

# Factors Affecting Performance of Usual Activities During Radiation Therapy

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**Purpose/Objectives:** To examine factors that might affect patients' ability to perform their usual activities during radiation therapy.

**Design:** Prospective, longitudinal design.

**Setting:** A community hospital radiation oncology department.

**Sample:** 77 patients receiving radiation therapy for curative or adjuvant intent.

**Methods:** The role function mode of the Roy Adaptation Model guided the study. Participants rated the extent to which they were performing their usual activities on a scale of 0 (not at all) to 10 (all the time). Data were collected at baseline prior to starting radiation, weekly during treatment, and one month post-treatment. Cross-sectional and longitudinal regression analyses were used to capture changes in performance of usual activities over time.

**Main Research Variables:** Performance of usual activities, Karnofsky Performance Status (KPS), fatigue, and side effects.

**Findings:** Participants maintained relatively high performance status throughout the course of treatment. The ability to perform usual activities decreased significantly from baseline to the end of treatment. Ability to perform usual activities was highly negatively correlated with fatigue and side effects. Work, sick-leave benefits, living situation, fatigue, KPS, and comorbidities were associated with ability to perform usual activities along the trajectory of radiation therapy.

**Conclusions:** Fatigue and side effects of treatment negatively affected patients' ability to carry out their usual activities during radiation therapy.

**Implications for Nursing:** Management of side effects of treatment, including fatigue, and supporting patients' need to work or not work during treatment may help patients continue to perform activities that are important to them during radiation therapy.

## Key Points . . .

- Side effects of treatment, including fatigue, may impact patients' ability to maintain their usual activities such as work, household chores, and social activities during radiation therapy.
- Patients with comorbidities, those who live alone, those who receive concurrent chemotherapy, and those who receive radiation to the chest or head and neck area are at higher risk for interference with usual activities.
- Research to further identify types of activities impacted by radiation therapy is needed to guide nursing interventions.

(1992) included the ability to perform everyday activities in a broad definition of quality of life. The purpose of this study was to examine factors that might affect patients' ability to perform their usual activities during radiation therapy.

## Literature Review

Side effects of radiation therapy have been well documented in the literature. Most side effects of radiation therapy are specific to the part of the body being treated (e.g., diarrhea during radiation to the pelvis, dysphagia and esophagitis during radiation to the chest, oral mucositis during radiation to the head and neck region) and generally begin after the second or third week of treatment (Bansal et al., 2004; Knopp, 1997; Maher, 2000). In addition, fatigue consistently has been shown to be the most common and distressing side effect of radiation therapy, occurring in 65%–100% of all patients receiving radiation therapy for cancer (Haylock & Hart, 1979; Munro & Potter, 1996; Oberst, Hughes, Chang, & McCubbin, 1991; Stone, Richards, A'Hern, & Hardy, 2001; Williams et al., 2001). Fatigue related to radiation therapy generally begins in approximately the second week of treatment, increases during the course of treatment, peaks at the end of treatment, and returns to near baseline by one month post-treatment (Greenberg, Sawicka, Eisenthal, & Ross, 1992; Irvine, Vincent, Graydon, Bubela, & Thompson, 1994; Poirier, 2006).

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Cancer treatment, such as radiation therapy, may have an impact on patients' ability to maintain their usual activities, including work, household chores, and social activities. Although side effects of cancer and cancer treatment, such as fatigue, have been shown to be related to functional status, no study was found that specifically looked at how levels of fatigue and site-specific side effects were associated with performance of usual activities during radiation therapy. Ahlberg, Ekman, and Gaston-Johansson (2005) found, in a sample of women receiving radiation for uterine cancer, that functional status decreased from baseline to completion of treatment. A correlation was found between general fatigue and functional status. The impact of site-specific side effects was not studied. A priority topic of the Oncology Nursing Society ([ONS], 2006) 2005–2009 Research Agenda is to maintain or promote physical function, functional status, or functional ability of individuals who receive cancer treatment. One measure of functional status is a patient's ability to carry out his or her usual activities. Gotay, Korn, McCabe, Moore, and Cheson

Fatigue also is reported by patients undergoing other types of cancer treatment. A majority of patients treated for cancer receive multimodality treatment—some combination of surgery, chemotherapy, and radiation therapy—which might exacerbate expected side effects of each treatment, especially fatigue (Christman, Oakley, & Cronin, 2001; Cimprich, 1998; Frogge & Cuning, 2000; McDaniel & Rhodes, 2000; Schwartz et al., 2000). Chemotherapy may be given prior to a course of radiation or concurrently with radiation. Use of chemotherapy may enhance side effects of radiation, such as diarrhea during pelvic radiation and esophagitis during chest radiation (Camp-Sorrell, 2000; Maher, 2000).

