FATIGUE, RELAED FACTORS, AND SELF-CARE ACTIONS TO MANAGE FATIGUE OF HEAD AND NECK CANCER PATIENTS RECEIVING RADIATION THERAPY

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF NURSING SCIENCE
(ADULT NURSING)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2001

ISBN 974-04-0800-1

Thesis
entitled

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was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Nursing Science (Adult Nursing)
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ACKNOWLEDGEMENT

I would like to express my deepest gratitude and sincere appreciation to Associate Professor Yauwaluk Lauhachinda, my principal thesis advisor for her understanding, encouragement, support and continuous valuable guidance throughout this study. My appreciation and gratitude is also extended to Professor Somchit Hanucharurnkul, and Assistant Professor Temsak Phungrassami, my co-advisors, Associate Professor Darunee Junhavat, and Associate Professor Pongsri Srimoragot, for their valuable comments and supervision.

My deepest grateful acknowledgement is also extended to Mrs. Ampiporn Sooksom, my dear friend, for valuable help as an English-editor as well as her friendly support, and to Mr. Paul Adams for his kind English editing.

My appreciation is expressed to Assistant Professor Temsak Phungrassami and Miss Ratchamon Katikarn, registered nurse at the Division of Radiology, Songklanagarind Hospital for their valuable advice, discussion, encouragement, and assistance throughout this research study. I likewise thank very much all staff of the Division of Radiology for their cooperation. Further thanks go to all head and neck cancer patients receiving radiation therapy who participated in this study for their cooperation to make this study complete.

I am particularly indebted to the University Development Committee (UDC) for Ministry of University Affairs' funding under the Prince of Songkla University. I am also thankful to the Department of Medical Nursing , Faculty of Nursing, Prince of Songkla University, for providing me with the time and opportunity to undertake this study program. I also record my special appreciation for the kind assistance, encouragement, and friendship granted to me by Miss Luppana Kitrungrote, Mrs. Kaitsara Wanachotitragul and Miss Chiraporn Chammo, classmates of Ramathibodi Nursing No. 23, and other friends for their love and encouragement.

Finally, my gratitude goes to my mother, sisters, and brothers for their entire care and love.

Aimorn Saejew

4236664 RAAN/M : MAJOR: ADULT NURSING; M.N.S. (ADULT NURSING)
KEY WORDS : FATIGUE/ SELF-CARE ACTIONS TO MANAGE FATIGUE / HEAD AND NECK CANCER / RADIATION THERAPY

AIMORN SAEJEW: FATIGUE, RELATED FACTORS, AND SELF-CARE ACTIONS TO MANAGE FATIGUE OF HEAD AND NECK CANCER PATIENTS RECEIVING RADIATION THERAPY. THESIS ADVISOR: YAUWALUK LAUHACHINDA, M.Ed., SOMCHIT HANUCHARURNKUL, Ph.D., TEMSAK PHUNGRASSAMI, M.D. 113 P. ISBN 974-04-0800-1

Fatigue is the most frequently experienced symptom of cancer and cancer treatment that may affect the health state of a person, and as a result treatment may be terminated or discontinued.

This prospective, descriptive study aims to describe patterns of fatigue, and to examine the relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change, and also to explore self-care actions to manage fatigue and their effectiveness.

Purposive sampling was used to recruit 60 head and neck cancer patients, who met the inclusion criteria, from the Division of Radiotherapy at Songklanagarind Hospital' s Faculty of Medicine, in Prince of Songkla University between February and July 2001. The questionnaires used to collect data were the Demographic Characteristic and Clinical Data Form, the Revised Piper Fatigue Scale, the Symptoms Interfering with Eating Questionnaire, The Sleep Disturbance Scale, and the Self-Care Actions to Manage Fatigue Questionnaire. Data were analyzed using the SPSS/FW program.

Results indicated that head and neck cancer patients receiving radiation therapy experienced mild fatigue. The mean scores of total fatigue gradually increased from the first week, peaked at the fourth week, and then gradually declined until the seventh week. However, there were no significant differences between total fatigue scores over time during radiation therapy ($p>.05$). Cluster analysis cannot identify any patterns of fatigue. Fatigue mostly peaked in late afternoon and early evening. The most common causes of fatigue were radiation therapy and lack of nutrition. As to the relationship, fatigue was significantly ($p<.01$) and positively correlated at a high level with symptoms interfering with eating and at a moderate level with sleep disturbance. The most frequently used self-care actions to manage fatigue were lying down and sleeping. Stopping receiving radiation therapy was the most effective strategy.

This study provides guidelines for nurses to assess and give information to head and neck cancer patients receiving radiation therapy who experience fatigue. Moreover, it shows the ability of patients to initiate actions to relieve fatigue.

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เอมอร แซ่จิว: ความอ่อนล้า ปัจจัยที่เกี่ยวข้อง และการดูแลตนเองเพื่อจัดการกับความอ่อนล้าของผู้ป่วยมะเร็งบริเวณศีรษะและคอที่ได้รับรังสีรักษา (FATIGUE, RELATED FACTORS, AND SELF-CARE ACTIONS TO MANAGE FATIGUE OF HEAD AND NECK CANCER PATIENTS RECEIVING RADIATION THERAPY) คณะกรรมการควบคุมวิทยานิพนธ์: รศ. เยาวลักษณ์ เลาหะจินดา, ค.ม. (การบริหารการพยาบาล), ศ. สมจิต หนุเจริญกุล, Ph.D., ผศ. เต็มศักดิ์ พึ่งรัศมี, พ.บ. 113 หน้า ISBN 974-04-0800-1

ความอ่อนล้าเป็นอาการที่พบบ่อยในผู้ป่วยมะเร็งและการรักษาที่ได้รับ ซึ่งอาจส่งผลต่อภาวะสุขภาพ เป็นผลให้การรักษาสิ้นสุดหรือไม่ต่อเนื่อง

การวิจัยเชิงพรรณนาแบบติดตามไปข้างหน้าครั้งนี้มีวัตถุประสงค์เพื่อ ศึกษาแบบแผนของความอ่อนล้า ความสัมพันธ์ระหว่างความอ่อนล้ากับอาการที่รบกวนการรับประทานอาหาร ปัญหาการนอนหลับ ความสามารถในการทำกิจกรรม น้ำหนักและระดับฮีมาโตคริทที่เปลี่ยนแปลง รวมทั้งศึกษาวิธีการและประสิทธิภาพของการดูแลตนเองเพื่อจัดการกับความอ่อนล้าของผู้ป่วยมะเร็งบริเวณศีรษะและคอที่มารับรังสีรักษา ณ หน่วยรังสีรักษา โรงพยาบาลสงขลานครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์ เลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามเกณฑ์ที่กำหนดจำนวน 60 ราย เก็บรวมรวมข้อมูลในช่วงเดือนกุมภาพันธ์ ถึงเดือนกรกฎาคม พ.ศ. 2544 โดยใช้แบบสอบถามข้อมูลส่วนบุคคลและด้านคลินิก แบบวัดความอ่อนล้า แบบสอบถามอาการที่รบกวนการรับประทานอาหาร แบบวัดปัญหาในการนอนหลับ แบบสอบถามวิธีการดูแลตนเองเพื่อจัดการกับความอ่อนล้า วิเคราะห์ข้อมูลโดยใช้โปรแกรม SPSS/FW

ผลการวิจัยพบว่า ผู้ป่วยมะเร็งบริเวณศีรษะและคอที่ได้รับรังสีรักษามีความอ่อนล้าเล็กน้อย โดยเพิ่มขึ้นจากสัปดาห์แรกและสูงสุดในสัปดาห์ที่สี่ แล้วลดลงจนกระทั่งสัปดาห์ที่เจ็ด ความอ่อนล้าโดยรวมที่เปลี่ยนแปลงไม่มีนัยสำคัญทางสถิติ ($p > .05$) เมื่อวิเคราะห์จัดกลุ่ม ไม่สามารถจำแนกแบบแผนของความอ่อนล้าในแต่ละสัปดาห์ได้ ช่วงเวลาที่พบความอ่อนล้าได้มากที่สุด คือช่วงบ่ายและเย็น สาเหตุของความอ่อนล้าที่พบมากที่สุด คือ การได้รับรังสีรักษาและการได้รับอาหารไม่เพียงพอ การศึกษาความสัมพันธ์พบว่า ความอ่อนล้ามีความสัมพันธ์ทางบวกในระดับสูงกับอาการที่รบกวนการรับประทานอาหาร และระดับปานกลางกับปัญหาการนอนหลับอย่างมีนัยสำคัญทางสถิติ ($p < .01$) นอกจากนี้พบว่า วิธีการดูแลตนเองเพื่อจัดการกับความอ่อนล้าที่ผู้ป่วยใช้มากที่สุด คือ การนอนพักและนอนหลับ ส่วนวิธีที่มีประสิทธิภาพมากที่สุด คือ การหยุดรับรังสีรักษา

ผลการศึกษาครั้งนี้ เป็นแนวทางสำหรับพยาบาลในการประเมินและให้คำแนะนำแก่ผู้ป่วยมะเร็งบริเวณศีรษะและคอที่ได้รับรังสีรักษาที่มีความอ่อนล้า อีกทั้งยังแสดงให้เห็นถึงศักยภาพในการจัดการกับความอ่อนล้าที่เกิดขึ้นของผู้ป่วย

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CHAPTER I

INTRODUCTION

Background and Rationale

Cancer of head and neck is a heterogeneous group with variable presentation, staging, treatment, and expected outcome. From the annual statistical reports of the National Cancer Institute of Thailand in 1995, head and neck cancer is 26.8% of total cancer, with the highest incidence in the old-age group. The incidence is three times higher in males than in females (Jacob & Pinto, In Mcdonald, et al., Eds., 1995: 162).

Although not among the five leading causes of death from cancer, the significance of head and neck cancer lies in what they represent to the patient, family, and professionals as an acutely visible and disabling threat to future function and well-being (Haggood, In Otto, Ed., 1997: 227). Head and neck cancer is relatively common in Thailand. Data on cancer incidence from the population-based cancer registries in 1992-1994 in five different regions of Thailand; Bangkok, Chiang Mai, Lampang, Khon Kaen, and Songkhla reported that Songkhla has the highest incidence of oral cavity cancer in males. This is probably directly related to risk behaviors including alcohol drinking and smoking. Remarkably, the incidence of patients with a history of drinking alcohol was 65.4% in males and 8.1% in females, while the history of smoking was 85.2% in males and 9.3% in females (Vatanasapt, V. & Sriamporn, S., In Deerasamee, S., et al., Eds., 1999: 26).

Head and neck cancer stands apart from the others because of their high rate of relapse and low risk for distant metastasis. Treatment consists of surgery, chemotherapy, and radiation therapy or a combination of these (Harris, et al., In Berman, et al., Eds., 1998: 79) with the ultimate goal being survival and quality of life. Ninety five percent of head and neck cancer are squamous cell carcinoma that is sensitive to radiation, so radiation therapy is one of the most common treatment modalities in its initial and terminal stages (Haggood, In Otto, Ed., 1997: 230-245; Strohl, 1987: 42). Combined surgery and radiation therapy for advanced disease offers improved locoregional control and enhanced survival (Sweeney, et al., 1994 cited by Iwamoto In Dow, et al., Eds., 1997: 240).

Radiation therapy of head and neck cancer can be divided into three treatment categories: curative, palliative, or as an adjunct to surgery (Haggood, In Otto, Ed., 1997: 245). Although radiation therapy has many advantages, it can produce many side effects that impact both physical and psychological health (King, et al., 1985: 59; Oberst, et al., 1991: 75-76). Radiation therapy produces reactions in a number of normal tissues, including the skin and membranes, salivary glands, and taste organs. These produce serious nutritional changes such as weight loss and decreased intake. For instance, as a result of normal tissue damage to the head and neck cancer area, patients commonly experience mucositis, xerostomia, abnormal taste sensations, reduced taste acuity, swallowing and chewing difficulties, and loss of appetite (Haggood, In Otto, Ed., 1997: 247-255; Strohl, In Miaskowski & Buchsel, Eds., 1999: 68-76). Therefore, head and neck cancer patients are at extreme risk for developing severe and sustained nutrition problems (Grant, et al., 1989: 196). Furthermore, most patients have to visit the hospital daily for radiation therapy.

Travelling was the most demanding self-care task (Oberst, et al., 1991: 76). They are not only exhausted from travelling, but also tired and fatigued from the side effects and unpleasant symptoms during radiation therapy.

Fatigue is the most frequently experienced symptom of cancer and cancer treatment (Aistars, 1987: 25; Blesch, et al., 1991: 81). Patients complain of an overwhelming lack of energy that severely limits their daily activities. Until recently, fatigue was poorly understood and health professionals had little to offer to treat fatigue. Now, more is known about fatigue, although much remains to be discovered. The underlying pathophysiology of fatigue is complex and difficult to understand. Abnormalities that alter nutrition, hydration, oxygenation, and biochemical markers may lead to fatigue. Multiple factors probably contribute to the fatigue of cancer patients (Paice, In Miaskowski & Buchsel, Eds., 1999: 287-288).

The incidence of fatigue in cancer patients receiving radiation therapy is 65-100% (Blesch, et al., 1991: 81-87; Irvine, et al., 1994: 367-378; King, et al., 1985: 55-61; Kubricht, 1984: 43-52). Fatigue is usually intermittent at the beginning of treatment and then gradually increases as the treatment progresses, and may decline over the weekend when patients are not receiving radiation therapy. Early afternoon and evening are the most common times for patients to feel fatigued. Usually within 3 months after radiation therapy is completed, fatigue decreases to pretreatment level (Blesch, et al., 1991: 81; Irvine, et al., 1991: 196, 1994: 373; King, et al., 1985: 55-61; Kobashi-Schoot, et al., 1985: 310; Winningham, et al., 1994: 28).

Few studies have systematically evaluated the prevalence of fatigue in cancer patients. Blesch and others (1991: 81-87) found that 99% of a convenience sample of patients with breast and lung cancer complained of some degree of fatigue.

Causes of fatigue in cancer patients receiving radiation therapy are not clear, but some research suggests that the risk for fatigue increases with the following factors; age over 34 years, weight loss, mood disturbance, pain, symptom distress, psychological distress, length of treatment, advanced disease, decreased functional performance, anemia and sleep disturbance (Blesch, et al., 1991: 81-87; Irvine, et al., 1991: 188-199, 1994: 367-378; Mock, et al., 1997: 991-1000; Winningham, et al., 1994: 23-36).

Fatigue can affect patients' role performance, lack of energy to carry on normal activities of daily living, decrease social activities and interactions, and negatively affect quality of life (Ferrell, et al., 1996: 1539-1547; King, et al., 1985: 55-61; Skalla & Lacasse, 1992: 1537-1541). Few studies have examined the efficacy of interventions designed to prevent fatigue. Strategies that patients undergoing radiation therapy used to reduce fatigue were categorized in four dimensions: reducing or ceasing activity (lying down, napping, sitting, stopping what one is doing); increasing physical or social activities (exercise, socialization, walking); distraction (listening to music, reading, watching TV); and others (asking for help, doing something different, working, eating or drinking, adequate nutrition, and hydration). Among these, effective strategies included sleeping, exercise, doing something different, and talking to a friend (Graydon, et al., 1995: 23-28; Irvine, et al., 1998: 127-135; King, et al., 1985: 55-61; Mock, et al., 1997: 991-1000; Pritsanapanurungsie, P., 2000: 51-52; Ream & Richardson, 1999: 1295-1303; Winningham, et al., 1994: 23-36).

Like pain, fatigue is not only explained by physiological mechanisms, but also must be understood as a multidimensional concept that includes physical, psychological, social, and spiritual aspects (Ferrell, 1996: 1540). Therefore, self-report is the most valid measure (Piper, et al., 1987: 19). Patients always wait until the fatigue is severe and persistent before initiating self-care actions. Nurses need to educate them proactively, not reactively when difficulties have already occurred (Dodd, 1997: 988). Nursing care of the fatigued patient begins with assessment of the physiological and psychological aspects of fatigue, as well as social factors that may affect fatigue. Patients need guidance in selecting effective and appropriate strategies because, without it, they select common-sense strategies that would have been used before cancer affected them (Ream & Richardson, 1999: 1300).

In Thailand, limited information or research on the mechanisms of fatigue and the relationships between multiple causes, patterns and management of fatigue has been performed. Thus, the management of fatigue represents a major nursing challenge. Pritsanapanurungsie, P. (2000) studied patterns of fatigue, related factors, and self-care actions among breast cancer patients receiving chemotherapy. The results showed that patients experienced moderate fatigue. Nausea, vomiting and, sleep disturbance had positive relationships with fatigue. The most frequently used self-care action to manage fatigue was sleeping and it's effectiveness was nearly complete relief. Nevertheless, there has been no publication related to fatigue in head and neck cancer patients who are receiving radiation therapy over a prolonged period. Consequently, developing effective strategies to prevent and control fatigue, knowledge and understanding about patterns and factors associated with fatigue as well as self-care actions are an area in need of research. The purpose of this study was to explore patterns of fatigue, factors relating to the experience of fatigue, and self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy.

Conceptual Framework

Two models are used in the conceptual framework for this study. Orem's self-care theory addresses the concepts of self-care and the Piper Integrated Fatigue Model (IFM) addresses the concepts of fatigue.

According to Orem (1995), self-care is defined as the practice of activities that individuals initiate and perform on their own behalf to maintain life, health, and well-being by prevention, alleviation, cure, or control of unwanted conditions, and also includes the seeking of and participation in medical care, as well as nursing and other forms of health care. Patients are conceived as active decision-makers who are responsible for fulfilling their self-care demands. Self-care is a deliberate action, which is composed of two phases, intentional acts and productive actions. The first phase, intentional acts, relates to what the person plans, or intends to do, with respect to achieving a certain end or goal. The second phase, the productive phase, consists of actions that a person performs and their effectiveness (Orem, 1995: 104-116; Somchit Hanucharurnkul, 1997: 23-25).

According to self-care theory, side effects of radiation therapy: fatigue, symptoms interfering with eating, sleep disturbance, Eastern Cooperative Oncology Group (ECOG) performance status, and body weight and hematocrit change, are components of the health state which are one of the basic conditioning factors (Orem, 1995: 203). The basic conditioning factor is purported to influence both therapeutic self-care demands and self-care agency. Therapeutic self-care demands is the totality of self-care actions necessary at specific times or over a duration of time to regulate an individual's human functioning and development (Orem, 1995: 187). Self-care agency is the power and capabilities of an individual to engage in self-care (Orem, 1995: 212). Thus, health state is one of the factors which influence the therapeutic self-care demands and self-care agency. Head and neck cancer patients receiving radiation therapy are living with the demands of symptoms. Patients need to exercise their self-care agency by developing a new repertoire of skills and knowledge to meet therapeutic self-care demands, and this results in self-care actions to manage fatigue (Richardson & Ream, 1997: 35).

According to Piper and associates (1987: 19-21), fatigue is defined as a subjective feeling of tiredness that is influenced by circadian rhythm. It can vary in unpleasantness, duration, and intensity. Manifestations of fatigue are the subjective (perceptual) and the objective (physiological, biochemical, and behavioral). The Piper Integrated Fatigue Model is a comprehensive framework that describes biological and psychosocial factors influencing the signs and symptoms of fatigue in clinical populations. These patterns include:

1. Accumulation of metabolites: in cancer patients, fatigue may be caused by the accumulation of lactate, hydrogen ions, cell destruction end-products and toxic metabolites in the blood that inhibit normal cell functioning when cells undergo lysis.

