

# Fatigue, Psychological Distress, Coping Resources, and Functional Status During Radiotherapy for Uterine Cancer

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**Purpose/Objectives:** To evaluate how patients diagnosed with uterine cancer experience fatigue, psychological distress, coping resources, and functional status before, during, and after treatment with radiation therapy and to study whether significant correlations exist among these variables.

**Design:** Longitudinal, descriptive, and correlational.

**Setting:** The Department of Oncology, Sahlgrenska University Hospital, Gothenburg, Sweden.

**Sample:** 60 women diagnosed with uterine cancer who were receiving curative external radiation therapy. Typical participants were 64 years old, married, and on sick leave or retired from work.

**Methods:** Data were collected through self-report instruments. Demographic and clinical data were extracted from the patients' records.

**Main Research Variables:** Cancer-related fatigue, psychological distress, coping resources, and functional status.

**Findings:** Patients' fatigue scores increased significantly during and after completion of radiotherapy. The participants reported normal levels of anxiety and depression, and their coping resources changed over time. After completing therapy, all dimensions of function had decreased; for social function, the decrease was significant. The correlation over time was significant among fatigue and physical function, role function, and cognitive function. The variation of the change in fatigue after therapy was completed was explained only by the level of fatigue experienced at baseline.

**Conclusions:** Fatigue is a symptom that increases in connection with radiotherapy. Functional status is influenced by the variation in fatigue levels. Fatigue level before treatment may be an important variable when trying to find a risk factor for the development of fatigue over the course of treatment.

**Implications for Nursing:** Nurses must inform patients receiving radiotherapy about the expected changes in fatigue and functional status. Pretreatment screening for fatigue is needed to identify patients at risk for developing fatigue.

## Key Points . . .

- ▶ Cancer-related fatigue is a symptom that may increase during treatment with radiation therapy.
- ▶ Fatigue level before treatment may be an important variable when trying to determine the risk of developing fatigue over the course of treatment.
- ▶ Pretreatment screening for fatigue and other variables of interest is important to give patients preparatory information about fatigue and to determine whether interventions to reduce fatigue should be used.

et al., 1994). Fatigue is symptomatic of a variety of conditions in patients with cancer (Curt, 2000) and has been explained by patients as a major obstacle to normal functioning and good quality of life (Vogelzang et al., 1997).

Despite significantly more literature on fatigue in recent years, cancer-related fatigue (CRF) remains understudied, and several important questions still are unanswered (Winningham & Barton-Burke, 2000). A lack of knowledge exists regarding the risk factors for developing fatigue in patients with uterine cancer who receive radiation therapy. The purpose of the current study was to describe how patients diagnosed with uterine cancer experience fatigue, psychological distress, coping resources, and functional status before, during, and after treatment with radiation therapy. Furthermore, the study aimed to describe the impact of selected variables on the degree of fatigue. The results of this study can provide new knowledge about the experience of CRF, the relationship between CRF and selected variables, and outcomes in a population of women with uterine cancer, in whom a limited number of studies have been performed.

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Patients with cancer may experience one or more symptoms and distress associated with the symptoms. Symptoms are multiplicative in nature and may act as catalysts for the occurrence of other symptoms. Consequences include effects on mood state, psychological status, functional status, quality of life, disease progression, and survival (Armstrong, 2003). The symptom experience is a dynamic process, involving the interaction of the perception of a symptom, evaluation of the meaning of a symptom, and response to a symptom (Dodd, Miaskowski, & Paul, 2001). Fatigue has been documented as one of the most frequently reported symptoms in patients with cancer (Cella, 1997; Jacobsen et al., 1999; Morrow, Andrews, Hickok, Roscoe, & Matteson, 2002; Stone, Richards, A'Hern, & Hardy, 2000; Winningham

## Theoretical Framework

The Conceptual Model of Symptom Management (CMSM) was developed in the School of Nursing at the University of California, San Francisco (University of California, San Francisco, School of Nursing Symptom Management Faculty Group, 1994). The revised model (Dodd et al., 2001) was used as the conceptual framework for this study. The CMSM is a broad and extensive model that allows researchers to study a symptom from a subjective and objective perspective. Three inter-related dimensions are taken into consideration: (a) symptom experience, (b) symptom management strategies, and (c) symptom outcome. The model is based on the relationships among these three dimensions, and the result is that a symptom can be mapped, evaluated, and treated. The focus for the current study involved symptom experience and symptom outcome.