Patients frequently report changes in usual activities, including employment, during treatment for cancer, often as a result of side effects of treatment (Arndt, Merx, Stegmaier, Ziegler, & Brenner, 2004; Karki, Simonen, Malkia, & Selfe, 2005; Knobf & Sun, 2005; Poirier, 2005; Serin et al., 2004). In addition, several studies have shown that functional status declines during radiation therapy (Ahlberg et al., 2005; Auchter et al., 2001; John, 2001; Knobf & Sun). Functional status also has been shown to decline during chemotherapy (Costanzo, Lutgendorf, Rothrock, & Anderson, 2006; Nowak, Stockler, & Byrne, 2004; Pandey et al., 2005). Cancer-related fatigue often is associated with decline in functional status (Ahlberg et al.; Curt et al., 2000). No study was found examining disruption of activities in patients with cancer as defined by the Roy Adaptation Model. However, DiMattio and Tulman (2003) found, in a study of 61 women following coronary artery bypass graft, that the women had minimal disruption in primary role (personal care activities) but moderate disruption in secondary (employment, household activities) and tertiary roles (leisure, volunteer, and social activities). Ahlberg et al. did find that the social dimension of functional status, which equates to Roy's tertiary role, decreased significantly from baseline to completion of radiation therapy for uterine cancer.

Individual characteristics such as comorbidity, age, gender, level of education, employment status, and living situation may be associated with functional status in cancer (Garman, Pieper, Seo, & Cohen, 2003; Lundh, Seiger, & Furst, 2005; Pandey et al., 2005; Schmidt et al., 2005; Sultan et al., 2004; Uzun, Aslan, Selimen, & Koc, 2004). Disease and treatment characteristics such as treatment site, extent of disease, multimodality treatment, and symptom severity also may affect functional status during cancer treatment. Patients with more extensive disease; those receiving multimodality treatment; those experiencing more severe symptoms, including pain, sleep disturbances, and fatigue; and those receiving radiation treatment to the chest or head and neck regions experience greater disruption in functional status and thus in their ability to carry out their usual activities (Ahlberg et al., 2005; Bansal et al., 2004; Given, Given, Azzouz, & Stommel, 2001; Kurtz, Kurtz, Stommel, Given, & Given, 1999; Rosenfeld, Roth, Gandhi, & Penson, 2004; Tanaka, Akechi, Okuyama, Nishiwaki, & Uchitomi, 2002; Tchen et al., 2003).

## Conceptual Framework

The role function mode of the Roy Adaptation Model (Roy & Andrews, 1999) guided the design of the study and the selection of variables. In this nursing model, the role function mode encompasses three types of roles: primary, secondary, and tertiary. Primary roles are determined by an individual's

age, gender, and developmental stage and include basic activities of daily living such as bathing, dressing, and walking (DiMattio & Tulman, 2003; Roy & Andrews). Secondary roles are assumed by the individual to accomplish tasks associated with primary role and include household chores, paid employment, and care of family members (DiMattio & Tulman; Roy & Andrews). Tertiary roles are temporary in nature and are related to secondary roles (DiMattio & Tulman; Roy & Andrews). Tertiary roles include volunteer activities, socialization with friends and family, and hobbies. The present study incorporated all three roles into the variable of usual activities that included basic activities of daily living as well as more advanced activities associated with secondary and tertiary roles (see Figure 1).

Site-specific treatment-related side effects, fatigue, pain, and sleep disturbances represented the physiologic mode response of the Roy model. Contextual stimuli that may influence performance of usual activities measured in the present study included age, gender, education, living situation, employment patterns, disease site and stage, radiation treatment site, radiation dose, extent of surgery, concurrent or sequential chemotherapy, and comorbidities.