2. Changes in energy and energy substrate patterns: in cancer patients, changes in energy patterns are common and may result from abnormalities in energy expenditure, cancer cachexia, anorexia, infection, fever, and imbalance in the thyroid hormones.

3. Activity/rest patterns: activity/rest patterns can play significant roles in the prevention, cause, and alleviation of fatigue.

4. Sleep/wake patterns: the relationship between sleep disorders in cancer patients and fatigue need to be examined.

5. Disease patterns: fatigue commonly precedes, accompanies, or follows malignancies.

6. Treatment patterns: fatigue is common in cancer patients receiving radiation therapy. Various mechanisms have been proposed to explain radiation-induced fatigue, but the actual mechanism or mechanisms are unknown.

7. Symptom patterns: other symptoms may occur with fatigue such as pain, dyspnea, nausea, and vomiting. Assessment and control of symptoms other than fatigue may reduce or prevent fatigue in cancer patients.

8. Psychological patterns: several psychological patterns, such as depression, anxiety, motivation, beliefs, and attitudes, may influence fatigue in cancer patients.

9. Oxygenation patterns: any factor that alters or interferes with the ability to obtain or maintain adequate oxygen levels in the lungs or blood can influence fatigue. Most people believe that anemia is the most common cause of weakness and fatigue. In reality, there often is no correlation reported between fatigue/weakness and the degree of anemia.

10. Changes in regulation/transmission patterns: any fluid or electrolyte imbalance can potentially affect neurotransmission and muscle force and results in fatigue.

11. Other related patterns: other factors that may be related to fatigue in cancer patients include environmental patterns, social patterns, life event patterns, and innate host factors.

This model delineates the multiple factors that can interrelate and lead to the chronic fatigue. It provides insight into the phenomenon and supports the notion seen in clinical practice that fatigue becomes more complex to manage as it becomes a chronic symptom; a combination of strategies may be needed to manage fatigue. When patients are unable to meet their self-care demands, nurses must work with them to maintain their health and well being. The nurse has a responsibility to assess the health state of every patient, in particular, what symptoms patients experience and how these symptoms interfere with the patients' ability to perform self-care activities. Therefore, the nurse can help them to achieve their self-care. In this study, the symptom of fatigue, which is one of the side effects of radiation therapy, was chosen for study. Subjective experiences (symptoms interfering with eating and sleep disturbance), and objective data (ECOG performance status, and body weight and hematocrit change) are also examined in this study because they may be associated with the symptom of fatigue. Figure 1. illustrates the theoretical integration of these factors, which forms the conceptual framework for this study.

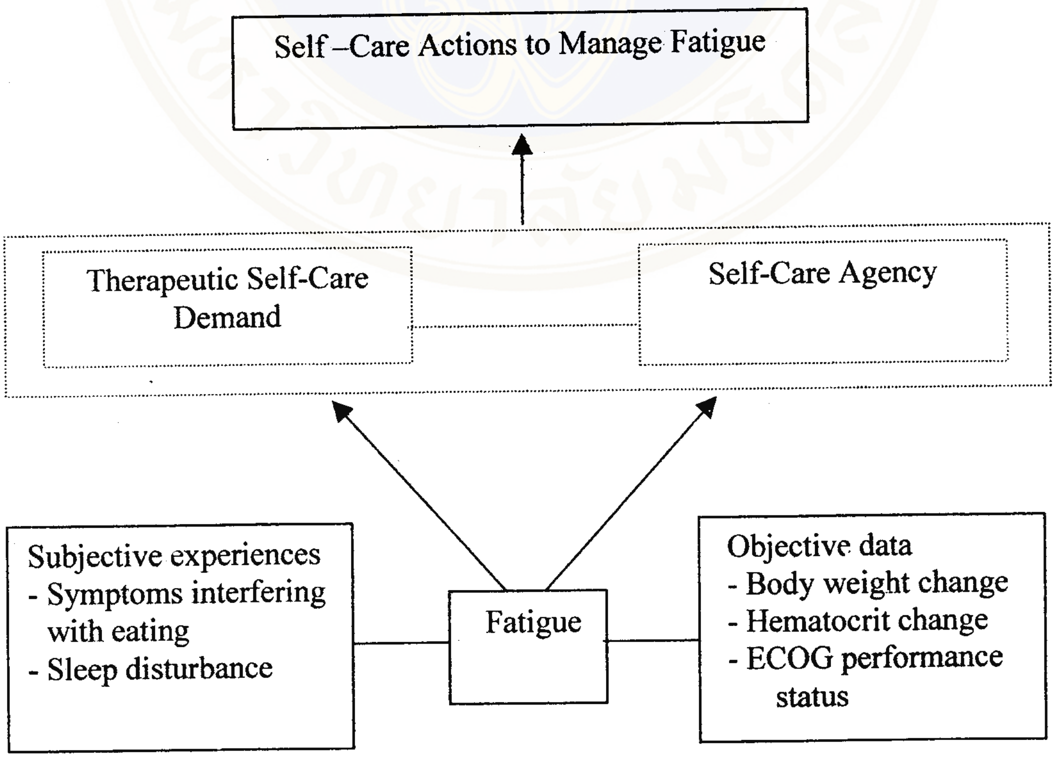

Figure 1. Conceptual framework for this study

Research Questions

1. Does the intensity of each dimension and total fatigue of head and neck cancer patients change over time during radiation therapy?

2. Are there identifiable patterns of fatigue among groups of head and neck cancer patients receiving radiation therapy?

3. When does the peak of fatigue during the day occur, as perceived by head and neck cancer patients receiving radiation therapy?

4. What are the causes of fatigue perceived by head and neck cancer patients receiving radiation therapy?

5. What are the relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change of head and neck cancer patients receiving radiation therapy?

6. What self-care actions to manage fatigue are performed by head and neck cancer patients receiving radiation therapy?

7. What is the effectiveness of the self-care actions to manage fatigue performed by head and neck cancer patients receiving radiation therapy?

Objectives of the Study

1. To describe the intensity of each dimension and total fatigue of head and neck cancer patients over time during radiation therapy.

2. To describe patterns of fatigue of head and neck cancer patients receiving radiation therapy.

3. To explore the peak of fatigue during the day as perceived by head and neck cancer patients receiving radiation therapy.

4. To explore the causes of fatigue perceived by head and neck cancer patients receiving radiation therapy.

5. To examine the relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change of head and neck cancer patients receiving radiation therapy.

6. To explore the self-care actions to manage fatigue performed by head and neck cancer patients receiving radiation therapy.

7. To determine the effectiveness of self-care actions to manage fatigue performed by head and neck cancer patients receiving radiation therapy.

Research Hypotheses

1. There are differences of total fatigue scores over time during radiation therapy.

2. Fatigue is correlated with symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change.

Scope of the Study

This prospective, descriptive study aimed to describe patterns of fatigue, related factors, and self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy. The samples were recruited from the Division of Radiotherapy of Songklanagarind Hospital, Faculty of Medicine, Prince of Songkla University, Songkhla Province. Data were collected from February to July 2001.

Significance of the study

1. To understand the phenomenon of fatigue and use it as a tool for developing effective strategies to manage fatigue for head and neck cancer patients receiving radiation therapy.

2. To encourage nurses to facilitate head and neck cancer patients to perform self-care actions to manage fatigue.

3. To be useful in developing future research for patients experiencing fatigue.

Definition of Terms

Fatigue is a subjective experience of physical and mental tiredness or exhaustion, occurring during radiation therapy. It was measured by the total scores of the Revised Piper Fatigue Scale. The Thai version questionnaire was translated by Pritsanapanurungsie, P. (2000) and the researcher simplified some wording for the old aged group in the southern area. Higher scores mean more fatigue.

Pattern of fatigue is a recurrent configuration of fatigue from all subjects as measured by the total scores of the Revised Piper Fatigue Scale from the first to the last week of radiation therapy; baseline data were measured prior to initiation of radiation therapy.

Symptoms interfering with eating are subjective experiences of discomfort interfering with eating, caused by radiation therapy. They were measured by the questionnaire translated and modified by the researcher which is based on the McMaster University Head and Neck Radiotherapy Questionnaire. Higher scores mean greater symptoms interfering with eating.

Sleep disturbance means a subjective experience of an insufficiency of sleep as measured by the sum of 2-items of sleep disturbance on the Adapted Symptom Distress Scale Form 2. The Thai version questionnaire was translated by Pritsanapanurungsie, P. (2000) and the researcher simplified some wording for the old aged group in the southern area. Higher scores indicate higher sleep disturbance.

Self-care actions to manage fatigue refer to any activities that patients initiate and perform on their own behalf to manage fatigue. The lists of self-care actions were obtained from the self-care actions to manage fatigue questionnaire from Pritsanapanurungsie, P's study (2000).

Effectiveness of self-care actions to manage fatigue is the outcome of self-care actions the patients used to manage fatigue measured by a questionnaire from Pritsanapanurungsie, P's study (2000). Higher scores show more effective self-care actions to manage fatigue.

ECOG performance status refers to the level of potential to perform physical activity prior to initiation of radiation therapy, using the ECOG standard, determined by the radiation oncologist. There are five levels; 0 = asymptomatic, fully mobile, 1 = symptomatic, fully ambulatory, 2 = symptomatic, in bed less than 50% of the day, 3 = symptomatic, in bed more than 50% of the day, but not bedridden, and 4 = bedridden, completely dependent. Higher scores mean more dependent.

CHAPTER II

LITERATURE REVIEW

Literature related to patterns of fatigue, related factors, and self-care actions to mange fatigue of head and neck cancer patients receiving radiation therapy were reviewed, as follows:

1. Radiation therapy for head and neck cancer patients.

2 Fatigue; definitions, mechanisms, and patterns of fatigue in cancer patients receiving radiation therapy and associated factors.

3. Self-care actions to manage fatigue.

Radiation Therapy for Head and Neck Cancer Patients

Head and neck cancer

Although not among the five leading causes of death from cancer, the significance of head and neck cancer lies in what they represent to the patient, family, and professional as an acutely visible and disabling threat to future function and well being. The incidence of head and neck cancer is highest after age 40, with more than 50% occurring in persons over age 65, and the male/female incidence ratio is 2 to 3: 1 (Haggood, In Otto, Ed., 1997: 227). The age at diagnosis is usually over 40 for most malignancies, but salivary and nasopharyngeal tumors may occur in a younger population (Baker & Feldman, 1987: 294). The most common site is the oral cavity followed by the larynx, and then the pharynx. At diagnosis, more than two-thirds of the patients have locally advanced cancer (stage III and IV) (Haggood, In Otto, Ed., 1997: 227). Carcinomas arising in the head and neck region are classified according to anatomic regions rather than cell type. These regions include the nasal cavity and paranasal sinuses, nasopharynx, oral cavity (lip, gingiva, retromolar trigone, buccal mucosa, hard palate, floor of mouth, anterior 2/3 of tongue, and salivary gland), oropharynx (tonsil, base of tongue, lateral and posterior hypopharyngeal wall, and soft palate), larynx (glottic, supraglottic, and subglottic), and hypopharynx (pyriform sinuses and post cricoid) (Baker & Feldman, 1987: 293-294; Couch, In Cummings et al., Eds., 1998: 10-12; Haggood, In Otto, Ed., 1997: 229; Iwamoto, In Dow, et al., Eds., 1997: 239).

The use of tobacco, alcohol, and the combination of both are the best-established and most significant predisposing factors of carcinogens of mucosal malignancy in the oral cavity, oropharynx, hypopharynx, and larynx. Other etiologic factors include malnutrition, excessive mouthwash use, poor oral hygiene, viral exposure (Epstein-Barr virus, herpes simplex virus, and human papillomavirus), and occupational risk factors such as exposure to wood dust, organic compounds, and coal products (Iwamoto, In Dow, et al., Eds., 1997: 239).

Head and neck cancer stands apart from the others because of their high rate of relapse and low risk for distant metastasis (Harris, et al., In Berman, et al., Eds., 1998: 79). Treatment modalities, including surgery, radiation therapy, and chemotherapy may be used alone or in combinations. The ultimate goal of all therapy is patient survival and quality of life (Haggood, In Otto, Ed., 1997: 230) including eradication of the cancer, maintenance of adequate physiologic function, free from suffering symptoms and achievement of socially acceptable cosmetic appearance (Baker & Feldman, 1987: 297). However, cancer in any of the sites of this region has its own natural cause and should therefore be considered separately.

The choice of treatment depends on histology, location, and size of the primary tumor, and involvement of cervical lymph nodes. In general, either surgery or radiation therapy alone can be used effectively for early stage disease (Sloan & Goepfert, 1991 cited by Iwamoto, In Dow, et al., Eds., 1997: 240). If surgery can be done safely and without significant disruption of normal function or cosmetic, surgery is preferable (Shah & Lydiatt, 1995 cited by Iwamoto, In Dow, et al., Eds., 1997: 240). The primary goal of surgery is removal of the primary disease and all metastasis of the lymph nodes in the hope of controlling local disease and preventing recurrent disease. A secondary goal is to preserve structure and function as much as possible without compromising the treatment. A final goal is to maximize the cosmetic and functional outcome (Haggood, In Otto, Ed., 1997: 239). In most advanced stage cancers, combined surgery and radiation therapy offers improved locoregional control and enhanced survival (Sweeney, et al., 1994 cited by Iwamoto, In Dow, et al., Eds., 1997: 240).

Radiation Therapy

Radiation Therapy uses high-energy ionizing radiation to damage cancer cells and slow down the mitotic process. The target for radiation damage within the cell is the DNA and the energy of radiation is able to break the covalent bonds that hold DNA together. This premise holds true for both cancers and normal tissue. The sequelae of radiation therapy in normal tissues are related to both the volume of tissue irradiated and the dose delivered. Ninety-five percent of head and neck cancer are squamous cell carcinoma; and sensitivity and response to radiation occurs, but at a longer time and a higher radiation dose (Strohl, 1995: 23; The National Cancer Institute, Internet, 1999).

Radiation Therapy in head and neck cancer is a localized treatment that can be divided into three treatment categories: curative, palliative, or as an adjunct to surgery (Haggood, In Otto, Ed., 1997: 245). Treatment planning is the most effective means for localizing the area that needs to receive radiation and protecting as much normal tissue as possible without compromising the therapeutic aim (Strohl, 1995: 23). It is based on the nature, size, location, and growth of the tumor, volume of disease, the organs to be spared, and the purpose of treatment (Haggood, In Otto, Ed., 1997: 245). Scheduling for a patient to receive a total curative dose of 5,000-7,000 cGy might require the patient to come to the treatment department 5 days a weeks, Monday to Friday, for a total of 5-7 weeks with the daily fractionated dose being 180-200 cGy per day (Baker & Feldman, 1987: 297). When radiation is used for palliative care, the course of treatment is shorter, usually 2 to 3 weeks. Using many small doses of daily radiation rather than a few large doses helps protect normal body tissues in the treatment area. Weekend rest breaks allow normal cells to recover. Missing or delaying treatments can lessen the effectiveness of radiation treatment (The National Cancer Institute, Internet, 1999).

In certain situations, combining radiation therapy with other therapies maximizes curative rates because of the effect of the other therapies on radioresistant cells. In the treatment of head and neck cancer, radiation therapy may be given preoperatively to prevent marginal recurrence and to control subclinical disease at the primary site or in the nodes. The combination of preoperative radiation therapy and surgery is successful in decreasing both local and regional recurrence. It is usually given for 4-5 weeks, followed by a 4-5 week rest period, which allows time for the acute tissue reaction to subside but stays within a time frame when radioactive cell kill is still occurring. Postoperative radiation therapy may be given to treat residual disease at the surgical margins and subclinical disease in the lymph nodes or may be implanted in the wound. Radiation treatments are usually given about 3 or 4 weeks after surgery to allow for wound healing (Haggood, In Otto, Ed., 1997: 245). The dose of radiation given to treat subclinical disease is 5,000 cGy/5weeks and more than 5,000 cGy/6-7 weeks for gross residual. In addition, radiation therapy may be given before, during, or after chemotherapy. The purpose of radiation therapy before or during chemotherapy is to make the tumor smaller and thus improve the effectiveness of the anticancer drugs, whereas when radiation therapy is used after complete chemotherapy, it may be given to kill any cancer cells that might remain (The National Cancer Institute, Internet, 1999).

Although radiation therapy holds some distinct advantages over other treatment modalities, the patient remains at risk for acute and chronic side effects that impact both physical and psychological health (Haggood, In Otto, Ed., 1997: 252; King, et al., 1985: 59; Oberst, et al., 1991: 75-76). Management of side effects must be aggressive if treatment is to be effective (Strohl, 1995: 23).

Side effects of radiation therapy

The onset, duration, and severity of side effects of radiation therapy vary from patient to patient and mostly depend on factors of treatment and factors of the patient. Treatment factors are total radiation dose, volume irradiated, total radiation time, and energy of radiation dose rate. Patient factors are general conditions, radiosensitivity of normal tissues in the treatment area, condition of the area to be treated, and other concurrent therapeutics, such as surgery and chemotherapy (Hollon, In Moossa, et al., Eds., 1991: 1784).

As with other cancer treatments, there are risks for patients receiving radiation therapy. The short course and high dose of radiation that destroys cancer cells can also damage normal neighboring cells. When this occurs, the patients have side effects in local effects and/or general systemic effects (Bushkin, In Holland, et al., Eds., 1993: 1039; Strohl, 1988: 429-434).

1. **Local effects.** Radiation is a local treatment delivered to those structures located within the target volume. Most physical side effects of radiation therapy are confined to those tissues and organs within the path of the reaction beam. Tissue damage occurs both acutely and as a late effect (Strohl, 1995: 23).

1.1 **Acute effects** The acute side effects of radiation therapy occur in cell populations such as mucous membranes and skin epithelium, which are rapidly proliferative (Parson, 1994 cited by Strohl, 1995: 23). They occur with days or weeks of treatment and usually are gone within a few weeks of finishing therapy, and are due to inflammation, edema and cell death.

1.1.1 **Mucous membranes.** Oral cavity reactions are among the earliest side effects that occur during radiation therapy. Severe mucositis can seriously disrupt nutrition. Appearing after 1 to 3 weeks of treatment, the white or yellow patches consist of dead surface epithelial cells, fibrin and polymorphonuclear leukocytes. A sore throat usually begins 2 weeks into therapy and resolves after therapy. The mucosa should begin to heal within 2 to 3 weeks after therapy. By the fifth week of treatment a confluent mucositis with erythema is present. Secondary infections with candida may also be seen (Parson, 1994 cited by Strohl, 1995: 23-24; Strohl, 1987: 43).

1.1.2 Salivary glands. Depending upon the site of treatment and the extent of disease, the salivary glands may receive significant radiation exposure. Radiation to the salivary glands results in significant decrease in the salivary secretions, changes in pH, viscosity, volume, and inorganic constituents of saliva. Alterations in quality and quantity of saliva inhibit the saliva to cleanse, lubricate, and buffer the oral cavity, predisposing the patient to caries and periodontal disease. Salivary flow may decrease as much as 50% within the first week of therapy, with maximum dysfunction after 6 weeks. This radiation injury to the salivary glands may be permanent (Parzuchowaki, In Otto, Ed., 1994: 247; Strohl, 1995: 24).