## Literature Review

### The Experience of Cancer-Related Fatigue

CRF is a subjectively experienced symptom and can be described in terms of perceived energy, mental capacity, and psychological status (Cella, Peterman, Passik, Jacobsen, & Breitbart, 1998; Portenoy & Itri, 1999). Fatigue broadly refers to a sense of malaise, tiredness, exhaustion, or sickness (Flechtner & Bottomley, 2003). Fatigue in patients with cancer has emerged only recently as one of the major concomitants of cancer and its treatment because it has a profound effect on decision making, health-related quality of life, and numerous other symptoms. CRF may be defined as an unusual, persistent, subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning (Mock et al., 2000).

Fatigue is one of the most frequently reported unmanaged symptoms of patients with cancer receiving chemotherapy, radiation therapy, or biologic response modifiers and affects 70%–100% of patients (Ahlberg, Ekman, Gaston-Johansson, & Mock, 2003). It may persist for months or years after treatment has ended (Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998; Loge, Abrahamsen, Ekeberg, & Kaasa, 2000). Despite the prevalence of fatigue, its causes and severity are less understood because several factors are involved in anti-neoplastic treatment (e.g., anemia, cachexia, infection, metabolic disorders) that may cause fatigue (Cella, Lai, Chang, Peterman, & Slavin, 2002). Data are conflicting concerning whether demographic factors (e.g., age, gender, marital status) influence level of fatigue (Bower et al., 2000; Jacobsen et al., 1999; Woo, Dibble, Piper, Keating, & Weiss, 1998). Several limitations exist in the current research literature on fatigue. For example, the majority of research has focused on the consequences of fatigue, and relatively few studies have examined predictors (Given, Given, Azzouz, Kozachik, & Stommel, 2001).

### Fatigue and Radiotherapy

Fatigue has been reported in almost 80% of patients receiving radiotherapy for lung cancer (Hickok, Morrow, McDonald, & Bellg, 1996), prostate cancer (Janda et al., 2000), and cervical cancer (Klee, Thranov, & Machin, 2000). The incidence and severity of fatigue depend on the irradiated volume, involved organs (Marty, Bedairia, Laurence, Espie, & Cottu,

2001), and length of radiation therapy (Maher, 2000). Fatigue may be multifactorial, involving other symptoms (Harrison et al., 2001). Fatigue usually develops during the first week of treatment and then diminishes two to four weeks after treatment is completed. Several studies have shown that fatigue is believed to be the worst side effect during the last week of treatment (Furst & Ahsberg, 2001; Smets et al., 1998). The level of fatigue slowly decreases to pretreatment levels by three months after treatment (Irvine, Vincent, Graydon, & Bubela, 1998; Schwartz et al., 2000). In addition to fatigue, radiation therapy can lead to anemia, diarrhea, weight loss, and anorexia (Gutstein, 2001), all of which can contribute to the development of fatigue.

The mechanisms of radiation-induced fatigue are not understood, although many theories have been proposed (Faithfull, 1998). The systemic effect of radiation may be related to its cytotoxic effect, where metabolites liberated from the destruction of tumor cells and normal cells participate in an inflammatory reaction, leading to the development of fatigue. An alternative explanation is that the increasing requirements for cellular repair may precipitate fatigue by increasing the body's need for resources (Winningham et al., 1994).