## Methods

### Sample

Seventy-seven participants were recruited from one community hospital radiation oncology department as part of a larger study of the relation of employment patterns to fatigue during radiation therapy (Poirier, 2006). One study participant was receiving hospice services at what would have been his one-month follow-up visit and thus did not complete that assessment. Using Cohen (1988) formulas, the researcher determined that the sample size yielded sufficient effect size and power to detect significant relationships among the variables and differences between groups (Munro, 2001). With a sample

#### Primary Roles

Related to development stage  
Activities of daily living  
Walking or bathing  
Eating or dressing

#### Secondary Roles

Associated with primary roles  
Household chores  
Paid employment  
Caring for family members

#### Tertiary Roles

Related to secondary roles  
Sexual relations  
Socializing with family and friends  
Volunteer activities  
Hobbies

#### Usual Activities

**Figure 1. Conceptualization of the Role Function Mode of the Roy Adaptation Model**

*Note.* Based on information from Roy & Andrews, 1999.

size of 77, findings revealed a medium effect size with powers of 0.7–0.91 in weeks two and three of treatment. However, by week four of treatment, findings revealed a large effect size with powers of 0.91–0.99.

Individuals with unstable medical or psychiatric comorbidities and those receiving radiation therapy to the brain were excluded to avoid confounding the effects of radiation therapy with limitations of activities that may be associated with those conditions. Individuals with a Karnofsky Performance Scale (KPS) score of 70 or less frequently are hospitalized or reside in a rehabilitation facility, so they also were excluded from the study because they would be unable to carry on normal activity or active work (Yates, Chalmers, & McKeegney, 1980). All participants received at least four weeks of radiation therapy for either curative or adjuvant intent.

## Instruments

Participants were asked to rate the extent to which they were continuing to perform their usual activities on a **single-item scale** of 0 (not at all) to 10 (all the time). The actual definition of what constitutes usual activities was left to the study participants. Participants were asked to consider basic activities of daily living such as bathing, dressing, walking, and eating (primary roles); housework, employment, and caring for family members (secondary roles); and any hobbies or volunteer, community, school, or other social activities (tertiary roles) that they engaged in prior to their diagnosis. **KPS** was used to measure performance status (Karnofsky & Burchenal, 1949; Mor, Laliberte, Morris, & Weimann, 1984; Yates et al., 1980). KPS scores range from 0 (moribund) to 100 (normal, no evidence of disease). KPS has been shown to correlate with other variables related to physical functioning, such as pain, sleep, fatigue, and physical quality of life (Akechi, Kugaya, Okamura, Yamawaki, & Uchitomi, 1999; Mor et al.; Yates et al.). Inter-rater reliability of 0.99 was achieved for the KPS in the present study.

The revised **Piper Fatigue Scale (PFS)** was used to measure radiation therapy–related fatigue. The revised PFS measures four dimensions of subjective fatigue: behavioral/severity (the impact fatigue has on activities of daily living), affective/emotional (the meaning individuals attribute to the fatigue), sensory (the mental, physical, and emotional symptoms of fatigue), and cognitive/mental (the impact fatigue has on thought processes), scaled from 0 (no fatigue) to 10 (severe fatigue) (Piper, 1997; Piper et al., 1998). Cronbach standardized alpha coefficient was 0.98 for the mean total fatigue scores.

Investigator-developed questionnaires were used to measure sick-leave benefits and employment patterns. Participants responded to questions about hours and days of work, job title, actual duties performed, and availability of paid time off (Poirier, 2005). Questions about employment were designed based on the Boston Area Survey (Center for Survey Research, 2002).

Information on age, gender, education, living situation (i.e., living alone or with a spouse or domestic partner, a roommate, dependent children, grown children, elderly parents, or other relative), cancer or treatment site, stage of disease, other treatment for cancer (e.g., surgery, chemotherapy), radiation dose, comorbidities, presence or absence of pain, and sleep disturbances were obtained by participant self-report and the medical record (Poirier, 2005, 2006). The radiation therapy patient care record based on the Common Toxicities Scoring

Scale (National Cancer Institute, 2003) was used to rate site-specific treatment-related side effects on a 0–4 scale.

## Procedures

Following approval by the appropriate institutional review boards, potential study participants were referred to the investigator by a radiation oncologist or primary nurse. A written informed consent and authorization for use of protected health information were obtained prior to data collection. Risks to study participants were minimal, with just an additional 10–20 minutes of time above that usually spent on routine assessments required to obtain study data (Poirier, 2005).