1.1.3 Xerostomia (dry mouth). Xerostomia results from radiation destruction of the salivary gland, leading to an increased potential for tooth decay and significant loss of taste (Strohl, 1995: 24). It occurs when radiation therapy causes sclerosis of acini of the salivary gland. It has been reported after 1 week of radiation therapy (Kashima, et al., 1965 cited by Iwamoto, In Dow, et al., Eds., 1997: 253).

1.1.4 Taste changes. Taste alterations related to radiation therapy are first noticed during the second week of treatment. Doses responsible for maximum taste loss are in the 5,000 to 6,500 cGy range. Taste alterations are believed to result from both the loss of saliva and the direct pathological effect of radiation on taste cells (Strohl, 1995: 24). Taste buds show signs of degeneration and atrophy at 1,000 cGy. The mechanism for the loss of sense of taste is radiation-induced damage to the microvilli of the taste cells or to their surfaces. At 3,000 cGy, the patient begins to notice a loss of taste; as therapy progresses, all taste perceptions may be lost (Conger, 1973 cited by Dudjak, 1987: 134). Sweet taste has been found to be the most persistent, but after an external dose of greater than 3,000 cGy, many individuals report that all food has lost its flavor. Taste acuity is partially restored within 20 to 60 days after completion of radiation therapy and is fully restored within 60-120 days; for others it may take up to a year or longer (Donaldson, 1977: 2407-2413; Strohl, 1987: 43, Strohl, In Miaskowski & Buchsel, Eds., 1999: 70).

1.1.5 Skin. A faint and transient erythema of the skin may be noted during the first week of radiation therapy. Dry desquamation of the skin occurs at 2 to 3 weeks and is the result of the killing of the basal cells in the epidermis (Strohl, In Miaskowski & Buchsel, Eds., 1999: 70).

1.2 Late effects. The late side effects of radiation therapy, developing in the less connective tissues, appear months or years after therapy and are predominantly caused by fibrosis, ischemia, stenosis, obstruction, or perforation (Mossman, 1994; Parson, 1994 cited by Strohl, 1995: 23).

1.2.1 Xerostomia. If doses to the salivary glands exceed 3,500 cGy, the gland is replaced by collagen so that permanent loss of salivary flow results. If the doses are within 3,000 to 3,500 cGy, there may be return of function within six months after therapy (Strohl, 1987: 43). The severity of xerostomia peaks at the end of radiation therapy and continues to be a problem at 6 months or longer after therapy (Donaldson, 1977: 2407-2413; Mossman, et al., 1982: 991-997). Dreizen and associates (1976: 273-278) reported that head and neck cancer patients receiving radiation therapy had an 83% reduction in saliva flow at 6 weeks. They also noted that xerostomia continued to progress to a 93% reduction in saliva flow rates at 3 months after therapy.

1.2.2 Salivary glands. Loss of salivary function is complete and permanent after doses greater than approximately 3,500 cGy (Strohl, 1995: 24).

1.2.3 Taste changes. Recovery of taste usually occurs within 2 to 4 months after therapy. Some permanent loss of acuity may be related to xerostomia (Strohl, 1995: 24).

1.2.4 Teeth. A late effect of radiation is the risk for radiation caries resulting from xerostomia and diminished salivary flow. Painful mucositis may result in reluctance to perform good oral care. Radiation caries occur months after therapy (Strohl, 1987: 43, 1995: 24).

1.2.5 Trismus. Fibrosis of muscles of mastication (temporalis, masseter and pterygoid) may lead to trismus. Radiation-induced trismus occurs most often in patients receiving high doses for nasopharyngeal, tonsillar, retromolar trigone, or paranasal sinus tumors (Strohl, 1987: 44).

1.2.6 Soft tissue, muscles, and bone. Soft tissue necrosis occurs as a result of irradiated tissue. The damage begins as an ulcer. If the ulcer occurs in an area that contains underlying bone, bone sequestration and osteoradionecrosis of the bone may result. Bone and tissue necrosis occur in the first two years after therapy, usually within five to eight months (Strohl, 1987: 44, 1995: 25).

2. General systemic effects (Radiation sickness or radiation syndrome). Radiation syndrome may be defined as a condition that sometimes occurs in cancer patients who receive therapeutic doses of radiation. The manifestations of radiation syndrome are: (Bushkin, In Holland, et al., Eds., 1993: 1042-1044).

2.1 Fatigue. Fatigue is a common occurrence in cancer patients receiving radiation therapy. The degree of fatigue can vary among patients. Most patients begin to feel tired after a few weeks of radiation therapy. Experience of fatigue will go away gradually after the treatment is finished.

2.2 Bone marrow suppression. The white blood cells, red blood cells and platelets are decreased due to bone marrow suppression in the treated area. Patients will be at risk of infection, anemia, and bleeding.

2.3 Alteration of nutrition. New patients may have an element of anxiety, which enhances the potential for radiation-induced nausea. Moreover, some of them indicate a loss of appetite, change in taste, and aversion to certain foods.

2.4 Sleep disturbance. This symptom is related to radiation syndrome and correlated with anxiety and depression. It leads to increased fatigue and mood changes (Sheely, 1996: 109).

Fatigue and Associated Factors

Fatigue is an universal symptom that everyone experiences at some time in their life. In a chronic illness such as cancer, it is a serious problem. Because the cause of fatigue is unclear and complex, management of fatigue becomes a challenge. To effectively support patients suffering from fatigue, nurses must develop understanding of the phenomenon.

Definitions of fatigue

Fatigue is the most frequently experienced symptom of cancer and cancer treatment (Aistars, 1987: 25; Blesch, et al., 1991: 81; Oberst, et al., 1991: 71; Smets, et al., 1993: 220; Winningham, et al., 1994: 23). It can affect patients' role performance, lack of energy to carry on normal activities of daily living, decrease social activities and interactions, and negatively affect quality of life. Patients feel that the symptom of fatigue are very distressing (Ferrell, et al., 1996: 1539; King, et al., 1985: 56; Pickard-Holley, 1991: 14). Although fatigue has been studied systematically in various populations for more than 30 years, no universal definition of fatigue exists (Holley, 2000: 1425). It has been viewed in terms of both objective performance and subjective experience. An objective indicator would identify the point at which performance declined either physically or psychologically. In the subjective state, the patient's self-report-perception of fatigue, and how it relates to that individual's functioning, is the most important indicator of fatigue (Piper, et al., 1987: 17). Fatigue can be considered as a subjective phenomenon described by many terms, including tiredness, weakness, exhaustion, lack of energy, lack of purpose, lethargy, sleepiness, malaise, generalized lassitude, changes in ability to concentrate, impaired mobility, increased discomfort and decreased functional status related to a decrease in energy, increased discomfort and decreased efficiency, and generalized weariness (Sitton, In Dow, et al., Eds., 1997: 89). Likewise, health professionals struggle to describe fatigue, using terms such as asthenia, fatigue, lassitude, prostration, exercise intolerance, lack of energy, and weakness (PDQ Editorial Board, Internet, 2001).

Piper and associates (1987: 19) differentiated acute and chronic fatigue. It can vary in unpleasantness, duration, and intensity. When acute, fatigue serves as a protective function. It is generally perceived as normal or an expected tiredness characterized by localized intermittent symptoms, rapid onset, and short duration.

Adequate rest may be effective in management. Chronic fatigue has no known function and is characterized by constant or recurrent tiredness lasting a minimum of a month, with insidious onset, and cumulative. Chronic fatigue is perceived as abnormal or excessive generalized tiredness. Rest alone is generally not effective in relieving it (Piper, 1989: 190).

Historically, fatigue in the cancer patient has received little attention and few published studies examined this phenomenon. Since 1979, when Haylock & Hart (1979: 461-467) published their article on radiation and fatigue, numerous studies and observations in radiation oncology have addressed fatigue as an effect related to radiation therapy.

Mechanisms of fatigue

Until recently, fatigue was poorly understood and health professionals had little to offer to treat fatigue. Like pain, fatigue is not only explained by physiological mechanisms, but must also be understood as a multidimensional concept that includes physical, psychological, social, and spiritual aspects (Ferrell, et al., 1996: 1540).

Because fatigue is multidimensional and multicausal, no clear support for any of the major hypotheses or models has emerged. Aistars (1987: 25-26) has proposed the Aistars'Organizing Framework, which is based on energy and stress theory, implicating physiological, psychological, and situational stressors as contributing to fatigue. Aistars attempted to explain the difference between tiredness and fatigue within the General Adaptation Syndrome of Selye (1976). Prolonged stress that produces a stress response may be used as a model for fatigue. People with cancer frequently suffer from extreme stress over a long period of time, causing them to expend energy and experience a high level of fatigue (PDQ Editorial Board, Internet, 2001).

Additionally, in Winningham's Psychobiologic-Entropy Hypothesis (PEH) model, fatigue is defined as an energy deficit and relates fatigue to disease, treatment, activity, rest, symptom perception, and functional status. Winningham suggests that fatigue has an unique relationship to other symptoms based on how the symptoms affect the individual's level of activity. Ten propositions were listed to describe the theoretical relationships among activity level, perception of fatigue, symptom management, and functional status. These propositions emphasize a need for balance between restorative activity and rest (Winningham, et al., 1994: 24-25).

Lastly, Piper's Integrated Fatigue Model (IFM), the most frequently cited theoretical framework on fatigue in cancer, was derived deductively from a review of the fatigue literature. This framework that has been proposed encompasses the subjective (perceptual) and the objective (physiological, biochemical, and behavioral) factors that cause manifestations of fatigue. These factors are modified by the perception of fatigue. Mechanisms (biological and psychosocial factors) considered most likely to influence the signs and symptoms of fatigue were: accumulation of metabolites, changes in energy and energy substrate patterns, activity/rest patterns, sleep/wake patterns, disease patterns, treatment patterns, symptom patterns, psychological patterns, oxygenation patterns, changes in regulation/transmission patterns, and other related patterns. This model delineates the multiple factors that can interrelate and lead to chronic fatigue. It provides insight into the phenomenon and supports the notion seen in clinical practice that fatigue becomes more complex to manage as it becomes a chronic symptom; a combination of strategies may be needed to manage fatigue (Piper, et al., 1987: 19-21).

Patterns of fatigue

Few studies have systematically evaluated the prevalence of fatigue in cancer patients. Fatigue is also the most severe, especially during the last week of radiation therapy (Nail, In Groenwald, et al., Eds., 1997: 644). The incidence of fatigue in patients receiving radiation therapy is about 65-100% (Blesch, et al., 1991: 81-87; Irvine, et al., 1994: 367-378; King, et al., 1985: 55-61; Kubricht, 1984: 43-52). Prospective studies have consistently found that most patients reported their fatigue as little to moderate, and intermittent (Blesch, et al., 1991: 81-87; Greenberg, et al., 1992: 38-45; King, et al., 1985: 55-61).

The prevalence of fatigue increases over the course of treatment (Haylock & Hart, 1979: 461-467; Irvine, et al., 1994: 367-378; King, et al., 1985: 55-61; Kobashi-Schoot, 1985: 306-313) and gradually diminishes after treatment, but remains in a small percentage of patients as late as the third month posttreatment (Eardley, 1986: 17-19; King, et al., 1985: 55-61). Fatigue did not increase with cumulative radiation dosage over time. The intensity of fatigue peaked at the fourth week, plateaued through the seventh week and then dropped beginning with the eleventh week (Greenberg, et al. 1992: 38-45). In contrast, the results from Beach's study differ from those. They found that fatigue in lung cancer patients did not change significantly from pretreatment to the fourth week or to the end of radiation therapy (Beach, et al., 2001: 1027-1031).

Fatigue mostly occurred in the early afternoon and evening (Greenberg, et al., 1992: 38-45; Haylock & Hart, 1979: 461-467; King, et al., 1985: 55-61) and was least intense during the early morning hours. The circadian pattern of body temperature peaks in the late afternoon, which coincides with the greatest intensity experienced by cancer patients (Hubsky & Sears, 1992: 179).

Fatigue feeling scores were found to be significantly lower on Sundays. This correlates with the weekend break from treatment that is characteristic of most regimens (Haylock & Hart, 1979: 461-467). These have not been found in other studies (Greenberg, et al., 1992: 38-45; Kobashi-Schoot, 1985: 306-313).

In addition, Pritsanapanurungsie, P. (2000: 45-46) reported that there were four patterns of fatigue in 30 breast cancer patients receiving chemotherapy; severe and then gradually declining, moderate and sustained, moderate and then gradually declining, and mild and then gradually declining.

Associated factors

Although fatigue is clearly prevalent in cancer patients, it has been difficult to identify consistent correlates of fatigue in this patient population. Exact mechanisms causing fatigue are unknown. During radiation therapy, the body uses a lot of energy healing itself. The extreme stress that people with cancer experience over a long period of time can cause them to use more energy, leading to fatigue (PDQ Editorial Board, Internet, 2001), daily trips for treatment, and the effects of radiation on normal cells may contribute to fatigue. These may be related to both the disease process and treatments. Treatment factors may play a significant role in the incidence of fatigue. For the cancer patient receiving radiation therapy, certain factors may be present that can be identified as actual or potential causes of fatigue (Sitton, In Dow, et al., Eds., 1997: 94). These factors include:

1. Decreased nutrition. Fatigue often occurs when the energy requirements of the body exceed the supply of energy sources (MacDonald., et al., 1995: 151-155; Watanabe & Bruera, 1996: 189-206). In cancer patients, three major mechanisms may be involved: alteration in the body's ability to process nutrients efficiently, increase in the body's energy requirements, and a decrease in intake of energy sources. Several symptoms related to radiation therapy of specific sites especially to the head and neck cancer may produce serious nutritional problems. For instance, as a result of normal tissue damage to the head and neck area, patients commonly experience dry mouth, abnormal taste sensations, reduced taste acuity, swallowing difficulties, mucositis, nausea, vomiting and loss of appetite (Parzuchowski, In Otto, Ed., 1994: 243-251; Strohl, In Miaskowski & Buchsel, Eds., 1999: 70). Decreased intake, depletion of protein stores, anorexia, and metabolic changes may contribute to lack of energy and fatigue. Weight loss or potential for weight loss should be anticipated during radiation therapy. It will continue after radiation therapy, being maximal at 3 months and remaining virtually unchanged for 6 months after radiation therapy. Irvine and associates (1994: 367-378) reported that loss of appetite, shortness of breath, difficulty breathing, nausea, and vomiting were all significantly related to fatigue at the last week of radiation therapy or 10-14 days after chemotherapy. Haylock and Hart (1979: 461-467) described a negative relationship between fatigue and weight loss in 30 cancer patients receiving radiation therapy. Abnormal muscle function due to imbalance of metabolites and possible loss of muscle mass may result from malnutrition. Chencharick & Mossman (1983: 811-815) reported that head and neck cancer patients receiving radiation therapy had dry mouth, change in taste, swallowing difficulties, loss of appetite, and 94% of the patients lost

5 kg of body weight. The mechanisms of anorexia and weight loss remain unknown, however, weight loss in head and neck cancer may be a secondary consequence of interference with oral intake and absorption. Donaldson (1977: 2407-2413) also found that 93% of head and neck cancer patients receiving radiation therapy lost an average of 3.7 kg during the sixth to the eighth week of therapy. Close to 9% of those patients lost greater than 10% of their body weight during that time, and many of the subjects were malnourished before starting the therapy. In another study by Johnson and associates (1982 cited by Iwamoto In Dow, et al., Eds., 1997: 248), 68% of the head and neck cancer patients receiving radiation therapy lost 5% of their pretreatment weight within 1 month after radiation therapy. The average overall weight loss was 10%. The patients who lost weight tended to have greater severity and longer duration of side effects associated with irradiation than those who did not lose weight. In contrast, there was no correlation between weight loss and fatigue (Beach, et al., 2001: 1027-1031; Greenberg, et al., 1992: 38-45).

2. Anemia. Anemia is often a significant contributor to symptoms in cancer patients or individual patients; it can be difficult to discern the actual impact of anemia, for there are often other problems that confound the ability to weigh the specific impact of anemia. The impact of anemia varies depending on factors such as the rapidity of onset, patient age, plasma volume status, and the number and severity of comorbidities (Johnston & Crawford In Berger, 1998 cited by PDQ Editorial Board, Internet, 2001). Anemia decreases the oxygen-carrying capacity of the blood, inhibiting the delivery of essential nutrients to the cells and decreasing the energy available to the organism. When individuals experiencing anemia and fatigue are treated with transfusions and subsequently demonstrate improvement in their hematocrit or hemoglobin values, they generally report a concurrent decrease in the severity of fatigue (Erickson, 1996 cited by Nail, In Groenwald, et al., Eds., 1997: 642). So, anemia is probably only a factor with regard to fatigue when hemoglobin levels are extremely low (Bruera & MacDonald, 1988 cited by Smets, et al., 1993: 222). It is hypothesized that the more quickly the rate of decline in hematocrit and hemoglobin values, the more profound the fatigue (Maxwell, 1984: 321-326). In patients undergoing radiation therapy, anemia can result when large areas of active bone marrow are treated. It is frequently mentioned as a possible factor in fatigue. However, a correlation between fatigue and the degree of anemia is rarely found (Piper. et al., 1987: 21). Irvine and associates (1994: 367-378) reported that hemoglobin and hematocrit values did not significantly correlate with fatigue. In another study, anemia was prevalent in 48% of the patients initially, and increased to 57% of the patients during radiation therapy. It was more common in women than men (64% versus 51%), however, men with prostate cancer experienced the greatest increase in anemia during radiation therapy (Bush, 1986: 2047-2050). In certain cancers, such as cervix and head and neck cancer, anemia has been found to be a predictor of poor survival and diminished quality of life in patients receiving radiation therapy (Dubray, et al., 1996: 553-558; Fein, et al., 1995: 2077-2083; Girinski, et al., 1989: 37-42).

3. Cancer therapy. Fatigue is a common symptom that accompanies surgery, chemotherapy, radiation therapy, and biologic response modifier therapy. In the case of radiation therapy, fatigue may be caused by increased energy requirements to repair damaged epithelial tissue. Haylock and Hart (1979: 461-467) discussed radiation-related cellular breakdown with accumulation of by-products as a possible cause of fatigue, but this hypothesis has not been tested. The phenomenon of fatigue accompanying radiation therapy, however, is not well understood (Winningham, 1994: 24). A number of research studies document the existence of a fatigue syndrome that is not specific to the disease type or to the radiation site, and that demonstrates a gradual decline in fatigue in the patient after the completion of radiation therapy (Greenberg, et al., 1992: 38-45; Haylock & Hart, 1979: 461-467; King, et al., 1985: 55-61). With combined modality therapy more patients experience either previous or concomitant chemotherapy, which may increase fatigue during radiation therapy. Recent surgery may also contribute to increased levels of fatigue during radiation therapy (Sitton, In Dow, et al., Eds., 1997: 95). Previous or concomitant chemotherapy has an additive effect to radiation and can account for the degree of fatigue, which may develop after only a few treatments (Hilderly, In Dow & Hilderly, Eds., 1992: 65).