### Factors Influencing the Experience of Cancer-Related Fatigue

**Psychological distress (anxiety and depression):** Patients with cancer may experience psychological distress (e.g., anxiety, depression) at diagnosis, during treatment, or over a long period of time as they adjust to life changes (Sivesind & Baile, 2001). A significant association between fatigue and anxiety has been shown (Graydon, 1994; Molassiotis et al., 1996). Depressive symptoms can interfere with cancer treatment, increase length of hospital stay, reduce a person's ability to care for himself or herself, impair quality of life, and possibly reduce overall survival time (McDaniel, Musselman, Porter, Reed, & Nemeroff, 1995). Fatigue is not only a symptom of many somatic illnesses but also one of the key symptoms of depression (Visser & Smets, 1998). A study by Tchekmedyian, Kallich, McDermott, Fayers, and Erder (2003) examined the relationship between changes in depression and anxiety levels with changes in fatigue levels among anemic patients with lung cancer. Improvements in fatigue were associated significantly with reductions in anxiety and depression. In a study to determine whether fatigue, depression, and pain were significant predictors of health status in patients with breast cancer, Gaston-Johansson, Fall-Dickson, Bakos, and Kennedy (1999) found a significant correlation between depression and fatigue. Studies have found that psychological distress (Irvine et al., 1998; Smets et al., 1998) is related to post-treatment fatigue.

**Coping resources:** Coping, a concept focusing on a situational context and changes within the context, may be defined simply as an effort to manage stress (Lazarus, 1999; Lazarus & Folkman, 1984). Coping can be viewed as adaptation (i.e., routine modes of getting along under relatively difficult conditions) (White, 1985). What a person experiences as stressful depends on the characteristics of the environment and the characteristics of the individual. In 1979, Antonovsky presented a theoretical model designed to advance understanding of the relationships among stressors, coping, and health. The model later formed the foundation of a salutogenesis orientation called sense of coherence (SOC). The concept of SOC reflects the assumption

that individuals have to cope with situations of distress and includes the following three components: comprehensibility, manageability, and meaningfulness. Antonovsky hypothesized that the stronger the SOC, the more likely a person will cope successfully with life stressors. SOC has been empirically shown to be a relatively stable characteristic (Langius, Bjorvell, & Antonovsky, 1992; Schnyder, Buchi, Sensky, & Klaghofer, 2000). On the other hand, SOC can change quickly in a negative direction, for example, in connection with a traumatic event such as admission to a hospital (Antonovsky, 1987; Schnyder et al.). Risk factors for poor adjustment when afflicted with gynecologic cancer have not been investigated adequately (Pearman, 2003). A patient's SOC, defined as coping resources, could be a factor influencing the experience of CRF.

## The Outcomes of Cancer-Related Fatigue

**Functional status:** Outcomes may result from the symptom experience. In the CMSM (Dodd et al., 2001; University of California, San Francisco, School of Nursing Symptom Management Faculty Group, 1994), outcomes address eight factors: quality of life, functional status, emotional status, mortality, morbidity, comorbidity, self-care, and costs. All outcomes may be related to each other as well as to symptom status (Dodd et al.). The current study examined functional status. Functional status is defined as an individual's ability to meet his or her basic needs, fulfill usual roles, and maintain health and well-being (Leidy, 1994). Functional status frequently is discussed as a key element of nursing practice and a critical outcome criterion, and yet the phenomenon is understood poorly because terms such as functional status, functional ability, health status, and quality of life have been used interchangeably (Leidy). Assessing functional status in patients with CRF can provide information about their functioning in routine occupations and about their well-being. Functional status is a significant concern for patients with cancer, and impairment often is associated with symptoms such as fatigue (Cella et al., 1998; Curt, 2000; Redeker, Lev, & Ruggiero, 2000; Yellen, Cella, Webster, Blendowski, & Kaplan, 1997) and insomnia, as well as psychological distress such as depression and anxiety (Redeker et al.). The issue of functional status in women treated with radiotherapy for gynecologic cancer is not well studied, and little is still known about the association with fatigue, psychological distress, coping resources, and selected demographic factors.

## Significance

A lack of evidence exists about the experience of fatigue, the correlations among selected variables, and how fatigue may affect functional status over time in patients with uterine cancer. This study's findings can provide knowledge about predictors of CRF. It will serve as a basis for future longitudinal studies in which different prophylactic strategies against therapy-related fatigue are studied prospectively.

## Purpose

The study had the following research objectives.

1. Describe fatigue, psychological distress, coping resources, and functional status over time in patients with uterine cancer.
2. Describe the relationships among fatigue, psychological distress, coping resources, and functional status over time in patients with uterine cancer.

3. Describe the variation within fatigue that is explained by functional status, psychological distress, and coping resources in patients with uterine cancer.