## Design

The data for the present study were collected as part of a larger study of the relation of employment patterns and fatigue during radiation therapy. The study employed a prospective, longitudinal design with data collected at baseline prior to starting radiation therapy, weekly during treatment, and at the one-month follow-up visit.

## Data Analysis

STATA<sup>®</sup> version 7.0 (StataCorp LP) and SAS<sup>®</sup> Learning Edition 2.0 (SAS Institute Inc.) were used to analyze the data. Participants' ratings of performance of their usual activities for the entire sample and for groups categorized by treatment site were graphed for each measurement point. Significant differences in usual activities at each measurement point were assessed with paired *t* tests. The relationships between performance of usual activities and the other variables measured in the study were evaluated with bivariate correlations.

A series of linear regression analyses were used to test for relations between usual activities at each measurement point and mean fatigue score from the previous measurement point. A second series of linear regression analyses were used to test for relations between usual activities at each measurement point and mean side-effect scores from the previous measurement point.

Because the study consisted of repeated observations over time for the same set of participants, longitudinal regression analysis was used to model performance of usual activities as a function of fatigue, employment patterns, and individual characteristics with time as the single within-subjects factor (Der & Everitt, 2002). Confirmatory regression analysis was conducted using the simultaneous regression procedure, entering all independent variables supported by the literature review into the regression model at the same time (Burns & Grove, 2001). Variables were retained or eliminated based on results of regression diagnostic tests, the strength of the supporting literature, and statistical significance.

## Results

The most common treatment site was the breast (44%), followed fairly equally by the chest, pelvis and abdomen, prostate, and head and neck. Pelvis and abdomen radiation were collapsed into one group because only one participant received treatment to the abdominal area (pancreas). Comorbidities were distributed evenly across gender and treatment sites, regardless of whether participants received chemotherapy or surgery. The comorbidities were primarily hypertension,

hypercholesterolemia, and osteoarthritis. Table 1 summarizes selected individual characteristics for the sample.

Bivariate correlations were measured between performance of usual activities along the trajectory of radiation therapy and the other variables included in the study. These included mean fatigue, side effects, KPS, sleep disturbances, presence of pain, radiation dose, hours of work, sick-leave benefits, age, living situation, gender, education, comorbidities, stage of disease, chemotherapy, surgery, and specific treatment site. Performance of usual activities was correlated strongly with KPS, treatment-related site-specific side-effect scores, and mean fatigue. Performance of usual activities was correlated moderately with sleep disturbances, pain, hours of work,

and chemotherapy, whether it was given prior to radiation or concurrently with radiation. Performance of usual activities was correlated weakly with availability of sick-leave benefits, education, presence of comorbidities, and previous surgery within three months prior to starting radiation (either minor such as a breast lumpectomy or major such as radical prostatectomy or hysterectomy). Age, gender, and stage of disease were not correlated with performance of usual activities at any time during radiation therapy.

## Performance Status

All participants had a KPS of 80 or greater at entry into the study ( $\bar{X} = 93.31$ ,  $SD = 6.10$ ). KPS remained relatively high throughout the course of treatment, although it did decrease somewhat by the end of treatment ( $\bar{X} = 86.04$ ,  $SD = 5.63$ ). By one month post-treatment KPS had returned to baseline levels ( $\bar{X} = 94.01$ ,  $SD = 6.27$ ). KPS was positively related to performance of usual activities ( $r = 0.64$ ,  $p < 0.0001$ ) and inversely related to mean fatigue, site-specific side effects, and radiation dose ( $r = -0.61$ ,  $p < 0.0001$  and  $r = -0.71$ ,  $p < 0.0001$ ,  $r = -0.41$ ,  $p < 0.0001$ , respectively). All but two participants maintained a KPS of 70 or greater during the course of radiation therapy. Two participants dropped their KPS to 50 and 60, respectively, during an acute hospitalization related to toxicity of combined chemotherapy and radiation therapy.