4. **Sleep disturbance.** Sleep disturbance is a frequent complaint of cancer patients (Munro & Potter, 1996: 640-647; Oberst, 1991: 71-78). Sleep deprivation can result in a variety of physiological conditions characterized by increased fatigue (Lubin, et al., 1996, cited by Irvine, et al., 1991: 197). Although the nature of the relationship between sleep and fatigue has received little attention to date, there is some evidence that fatigue and sleep difficulties are significantly related. Beszterczey & Lipowski (1977, cited by Irvine, et al., 1991: 197) noted that 45% of cancer patients cited difficulties in either getting to sleep or staying asleep. Sarna (1993 cited by Irvine, et al., 1998: 128) found that 30% of lung cancer patients with fatigue also experience insomnia. McCorkle & Young (1978: 373-378) found that insomnia was positively related to fatigue in cancer patients receiving radiation therapy and

chemotherapy. Consistent with these finding, Irvine and associates (1994: 367-378) reported that difficulty sleeping was significantly related to fatigue at the last week of radiation therapy or 10-14 days after chemotherapy. In addition, Pritsanapanurungsie, P. (2000: 50-51) found that sleep disturbance had significant positive relationships with fatigue among breast cancer patients receiving chemotherapy.

5. **Performance status.** Performance status is an assessment of patients' actual level of function and capability of self-care. In head and neck cancer, quality of survival is critically influenced by performance, or functional ability (List, et al., 1990: 564). Performance status at baseline was an important predictor of physical functioning, role activities, and global quality of life of head and neck cancer after surgery and/or radiation therapy (Graeff, et al., 2000: 398-407). Many patients continue to maintain as normal as possible daily routines and activities during the weeks of their radiation therapy. Treatment related symptom distress could affect their ability to function.

6. **Pain.** Pain is often the source of extreme fatigue, particularly when pain is poorly controlled or of a chronic nature (Britton, 1983 cited by Hilderly, In Dow & Hilderly, Eds., 1992: 66). Blesch and associates (1991: 81-87) found a correlation between the severity of pain and intensity of fatigue. The wearing and wearying effects of long-term pain are also related to lack of sleep (Spross, et al., 1990a cited by Hilderly, In Dow & Hilderly, Eds., 1992: 66).

7. **Psychological factors.** Numerous factors related to the moods, beliefs, attitudes, and reactions to stressors of cancer patients are thought to contribute to the development of chronic fatigue. Anxiety related to undergoing a course of radiation therapy may adversely affect fatigue levels. Fatigue may also accompany depression

in cancer patients (Blesch, et al., 1991: 81-87). Depression may be not only a cause but also a result of persistent feelings of tiredness (Smets, et al., 1993: 220-224).

8. Frequency of treatment visits. The energy required to make daily trips to the radiation center/unit facility depletes the "healthy" outpatient's reserves and can be more fatigue than for the inpatient (Hilderly, In Dow & Hilderly, Eds., 1992: 65). In a study by Oberst and associates (1991: 71-78) fatigue was found to be the most prevalent and distressing symptom in 72 cancer patients receiving radiation therapy, and travelling every day for treatment was the most demanding self-care task. Subjects who underwent the most lengthy regimens had the greatest change in their fatigue levels (Haylock & Hart, 1979: 461-467).

Self-Care Actions to Manage Fatigue

Because fatigue is not life threatening, health professionals often minimize the impact that it has on patients' level of functioning and quality of life. Despite limitations in the knowledge about prevention and treatment of fatigue, nursing has much to offer in helping patients manage fatigue. As with other purely subjective symptoms such as pain, it may be necessary to encourage the patient and other family members to report symptoms of fatigue. Careful nursing assessment, collaboration, planning the interventions, evaluation, and modification of the nursing plan are key elements in the management of fatigue (Barnett, In Otto, Ed., 1997: 675).

When patients are diagnosed with cancer, they have to develop a new repertoire of skills and knowledge to enable them to adapt to living with the disease and the demands of treatment (Richardson & Ream, 1997: 35). Patients need guidance in selecting effective and appropriate strategies because, without it, they select common-sense strategies that would have been used before cancer affected them

(Ream & Richardson, 1999: 1300). Dodd (1984: 23-27) examined the patterns of self-care that patients undergoing chemotherapy and radiation therapy use, and identified that patients do little to manage the side effects of treatment. Patients always waited until the side effects were severe and persistent before initiating self-care actions. Nurses need to educate them proactively, not reactively, when difficulties already have occurred (Dodd, 1997: 988). Increased knowledge was significantly directly related to the number of self-care strategies used and several behaviors had clearly come from professional information sources (Dodd, 1984: 23-27).

Since 1987, Piper & Dodd have reported Patient-Initiated Fatigue Interventions including activity/rest patterns (rest, nap), altering activities (sit/lie down, read, walk/exercise), psychological patterns (distraction, relaxation), sleep/wake patterns (sleep), and other patterns (nutritional, environmental, social, symptoms) (Piper & Dodd, 1987 cited by Piper, 1989: 197). In 1991, Piper described three strategies useful for effective management of fatigue: energy conservation, effective energy utilization, and energy restoration. Energy conservation is accomplished by activities reducing metabolic and oxygen consumption requirements of activity. Resting or napping during the day, reducing nonessential activities, and asking or allowing others to help with home activities will also contribute to conservation of energy. Prioritizing, careful planning, and scheduling of activities can be effective in the efficient use of available energy. Maintenance of normal nighttime sleep patterns and good nutrition may contribute to energy restoration. Additional restorative activities may include relaxation or diversion such as social visits, reading, watching television, listening to music, and participating in enjoyable hobbies or activities (Piper, 1991: 903).

Richardson and Ream (1997: 35-43) classified the self-care actions to relieve fatigue adapted from the patient diary reports by Piper (1989) into seven common categories: modification/alteration in patterns of activity and rest, psychosocial strategies, attempting to preserve normality, relieving symptoms and providing comfort, social interventions, nutritional strategies, and alteration in sleep/waking patterns. All activities attained a median effectiveness of partial releief.

Patients undergoing cancer treatment should be encouraged to employ strategies other than sleep and rest, including active strategies such as exercise activities and conversation with friends (Graydon, et al., 1995: 27). Numerous studies (Berglund, et al., 1994: 1744-1751; Mock, et al., 1994: 899-907, 1997: 991-1000; Winningham, 1991: 270-276) have suggested that exercise including light-to moderate-intensity walking programs have many benefits for cancer patients. Those who exercise may have more physical energy, improved ability to function, quality of life, and outlook. Exercise for patients with advanced or terminal disease is difficult to study but may yield similar benefits. The ability of patients with advanced cancer who are in hospice care and on a physical therapy regimen to carry out activities of daily living has been reported to improve in one study (Yoshioka, 1994 cited by PDQ Editorial Board, Internet, 2001).

Graydon and associates (1995: 23-28) found that strategies that patients undergoing chemotherapy or radiation therapy used to reduce fatigue were categorized in four dimensions: reducing or ceasing activity (lying down, napping, sitting, stopping what one is doing), increasing physical or social activities (exercise, socializing, walking), distraction (listening to music, reading, watching TV), and others (asking for help, doing something different, working, eating or drinking). They also reported that effective strategies to reduce fatigue were sleeping, exercise, doing something different, and talking to friends.

In Thailand, Pritsanapanurungsie, P. (2000: 51-54) reported that the most frequently used self-care action to manage fatigue in breast cancer patients receiving chemotherapy was sleeping and it's effectiveness was nearly complete relief. Sleeping and lying down for short periods of time were reported by the patients as being effective in relieving fatigue. Fifty-six point six percent of cancer patients experiencing fatigue expressed the need to rest (Kubricht, 1984: 43-52).

Health professionals can work with cancer patients to develop an activity/rest program based on an assessment of the patient's fatigue that allows the best use of the individual's energy. They should be advised about setting priorities and maintaining a reasonable schedule because any change in daily routines requires additional energy expenditure. Taking a nap immediately after returning home from treatment helps some have energy for the rest of the day (Hiderly cited by Iwamoto, In Otto, Ed., 1997: 515). Neteland found that the way health professionals and nurses meet and support head and neck cancer patients during radiation therapy seems to be of great importance with regard to how the patient "endures" disease, suffering and treatment (Neteland, Internet, 2001).

In summary, much of the management of chronic fatigue in cancer patients involves promoting adaptation and adjustment to the condition. The possibility that fatigue may be a chronic disability should be discussed. Although fatigue is frequently an expected, temporary side effect of treatment, the problem may persist if other factors continue to be present. An important goal of management is to facilitate self-care for cancer patients. It is imperative that individuals with cancer are educated to develop the self-care abilities necessary to cope with fatigue.

Summary of Literature Review

Intensity of fatigue in head and neck cancer patients receiving radiation therapy should be assessed at multiple points of time. Most of the studies of fatigue in cancer patients are cross-sectional designs and a small number of sample sizes is used, which are limitations. It is necessary first to clarify exactly what the patient means by fatigue. Specifically, what changes have occurred? Activity patterns may have changed and the patient may be unable to maintain the previous level of activity. The nurse should assess the physiological and psychological aspects of fatigue, as well as social factors that may affect fatigue. Enhanced understanding of the phenomenon of fatigue and fatigue reducing strategies has exciting potential for improving effective nursing intervention to reduce fatigue in cancer patients.

Although there were many studies that reported on fatigue, most of them focused on breast cancer patients. Furthermore, in Thailand there has been no publication related to fatigue in head and neck cancer patients who are receiving prolonged radiation therapy. Therefore, this study aimed to explore patterns of fatigue, factors relating to the experience of fatigue, and self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy, using Orem's self-care theory and the Piper Integrated Fatigue Model as the conceptual framework.

CHAPTER III

MATERIALS AND METHODS

This prospective and descriptive research studied patterns of fatigue, relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change. In addition, self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy and their effectiveness were studied.

Population and Samples

The population of this study was head and neck cancer patients receiving radiation therapy at the Division of Radiotherapy of Songklanagarind Hospital, Faculty of Medicine, Prince of Songkla University.

The convenience samples included head and neck cancer receiving radiation therapy recruited from the Division of Radiotherapy of Songklanagarind Hospital. They were selected by purposive sampling according to the inclusion criteria, as follows;

1. Newly diagnosed patients aged 20 years or over,
2. Planned for radiation therapy alone or postoperative radiation therapy,
3. Had been receiving radiation with a minimum dose of at least 4,000 cGy with 200 cGy/day,
4. Were able to understand and speak Thai,
5. Were not confused at the beginning of the study,
6. Agreed to participate in the study.

The exclusion criteria for patients not entered into the study were as follows:

1. Had history of previous chemotherapy or were undergoing combination therapy; chemotherapy and radiation therapy,
2. Had ECOG performance status level 4,
3. Were confused during data collection.

Data were collected in a six-month period from February to July 2001. Based on the inclusion criteria, a total of 72 head and neck cancer patients who met the inclusion criteria were approached and asked to participate in this study. Of these, 70 initially agreed to participate; however 60 subjects finished the study. Ten subjects dropped out due to treatment termination (4 cases), withdrawal from the study (3 cases), confusion (1 case), being referred to a hometown radiation center (1 case), and being dead during the study (1 case).

Setting

Songklanagarind Hospital, a tertiary care center with 700 beds, is located in Songkhla Province, in the lower part of the southern region of Thailand. The Division of Radiotherapy is one of two centers serving comprehensive radiation therapy for patients in 14 provinces in the southern region of Thailand. The staff operating at the Division are three radiation oncologists, one registered nurse, and two practical nurses. The Division's service time is Monday to Friday from 8.00 a.m. to 4.30 p.m., which is divided into two periods per day, in the morning and in the afternoon. There are about 110 patients, inpatients and outpatients, visiting the Division per day. Inpatients are defined as the patients admitted to Songklanagarind Hospital and Hadyai Hospital. Hadyai Hospital is another tertiary care center under the jurisdiction of the Ministry of

Public Health located downtown, 15 minutes from Songklanagarind Hospital, and provides a microbus for patients receiving radiation therapy at Songklanagarind Hospital. Outpatients are those who take the daily trip for radiation therapy. Travel time to the Division by the outpatients is between 5 minutes and 3 hours because of differences in the distance to travel. If they had no accommodation in Songkhla, they stayed at Arkan Yen Sira: a building located in "Wat Koknow" temple, 10 minutes' walk from the Division and provided for the outpatients and the relatives of the patients being treated at Songklanagarind Hospital. During radiation therapy, all patients received care from health professionals, as follows:

1. Prior to initiation of radiation therapy, the radiation oncologists educate patients individually or in a group about disease, proposed treatment and duration of treatment, and possible side effects. Throughout treatments, they would regularly reassess the effects of radiation on patients weekly or earlier if the patients needed it or if the nurse notified, by physical examination, especially oral complications such as xerostomia, pain in the mouth, or mucositis, when they were given xylocaine viscous, paracetamol or other drugs according to their problem. There was follow-up complete blood cell count every Thursday, and if the absolute neutrophil count was less than 1,500 cell/mm^3, then consideration was given to stopping receiving radiation therapy for 1 week, or if hemoglobin was less than 9.5 g/dl or hematocrit was less than 30%, then consideration was given to packing red cell transfusion. In addition, if body weight decreased more than 1 kg per week or the patients could not eat at all, nasogastric tube feeding with a blenderized diet or administering intravenous fluid were considered.

2. Prior to initiation of radiation therapy, the nurse instructed the patients receiving radiation therapy individually or in a group and gave them pamphlets for guidance about radiation therapy. Then, they were educated how to deal with the side effects when not at the hospital, such as oral hygiene care by rinsing with normal saline 5 times per day, drinking 3,000 cc. of fluid each day, and exercise as tolerated by walking or ROM exercise. In addition, her main duties were to supply televisions, magazines, beverages, syrup and water for the patients and relatives during the waiting period and supply a bottle of syrup, cereals, eggs, and bottle of water for every low socioeconomic patient to use at home any time they needed them.

3. Social workers were available to facilitate patients' financial problems once a week, on Tuesday.

4. At Arkan Yen Sira, the nurse from the Division always acted as the leader of the patients for leading ROM exercise, about 10-15 minutes every morning. In addition, about 10-20 volunteer nurses regularly visit the patients at least once a week for assessing symptoms and other problem, screening basic physical examination, especially oral cavity, and rendering emotional support. Also, patients sometimes raised their problems in their next physician appointment.

Instruments

1. Demographic Characteristic and Clinical Data Form. This was developed by the researcher. Demographic characteristics include sex, age, religion, marital status, education background, occupation, total family income, economic problems, and type of medical payment. Clinical data include anatomic site, stage of cancer, ECOG performance status, treatment plan, dose and duration of radiation, travel time to the Division, home during radiation therapy, risk behaviors, and body weight and hematocrit change per week. These data were obtained from interview and medical records.

2. The Revised Piper Fatigue Scale (the Revised PFS). The Revised PFS, developed from the PFS by Piper and associates (1998), was used for measuring patients' fatigue. It was translated into the Thai language by Pritsanapanurungsie, P. (2000), and the researcher simplified some wording for the old aged group in the southern area. The questionnaire includes three parts. Part one is a 22-item self-report measure, 0-10 scales, that is used to assess four dimensions of the subjective fatigue. These dimensions include behavioral/severity (six items); affective meaning (five items); sensory (five items); and cognitive/mood (six items) (Piper, et al., 1998: 677-684). Part two is the six-item checklist of the peak of fatigue during the day, and the comparison of severity of fatigue between weekday and weekend. Part three contains 16 causes of fatigue perceived by the subjects arranged in a checklist, based on the Piper Integrated Fatigue Model.

To score the PFS, the items contained on each specific subscale are added together and divided by the number of items on that subscale. A total fatigue score is calculated by adding the 22-item scores together and dividing by 22 in order to keep the score on the same numeric 0 to 10 scale. Higher scores mean more fatigue.

Determination of the Intensity of Fatigue

It is difficult to give a precise description to determine what score ranges indicate intensity of fatigue. Thus, a subject mean score was proposed to be an appropriate score for use in this study to classify subjects into three categories; mild, moderate, and severe fatigue, according to the following criteria:

Mild fatigue refers to the mean of total fatigue score = 0.01 – 3.00

Moderate fatigue refers to the mean of total fatigue score = 3.01 – 6.00

Severe fatigue refers to the mean of total fatigue score = 6.01 – 10.00

Validity and Reliability

The face and content validity of the Revised PFS were determined by a literature review and reviewed by an 11-member national fatigue expert panel. Concurrent validity was established by significant correlation between the subscale and mood disturbance scores of the Profile of Mood States (POMS) and the Fatigue Symptom Checklist (FSCL) and the total fatigue scores. To revised the PFS, a 40 item, numeric scale version of the PFS was mailed to 2,250 women survivors of breast cancer to confirm the multidimensionality of the PFS and to reduce the total number of PFS items without compromising reliability and validity estimates. Seven hundred and fifty-five surveys (32%) were returned. Of these, 382 women met the study's inclusion criteria for having completed each of the 40 items on the PFS (Piper, et al., 1998: 677-678).

A principal axes factor analysis with oblique rotation was used to analyze the items on the PFS. The final version of the PFS consists of 22 numerically scaled items. The internal consistency reliability of the retained subscales, as measured by Cronbach's alpha ranged from .92 to .96 and the standardized alpha for the entire scale (22 items) of the instrument was .97 (Piper, et al., 1998: 677-680).

The content validity for the Thai version was evaluated by 5 experts; two oncologists, one oncology nurse, and two nursing instructors who are experts in cancer care. This instrument was used with 30 breast cancer patients receiving chemotherapy for 84 days. The internal consistency of this tool was measured by Cronbach's alpha, and ranged from .96 to .99 for the entire scale and .88 to .99 for the subscales (Pritsanapanurungsie, P., 2000: 29-30).

In this study, the content was validated by 5 experts; one radiation oncologist, two registered nurses with oncology experience of more than 10 years, two nursing instructors; one experienced in caring for head and neck cancer patients, the other experienced in studying cancer patients. It was tested with 15 head and neck cancer patients receiving radiation therapy at Songklanagarind Hospital, but not the sample group, and it was found that the reliability by Cronbach's alpha was .96 for the entire scale, and .86, .89, .94, and .92 for the four dimensions, respectively. When this tool was used with 60 subjects for 5-7 weeks, the Cronbach's alpha ranged from .96 to .98 for the entire scale, and .93 to .97, .93 to .97, .95 to .97 and .80 to .87 for the four dimensions, respectively.

3. The Symptoms Interfering with Eating Questionnaire. This questionnaire was translated and modified by the researcher, and was based on the McMaster University Head and Neck Radiotherapy Questionnaire (the HNRQ) (Browman, et al., 1993: 863-872). The HNRQ was therefore a disease-specific instrument, that consists of 22 items with 0-7 Likert scale covering symptoms related to six domains: oral cavity, throat, skin, digestive function, energy, and psychosocial. The HNRQ was validated prospectively in the context of a clinical trial conducted at the Hamilton and Ottawa Regional Cancer Centers. Only the frequently acute complications associated with symptoms interfering with eating of these patients were selected. Thus, the Symptoms Interfering with Eating Questionnaire includes 12 items covering pain in the mouth, difficulty swallowing, nausea, vomiting, constipation, dryness of mouth, sore throat, sticky saliva, loss of appetite of food, loss of appetite of liquid, difficulty chewing, and difficulty tasting food and one open item for other symptoms. If the patient had symptoms interfering with eating, they then evaluated the severity of those on a 6-point Likert-type scale according to the following criteria: 0 means not interfere, 1 means hardly any, 2 means a little, 3 means a fair bit, 4 means a lot, and 5 means a great deal. The mean score is calculated by adding scores together and dividing by the number of items, which ranged from 0 to 5. Higher scores mean greater symptoms interfering with eating.