## Methods

### Design

The investigators used a longitudinal, descriptive, and correlational design.

### Sample and Setting

The study took place in the Department of Oncology at Sahlgrenska University Hospital in Gothenburg, Sweden, where patients from the city of Gothenburg and from the western region (population 1.7 million) are referred for radiotherapy. All patients were treated as outpatients unless severe physical symptoms necessitated hospital admission.

The study population consisted of women diagnosed with uterine cancer who, after surgical treatment (hysterectomy), were scheduled to receive external radiation therapy (46 Gy, 2 Gy/fraction, four days a week) as a part of a curative treatment according to established Swedish guidelines. Other inclusion criteria were that the patients gave informed consent; had the ability to understand, speak, and read Swedish; and understood the purpose of the study as well as the procedures involved. Exclusion criteria were evidence of dementia and a known history of psychiatric disorder. The sample size was estimated to be 55 patients at baseline, according to Wilcoxon signed rank test. This was calculated to a statistical power of 80% and two-tailed probability at 0.05 and an estimated dropout of 5% of the patients over time.

### Instruments

Fatigue was measured by a Swedish version (Furst & Ahsberg, 2001) of the **Multidimensional Fatigue Inventory (MFI-20)** (Smets, Garssen, Bonke, & de Haes, 1995; Smets, Garssen, Cull, & de Haes, 1996). The tool consists of 20 statements that assess five dimensions of fatigue based on different modes of expressing fatigue: (a) general fatigue includes general statements concerning a person's function, such as "I feel rested"; (b) physical fatigue refers to the physical sensation related to the feeling of tiredness; (c) reduced activities; (d) lack of motivation to start any activity; and (e) mental fatigue, which covers cognitive symptoms, such as difficulty concentrating. Each dimension contains four items, and the dimensions are balanced to reduce the influence of response tendencies as much as possible. Each dimension contains two items indicative for fatigue and two items contraindicating fatigue. The response consists of five squares and ranges from agreement with the accompanying statement ("Yes, that is true.") to disagreement ("No, that is not true."). The statements refer to the past few days. The instrument can be presented as a written questionnaire to be completed in the absence of the researcher. The MFI-20 has been used in several studies of patients with cancer and has demonstrated high reliability and validity in patients receiving radiotherapy (Smets et al., 1995). The Swedish version of the MFI-20 has shown good internal consistency (Cronbach's  $\alpha = 0.75-0.94$ ) (Furst & Ahsberg).

The Swedish version of the **Hospital Anxiety and Depression Scale (HAD)** (Zigmond & Snaith, 1983) is a 14-item screening tool that has been used to measure the degree of anxiety (HADA) and depression (HADD). A total score also



can be generated (HADT). Scores are independent of physical symptoms because HAD was developed specifically for the detection of anxiety and depression in medically ill patients by excluding items related to somatic symptoms. The HAD consists of a brief scale of anxiety (seven items) and one for depression (seven items). Replies relate to feelings during the prior week, and ratings are made on four-point scales. Scores range from 0 (no symptoms of depression or anxiety) to 21 (numerous and severe symptoms). Severity ratings correlate highly with psychiatric assessments, and the scale can be used to monitor change over time. The HAD has been used in studies involving general medical outpatients, individuals experiencing chronic illnesses (e.g., cancer, cardiac conditions), and nonpatient community volunteers (Grimm, 1997). HAD scores are defined as follows: 0–7 = noncases, 8–10 = doubtful cases, and 11–21 = cases (Zigmond & Snaith). Item-to-subscale reliability correlations are reported to be 0.41–0.76 for the anxiety items and 0.30–0.60 for the depression items. Spearman correlations between the scales and psychiatric ratings were 0.70 and 0.74, respectively, for anxiety and depression (Grimm). The instrument has good internal consistency for anxiety (0.93) and depression (0.90) (Pasacreta, 1997).