## Site-Specific Treatment-Related Side Effects

Participants were assigned a total side-effect score at each measurement time using the radiation therapy patient care record. Site-specific treatment-related side effects increased over the course of treatment from a range of 0–7 ( $\bar{X} = 1.14$ ,  $SD = 1.56$ ) by week two to a range of 0–15 at the end of treatment ( $\bar{X} = 3.71$ ,  $SD = 3.00$ ). The highest side-effect scores were noted by participants receiving radiation therapy to the chest, followed by participants receiving radiation to the head and neck, pelvis, breast, and prostate. Performance of usual activities was inversely related to side-effect scores during the course of radiation therapy ( $r = -0.52$ ,  $p < 0.0001$ ).

## Fatigue

At baseline, 37 (48%) of the participants reported some fatigue, which generally was mild. At the completion of therapy, 75 (97%) of the participants reported fatigue, with 23 (30%) participants reporting moderate or severe fatigue. At the one-month follow-up visit, 42 (55%) continued to report some fatigue, although it primarily was mild. Mean total fatigue scores on the PFS for the entire sample ranged from 0–4.77 at baseline ( $\bar{X} = 0.46$ ,  $SD = 0.93$ ), 0–8.77 at the completion of treatment ( $\bar{X} = 2.84$ ,  $SD = 2.40$ ), and 0–4.82 ( $\bar{X} = 0.77$ ,  $SD = 1.20$ ) at one month post-treatment. The ability to perform usual activities during radiation therapy was inversely related to mean total fatigue scores ( $r = -0.70$ ,  $p < 0.0001$ ).

## Employment Patterns

Seventy-three percent ( $n = 56$ ) of the participants were working at the start of radiation therapy. The number decreased to 58% ( $n = 45$ ) by the end of radiation and increased to 82% ( $n = 62$ ) one month post-treatment. Several participants who had chosen not to work during their radiation therapy returned to work by their one-month post-treatment visit. Average number of hours worked per week ranged from 12–60 at the time of diagnosis ( $\bar{X} = 37$ ,  $SD = 7.99$ ), 0–60 at the start of radiation ( $\bar{X} =$

**Table 1. Selected Sample Characteristics**

Characteristic	n	%
<b>Age (years)</b>		
Range = 29–67	–	–
$\bar{X} = 53.95$	–	–
$SD = 8.44$	–	–
<b>Education (years)</b>		
Range = 8–18	–	–
$\bar{X} = 14$	–	–
$SD = 2.21$	–	–
<b>Gender</b>		
Male	32	42
Female	45	58
<b>Living situation</b>		
Alone	18	23
Family or significant other	59	77
<b>Comorbidities</b>		
None	21	27
1–2	39	51
> 2	17	22
<b>Stage of disease</b>		
I	27	35
II	21	27
III	16	21
IV	8	10
Other	5	7
<b>Chemotherapy</b>		
Prior only	19	25
Concurrent only	3	4
Both	17	22
None	38	49
<b>Surgery</b>		
Major	21	27
Minor	29	38
Biopsy only or none	27	35
<b>Treatment site</b>		
Chest	13	17
Lung	9	12
Esophagus	3	4
Other	1	1
Abdomen or pelvis	9	12
Rectal	5	6
Bladder	1	1
Uterus	2	3
Pancreas	1	1
Head or neck	10	13
Prostate	11	14
Breast	34	44

N = 77

26, SD = 18.19), 0–48 by the end of treatment ( $\bar{X}$  = 19, SD = 17.85), and 0–48 at one month post-treatment ( $\bar{X}$  = 28, SD = 15.30) (Poirier, 2005). Twenty-five (45%) of the 56 study participants employed at the start of radiation made changes in their employment during their radiation therapy course. Changes included stopping work altogether, changing type of duties, working from home, or decreasing hours or days worked per week. Side effects of treatment, including fatigue, were the major reasons for making changes in employment. However, two participants stopped work altogether because their employers were not able to adjust their hours of work to accommodate time required for treatment.

## Performance of Usual Activities

Figure 2 graphically displays the decline in performance of usual activities over time for all study participants and for study participants divided by treatment site. Performance of usual activities begins to decline after week one of treatment, the nadir is at the end of treatment, and levels return to near baseline by one month post-treatment. Participants receiving radiation therapy to the pelvis had lower performance scores at baseline than participants receiving radiation to the other sites. The trend was toward lower performance scores over time but the decline was not statistically significant. All nine participants receiving radiation to the abdomen or pelvis region had undergone major surgery six to eight weeks before beginning radiation (e.g., Whipple procedure, total abdominal hysterectomy, colon resection, cystectomy). Study participants receiving radiation therapy to the head and neck area still had significantly decreased performance of usual activities at the one-month follow-up visit as compared to baseline.