Validity and Reliability

The Thai version tool was content validated by 5 experts; one radiation oncologist, two registered nurses with oncology experience of more than 10 years, two nursing instructors; one experienced in caring for head and neck cancer patients, the other experienced in studying cancer patients. It was tested with 15 head and neck cancer patients receiving radiation therapy at Songklanagarind Hospital, but not the sample group, and it was found that the reliability by Cronbach's alpha was .72. When this tool was used with 60 subjects for 5-7 weeks, the Cronbach's alpha ranged from .86 to .91.

4. The Sleep Disturbance Scale. This scale was derived from the sleep disturbance items of the Adapted Symptom Distress Scale (ASDS) Form II, developed by Rhodes and Watson (1987 cited by Simms, et al., 1993: 236). It was translated into the Thai language by Pritsanapanurungsie, P. (2000), and the researcher simplified some wording for the old aged group in the southern area. This scale is a 2-item, 5-checklist self-report tool, the number values ranging from 0 being no symptom experienced, to 4 being most severe symptom experienced, were assigned. The total experience score is calculated by summing the 2-item scores together. The total possible score ranged from 0 to 8. Higher scores indicate higher sleep disturbance.

Validity and Reliability

The content validity of the Thai version was evaluated by 5 experts, two oncologists, one oncology nurse, and two nursing instructors who are expert in cancer care. This instrument was used with 30 breast cancer patients receiving chemotherapy for 84 days. The internal consistency of this tool, which was measured by Cronbach's alpha, ranged from .85 to .99 (Pritsanapanurungsie, P., 2000: 31-32).

In this study, the content was validated by 5 experts; one radiation oncologist, two registered nurses with oncology experience of more than 10 years, two nursing instructors; one experienced in caring for head and neck cancer patients, the other experienced in studying cancer patients. It was tested with 15 head and neck cancer patients receiving radiation therapy at Songklanagarind Hospital, but not the sample group, and it was found that the reliability by Cronbach's alpha was .97. When this tool was used with 60 subjects for 5-7 weeks, the Cronbach's alpha ranged from .95 to .98.

5. The Self-Care Actions to Manage Fatigue Questionnaire. This questionnaire was developed by this investigation based on Pritsanapanurungsie, P's study (2000). It is a checklist questionnaire to assess the subjects' self-care actions to manage fatigue. If the patient performed actions, they then evaluated the effectiveness of each of those actions on a 5-point Likert-type scale according to the following criteria: 0 means not relieved, 1 means partly relieved, 2 means moderately relieved, 3 means nearly completely relieved, and 4 means completely relieved. Higher scores show more effective self-care action to manage fatigue.

Validity and Reliability

In this study, the content was validated by 5 experts; one radiation oncologist, two registered nurses with oncology experience of more than 10 years, two nursing instructors; one experienced in caring for head and neck cancer patients, the other experienced in studying cancer patients. It was tested with 15 head and neck cancer patients receiving radiation therapy at Songklanagarind Hospital, but not the sample group to assure ready answerability by the patients before language revision.

Protection of Human Rights

The human rights of the subjects were respected in this study (Appendix B). Eligible subjects were individually approached to participate in this study. The study objectives, the data collection processes, expected research outcomes, subject rights, the type of questionnaires, length of time for completing the questionnaires weekly during radiation therapy, and the right to refuse to participate in this study were explained. The subjects who agreed to participate were assured that the data would be kept confidential and reported as group data. Verbal explanations were given when there were questions about the study.

Data Collection

The letter of permission from the Dean of the Faculty of Graduate Studies, Mahidol University was submitted to the Dean of the Faculty of Medicine, Prince of Songkla University, in order to explain the objectives and processes of the study and ask for cooperation in collecting data. The steps of data collection were as follows:

1. The researcher contacted and requested permission from the Head of the Division of Radiotherapy, Songklanagarind Hospital and explained the objectives and processes of the study.

2. All eligible subjects who met the criteria were approached and the protection of human rights was explained, as previously described.

3. After the patients agreed to participate in this study, the data were collected in a private area of the Division of Radiotherapy, after radiation.

4. The subjects completed the Demographic Characteristic Form and the Clinical Data Form were completed from the patient's record by the researcher at the initial contact.

5. The researcher explained to the subjects how to complete the questionnaires, including the Revised PFS, the Symptoms Interfering with Eating Questionnaire, the Sleep Disturbance Scale, and the Self-Care Actions to Manage Fatigue Questionnaire. The questionnaires were completed for a baseline assessment at the first contact prior to initiation of radiation therapy (week 0), then continuously completed weekly on Thursday or Friday for 5-7 weeks. During this process, the researcher provided more information and clarification to the subjects if needed. The researcher then checked the missing data by discussing the questionnaires with them, and resolved any problem regarding their accurate completion.

6. The researcher read the questionnaires verbatim to any participants experiencing difficulties in reading and writing, and then completed the questionnaires according to the subject's decision. The subjects could answer the interview questions either verbally or in writing. The researcher read the questionnaires to 97% of the subjects.

7. Body weights were taken using the same scale, before and once a week during radiation therapy.

8. Hematocrit level was measured every Thursday during radiation therapy.

Data Analysis

The Statistical Package for Social Sciences for Windows Program (SPSS/FW) Version 9.0 was used for analysis.

1. Demographic characteristics and clinical data were analyzed by using descriptive statistics: frequencies, percentages, min-maxs, means, and standard deviations.

2. The Friedman test was used to compare the intensity of fatigue over time during radiation therapy.

3. Cluster analysis was used to identify the patterns of fatigue.

4. Peaks of fatigue during the day, and causes of fatigue perceived by the subjects were presented with frequencies and percentages.

5. Spearman's rho correlation coefficients was used to analyzed the relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change.

6. Each self-care action to manage fatigue performed by the subjects was presented with frequencies and percentages.

7. The effectiveness of self-care actions to manage fatigue was determined through the means and standard deviations.

CHAPTER IV

RESULTS

This descriptive research was conducted to describe patterns of fatigue, related factors, self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy and their effectiveness. The findings from this study are presented in seven parts, as follows;

Part I Demographic characteristics and clinical data

Part II Intensity of fatigue

Part III Patterns of fatigue

Part IV Peaks of fatigue during the day

Part V Causes of fatigue

Part VI Relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change

Part VII Self-care actions to manage fatigue and their effectiveness

Part I Demographic Characteristics and Clinical Data

Demographic characteristics of the subjects

The demographic characteristics of the subjects are presented in Table 1. Within the subjects, 52 men and 8 women participated in the study. Their ages ranged from 32 to 81 years ($\bar{X}$=62.7, S.D.=11.1), with the majority (65%) being 60 years or over. Most of them were Buddhist (91.7%). Eighty-one point seven percent of the subjects were married. The largest groups of the education level (80%) were no formal education to primary education. By occupation, 33.3% of subjects were unemployed, and 31.7% were agriculturists. The family income per month ranged widely from 1,000 to 50,000 Baht ($\overline{X}$=6,891.7, S.D.=9,089.1), and more than half (58.3%) had a family income of less than 5,000 Baht. Nearly sixty percent of families had an income equal to expenses. Most of the subjects (91.7%) reimbursed their medical expenses from insurance. Nearly half (46.7%) of travel time to the Division of Radiotherapy of the subjects was less than 15 minutes ($\overline{X}$=25.1, S.D.=34.4). During radiation therapy, 45% of the subjects stayed at home in Songkhla, and 30% stayed at Arkan Yen Sira.

Table 1. Demographic characteristics of the subjects (n = 60)

Characteristics	Frequency	Percent
Sex		
Male	52	86.7
Female	8	13.3
Age (years)		
$<$ 40	1	1.7
40-49	8	13.3
50-59	12	20.0
60-69	20	33.3
$\geqslant$ 70	19	31.7
Min = 32 Max = 81 $\overline{X}$ = 62.7 S.D. = 11.1		
Religion		
Buddhism	55	91.7
Islam	5	8.3
Marital status		
Married	49	81.7
Divorced/Separated/Widow	11	18.3

Table 1. Demographic characteristics of the subjects (cont'd)

Characteristics	Frequency	Percent
Education background		
No formal education to primary education	48	80.0
Secondary education	10	16.7
Diploma	1	1.7
Bachelor' degree/Graduate	1	1.7
Occupation		
Unemployed	20	33.3
Agriculturist	19	31.7
Government office	10	16.7
Business owner	6	10.0
Employee	5	8.3
Total Family Income/month (baht)		
< 5,000	35	58.3
5,000 – 10,000	16	26.7
>10,000	9	15.0
Min = 1,000 Max = 50,000 $\overline{X}$ = 6,891.7 S.D. = 9,089.1		
Family Economic Status		
Income higher than expenses	2	3.3
Income equal to expenses	34	56.7
Income lower than expenses	24	40.0
Medical Expense		
Social insurance/health insurance	30	50.0
Government insurance	25	41.7
Self paid	4	6.7
Social welfare	1	1.7
Travel time to the Division of Radiology		
< 15 min	28	46.7
15-30 min	25	41.7
> 30 min	7	11.7
Min = 5 Max = 180 $\overline{X}$ = 25.1 S.D. = 34.4		
Home during radiation therapy		
Home in Songkhla	27	45.0
Arkan Yen Sira	18	30.0
Hatyai Hospital	9	15.0
Home outside Songkhla	4	6.7
Songklanagarind Hospital	2	3.3

Clinical data of the subjects

When classified cancer of head and neck by anatomic site, the majority of the subjects were larynx (26.7%), oral cavity (25%), and oropharynx (20%) respectively. Seventy-five percent of the subjects were diagnosed with stage III and IV cancer. Most performance statuses of the subjects were ECOG level 1 (60%). Fifty-five percent of the subjects were treated with radiation therapy alone and 45% received postoperative radiation therapy. The majority of radiation doses (86.7%) ranged from 5,001 to 7,000 cGy ($\bar{X}$=6,573.1, S.D.=734.3), and patients underwent treatment for 5.1 to 7 weeks ($\bar{X}$=6.5, S.D.=0.7). More than half (65%) of radiation times were in the morning. Risk behaviors of the subjects were smoking (82.7%), alcohol drinking (63.3%), and betel nut chewing (13.3%). The details are shown in Table 2.

Table 2. Clinical data of the subjects (n=60)

Clinical data	Frequency	Percent
Anatomic Site		
Larynx	16	26.7
Oral cavity	15	25.0
Oropharynx	12	20.0
Hypopharynx	10	16.7
Nasopharynx	5	8.3
Others	2	3.3
Stage		
Stage I	6	10.0
Stage II	7	11.7
Stage III	17	28.3
Stage IV	28	46.7
Unknown	2	3.3
ECOG performance status		
Level 1	36	60.0
Level 2	23	38.3
Level 3	1	1.7

Table 2. Clinical data of the subjects (cont'd)

Clinical data	Frequency	Percent
Treatment plan		
Radiation therapy alone	33	55.0
Postoperative radiation therapy	27	45.0
Dose of radiation (cGy)		
5,000	8	13.3
5,001 - 6,000	18	30.0
6,001 - 7,000	34	56.7
Min = 5,000 Max = 7,000 $\overline{X}$ = 6,573.1 S.D. = 734.3		
Duration of radiation (weeks)		
5.0	8	13.3
5.1 – 6.0	18	30.0
6.1 – 7.0	34	56.7
Min = 5 Max = 7 $\overline{X}$ = 6.5 S. D. = .7		
Radiation time		
In the morning	39	65.0
In the afternoon	21	35.0
Risk behaviors		
Smoking		
Yes	49	82.7
No	11	17.3
Alcohol		
Yes	38	63.3
No	22	36.7
Betel nut chewing		
Yes	8	13.3
No	52	86.7

Part II Intensity of Fatigue

The intensity of fatigue is based on the 3 ranges of scores set up for determination of the intensity of fatigue in Chapter 3. The means of fatigue scores before and during radiation therapy are listed by each dimension and total fatigue scores as shown in Table 3 and Figure 2. The means of intensity of each dimension and total fatigue scores were mild. Prior to initiation of radiation therapy, the mean of total fatigue scores was 0.9 (S.D.=1.7). After receiving radiation therapy, the total fatigue scores gradually increased from the first week ($\overline{X}$=1.5, S.D=2.1) to the third week, with the highest peak at the fourth week ($\overline{X}$=2.2, S.D.=2.4), and then gradually declining until the seventh week ($\overline{X}$=1.9, S.D. =2.5).

When considering each dimension, the means of behavioral/severity and sensory scores were higher than other dimensions. On the first week the means of both dimensions were 2 (S.D.=2.9 and 2.7, respectively). The mean of behavioral/severity scores peaked at the third to the fifth week ($\overline{X}$=2.8, and S.D.=2.8, 2.9, and 2.9, respectively), and then gradually declined until the seventh week ($\overline{X}$=2.6, S.D.=3.3). In the sensory dimension, it peaked at the third week ($\overline{X}$=2.8, S.D.=2.6), and then gradually declined until the seventh week ($\overline{X}$=2.3, S.D. =2.7). In contrast, the lowest mean scores from the first to the seventh week were found to be in the cognitive/mood dimension ($\overline{X}$= 0.7-1.3, S.D.=1.2-1.8). Notably, there were similarities in patterns of either each dimension or total fatigue scores.

Table 3. Ranges, means, and standard deviations of each dimension and total fatigue scores before and during radiation therapy

wk	n	Behavioral/severity		Affective meaning		Sensory		Cognitive/mood		Total	
		Range	$\overline{X}$ (S.D.)	Range	$\overline{X}$ (S.D.)	Range	$\overline{X}$ (S.D.)	Range	$\overline{X}$ (S.D.)	Range	$\overline{X}$ (S.D.)
0	60	0-8.0	1.1 (2.3)	0-8.0	0.9 (1.9)	0-6.6	1.0 (1.9)	0-5.5	0.6 (1.3)	0-5.6	0.9 (1.7)
1	60	0-9.0	2.0 (2.9)	0-9.6	1.4 (2.3)	0-8.0	2.0 (2.7)	0-4.7	0.7 (1.2)	0-6.8	1.5 (2.1)
2	60	0-9.6	2.1 (2.7)	0-9.4	1.4 (2.2)	0-8.4	2.3 (2.6)	0-6.7	0.9 (1.4)	0-7.4	1.7 (2.0)
3	60	0-8.4	2.8 (2.8)	0-7.8	1.9 (2.4)	0-8.4	2.8 (2.6)	0-6.3	1.1 (1.5)	0-7.1	2.1 (2.1)
4	60	0-9.5	2.8 (2.9)	0-10	2.0 (2.8)	0-9.6	2.7 (2.8)	0-7.0	1.3 (1.8)	0-9.0	2.2 (2.4)
5	60	0-8.4	2.8 (2.9)	0-9.0	2.0 (2.7)	0-9.4	2.6 (2.9)	0-5.8	1.1 (1.6)	0-7.2	2.1 (2.4)
6	52	0-9.6	2.7 (3.1)	0-10	1.9 (2.9)	0-9.0	2.5 (2.9)	0-6.5	1.2 (1.8)	0-8.1	2.1 (2.6)
7	34	0-10	2.6 (3.3)	0-9.2	2.1 (2.9)	0-8.0	2.3 (2.7)	0-5.3	1.0 (1.5)	0-7.9	1.9 (2.5)

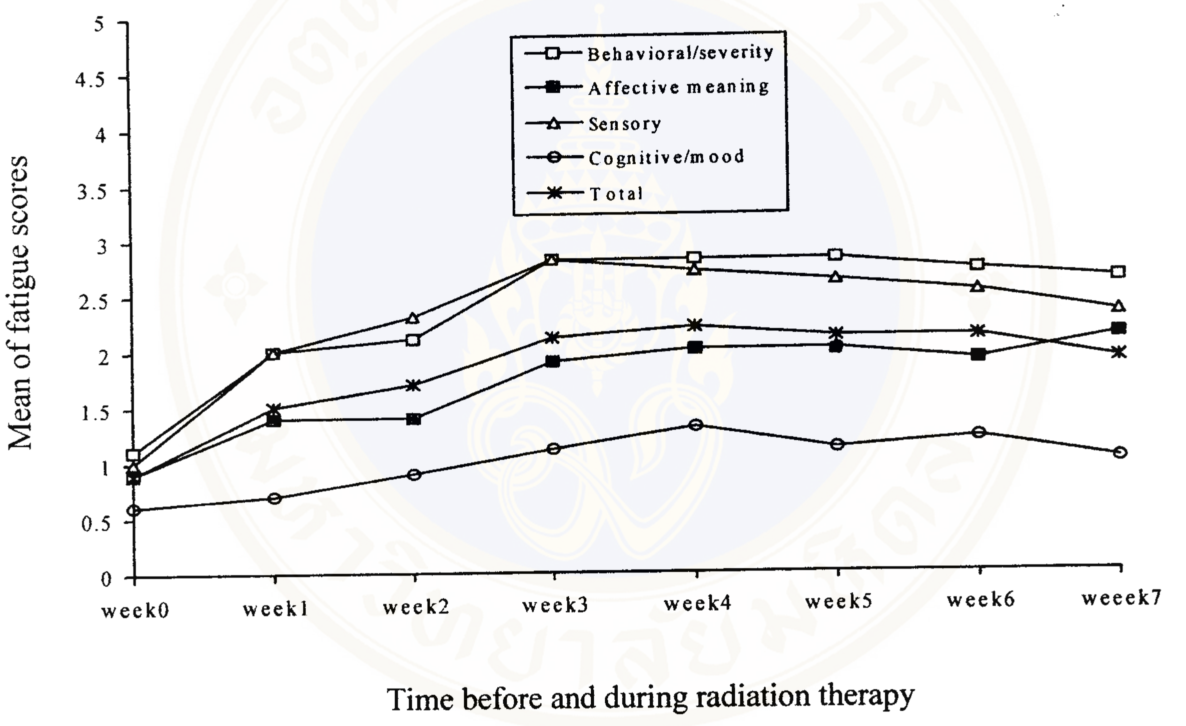

Figure 2 Plot of mean Piper Fatigue Scale Scores over time

The first research hypothesis concerns the changes in intensity of total fatigue scores during radiation therapy. To answer this hypothesis, Friedman test was employed to determine whether there were significant differences in respondents' total fatigue scores according to the weeks during radiation therapy due to nonnormal distribution (positive skewness) and several measures from a single subject obtaining of the data (Polit and Hungler, 1999: 487; Siegel, 1956: 166-173). The result shown in Table 4 was calculated from the first to the sixth week because the number of subjects in the seventh week was 34. It revealed that there were no significant differences between total fatigue scores over time during radiation therapy ($F_{5,52}$ = 7.944, p>. 05).

Table 4. Comparison of difference of total fatigue scores over time during radiation therapy by Friedman test (n = 52)

Wk	N	Range		Mean	S.D.	Skewness	F
		Possible Range	Actual Range				
1	60	0 – 10	0 – 6.8	1.5	2.1	1.16	7.944^{ns}
2	60	0 – 10	0 – 7.4	1.7	2.0	1.10	
3	60	0 – 10	0 – 7.1	2.1	2.1	.62	
4	60	0 – 10	0 – 9.0	2.2	2.4	.90	
5	60	0 – 10	0 – 7.2	2.1	2.4	.80	
6	52	0 – 10	0 – 8.1	2.1	2.6	.91	
7	34	0 – 10	0 – 7.9	1.9	2.5	.99	

^{ns}p>.05

Part III Patterns of Fatigue

From the previous results, the intensity of total fatigue scores was mild and the Friedman test revealed that it did not change significantly over time during radiation therapy. Due to the scattered nature of the data, cluster analysis cannot identify the patterns of fatigue. However, the intensity of fatigue was identified by total fatigue scores, as shown in Table 5. Prior to initiation of radiation therapy, 26.6% of the subjects (n=16) reported fatigue. The majority of those experienced moderate fatigue (18.3%) but severe fatigue was not found. After receiving radiation therapy, the number of subjects experiencing fatigue increased from the first week (53.3%) to the third week (70%), peaked at the fourth week (75%), and then declined until the seventh week (52.9%).

