

# Determinants of Mammography Screening Participation in Adult Childhood Cancer Survivors: Results From the Childhood Cancer Survivor Study

Cheryl L. Cox, PhD, RN, Kevin C. Oeffinger, MD, Michele Montgomery, RN, MPH, Melissa M. Hudson, MD, Ann C. Mertens, PhD, John Whitton, MS, and Leslie L. Robison, PhD

**M**any female childhood cancer survivors ages 20–40 years are at an elevated risk for breast cancer because their developing breast tissue was exposed to radiation during childhood cancer treatment (Hewitt, Weiner, & Simone, 2003; Ries et al., 2007). Survivors of Hodgkin disease comprise the largest proportion of childhood cancer survivors in the group at risk for secondary breast cancer. However, chest radiation also is used routinely in treatment protocols for metastatic Wilms tumor and soft tissue sarcomas as well as other refractory or recurrent pediatric malignancies. Previous investigations indicate that by age 45, 12%–20% of young women treated with radiation therapy will be diagnosed with breast cancer (Bhatia et al., 2003; Kenney et al., 2004; Taylor, Winter, Stiller, Murphy, & Hawkins, 2007). Therefore, the risk of breast cancer after chest radiation for a pediatric malignancy rivals that of women with a *BRCA* mutation, who have an estimated cumulative incidence of breast cancer at age 40 ranging from 10%–19% (Bhatia et al.; Bishop, 1999; Ford et al., 1998; Struewing et al., 1997).

Information about secondary breast cancer following radiation for pediatric malignancies is derived largely from studies of survivors of Hodgkin disease. The risk of breast cancer in this group begins to increase about 8 years after chest radiation (Bhatia et al., 2003; Kenney et al., 2004; Metayer et al., 2000); the interval from Hodgkin disease treatment to breast cancer for pediatric and adult groups is 15–20 years (Bhatia et al.; Cutuli et al., 2001; Kenney et al.; Metayer et al.; Taylor et al., 2007; Wolden et al., 2000). The median age of breast cancer diagnosis is 32–35 (Bhatia et al.; Kenney et al.; Taylor et al.), which is well below the average age of breast cancer onset (age 50 and older) (Ries et al., 2007) in the general population and below the age at which most women routinely begin to undergo mammography (age 40) (American Cancer Society, 2007).

Consistent with the general population (Berry et al., 2005; Vlastos & Verkooijen, 2007), early detection of breast cancer in the population of childhood cancer survivors who are at high risk may lead to increased

**Purpose/Objectives:** To identify treatment, intrapersonal, and provider factors that influence childhood cancer survivors' adherence to recommended mammography screening.

**Design:** Secondary analysis of data derived from three consecutive surveys within the Childhood Cancer Survivor Study.

**Sample:** Female childhood cancer survivors:  $N = 335$ ,  $\bar{X}$  age = 30.92,  $\bar{X}$  years after diagnosis = 21.79.

**Methods:** T tests and structural equation modeling.

**Main Research Variables:** Mammogram recency, health concerns, affect, motivation, and survivor-provider interaction.

**Findings:** Forty-three percent of the variance was explained in mammogram recency. Survivors most likely to follow the recommended mammogram schedule were directly influenced by cancer treatment exposure to mantle radiation ( $p = 0.01$ ), less intrinsic motivation ( $p = 0.01$ ), positive affect ( $p = 0.05$ ), recent visits to an oncology clinic ( $p = 0.01$ ), discussion of subsequent cancer risks with a physician ( $p = 0.001$ ), perceptions of more severe late effects ( $p = 0.05$ ), age (40 years or older) ( $p \leq 0.001$ ), and a print media intervention detailing breast cancer risks and follow-up strategies.

**Conclusions:** Perceived symptoms, motivation, affect, provider influences, readiness for medical follow-up, and knowledge of treatment exposures are potential modifiable targets for intervention to support mammography screening in childhood cancer survivors at risk.

**Implications for Nursing:** (a) Provide written summaries of treatment exposures and recommended schedule of mammography screening at the end of cancer treatment and throughout follow-up; (b) identify and address survivor symptoms and concerns that may negate screening; and (c) enhance motivation for screening by tailoring personal risk information to health concerns, affect, and readiness for follow-up.

diagnosis of breast cancers at early stages, thereby requiring less invasive treatments and incurring improved outcomes and enhanced quality of life. Annual screening mammography with adjunct breast magnetic resonance imaging is recommended for childhood cancer survivors, beginning at age 25 or eight years after completion of radiation therapy, whichever occurs last (Children's Oncology Group, 2006). Among Hodgkin