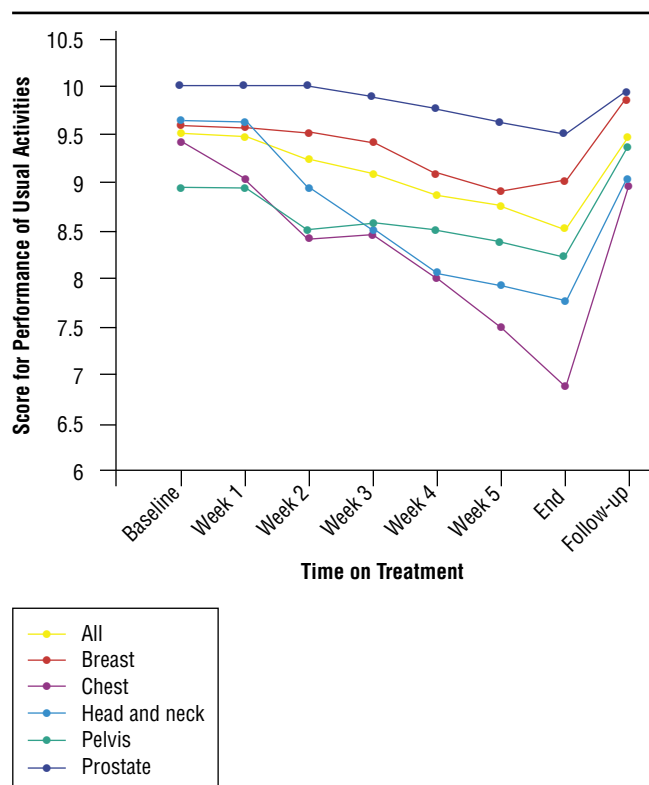
In a series of linear regression analyses, mean fatigue scores from the previous week were negatively associated with ability to carry out usual activities at each measurement point. That is, as fatigue increased each week, participants were less able to carry out their usual activities in the following week. The amount of variance in usual activities explained by mean fatigue scores ranged from a low of 16% at week two to a high of 50% at the end of treatment.

In another series of linear regression analyses, mean side-effect scores from the previous week were negatively associated with ability to carry out usual activities at each measurement point, beginning in week two. That is, as side effects increased each week, participants were less able to carry out their usual activities in the following week. The amount of variance in usual activities explained by mean side-effect scores ranged from 11% at week three to 32% at the end of treatment.

A longitudinal regression model was developed. Bivariate correlation between KPS and treatment-related side effects was  $-0.71$ , which could represent a potential issue with multicollinearity; thus, KPS and side effects were not used as independent variables in the same regression model (Burns & Grove, 2001; Wulder, 2005). After controlling for KPS and work, 59% of the variance in usual activities was accounted for by mean fatigue, living situation, presence of comorbidities, and availability of sick-leave benefits.

## Discussion

The present study found that several factors were associated with a decrease in patients' ability to carry out their usual activities during a course of radiation therapy. Increases in



**Figure 2. Performance of Usual Activities by Treatment Site**

fatigue and site-specific treatment-related side effects over the course of radiation therapy were associated with a decrease in performance of usual activities in subsequent measurement points. Previous studies found a correlation between fatigue and functioning but did not look at other side effects of radiation (Ahlberg et al., 2005; Curt et al., 2000). Management of all side effects of treatment, not only fatigue, is essential in helping to maintain patients' functional status during radiation therapy.

The presence of comorbidities and living alone also were associated with decreased performance of usual activities. The study findings were consistent with previous findings that the presence of comorbidities and the absence of social support can adversely affect functioning in patients with cancer (Garman et al., 2003; Kurtz et al., 1999; Sultan et al., 2004). These high-risk patients require earlier and more intense interventions. Patients who received radiation to the head and neck area also were considered high risk; they still had statistically significant decreased ability to carry out usual activities at the one-month follow-up visit.