In considering intensity of fatigue, the majority of the subjects experienced mild fatigue, and the highest number of those was on the fourth week (38.3%). In contrast, the least number of subjects were found to experience severe fatigue (7.8%), being highest on the sixth week (13.5%). Remarkably, from raw data, 83.3% of the subjects (n=50) experienced fatigue during some weeks, whereas only 16.7% of those (n=10) experienced no fatigue throughout the course of radiation therapy.

Table 5. Intensity of fatigue before and during radiation therapy

Wk	n	Experienced fatigue	Intensity of fatigue		
			Mild	Moderate	Severe
		n (%)	n (%)	n (%)	n (%)
0	60	16 (26.6)	5 (8.3)	11 (18.3)	-
1	60	32 (53.3)	19 (1.7)	11 (18.3)	2 (3.3)
2	60	37 (61.7)	22 (36.7)	12 (20.0)	3 (5.0)
3	60	42 (70.0)	19 (31.7)	19 (31.7)	4 (6.6)
4	60	45 (75.0)	23 (38.3)	17 (28.3)	5 (8.3)
5	60	40 (66.6)	20 (33.3)	14 (23.3)	6 (10.0)
6	52	29 (55.8)	12 (23.1)	10 (19.2)	7 (13.5)
7	34	18 (52.9)	8 (23.5)	7 (20.6)	3 (8.8)
1-7	386	243 (63.0)	123 (31.9)	90 (23.3)	30 (7.8)

As noted earlier, patterns were not identified, and most subjects experienced only mild fatigue; the researcher then tried to study the possible explanation for that. Additional data were found. Several subjects took the opportunity to stop receiving radiation therapy from 3 to 16 days, for various reasons. This was caused by a long holiday (3–5 days), their radiator being out of order, contraindication of radiation therapy (decreased white blood cell count) and the subjects' state of exhaustion. The results in Table 6 showed that after receiving radiation therapy, the number of subjects stopping receiving radiation therapy from the first to the seventh week were 16.7-33.3% and the greatest number of subjects was found on the fourth week. In addition, not more than 5% of the subjects stopped receiving radiation therapy for more than 5 days, which began from the third to the seventh week.

Table 6. Percentage of number of subjects stopping receiving radiation therapy during radiation therapy

Wk	n	Stopping receiving radiation therapy 3-5 days	Stopping receiving radiation therapy > 5 days	Total
		n (%)	n (%)	n (%)
1	60	10 (16.7)	-	10 (16.7)
2	60	13 (21.7)	-	13 (21.7)
3	60	9 (15.0)	2 (3.3)	11 (18.3)
4	60	17 (28.3)	3 (5.0)	20 (33.3)
5	60	13 (21.7)	2 (3.3)	15 (25.0)
6	52	12 (23.1)	1 (1.9)	13 (25.0)
7	34	9 (26.5)	1 (2.9)	10 (29.4)

Remarkably, from raw data, it was apparent that throughout the course of radiation therapy, 8 out of 10 subjects experiencing no fatigue stopped receiving radiation therapy for 3-5 days due to a long holiday. The frequency of stopping in these subjects varied from 1 to 4 times for which 1, 2, 3, and 4 times was found in 3,1,3, and 1 subjects, respectively

Part IV Peaks of Fatigue during the Day

For each week in which subjects experienced fatigue, they were asked to mark a check on the period of time during the day that they perceived fatigue. Subjects always marked more than one response. Of all the data obtained (n = 243), as presented in Table 7, the peaks of fatigue during the day were categorized into 2 groups: group 1 = subjects receiving radiation in the morning, and group 2 = subjects receiving radiation in the afternoon. The subjects in both groups reported that fatigue varied throughout the day. The most common peak of fatigue during the day were late afternoon (62.8% and 58.9% occasions, respectively), and early evening (56.8% and 48.4% occasions, respectively). Besides that, subjects receiving radiation in the morning reported that late morning (60.1%) was the other period of peak fatigue during the day. Meanwhile, no more than 35% of subjects receiving radiation in the afternoon reported fatigue in other periods in the day.

Table 7. Peaks of fatigue during the day perceived by subjects experiencing fatigue between group 1 (subjects receiving radiation in the morning) and group 2 (subjects receiving radiation in the afternoon) during radiation therapy (n = 243)

Wk	n	Early morning n (%)	Late Morning n (%)	Early afternoon n (%)	Late afternoon n (%)	Early evening n (%)	Late evening n (%)
Group 1							
1	18	10 (55.6)	13 (72.2)	15 (83.3)	14 (77.8)	13 (72.2)	9 (50.0)
2	22	8 (36.4)	15 (68.2)	13 (59.1)	12 (54.5)	7 (31.8)	11 (50.0)
3	25	9 (36.0)	7 (28.0)	10 (40.0)	15 (60.0)	14 (56.0)	13 (52.0)
4	26	10 (38.5)	13 (50.0)	14 (53.8)	13 (50.0)	14 (53.8)	14 (53.8)
5	25	11 (44.0)	15 (60.0)	10 (40.0)	12 (48.0)	16 (64.0)	14 (56.0)
6	20	11 (55.0)	15 (75.0)	10 (50.0)	15 (75.0)	12 (60.0)	10 (50.0)
7	12	5 (41.7)	10 (83.3)	9 (75.0)	12 (100)	8 (66.7)	7 (58.3)
1-7	148	64 (43.7)	88 (60.1)	81 (54.7)	93 (62.8)	84 (56.8)	78 (52.7)
Group 2							
1	14	7 (50.0)	5 (35.7)	7 (50.0)	8 (57.1)	8 (57.1)	3 (21.4)
2	15	2 (13.3)	1 (6.7)	3 (20.0)	9 (60.0)	8 (53.3)	5 (33.3)
3	17	6 (35.3)	2 (11.8)	4 (23.5)	7 (41.2)	8 (47.1)	1 (5.9)
4	19	6 (31.6)	6 (31.6)	6 (31.6)	12 (63.2)	8 (42.1)	4 (21.1)
5	15	4 (26.7)	6 (40.0)	6 (40.0)	11 (73.3)	7 (46.7)	7 (46.7)
6	9	3 (33.3)	4 (44.4)	5 (55.6)	6 (66.7)	4 (44.4)	4 (44.4)
7	6	4 (66.7)	2 (33.3)	2 (33.3)	3 (50.0)	3 (50.0)	3 (50.0)
1-7	95	32 (32.7)	26 (27.4)	33 (34.7)	56 (58.9)	46 (48.4)	27 (28.4)

In addition, the subjects experiencing fatigue were asked to compare the severity of fatigue between weekday and weekend. The result is shown in Table 8. From the first to the seventh week, on nearly half of the occasions the subjects (46.1%) felt no difference in fatigue. Forty point seven percent of those reported that fatigue decreased over the weekend when they were not receiving radiation therapy; in contrast only 8.2% felt that there was increased fatigue.

Table 8. Change of fatigue during weekend compare to weekday

Wk	n	Increased fatigue n (%)	No difference in fatigue n (%)	Decreased fatigue n (%)
1	32	3 (9.4)	8 (25.0)	12 (37.5)
2	37	4 (10.8)	20 (54.1)	13 (35.1)
3	42	2 (4.8)	19 (45.2)	20 (47.6)
4	45	3 (6.7)	24 (53.3)	17 (37.8)
5	40	3 (7.5)	17 (42.5)	19 (47.5)
6	29	4 (13.8)	13 (44.8)	12 (41.4)
7	18	1 (5.6)	11 (66.1)	6 (33.3)
1-7	243	20 (8.2)	112 (46.1)	99 (40.7)

Part V Causes of Fatigue

For each week in which subjects experienced fatigue, they were asked to mark a check on causes they perceived as contributing to fatigue. Subjects always marked more than one response. A variety of those is reported in Table 9. Perceived causes of fatigue were classified into seven categories based on those reported by Piper (1989: 196). The five most common causes were radiation therapy (86% of occasions of the subjects), lack of nutrition (83.1%), cancer (79.4%), travelling to the Division of Radiotherapy (52.7%), and waiting at the Division (40.7%).

Table 9. Percentage of causes of fatigue perceived by the subjects experiencing fatigue during radiation therapy (n = 243)

Causes of fatigue	n (%)
Treatment patterns	
Radiation therapy	209 (86)
Operation	4 (1.7)
Changes in energy and energy substrate patterns	
Lack of nutrition	202 (83.1)
Fever	30 (12.4)
Disease patterns	
Cancer	193 (79.4)
Activity/rest patterns	
Travelling to division of Radiotherapy	128 (52.7)
Waiting at division of Radiotherapy	99 (40.7)
Symptom patterns	
Cough	87 (35.8)
Pain	59 (24.3)
Dyspnea	46 (18.9)
Diarrhea	2 (0.8)
Sleep/wake patterns	
Lack/change in sleep patterns	79 (32.5)
Psychological patterns	
Anxiety	78 (32.1)
Stress	73 (30.0)
Easily irritable	50 (20.6)
Other related patterns	
Hot weather	52 (21.4)

Part VI Relationships Between the Variables

The second research hypothesis concerns the possible relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change. Data from sleep disturbance and total fatigue scores were nonnormal distribution, so Spearman's rho correlation coefficient was used to determine the relationships among these variables. Results are reported in Table 10. Fatigue was significantly and positively correlated at a high level with the symptoms interfering with eating (r =.794, p<.01) and at a moderate level with sleep disturbance (r =.371, p<.01). On the contrary, there were no significant relationships between fatigue and ECOG performance status, and body weight and hematocrit change (r =.009,-.036, and .192, respectively, all p_s>.05).

Table 10. Spearman's rho correlation coefficients between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change (n = 60)

Fatigue correlated with	r
Symptoms interfering with eating	.794**
Sleep disturbance	.371**
ECOG performance status	.009
Body weight change	-.036
Hematocrit change	.192

** p < 0.01

Due to the high correlation between fatigue and symptoms interfering with eating, each symptom interfering with eating from the first to the seventh week was studied. Additional data were found that the means of each symptom score were .2-2.3 (S.D.= .7–2). This indicated that the subjects had a trend towards hardly any, to a little, symptoms interfering with eating, as shown in Table, 15, Appendix C.

In considering the correlation between fatigue and symptoms interfering with eating each week, results also showed that fatigue was significantly and positively correlated at a high level with the symptoms interfering with eating (r ranged from .649- .811, all $p_s < .01$) as shown in Table, 16, Appendix C.

Part VII Self-Care Actions to Manage Fatigue and their Effectiveness

For each week in which subjects experienced fatigue, they were asked to mark a check on self-care actions to manage fatigue and to rate their effectiveness. Subjects always marked more than one response. A variety of those are listed in Table 11. Self-care actions were classified into five common categories based on the general sets of actions for meeting universal self-care requisites (Orem, 1995: 191-200). The five most common actions were lying down (81.9% of occasions of the subjects), sleeping (81.1%), drinking juice/cereals/water (79%), staying with significant others (77.8%), and napping (74.1%).

Strategies most frequently used were not necessarily the most effective ones. Stopping receiving radiation therapy was reported to be the most effective strategy ($\overline{X}$=3.5, S.D.= .6) but was performed on only 6.2% of occasions by the subjects.

Table 11. Percentage of self-care actions to manage fatigue performed by subjects experiencing fatigue and their effectiveness (n = 243)

Self-care actions	n (%)	$\bar{X}$ (S.D)
Maintenance of balance between activity and rest		
Lying down	199 (81.9)	1.7 (.7)
Sleeping	197 (81.1)	2.2 (.8)
Napping	180 (74.1)	1.7 (.7)
Walking	156 (64.2)	1.7 (.7)
Watching television	87 (35.8)	1.9 (.8)
Praying	87 (35.8)	1.7 (.7)
ROM exercise	82 (33.7)	1.9 (.7)
Reading book	76 (31.3)	1.7 (.6)
Attending sermons of the monks	57 (23.5)	1.9 (.8)
Listening radio	31 (12.8)	2.3 (.8)
Gardening	15 (6.2)	1.9 (.6)
Stopping what one is doing	8 (3.3)	1.8 (1)
Meditation	6 (2.5)	2.3 (.8)
Trying a new activity	6 (2.5)	2.3 (1)
Maintenance of sufficient intake of food and water		
Drinking juice/cereals/water	192 (79.0)	2.0 (.7)
Eating	171 (70.4)	2.0 (.8)
Maintenance of balance between solitude and social interaction		
Staying with significant others	189 (77.8)	2.5 (1)
Talking with friends	117 (48.1)	1.8 (.7)
Meeting family	9 (3.9)	2.9 (.6)
Travelling	3 (1.2)	2.7 (.6)
Management of discomfort and symptom distress		
Medication	74 (30.5)	2.2 (.9)
Massage	72 (29.6)	2.3 (.7)
Stopping receiving radiation therapy	15 (6.2)	3.5 (.6)
Eating herbs	8 (3.3)	2.4 (.5)
Taking a bath	5 (2.1)	2.8 (.8)
Promotion of normalcy		
Shopping	17 (7.0)	1.6 (.8)
Working	7 (2.9)	3.0 (0)

Additional findings

Symptoms interfering with eating

During radiation therapy, symptoms interfering with eating occurred, which significantly and positively correlated at a high level with fatigue. Subjects always marked more than one symptom. The list from most to least frequently is presented in Table 12. The five most common symptoms interfering with eating were difficulty swallowing (86.9% of occasions of the subjects), sore throat (79.4%), difficulty tasting food (79.4%), sticky saliva (78.2%), and loss of appetite for food (71.2%). In addition, symptoms interfering with eating perceived by more than half of the subjects were dryness of the mouth (67.5%), difficulty chewing (58%), and pain in the mouth (51.9%).

Table 12. Percentage of symptoms interfering with eating perceived by subjects experiencing fatigue during radiation therapy (n = 243)

Symptoms interfering with eating	n (%)
Difficulty swallowing	211 (86.9)
Sore throat	193 (79.4)
Difficulty tasting food	193 (79.4)
Sticky saliva	190 (78.2)
Loss of appetite for food	173 (71.2)
Dryness of the mouth	164 (67.5)
Difficulty chewing	141 (58.0)
Pain in the mouth	126 (51.9)
Nausea	72 (29.6)
Loss of appetite for liquid	69 (28.4)
Vomiting	52 (21.4)
Constipation	50 (20.6)
Others	25 (10.3)

CHAPTER V

DISCUSSION

In this chapter, intensity of fatigue is initially presented and discussed, followed by a discussion of peak of fatigue during the day, causes of fatigue, relationships between fatigue and symptoms interfering with eating, sleep disturbance, ECOG performance status, and body weight and hematocrit change, and self-care actions to manage fatigue and their effectiveness.

Intensity of Fatigue

In this study, prior to initiation of radiation therapy, 26.6% of the subjects reported fatigue. After receiving radiation therapy, 83.3% of the subjects experienced fatigue during some weeks and 16.7% of those experienced no fatigue throughout the course of radiation therapy. The means of each dimension and total fatigue scores were mild (Table 3). These might result from various factors. First, there were informal small group supports among subjects. During their waiting time for radiation therapy and/or during their resting period at Arkan Yen Sira, the subjects always exchanged their information about illness, side effects, their actions to manage fatigue, their changes in life style since they were treated, and their feelings of anxiety, worry, stress, depression, or emotional strain. This might make them all feel that they were in the same situation and might be psychosocial support for them to tolerate fatigue. Furthermore, they also received ongoing information from health professionals throughout their treatment. Another factor was the age group of the subjects. The majority of them (65%) were more than 60 years of age who had retired from work, and they did not need to take the responsibility of daily routine work. Accordingly, the study by Vogelzang and associates (1997: 4-12) reported that older patients (>66 years of age) were less likely to report that fatigue affected their daily routine. Marital status and sociocultural environment may be major resources of support during radiation therapy, which was the period when self-care demands appear to be greater and more complex. The great majority of the subjects (81.7%) were married and all of them lived with their spouses or relatives during radiation therapy, which is characteristic of southern rural communities. Married individuals reported significantly higher levels of support and more self-care practices than non-married individuals (Hubbard et al., 1984 cited by Hanucharurnkul, S. 1989: 22). The last factor was treatment modality. Radiation therapy is a local therapy, which affects the cancer cells only in specific areas of the body. Using small doses of daily radiation helps protect normal body tissue in the therapy area. Weekend rest breaks allow normal cells to recover (The National Cancer Institute, Internet, 1999). In contrast, chemotherapy is a systemic therapy, which affects all of the body tissue continuously, although there are rest breaks in the course of treatment.

At baseline 26.6% of the subjects experienced mild to moderate fatigue (Table 5). The lower baseline fatigue might result in a higher tolerance of fatigue or a small increase in fatigue during radiation therapy. Besides, subjects receiving radiation therapy in April to May took the opportunity to stop receiving radiation therapy longer due to long holidays than did those in other periods of the study. Frequent and long periods should be taken to restore and conserve energy levels (Sarna & Conde, 2001: 1046). In addition, if patients experienced severe fatigue, the radiation oncologists then reassessed and prescribed a break of radiation therapy of about 1-2 weeks. Notably, stopping 5-7 days was apparently sufficient to allow recovery of fatigue in this study. Six subjects had to break for 1-2 weeks before completing radiation therapy. Only one subject could not tolerate it, so he terminated radiation therapy in the sixth week. So, from the Friedman test, the intensity of fatigue did not change significantly over time during radiation therapy (Table 4). These findings were similar to Beach and others' study (2001: 1027-1031). They also found that the overall PFS scores of lung cancer patients did not change from pretreatment to the fourth week or to the end of radiation therapy. However, these results differed from several studies which reported that fatigue increased over the course of radiation therapy (Haylock & Hart, 1979: 461-467; King, et al., 1985: 55-61; Kobashi-Schoot, 1985: 306-313).

From Table 3, prior to initiation of radiation therapy, the mean of total fatigue scores was 0.9 (S.D.= 1.7). After receiving radiation therapy, the total fatigue scores gradually increased from the first week ($\overline{X}$ = 1.5, S.D. = 2.1) to the third week, highest peak at the fourth week ($\overline{X}$ = 2.2, S.D. = 2.4), and then gradually declined until the seventh week ($\overline{X}$ = 1.9, S.D.= 2.5) which is consistent with Greenberg and associates (1992: 38-45). Similarly, the means of intensity of each dimension also were mild and fatigue scores peaked at the third to the fourth week (Table 3 and Figure 2). Acute side effects of radiation therapy occur with days or weeks of treatment. They had been reported in the first or the second week (Strohl, 1995: 24) and peaked at the third or fourth week. Remarkably, the number of subjects stopping receiving radiation therapy (33.3%) (Table 6), as well as the intensity of fatigue peaked at the fourth week (75%) (Table 5). Without stopping, there might be an occurrence of increased fatigue among subjects.

Most of the previous studies reported breast cancer patients using cross-sectional designs to describe fatigue. Therefore, it was not surprising that the findings of these previous studies were not congruent with this present longitudinal design that allowed changing detail of information to be collected over time. Additionally, the different characteristics of the subjects across studies, including aged, treatment, duration of treatment may produce various side effects and may make a difference.