The concept of SOC has been operationalized by the **SOC Scale** (Antonovsky, 1987, 1993). The SOC Scale was designed to test the hypothesis that SOC is related causally to health status and measures overall orientation toward demanding life situations (Antonovsky, 1987). The scale measures comprehensibility, manageability, and meaningfulness. In the current study, the 29-item version of the SOC Scale (11 comprehensibility, 10 manageability, and 8 meaningfulness items) was used. Each item has a seven-point response scale. A high score on the scale indicates high SOC (range = 29–203). Although items on the three dimensions are separable visually, the SOC Scale was developed to measure SOC as a global concept. The Swedish version of the SOC Scale (29 items) has been tested, and a Cronbach's alpha ranging from 0.77–0.89 has been reported (Forsberg & Bjorvell, 1996; Langius et al., 1992; Lundman & Norberg, 1993).

Functional status was measured by a subscale of the **European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ)-C30**, version 2 (Aaronson et al., 1993; Fayers, Aaronson, Bjordal, & Sullivan, 1995). The subscale covers five functional dimensions: physical, role, cognitive, social, and emotional and social function. Subjects are asked to rate each item on a four-point scale. Scores are transformed into a 0–100 scale; a higher score represents a higher level of function. The instrument is well validated, with a Cronbach's alpha  $\geq 0.70$  (Aaronson et al.). The Swedish version of the QLQ-C30 has been used widely and has demonstrated high reliability and validity in different groups of patients with cancer.

## Procedures

The ethics committee at Goteborg University approved the study prior to participant accrual. The project leader or the project's research nurses identified potential subjects who met the inclusion criteria through the hospital's clinical database. All potential participants received verbal and written information. The participants included in the studies gave their consent before any data were collected.

The data were collected within two weeks before the start of radiotherapy, after 30 Gy (plus three weeks), and after com-

pleted treatment with 46 Gy (plus five to six weeks). The first questionnaires (baseline) were given to the patients, who, after having been given instructions, completed them before starting radiotherapy. The remaining questionnaires were given directly to the patients when they were visiting the radiation unit or sent to the patients' homes with a stamped return envelope. One reminder was sent. Demographic and clinical data (age, level of education, marital and work status, cancer stage, other medication, and hemoglobin) were extracted from patients' records.

## Data Analysis

Means, standard deviations, medians, and ranges were calculated for descriptive purposes. For comparison over time for each variable, Friedman's test with Tukey's post-hoc test was used. Spearman's correlations coefficient was used for all correlations analyses. For correlations between two variables over time, intra-individual correlations were calculated and formally tested with Wilcoxon signed rank test. Stepwise linear regression was used (after transforming the dependent variable to normal distribution by calculating normal score using Blom's [1958] method) to find independent predictors related to change in general fatigue and general fatigue at baseline. All tests were two-tailed and conducted at 5% significance level.

## Results

### Sample Characteristics

Of the 82 patients fulfilling the criteria for inclusion in the study, 22 did not agree to participate. Demographic characteristics of the sample ( $N = 60$ ) are presented in Table 1. The group of 22 patients who did not agree to participate did not differ significantly from the study group with regard to demographic characteristics.

Regarding medications for symptoms that might have influenced the perception of fatigue, psychological distress, and functional status, only a few patients were treated for pain ( $n = 1$ ), insomnia ( $n = 1$ ), and depression ( $n = 5$ ). Before treatment started, the mean value for hemoglobin was 131 g/l ( $SD = 11.46$ ). The levels of hemoglobin changed but remained in the normal range during the entire period studied.

### The Experience of Fatigue

Table 2 presents means, standard deviations, medians, and ranges of all dimensions of fatigue. The patients had a low grade of fatigue before treatment. During the first three weeks of therapy, the change from baseline was significant for all dimensions ( $p < 0.05$ ). After radiotherapy completion, significant changes occurred for general fatigue, physical fatigue, reduced activity, and reduced motivation ( $p < 0.05$ ) but not for mental fatigue.

### The Experience of Psychological Distress and Coping Resources

Table 2 presents means, standard deviations, medians, and ranges of psychological distress and coping resources. The participants reported normal levels of anxiety and depression that were defined as noncases (i.e., scores of 0–7) before, during, and after radiotherapy, even though the change for depression from before the start of treatment, after three weeks of therapy, and after therapy was significant ( $p < 0.05$ ). The scores for SOC did not increase significantly over time.

