Smith et al., 2003), subsets of the sample (survivors in lower grades, a diagnosis of solid

Table 3. Distribution of Categorical Study Data

Categorical Variable	Baseline		One Year Later	
	n ^a	%	n ^a	%
It is difficult to stay healthy.				
Disagree or strongly disagree	31	21	113	80
Agree or strongly agree	118	79	29	20
Improving health is difficult.				
Disagree or strongly disagree	2	16	23	16
Agree or strongly agree	124	84	119	84
Need to change behaviors to be healthy				
No	93	64	51	36
Yes	53	36	91	64
Want to change behaviors to be healthy				
No	51	35	52	37
Yes	96	65	90	63
Worried about appearance				
No	117	79	100	78
Yes	32	22	32	22
Worried about physical issues				
No	126	85	116	87
Yes	23	15	17	13
General fears about cancer				
No	131	88	109	82
Yes	18	12	24	18
Fear of cancer returning				
No	106	71	92	69
Yes	43	29	41	31

^a Because of missing data, total n values may differ for each variable.

Note. Because of rounding or missing data, percentages may not total 100.

tumor) who felt more susceptible to the late effects of cancer treatment, feared that the cancer would return, or had general fears about cancer, were less likely to practice BSE. Similarly, survivors who were more concerned about appearance were less likely to practice BSE. Some patients, on learning that they are at risk for serious health consequences, become immobilized and tend to avoid BSE (Mullens, McCaul, Erickson, & Sandgren, 2004). The personalized risk information given to survivors who have completed breast development and who are at greatest risk for developing secondary breast cancer may exacerbate fears. If so, avoiding BSE would be a logical anxiety reduction strategy for some. Survivors more concerned about appearance may avoid BSE because a discovery of an abnormality carries the threat of surgical intervention and potential disfigurement.

Although motivation was not a specific target of the intervention, intrinsic motivation is a central construct of the IMCHB and was included in the analysis. All four of the motivation-associated variables, alone or in interaction with other variables, had an effect on BSE frequency. Perceptions of needed behavior changes and the commitment required to maintain or improve health positively changed between baseline and follow-up, suggesting that components of the intervention may have been successful in altering survivors' motivation (see Table 3).

Implications for Nursing

The IMCHB, a model developed to capture the complex process of professional nursing intervention, was useful in

identifying isolated factors that describe female survivors of childhood cancer who are less likely to perform BSE: younger survivors, those more fearful about cancer in general, those who fear the cancer will return, those who feel neither the need nor the desire to change their health behaviors, those who perceive that staying healthy does not require much commitment, or those who have had childhood cancer diagnoses where breast cancer treatment risks were not emphasized.

Consistent with the assumptions and propositions of the IMCHB, the results suggest that interventions simultaneously tailored to a broad array of factors are more likely to support behavior change than a one-size-fits-all approach limited to increasing knowledge. To motivate survivors to perform BSE, nurses should consider intervention strategies that examine survivors' fears and anxieties related to cancer and late effects so that misconceptions can be addressed, use concrete modeling techniques with return demonstrations (Glascoe, Oberklaid, Dworkin, & Trimm, 1998) to ensure survivors' competency in performing BSE, offer factual data in person and in attractive formats about the value of early detection and specific information on how and why BSE has the potential to modify late-effects risks, and tailor personalized risk information to survivors' relevant background (socioeconomic status, age, development), cognitive (disease and treatment knowledge, risks, health behavior efficacy beliefs), and affective (fears or worries) characteristics.

Conclusion

Study limitations commonly are associated with secondary analyses. Analyses were confined to the primary study measures. Ideally, BSE frequency should assess the absolute number of times per year in which the survivor engages in BSE or be represented in equidistant ordinal categories. Scaled measures of motivation and affect in contrast to single items likely would have led to stronger associations than what was demonstrated. The primary study was powered on the basis of two genders; the power was significantly reduced by examining an outcome only related to females. Despite the reduced power, however, significant changes were demonstrated in many of the study variables from baseline to follow-up and illustrate the influence of multiple variables on BSE frequency without large error variances.

The theoretical basis for the structure of the IMCHB suggests that motivation is increased when patients understand their personal risk, when they learn and feel competent in behaviors that can reduce risk, and when worries and fears about risks are not immobilizing (Cox, 1982, 1984). The intervention focused on providing personalized risk information related to each survivor's cancer diagnosis and treatment and ensuring that survivors acquired the skill needed to perform BSE. Although the intervention did not target fear and worry, accurate information about risks and the efficacy of health-protective behaviors likely reduced general cancer fear in some survivors. With fears reduced, risks clarified, motivation to change behavior increased, and the requisite skills to support BSE, survivors performed BSE more frequently.

Of greater concern are young female childhood cancer survivors who do not perform routine BSE. The IMCHB was successful in identifying fear and lack of motivation as likely causes. Avoiding BSE, a coping strategy to reduce fear and anxiety, is a significant threat to the early detection of

secondary breast neoplasms. By understanding the complex relationships that exist among risk perceptions, motivation, and affect, nurses can more pointedly target interviewing and counseling strategies to elicit and address specific fears and concerns, provide personalized information about disease and treatment risks, and support survivor competency and autonomy through promoting the development of well-

honed BSE skills. The powerful combination of addressing personal risk, modifying exacerbated fear and worry, and introducing skill competencies is key in motivating sustained behavior.

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