Peaks of Fatigue during the Day

Fatigue occurrence varied throughout the day. All of the subjects experiencing fatigue in this study reported that the most common peaks of fatigue during the day were late afternoon and late evening (Table 7). Fatigue is often the greatest 2 to 4 hours after radiation therapy (Hagopian, Internet, 2001). The circadian pattern of body temperature peaks in the late afternoon, which coincides with the greatest intensity experienced by cancer patients (Hubsky & Sears, 1992: 179). Besides, data were collected in the summer time, and 21.4% of occasions of the subjects reported that hot weather caused fatigue, especially in the afternoon (Table 9). The finding was consistent with recent studies (Greenberg, et al., 1992: 38-45; Haylock & Hart, 1979: 461.467; King et al., 1985: 58; Pritsanapanurungsie, P., 2000: 40).

Nevertheless, 60.1% of the occasions of the subjects receiving radiation in the morning reported that they also felt more fatigue in the late morning (Table 7). This might be the result of longer waiting time due to the greater number of patients being radiated in the morning than in the afternoon, and reassessment procedures by the radiation oncologists, including physical examination, laboratory test, etc. Nearly half of the occasions of the subjects (46.1%) felt there was no difference in fatigue between weekdays and the weekend. Forty point seven percent of those reported that fatigue decreased over the weekend when they were not receiving radiation therapy (Table 8), which was similar to the finding of a previous study by Haylock & Hart (1979: 461-467) that fatigue was significantly lower on Sundays. A weekend break from radiation therapy and resting will also contribute to restoration and conservation of energy level (Piper, 1991: 903; Sarna & Conde, 2001: 1046). In contrast, only 8.2% felt that there was increased fatigue. Fatigue recovery time will vary depending upon the severity of fatigue (Hubsky & Sears, 1992: 178). In this study, only 3.3 to 13.5% of the subjects experienced severe fatigue (Table 5). They reported that 2 days of rest during the weekend from radiation and travel to the hospital were apparently not sufficient to allow recovery from fatigue.

Causes of Fatigue

The causes of fatigue in cancer patients can occur for many reasons. In this study, radiation therapy was the first cause perceived by 86% of occasions of the subjects (Table 9). This report by the patients is consistent with the data, in that during radiation therapy, the body uses a lot of energy healing itself and the effects of radiation on normal cells may contribute to fatigue (The National Cancer Institute, Internet, 1999). Also, the finding of Pritsanapanurungsie, P. (2000: 55-56) was that treatment pattern was the first commonly perceived cause of fatigue but the following causes differed. Lack of nutrition was the second perceived cause of fatigue (83.1%). Radiation therapy, especially to head and neck cancer may produce serious nutritional problems. For instance, as a result of normal tissue damage to the head and neck area, patients commonly experience dry mouth, abnormal taste sensations, reduced taste acuity, swallowing difficulties, mucositis, and loss of appetite (Parzuchowski, In Otto, Ed., 1994: 243-251; Strohl, In Miaskowski & Buchsel, Eds., 1999: 70). In this study, 51.9-86.9% of occasions of the subjects reported difficulty swallowing, sore throat, difficulty tasting food, sticky saliva, loss of appetite of food, dryness of the mouth, difficulty chewing, and pain in the mouth interfered with their eating (Table 12), whereas nausea and vomiting were the most distressing symptoms in cancer patients receiving chemotherapy (Pritsanapanurungsie, P., 2000: 55-56). Thus, these might make the rank order differ. Obviously, another common cause was travelling (52.7%). Although nearly half of the subjects (46.7%) less than 15 minutes to travel to the hospital but travelling daily was the most demanding self-care task (Oberst, et al, 1991: 76). In addition, the subjects reported that waiting time at the Division of Radiotherapy of more than 30 minutes contributed to fatigue (40.7%). In this study, according to observations from the investigator and reports from the subjects, waiting time at the Division ranged from 30 minutes to 1.30 hours.

Perceived causes of fatigue, from the perspective of the subjects, were similar to those reported by Piper (1989: 196), although the rank order differed. Piper found that psychological patterns were the most frequently identified cause. In contrast, in this study, this is reported for only 20.6-32.1% of occasions of the subjects. Due to the context of psychosocial support in Thailand and other countries being different, psychological patterns were not the most frequently identified cause. In Thailand, after being diagnosed with cancer and during radiation therapy, families, friends, relatives and also the health care team would take care and give mental support to patients. In this study, all of the subjects stayed with significant others, with the majority (65%) of them were in the old age group. Most of them (91.7%) were Buddhist and reimbursed their medical expenses from insurance (Table 1). In addition, prior to initiation of radiation therapy, the subjects received adequate information from radiation oncologists and the nurse about treatment and how to deal with side effects. These could reduce the feelings of anxiety, worry, stress, depression, and emotional strain.

Relationships between Fatigue and Symptoms Interfering with Eating, Sleep Disturbance, ECOG Performance Status, and Body Weight and Hematocrit Change

Fatigue was significantly and positively correlated at a high level with the symptoms interfering with eating ($r = .794$, $p < .01$) (Table 10). Radiation therapy of head and neck cancer further compromises the nutritional status of the patient principally by affecting the normal tissues in and around the oral cavity. Impairment of taste and salivary function are frequent complications of the radiation therapy. In this study, during radiation therapy, total symptoms interfering with eating had a mean score of .4 - 1.4 (actual range = 0 - 5) (Table 13, Appendix C). When considering each symptom interfering with eating, the means of each symptom score were .2-2.3 (S.D.=.7 – 2) (Table, 15, Appendix C). This indicated that the subjects had a trend towards hardly any, to a little, symptoms interfering with eating. Nurse and radiation oncologists are always concerned about the side effects of radiation therapy, especially nutritional problems and body weight loss. Radiation oncologists always detected whether the patients had any symptoms interfering with eating, such as xerostomia, pain in the mouth, or mucositis, and gave advice or treatment according to their problems. The nurse always assessed the patients' status and advised them according to their problems. Her main duties were to supply supplementation for every low socioeconomic patient such as a bottle of syrup, cereals, eggs, or bottles of drinking water any time they needed them. In this study, there were 15 subjects experiencing severe symptoms interfering with their eating so that they could not eat at all according to their oral complications. Among these, 7 subjects needed nasogastric tube feeding with a blenderized diet, and 8 subjects were administered intravenous fluid.

Fatigue was significantly and positively correlated at a moderate level with sleep disturbance ($r = .371$, $p < .01$) (Table 10). Sleep disturbance had a mean score of .8 - 1.3 (actual range = 0 - 8) so it could be interpreted that the subjects experienced low sleep disturbance (Table 14, Appendix C). Subjects who had a higher score in the sleep disturbance scale reported that they needed more sleep during the day. Sleep deprivation can result in a variety of physiological and psychological conditions characterized by increased fatigue (Lubin, et al., 1976 cited by Irvine, et al., 1991: 197). As reported in the studies conducted by Irvine and associates (1994: 367-378); McCorke & Young (1978: 373-378); Pritsanapanurungsie, P. (2000: 50-51), the results also showed that fatigue was significantly and positively correlated with difficulty sleeping, insomnia, and sleep disturbance in cancer patients receiving radiation therapy or chemotherapy.

On the contrary, there were no significant relationships between fatigue and ECOG performance status, body weight and hematocrit change ($r = .009$, $-.036$, and $.192$ respectively, all $p_s > .05$) (Table 10). A possible explanation might be that most subjects (98.3%) in this study were mostly homogeneous in performance status (level 1 = 60% and level 2 = 38.3%). It indicated that the subjects had a higher probability of achieving mild fatigue. When considering body weight change, the majority of the subjects (76.6%) lost weight, which ranged from 0.1 to 13.9 kilograms. Among these, 51.7% lost less than 5 kilograms. However, 21.7% gained weight, which mostly ranged from 0.1 to 2 kilograms (20%), and only one subject gained 9.4 kilograms (1.7%) (Table 18, Appendix C). Concern about nutrition problems by the nurse and radiation oncologists, as mentioned above, might account for some of the discrepancy in the amount of weight actually lost during the study period. This finding was similar to Greenberg and associates' study (1992: 38-45), and Beach and others' study (2001: 1027-1031), which also reported no correlation between weight loss and fatigue. In addition, the means of hematocrit level in the males were stable ($\overline{X}$ = 36.3-37.2, S.D.=2.5-5), although they were in a lower range of normal values (Table 19, Appendix C). However, in the females they were changed minimally ($\overline{X}$ = 33.9-36.8, S.D.= 4.2-4.5), indicating that the subjects had a trend towards normal range (Table 20, Appendix C). In this study, only one subject was administered blood transfusion. In accordance with Irvine and associates (1994: 367-378), hemoglobin and hematocrit values did not significantly correlate with fatigue.

Self-Care Actions to Manage Fatigue and their Effectiveness

Fatigue is an unavoidable aspect of cancer treatment for which it is unusual to find a specific correctable cause. Therefore, subjects experiencing fatigue must learn to live with it and find strategies to manage fatigue. Assistance can be given to patients and families to understand that fatigue can occur with radiation therapy and help them evaluate their activities so they can pace themselves throughout the day.

Lying down, sleeping, and napping were the most common strategies (81.9%, 81.1%, and 74.1% of occasions performed by the subjects, respectively), which gave partial to moderate relief ($\overline{X}$ =1.7, 2.2, and 1.7, respectively) (Table 11).

These are common responses to fatigue which are useful to maintain physical and psychological functioning and are often suggested by health professionals. According to Piper (1991: 903), three strategies are useful for effective management of fatigue: energy conservation, effective energy utilization, and energy restoration. Resting or napping during the day will also contribute to conservation of energy. Maintenance of normal nighttime sleep patterns and good nutrition may contribute to energy restoration. Fifty-six point six percent of cancer patients experiencing fatigue, expressed the need to rest (Kubricht, 1984: 43-52). Several short naps or breaks may be more helpful than a long period (The National Cancer Institute, Internet, 1999). This is because the heart rate slows down very quickly at the beginning of a rest period, but more slowly at the end of a rest period. So many short rests give the heart rate more chances to beat more slowly and thus tirelessly (Skalla, 1992: 1540). Determining the times of the day when extra energy is needed can help a person plan rest periods throughout the day and evening. Taking a nap immediately after returning home from treatment helps some to restore energy for the rest of the day (Hiderly cited by Iwamoto, In Otto, Ed., 1997: 515). This finding supports numerous studies by others (Graydon, et al., 1995: 25; Irvine, et al., 1998: 131; Piper & Dodd, 1987 cited by Piper, 1989: 197; Pritsanapanurungsie, P., 2000: 51-52; Richardson & Ream, 1997: 35-43).

Oral complications from side effects cause patients not to get enough nutritional intake and induced fatigue occurred. In this study, during radiation therapy, drinking juice/water/cereals was the common strategy that was performed on 79% of occasions of the subjects and its effectiveness was moderate relief ($\overline{X} = 2$, S.D. = 0.7) (Table 11). Sanguanijiraphan, C. (1997: 51) reported that 70.9% of the samples changed their pattern by drinking milk or having supplemented nutrition. Drinking 3,000 cc. of fluid each day can help patients avoid the build-up of cellular waste product (Halopian, Internet, 2001). Drinking juice such as molasses, toddy, coconut, Hale's Blue Boy syrup and warm water, and eating sweet fruit were the most effective self-care strategies which patients used to get enough calories and water (Soivong, P., 1995: 80).

Another common strategy that was performed on 77.8% of occasions of the subjects was staying with significant others (Table 11). All of the subjects stayed with a spouse or significant others and almost all of them were married. The presence of a social support as an environmental resource may facilitate self-care by meeting interaction needs and by enhancing motivation to engage in self-care behaviors (Orem, 1985 cited by Hanucharurnkul, S., 1989: 22). Social support was a strong predictor of self-care in cancer patients receiving radiation therapy (Hanucharurnkul, S., 1989: 22).

Patients undergoing cancer treatments were often suggested to limit their activities and get plenty of rest when they experienced fatigue (Graydon, et al., 1995: 27-28). Nearly 50% of cervical cancer patients receiving radiation therapy indicated that they were reluctant to perform exercise because they were unsure if exercise might be risky for their health (Kitrungrote, L., 2000: 75). However, sometimes, light exercise such as walking and ROM exercise may combat fatigue (The National Cancer Institute, Internet, 1999). In this study, walking (64.2%) and ROM exercise (33.7%) were reported as the fourth and eleven strategies used and their mean of effectiveness was nearly moderate relief ($\bar{X}$ = 1.7 and 1.9, respectively) (Table 11). These were due to adequate advice about exercise and encouragement from the nurse, so the subjects still considered exercise an appropriate strategy for them. At Arkan Yen Sira, the nurse always acted as the leader of the patients, leading ROM exercise about 10-15 minutes every morning. In addition, walking is a major type of activity of daily living that is convenient for many patients, regardless of age or disease status (Winningham, 1991: 271). This finding supports numerous studies by others (Berglund, et al., 1994: 1744-1751; Mock, et al., 1994: 899-907, 1997: 991-1000; Winningham, 1991: 270-276). They also found that light exercise has many benefits for cancer patients such as more physical energy, improved ability to function, quality of life, and outlook.

Lastly, strategies most frequently used were not necessarily the most effective ones. Stopping receiving radiation therapy was reported to be the highest effective strategy ($\overline{X}$=3.5, S.D.= .6) but it was performed on only 6.2% of occasions by the subjects (Table 11). Patients knew that delaying treatment can lessen the effectiveness of radiation therapy (The National Cancer Institute, Internet, 1999), therefore this strategy was used only when necessary.

Additional Findings

Oral complications from the side effects of radiation therapy might make it difficult for patients to receive radiation therapy. Sometimes treatment must be stopped completely. In this study, 51.9-86.9% of occasions of the subjects reported difficulty swallowing, sore throat, difficulty tasting food, sticky saliva, loss of appetite of food, dryness of the mouth, difficulty chewing, and pain in the mouth interfered with their eating (Table 12). During radiation therapy symptoms interfering with eating occurred, which was significantly and positively correlated at a high level with fatigue ($r = .794$, $p < .01$) (Table 11). Education, supportive care, and treatment of these symptoms are very important. Patients should closely monitor their oral complications. Thus, effective management of symptoms interfering with eating appears to be essential in maintaining a lower level of fatigue.

In conclusion, the majority of head and neck cancer patients experienced fatigue while receiving radiation therapy. According to the conceptual framework, a variety of causes perceived as contributing to fatigue supported the Piper Integrated Fatigue Model. In addition, fatigue was one of the basic conditioning factors that influenced both therapeutic self-care demand and self-care agency. Even though the majority of the subjects in this study experienced mild fatigue, they still found various strategies of self-care actions to manage fatigue. The finding supported Orem's theory of self-care as a deliberate action; after perceived fatigue, symptoms interfering with eating, and sleep disturbance, a new set of demands occurred. Subjects then initiated self-care activities to reduce fatigue and monitor the effectiveness of each of their self-care actions. In subjects experiencing no fatigue to mild fatigue there is a potential for self-care actions to manage fatigue, which the nurse should take into consideration for increasing fatigue management ability. On the contrary, a result of a moderate or severe fatigue indicated that the subjects' possibly performed self-care actions ineffectively, or that this set of demands was beyond the skill and knowledge of the patients. The nurse, therefore, should be aware and has the responsibility to assess these symptoms and work with patients to find appropriate self-care actions to manage fatigue and other symptoms.

CHAPTER VI

CONCLUSION

Conclusion

This prospective and descriptive study aimed to describe patterns of fatigue, related factors, and self-care actions to manage fatigue of head and neck cancer patients receiving radiation therapy. Orem's self-care theory and the Piper Integrated Fatigue Model were used as a conceptual framework for the study. The purposive samples for this study were 60 head and neck cancer patients receiving radiation therapy recruited from the Division of Radiotherapy of Songklanagarind Hospital, Faculty of Medicine, Prince of Songkla University. Data were collected from February to July 2001. The inclusion criteria for the samples were patients who 1) were newly diagnosed, with age 20 years or over, 2) planned for radiation therapy alone or postoperative radiation therapy, 3) had been receiving a radiation minimum dose of at least 4,000 cGy with 200 cGy/day, 4) were able to understand and speak Thai, 5) were not confused at the beginning of the study, and 6) agreed to participate in this study. The exclusion criteria for the subjects were patients who 1) had history of previous chemotherapy or were undergoing combination therapy; chemotherapy and radiation therapy 2) had ECOG performance status level 4, and 3) were confused during data collection.

A total of 52 men and 8 women head and neck cancer patients participated in this study. Their ages ranged from 32 to 81 years, with the mean age of 62.7 years, and the majority (65%) were of age 60 years, or over. Most of them were Buddhist

(91.7%). Eighty-one point seven percent of the subjects were married. The largest groups for education level (80%) were no formal education to primary education. By occupation, 33.3% of the subjects were unemployed. Most of the subjects (91.7%) reimbursed their medical expenses from insurance. Nearly half (46.7%) of travel time to the Division of Radiotherapy was less than 15 minutes. During radiation therapy, 45% of the subjects stayed at home in Songkhla, and 30% stayed at Arkan Yen Sira. By anatomic site, the majority of the subjects were larynx cases (26.7%) and 75% were diagnosed with stage III and IV cancers. The majority of performance status of the subjects was at ECOG level 1 (60%). Fifty-five percent of the subjects were treated with radiation therapy alone. The majority of radiation doses (86.7%) ranged from 5,001 to 7,000 cGy and patients underwent treatment for 5.1 to 7 weeks. More than half (65%) of radiation times were in the morning.

The questionnaires used in this study were as follows: the Demographic Characteristic and Clinical Data Form, the Revised PFS, the Symptoms Interfering with Eating Questionnaire, the Sleep Disturbance Scale, and the Self-Care Actions to Manage Fatigue Questionnaire. The above questionnaires were content validated by 5 experts. These instruments were tested with a group of 15 head and neck cancer patients receiving radiation therapy at Songklanagarind Hospital, but not the sample group. The reliabilities of Cronbach's alpha of the Revised PFS, the Symptoms Interfering with Eating Questionnaire, and the Sleep Disturbance Scale were .96, .72, and .97, respectively. When these instruments were used with 60 subjects for 5-7 weeks, Cronbach's alpha for three instruments ranged from .96 to .98, .86 to .91, and .95 to .98, respectively.

Data were analyzed with the SPSS/FW program by using descriptive statistics, the Friedman test, cluster analysis, and Spearman's rho correlation coefficients.

The results of this study are summarized as follows;

1. After receiving radiation therapy, the majority of subjects (83.3%) experienced fatigue and 16.7% had no fatigue throughout the course of radiation therapy. The means of intensity of each dimension and total fatigue scores were mild; the total fatigue scores gradually increased from the first to the third week, with the highest peak at the fourth week, and then gradually declining until the seventh week. However, there were no significant differences between total fatigue scores over time during radiation therapy. Due to the scattered nature of the data, cluster analysis cannot identify patterns of fatigue.

2. Fatigue varied throughout the day, with the most common peak of fatigue during the day being late afternoon and early evening, and it decreased over the weekend. In addition, subjects receiving radiation in the morning reported that late morning was the other peak period of fatigue in the day when they also felt more fatigued.

3. The five most common causes of fatigue were radiation therapy, lack of nutrition, cancer, travelling to the Division of Radiotherapy, and waiting at the Division, respectively.

4. Fatigue was significantly and positively correlated at a high level with the symptoms interfering with eating and at a moderate level with sleep disturbance. On the contrary, there were no significant relationships between fatigue and ECOG performance status, and body weight and hematocrit change.