**Table 1. Demographic Characteristics**

Characteristic	n	%
<b>Age (years)</b>		
$\bar{X}$ = 66	—	—
SD = 11	—	—
Median = 64	—	—
Range = 37–84	—	—
<b>Marital status</b>		
Married	36	60
Single or divorced	24	40
<b>Education</b>		
High school	42	70
Some college	4	7
College or graduate degree	14	23
<b>Work status</b>		
Employed full-time	8	13
Employed half-time	6	10
Unemployed	1	2
Sick leave	14	23
Retired	31	52
<b>Children</b>		
Yes	51	85
No	9	15
<b>Children at home</b>	3	5
<b>Cancer stage (Creasman et al., 2001)</b>		
I	46	77
II	6	10
III	8	13

N = 60

### The Experience of Functional Status

Table 2 also presents means, standard deviations, medians, and ranges of the patients' functional status. During the first three weeks of treatment, the scores for physical function, cognitive function, and social function decreased, but not significantly. The opposite was seen for the scores for role function and emotional function, both of which increased. All dimensions of function decreased from baseline to completion of therapy. For social function, the decrease was significant ( $p < 0.05$ ).

### Correlations Between General Fatigue and Selected Variables

The correlation over time between general fatigue and the other fatigue dimensions was significant for all ( $p < 0.001$ ). Significant correlations were observed at baseline between general fatigue and anxiety ( $r = 0.36$ ,  $p = 0.005$ ) and between general fatigue and depression ( $r = 0.71$ ,  $p < 0.001$ ). The correlation over time was significant for depression ( $r = 0.51$ ,  $p < 0.001$ ) but not for anxiety. The patients' coping resources had a significant negative correlation with general fatigue at baseline ( $r = -0.49$ ,  $p < 0.001$ ) but not over time.

Significant negative correlations existed between general fatigue and physical function ( $r = -0.76$ ,  $p < 0.001$ ), role function ( $r = -0.67$ ,  $p < 0.001$ ), emotional function ( $r = -0.53$ ,  $p < 0.001$ ), cognitive function ( $r = -0.44$ ,  $p < 0.001$ ), and social function ( $r = -0.39$ ,  $p = 0.002$ ) at baseline. The correlation over time was significant between general fatigue and physical function ( $r = -0.44$ ,  $p < 0.001$ ), role function ( $r = -0.48$ ,  $p = 0.0015$ ), and cognitive function ( $r = -0.46$ ,  $p = 0.0015$ ), but not for emotional function or social function. A stepwise regression analysis showed that anxiety ( $p = 0.004$ ), physical

function ( $p = 0.002$ ), and role function ( $p < 0.001$ ) explained 69% ( $R^2$ ) of the variation in general fatigue at baseline. The variation of the level in general fatigue after therapy was completed is explained only by the level of general fatigue at baseline ( $R^2 = 53\%$ ,  $p < 0.001$ ). Correlations between variables did not change based on demographic characteristics regarding age, disease stage, or marital status. Table 3 presents the correlations between general fatigue and the other fatigue variables, anxiety, depression, SOC, and functional status at baseline and over time in total.

## Discussion

The current study found that patients had a low grade of fatigue before treatment and that the fatigue score increased significantly during therapy and when it was measured after therapy was completed. This is comparable with the ratings profiles of other populations in other studies (e.g., Furst & Ahsberg, 2001; Smets et al., 1996, 1998; Stone et al., 2001). The findings confirm that the increase of fatigue over the period of radiotherapy in other populations is comparable with the development of fatigue in women with uterine cancer. Stone et al. (2000) showed that fatigue severity was significantly correlated with a number of variables (e.g., depression in patients with different kinds of cancer). This association also has been reported in other studies (Smets et al., 1996). The participants in the current study reported levels of anxiety and depression that were defined as noncases before, during, and after radiotherapy, despite the fact that the level of fatigue increased. In a study by Visser and Smets (1998), no strong evidence was found for a cause-and-effect relationship between depression and fatigue. In contrast, Loge et al. (2000) found a moderate correlation between fatigue and anxiety and depression. The nature of the relationship between fatigue and anxiety and depression is complex; it does not appear to be straightforward. Theoretically, a person's coping resources may be related to his or her level of fatigue. For example, optimists are more likely to engage in active attempts to cope with problems (Smets et al., 1998). The measured coping resources of the patients in the current study did not change significantly over time; thereby, the results confirmed findings from earlier studies (Antonovsky, 1987; Langius et al., 1992; Schnyder et al., 2000).