Contrary to what would have been expected based on the literature, chemotherapy had mixed effects on usual activities in the present study. In multivariate analyses, chemotherapy, whether given prior to or concurrently with radiation, was not associated with a decrease in the performance of usual activities. However, in a bivariate correlation, chemotherapy was moderately correlated with performance of usual activities. In addition, chemotherapy did contribute to increases in treatment-related site-specific side effects. Participants receiving radiation therapy to the prostate (who received no chemotherapy) and those receiving radiation therapy to the breast (56% of whom received chemotherapy prior to radia-

tion; none received chemotherapy during radiation) had the least impact on their ability to carry out their usual activities. Participants receiving radiation therapy to the chest, abdomen or pelvis, or head and neck region (more than 60% of whom received chemotherapy concurrently with radiation) had a greater loss of ability to carry out usual activities. Overall, the findings suggest that chemotherapy along with radiation may have a greater impact on functioning than radiation alone.

## Study Limitations

The major limitation of the study was the use of a single-item instrument that asked only about “usual activities”; it did not differentiate what types of activities (e.g., work, household chores, social activities) were affected. Although participants were asked to consider activities such as bathing, dressing, walking, eating, housework, employment, caring for family members, and any hobbies or volunteer, community, school, or other social activities when thinking about usual activities, the study did not obtain specifics about actual activities performed or not performed. Thus, the study was unable to determine which activities were less likely to be continued as fatigue and side effects increased over the course of treatment. Differing medical, social, and demographic situations might affect specific activities differently. Other limitations of the study were the small number of participants receiving treatment to sites other than the breast and the homogeneous racial and ethnic make-up of the sample, which limits the ability to generalize the findings to other treatment sites and other populations.

## Nursing Implications

The present study only asked about “usual activities,” so it could not determine which specific activities (primary, secondary, or tertiary roles) experienced the greatest disruption during radiation. The finding highlights the need for nurses to help patients identify which activities have the greatest priority for them, which activities they might be willing to forgo, and which activities have the greatest potential for disruption. Nurses then can design interventions to support priority activities and help patients maintain optimal functioning. For example, if patients are having difficulty with secondary roles such as cooking, interventions such Meals on Wheels® might be appropriate.

One secondary role that the present study did identify was participation in the workforce. Participants changed their employment status for treatment-related issues, such as side effects, but also for societal-related reasons, such as employers who were not able to adjust work schedules to accommodate treatment times. Nurses can work with patients and employers to try to develop mutually acceptable schedules. Nurses also can engage in policy research and discussions with policy

makers regarding equitable programs related to employment during a course of cancer treatment.

Aggressive management of side effects of treatment, including fatigue, is a major role for nurses in radiation oncology departments and may help patients continue to perform activities that are important to them during radiation therapy, including participation in the workforce (Moore-Higgs et al., 2003). In addition, nurses need to intervene earlier with high-risk populations—those who have significant comorbidities, live alone, receive concurrent chemotherapy, and receive radiation to the chest or head and neck areas.

## Suggestions for Future Research

Evidence-based nursing practice is crucial to the provision of high-quality care to patients with cancer. The present study suggested several areas where outcome-based studies are appropriate.

Replication of the study using valid and reliable instruments such as the Inventory of Functional Status–Cancer (Tulman & Fawcett, 2006; Tulman, Fawcett, & McEvoy, 1991) or the various scales of the Functional Assessment of Cancer Therapy (Brucker, Yost, Cashy, Webster, & Cella, 2005; Cella et al., 1993) would provide more detailed information on what types of activities might be affected by radiation therapy. Appropriate outcome studies can be designed using the instruments to measure the impact of nursing interventions on primary, secondary, or tertiary roles.

Outcome studies that look at the impact of aggressive management of the most common and distressing side effects of radiation treatment, such as fatigue, diarrhea, esophagitis, and oral mucositis, on functional status are also warranted. Such outcome studies will provide practicing nurses with feasible, effective interventions to help patients maintain functional status.

## Conclusions

Although the findings of this study are limited by not differentiating the types of activities affected by radiation therapy, they add to the body of knowledge of factors related to changes in functional status during radiation therapy. The findings can be used to design nursing interventions to improve patient outcomes and to identify areas for further study. Studies such as this that begin to characterize clinically significant changes in functional status are one way to address the ONS 2005–2009 Research Agenda priority topic of identifying nursing-sensitive patient outcomes related to functional status (ONS, 2006).

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