Few studies have examined CRF and its correlation with functional status. The current study showed a correlation between functional status and fatigue. Given, Given, Azzouz and Stommel (2001) wrote that treatment is related to loss in function. Furthermore, pain, fatigue, and insomnia are significant and independent predictors of changes in functioning. This underscores the importance of interventions to manage symptoms for individuals early in the course of treatment. Clinical interventions should be targeted to keep or even improve patients' functional status with fatigue-management strategies.

An important finding in the current study was that the variation of the level in general fatigue after therapy was explained mainly by the level of general fatigue at baseline. In addition, Smets et al. (1998) stated that the degree of fatigue before the start of treatment might be the most powerful predictor of post-treatment fatigue. This means that the fatigue level before treatment may be an important variable in finding risk factors for the development of fatigue over the course of treatment.

**Table 2. Scores for Fatigue, Psychological Distress, Coping Resources, and Functional Status at Baseline, After Three Weeks of Therapy (+ 30 Gy), and After Therapy Is Completed (+ 46 Gy)**

Variable	Baseline (N = 60)				After Three Weeks of Therapy (N = 47)				After Completed Therapy (N = 53)			
	$\bar{X}$	SD	Median	Range	$\bar{X}$	SD	Median	Range	$\bar{X}$	SD	Median	Range
<b>Fatigue</b>												
General fatigue	10.4	5.3	9.5	4–20	12.7*	5.2	12.0	4–20	13.1*	5.4	14.0	4–20
Physical fatigue	10.1	5.2	8.5	4–20	11.4*	5.5	11.0	4–20	11.7*	5.8	12.0	4–20
Reduced activity	10.9	5.4	11.0	4–20	12.2*	5.3	12.0	4–20	12.6*	6.0	13.5	4–20
Reduced motivation	8.8	4.5	8.0	4–20	9.3*	5.0	8.0	4–20	9.7*	5.2	9.0	4–20
Mental fatigue	8.9	4.7	7.5	4–20	9.7*	5.2	9.0	4–20	9.6	5.2	8.5	4–20
<b>Psychological distress</b>												
Anxiety	5.4	4.6	4.0	0–19	4.1	3.6	4.0	0–13	4.7	4.4	4.0	0–15
Depression	3.4	3.7	2.0	0–17	3.8*	3.9	2.0	0–14	4.2*	4.3	2.0	0–18
<b>Coping resources</b>												
Sense of coherence	147.4	21.6	151.0	76–179	–	–	–	–	146.6	21.4	145.0	91–181
<b>Functional status (higher scores indicate better function)</b>												
Physical function	75.9	21.6	80.0	20–100	74.8	19.5	80.0	33–100	74.0	20.3	80.0	33.3–100
Role function	64.4	33.5	66.7	0–100	66.0	66.7	66.7	0–100	62.6	31.8	66.7	0–100
Emotional function	75.8	20.3	75.0	16.7–100	80.1	19.2	83.3	25–100	78.8	20.8	83.3	25–100
Cognitive function	86.1	23.4	100	16.7–100	84.0	22.2	100	16.7–100	82.1	21.1	83.3	33.3–100
Social function	85.0	21.8	100	0–100	77.7	26.3	83.3	0–100	72.6*	27.0	66.7	0–100

\* $p < 0.05$ ; Friedman's test with Tukey's post-hoc test

## Implications for Nursing Practice

Fatigue increases over the course of radiotherapy, and the literature supports that this symptom is one of the most distressing. Klee and Machin (2001) found that radiotherapy for endometrial cancer exposes patients to one to three months of adverse physical symptoms that affect their daily lives. Patients must be informed of expected changes so that they have a chance to prepare themselves. Patient education also includes helping them to choose the most appropriate interventions to fight fatigue. Nurses should perform pretreatment screenings for fatigue to identify patients at risk for developing fatigue in connection to treatment. An assessment of other variables also may help nurses to identify patients at risk.

Nurses play a critical role in maintaining and improving the well-being and functional status of patients at risk for developing fatigue by understanding experience, risk factors, and outcomes. Although specific gaps in knowledge need to be addressed to guide future practice, nurses should use existing knowledge in the care they are delivering today. All of the interventions proposed for managing cancer treatment-related fatigue are health policy challenges because they represent additions to usual care rather than replacements of existing components of care (Nail, 2002). The first steps in treating fatigue in a patient with cancer are to determine the patient's expectations and to set realistic goals. This necessitates mutual discussion with emphasis on the patient's experience of his or her situation, the disease, treatment plan, and functional status. Because fatigue changes over time, evaluations of the experience of fatigue must be done repeatedly in relation to the disease, the cancer therapy, and the patient's situation, as well as to treatment of fatigue and other symptoms.

In the current study, the CMSM was used as the framework and tested over time, which is innovative. The clinical

relevance of this research is to improve healthcare professionals' knowledge and, thereby, nursing interventions in the care of patients with uterine cancer receiving radiotherapy. The CMSM was used when designing the study, when formulating the research questions for the study, and to get a better understanding of the complexity of the fatigue experience. Furthermore, it provided a way to gain a deeper understanding of the results when looking at influencing factors, responses, and outcomes of CRF. The model will be used and tested in further studies of CRF.

Symptom management is a challenging experience for patients, families, and healthcare professionals. From a nursing perspective, managing symptoms requires an understanding of a person's experience of the symptom as well as the responses and outcomes from the symptoms experience. Healthcare professionals have difficulty developing symptom-management strategies that can be applied across acute and homecare settings because few models of symptom management have been tested empirically (Dodd et al., 2001). The CMSM may provide direction for selecting clinical interventions, informing research, and bridging an array of symptoms associated with a variety of diseases and conditions and allows the integration of science from other fields (Dodd et al.).

## Limitations of the Study

Using questionnaires to collect data offers many advantages, but the practice also has some disadvantages. A questionnaire can be difficult to complete, and forced-choice answers may not reflect an individual's experience. In the current study, a minority of the patients received the questionnaire through the mail rather than by hand for practical reasons. This may have led to differences in the respondents' interpretations of questions. To avoid bias and increase personal contact, the person who was collecting the data tried to have contact with

**Table 3. Correlations Between General Fatigue and Other Fatigue Dimensions, Psychological Distress, Coping Resources, and Functional Status at Baseline and Over Time**

	General Fatigue at Baseline (N = 60) Spearman's Rho	General Fatigue Over Time in Total (N = 53) Spearman's Rho <sup>a</sup>
<b>Fatigue</b>		
Physical fatigue	0.87***	0.65***
Reduced activity	0.84***	0.58***
Reduced motivation	0.68***	0.55**
Mental fatigue	0.60***	0.44*
<b>Psychological distress</b>		
Anxiety	0.36**	0.08
Depression	0.71***	0.51***
<b>Coping resources</b>		
Sense of coherence	-0.49***	-0.26
<b>Functional status</b>		
Physical function	-0.76***	-0.44***
Role function	-0.67***	-0.48**
Emotional function	-0.53***	-0.10
Cognitive function	-0.44***	-0.46**
Social function	-0.39**	-0.41

\* p < 0.05

\*\* p < 0.01

\*\*\* p < 0.001

<sup>a</sup> Formally tested with the Wilcoxon signed rank test; means of intra-individual correlation coefficients for all patients

participants either by telephone or at the patients' next visit to the hospital.

Of the 82 patients fulfilling the criteria for inclusion in the study, 22 did not agree to participate. Important information may be missed when a cohort of a population is excluded, regardless of the reason. In a study such as this, in which the purpose is to describe patients' experience of fatigue, perhaps the most tired patients were those who declined to participate. Even if the patients not included in the study had the same demographic characteristics as those who were included in the study, nothing can be said about their levels of fatigue.

## Further Research

Implications for future research include a follow-up on the present study after 6, 9, and 12 months. The findings could serve as a basis for future longitudinal studies in which different prophylactic strategies, including nursing interventions, against therapy-related fatigue are studied prospectively.

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