5. The five most common self-care actions to manage fatigue were lying down, sleeping, drinking juice/cereals/water, staying with significant others, and napping, respectively. Stopping receiving radiation therapy was reported to be the most effective strategy but was performed on only 6.2% of occasions by the subjects.

6. The five most common symptoms interfering with eating were difficulty swallowing, sore throat, difficulty tasting food, sticky saliva, and loss of appetite of food, respectively. In addition, symptoms interfering with eating perceived by more than half of the subjects were dryness of the mouth, difficulty chewing, and pain in the mouth.

Based on the findings and discussion, the study was in accordance with the Orem' s self-care theory and the Piper Integrated Fatigue Model. Thus, the contribution to nursing knowledge is to assess fatigue and related factors and work with patients to find appropriate self-care actions to manage fatigue and other symptoms.

Limitations

1. There were many long holidays during the data collection period. Some patients took the opportunity to stop receiving radiation therapy. This might have decreased their intensity of fatigue.

2. The clinical manifestations of some participants worsened so the treatment had to be terminated or discontinued; the subjects then were excluded from the study. This might affect the results, because the participants completing the study were healthier than those who were later excluded.

3. Interaction among patients with each other or nonstudy individuals during their waiting time for radiation therapy and/or their resting period at Arkan Yen

Sira, the ongoing information from health professionals, as well as interaction between investigator and participants during data collection might be mental supports that introduced bias and decreased the intensity of fatigue.

Recommendations

The findings of this study provide several important implications for the nursing profession including nursing practice, nursing education, and nursing research.

Nursing practice

1. Information on the intensity of fatigue and symptoms interfering with eating is significant for nurses to prepare patients and relatives for radiation therapy. Patients will be able to incorporate this knowledge and closely monitor their symptoms. Effective management of symptoms interfering with eating appears to be essential in maintaining a lower level, or decreasing intensity of fatigue.

2. Providing nurses with assessment guidelines and intervention strategies to assess patients for fatigue at all stages of illness and in all settings, particularly as their survival times lengthen. Because of the high incidence of fatigue, all patients should be assessed, not just those who had aggressive disease and received aggressive therapy. Planning should include interventions to prevent fatigue, such as control of symptoms interfering with eating, sleep disturbance, pain and care of the individual's mental and emotional health.

3. In this study, symptoms interfering with eating had a high correlation with fatigue; controlling and managing these symptoms is necessary and important to maintain daily activities. Nurses should regularly assess symptoms interfering with

patients' eating and their knowledge regarding self-care practices and provide information according to their needs.

4. The result of this study indicated that a combination of strategies might be required for relief of fatigue. Information on self-care actions and their effectiveness are useful for nurses to assist patients to alleviate fatigue. Individuals who experience severe fatigue or who do not develop self-care behaviors may receive and benefit from interventions tailored to reduce fatigue during radiation therapy, whereas individuals who experience mild fatigue still may benefit from routine education and support from staff and interaction with other patients during radiation therapy.

Nursing education

The results from this study indicate the need for emphasizing the importance of the phenomenon of fatigue in cancer patients in nursing education. Specifically, fatigue and its contributing factors, as well as nursing interventions, should be acknowledged and addressed for the oncology nurse specialist or registered nurses who are preparing to care for cancer patients receiving radiation therapy.

Nursing research

1. Future research should concentrate on:

1.1 Program for minimizing side effects of the radiation therapy program (e.g.symptoms interfering with eating).

1.2 Comparing the incidence and effectiveness of proactive and reactive self-care actions to expand nursing knowledge.

1.3 Comparion between groups of patients experiencing no, to mild fatigue, and groups of those with moderate, to severe fatigue. By considering demographic data, including sex, age, marital status, stage of disease, social support, stopping receiving radiation therapy.

2. Future studies with various age groups and populations such as chronically ill patients should be considered in order to increase generalization of fatigue to wider populations.

3. In order to collect data in old-age patients experiencing fatigue, structural interviewing should be used.

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APPENDIX

APPENDIX A

Instruments

แบบสอบถามความอ่อนล้า

วันที่ ...... เดือน ...... พ.ศ.... ... No......... HN .... ห้อง ....

ตอนที่ 1 แบบสอบถามข้อมูลส่วนบุคคล

กรุณาเติมคำในช่องว่าง และทำเครื่องหมาย ✓ ลงในช่อง ❑ ที่ตรงกับความเป็นจริงของท่าน

1. เพศ .... ❑ 1. ชาย ❑ 2. หญิง [ ]

2. อายุ.......ปี

.

10. ❑ สูบบุหรี่ ❑ สูบใบจาก เป็นเวลา ..... ปี จำนวน .... มวน/วัน หยุดมา .... ปี

11. ดื่มเหล้าเป็นเวลา ....ปี จำนวน ..../วัน หยุดมา ......ปี

ข้อมูลด้านสุขภาพของผู้ป่วย (สำหรับผู้วิจัยกรอก) No......... HN .... ห้อง

1. ตำแหน่งที่เป็นมะเร็ง .... [ ]

❑ 1. Nasal cavity and paranasal sinus ❑ 2. Nasopharynx

❑ 3. Oral cavity ❑ 4. Oropharynx

❑ 5. Larynx ❑ 6. Hypopharynx ❑ 7. Others

2. ระยะของโรค T.....N.....M..... stage ..... [ ]

3. ECOG performance status.................. [ ]

9. วันที่เก็บข้อมูล ก่อนได้รับรังสีรักษา ...../....../......

วันที่เก็บข้อมูล สัปดาห์ที่ 1 ..../....../....... ปริมาณรังสีที่ได้.รับ..............cGy

.

วันที่เก็บข้อมูล สัปดาห์ที่ 7 ...../....../...... ปริมาณรังสีที่ได้รับ..............cGy

10. ก่อนได้รับการรักษาด้วยรังสี น้ำหนัก ...... กก. Hct ....%

wk 1 นน.........กก. นน. ปป.......kg./wk Hct ....% Hct ปป........%/wk

.

wk 7 นน.........กก. นน. ปป........kg./wk Hct ....% Hct ปป........%/wk

ตอนที่ 2 แบบวัดความอ่อนล้า

ส่วนที่ 1 กรุณาวงกลมล้อมรอบตัวเลขที่ตรงกับระดับความรู้สึกอ่อนล้าที่เกิดขึ้นกับท่านในระยะ 1 สัปดาห์ ที่ผ่านมามากที่สุด

1. ท่านรู้สึกทุกข์ทรมานจากความอ่อนล้ามากน้อยเพียงใด

0 1 2 3 4 5 6 7 8 9 10

ไม่ทุกข์ทรมานเลย ทุกข์ทรมานมากที่สุด

.

7. ลักษณะความอ่อนล้าที่ท่านประสบในระยะ 1 สัปดาห์ที่ผ่านมาเป็นอย่างไร

0 1 2 3 4 5 6 7 8 9 10

เป็นที่พอใจ ไม่เป็นที่พอใจ

.

12. ในระยะ 1 สัปดาห์ที่ผ่านมาท่านรู้สึกอย่างไร

0 1 2 3 4 5 6 7 8 9 10

แข็งแรง อ่อนแอ

.

17. ในระยะ 1 สัปดาห์ที่ผ่านมา ท่านรู้สึกอย่างไร

0 1 2 3 4 5 6 7 8 9 10

อดทนได้ อดทนไม่ได้

22. ในระยะ 1 สัปดาห์ที่ผ่านมา ท่านรู้สึกอย่างไร

0 1 2 3 4 5 6 7 8 9 10

คิดได้อย่างชัดเจน คิดได้อย่างไม่ชัดเจน

ส่วนที่ 2 กรุณาทำเครื่องหมาย ✓ ลงในช่อง ❑ ที่แสดงช่วงเวลาที่ท่านเกิดความอ่อนล้าในระยะ 1 สัปดาห์ที่ผ่านมา (สามารถทำเครื่องหมาย ได้มากกว่า 1 ช่อง)

❑ 1. เช้าตรู่ ❑ 2. สาย ❑ 3. กลางวัน
❑ 4. บ่าย ❑ 5. เย็น ❑ 6. ดึก

เมื่อเปรียบเทียบกับวันจันทร์-ศุกร์ วันเสาร์-อาทิตย์ ท่านมีความอ่อนล้า
❑ 1. มากขึ้น ❑ 2. เท่าเดิม ❑ 3. ลดลง

ส่วนที่ 3 กรุณาทำเครื่องหมาย ✓ ลงในช่อง ❑ หน้าข้อที่ท่านคิดว่าเป็นสาเหตุที่ทำให้เกิดความอ่อนล้าในระยะ 1 สัปดาห์ที่ผ่านมา (สามารถระบุได้มากกว่า 1 ข้อ)

❑ 1. การได้รับรังสีรักษา
❑ 2. การผ่าตัด
❑ 3. โรคที่เป็น
❑ 4. การเดินทางมารับการรักษา
❑ 5. ระยะเวลาที่รอรับรังสีรักษา
❑ 6. การได้รับอาหารไม่เพียงพอ
❑ 7. การนอนหลับพักผ่อนไม่เพียงพอ
❑ 8. การทำงาน
❑ 9. การออกกำลังกาย
❑ 10. ความวิตกกังวล
❑ 11. ความเครียด
❑ 12. อาการหงุดหงิดง่าย
❑ 13. อาการไข้
❑ 14. อาการไอ
❑ 15. อาการหายใจลำบาก
❑ 16. อื่นๆ ระบุ ....
....

ตอนที่ 3 แบบสอบถามอาการที่รบกวนการรับประทานอาหาร

คำชี้แจง แบบสอบถามชุดนี้ เป็นข้อความเกี่ยวกับอาการที่รบกวนการรับประทานอาหารของท่าน กรุณาอ่านข้อความแต่ละข้อ แล้วพิจารณาว่า ในระยะ 1 สัปดาห์ที่ผ่านมา ท่านมีอาการเหล่านี้หรือไม่ ถ้าไม่มี ให้ทำเครื่องหมาย ✓ ลงในช่อง ไม่มี ถ้ามี ให้ทำเครื่องหมาย ✓ ลงในช่อง มี และ อาการเหล่านั้นรบกวนการรับประทานอาหารของท่านมากน้อยเพียงใด ให้ทำเครื่องหมาย ✓ ลงในช่องตาราง โดยมีเกณฑ์การเลือกตอบมีดังนี้

ไม่มี หมายถึง ท่านไม่มีอาการเลยในระยะ 1 สัปดาห์ที่ผ่านมา
มี หมายถึง ท่านมีอาการเลยในระยะ 1 สัปดาห์ที่ผ่านมา
ไม่รบกวนเลย หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นไม่รบกวนการรับประทานอาหารเลย
น้อยมาก หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นรบกวนการรับประทานอาหารน้อยมาก
น้อย หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นรบกวนการรับประทานอาหารน้อย
ปานกลาง หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นรบกวนการรับประทานอาหารปานกลาง
มาก หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นรบกวนการรับประทานอาหารมาก
มากที่สุด หมายถึง ท่านมีอาการและอาการที่เกิดขึ้นรบกวนการรับประทานอาหารมากที่สุด

อาการที่เกิดขึ้น	**ไม่มี (0)**	**มี**	**อาการที่เกิดขึ้นรบกวนการรับประทานอาหาร**					
			ไม่รบกวนเลย (0)	**น้อยมาก (1)**	**น้อย (2)**	**ปานกลาง (3)**	**มาก (4)**	**มากที่สุด (5)**
1. เจ็บในปาก								
2. กลืนลำบาก								
.								
.								
11. เคี้ยวลำบาก								
12. รับรสชาดอาหารเปลี่ยนแปลง								
13. อื่นๆ ระบุ ………..….								

ตอนที่ 4 แบบสอบถามปัญหาการนอนหลับ

กรุณาทำเครื่องหมาย ✓ ลงในช่อง ❑ หน้าข้อความที่ตรงกับความรู้สึกของท่านในระยะ 1 สัปดาห์ที่ผ่านมา

1. การนอนหลับของท่านเป็นอย่างไร

❑ 0. นอนหลับได้ดี ❑ 1. มีปัญหาในการนอนหลับน้อย

❑ 2. มีปัญหาในการนอนหลับปานกลาง ❑ 3. มีปัญหาในการนอนหลับมาก

❑ 4. ไม่สามารถนอนหลับได้เลย

กรุณาระบุลักษณะปัญหา ....

2. เมื่อมีปัญหาในการนอนหลับ ท่านรู้สึกอย่างไร

❑ 0. ไม่ทุกข์ทรมานเลย ❑ 1. ทุกข์ทรมานเล็กน้อย

❑ 2. ทุกข์ทรมานปานกลาง ❑ 3. ทุกข์ทรมานมาก

❑ 4. ทุกข์ทรมานมากที่สุด

ตอนที่ 5 แบบสอบถามวิธีการจัดการกับความอ่อนล้า

คำชี้แจง แบบสอบถามชุดนี้ เป็นข้อความเกี่ยวกับกิจกรรมที่ทำเพื่อจัดการกับความอ่อนล้า กรุณาอ่านข้อความแต่ละข้อ แล้วพิจารณาว่า ในระยะ 1 สัปดาห์ที่ผ่านมา ท่านได้ทำกิจกรรมเหล่านี้หรือไม่ ถ้าไม่ได้ทำ ให้ทำเครื่องหมาย ✓ ลงในช่อง ไม่ได้ทำ ถ้าทำ ให้ทำเครื่องหมาย ✓ ลงในช่อง ทำ และกิจกรรมเหล่านั้นได้ผลในการลดความอ่อนล้าของท่านมากน้อยเพียงใด กรุณาทำเครื่องหมาย ✓ ลง ในช่องตาราง โดยมีเกณฑ์การเลือกตอบมีดังนี้

ไม่ได้ทำ หมายถึง ท่านไม่ได้ทำกิจกรรมในการช่วยลดความอ่อนล้าในระยะ 1 สัปดาห์ที่ผ่านมา
ทำ หมายถึง ท่านทำกิจกรรมในการช่วยลดความอ่อนล้าในระยะ 1 สัปดาห์ที่ผ่านมา
ไม่ได้เลย หมายถึง กิจกรรมที่ทำ ไม่ช่วยลดความอ่อนล้าเลย
เล็กน้อย หมายถึง กิจกรรมที่ทำ ลดความอ่อนล้าได้เล็กน้อย
ปานกลาง หมายถึง กิจกรรมที่ทำ ลดความอ่อนล้าได้ปานกลาง
ค่อนข้างมาก หมายถึง กิจกรรมที่ทำ ลดความอ่อนล้าได้ค่อนข้างมาก
มากที่สุด หมายถึง กิจกรรมที่ทำ ลดความอ่อนล้าได้มากที่สุด

กิจกรรมที่ทำ	ไม่ได้ทำ	ทำ	ผลในการลดความอ่อนล้า				
			ไม่ได้เลย (0)	เล็กน้อย (1)	ปานกลาง (2)	มาก (3)	มากที่สุด (4)
1. นอนหลับ							
2. นอนพัก							
3. งีบหลับหรือหลับช่วงสั้นๆ							
.							
.							
23. ใช้ยาลดอาการอื่นๆ ระบุ							
24. อื่นๆ ระบุ							

APPENDIX B

Consent to Participate in Research Study

คำชี้แจงและพิทักษ์สิทธิ์ของผู้ป่วยในการเข้าร่วมการวิจัย

สวัสดีค่ะ ดิฉัน นางสาวเอมอร แซ่จิว เป็นนักศึกษาพยาบาลปริญญาโท คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี ขณะนี้กำลังศึกษาวิจัยเรื่อง แบบแผนความอ่อนล้า ปัจจัยที่เกี่ยวข้อง และการดูแลตนเองเพื่อจัดการกับความอ่อนล้าของผู้ป่วยมะเร็งบริเวณศีรษะและคอที่ได้รับรังสีรักษา โดยมีวัตถุประสงค์เพื่อนำความรู้ที่ได้จากการศึกษาครั้งนี้ไปใช้เป็นแนวทางในการดูแลและให้ความช่วยเหลือในผู้ป่วยกลุ่มนี้ต่อไป รวมทั้งในผู้ป่วยกลุ่มอื่นที่มีความอ่อนล้าด้วย ถ้าคุณตกลงจะเข้าร่วมโครงการวิจัย ดิฉันจะอธิบายเกี่ยวกับการศึกษาครั้งนี้ ดังนี้

คุณจะได้รับการสัมภาษณ์หรือการตอบแบบสอบถามเกี่ยวกับ ข้อมูลส่วนบุคคล แบบสอบถามความอ่อนล้า แบบสอบถามอาการที่รบกวนการรับประทานอาหาร แบบสอบถามปัญหาการนอนหลับ และแบบสอบถามการดูแลตนเองเพื่อจัดการกับความอ่อนล้า โดยท่านจะใช้เวลาในการตอบแบบสอบถามหรือได้รับการสัมภาษณ์ครั้งละประมาณ 20-25 นาที ณ หน่วยรังสีรักษา ในวันแรกก่อนได้รับการฉายรังสี และทุกสัปดาห์ตลอดระยะเวลาที่ท่านได้รับรังสีรักษา ซึ่งในระหว่างนี้ ถ้าท่านมีข้อสงสัยประการใดเกี่ยวกับการวิจัยครั้งนี้ ดิฉันยินดีอธิบายให้คุณเข้าใจ โดยข้อมูลทั้งหมดที่ได้จากแบบสอบถาม ดิฉันจะเก็บเป็นความลับ และการนำเสนอผลการวิจัยจะนำเสนอในภาพรวม คุณจะไม่ได้รับความเสี่ยงในการเข้าร่วมโครงการวิจัย และคุณสามารถเลือกว่าจะเข้าร่วมในโครงการวิจัยครั้งนี้หรือไม่ก็ได้ หรือในระหว่างที่คุณเข้าร่วมโครงการ คุณมีสิทธิ์ที่จะยกเลิกได้ตลอดเวลาที่คุณต้องการ โดยไม่มีผลต่อการรักษาหรือบริการที่คุณจะได้รับ

ขอบคุณค่ะ

เอมอร แซ่จิว

APPENDIX C

Table 13. Ranges, means, and standard deviations of total symptoms interfering with eating scores before and during radiation therapy

Wk	n	Range		Mean	S.D.
		Possible range	Actual range		
0	60	0 – 5	0 – 3.5	0.4	0.6
1	60	0 – 5	0 – 3.3	0.7	0.8
2	60	0 – 5	0 – 3.8	1.0	0.9
3	60	0 – 5	0 – 3.6	1.3	1.0
4	60	0 – 5	0 – 3.6	1.4	1.0
5	60	0 – 5	0 – 3.4	1.3	1.0
6	52	0 – 5	0 – 3.8	1.2	1.1
7	34	0 – 5	0 – 3.3	1.1	1.0

Table 14. Ranges, means, and standard deviations of sleep disturbance scores before and during radiation therapy

Wk	N	Range		Mean	S.D.
		Possible range	Actual range		
0	60	0 – 8	0-8	1.0	2.0
1	60	0 – 8	0-6	1.1	1.9
2	60	0 – 8	0-6	0.8	1.7
3	60	0 – 8	0-6	1.1	1.9
4	60	0 – 8	0-6	1.0	1.9
5	60	0 – 8	0-6	1.1	1.9
6	52	0 – 8	0-6	1.3	2.2
7	34	0 - 8	0-7	1.3	2.3

Table 15. Means and standard deviations of each symptom interfering with eating scores during radiation therapy

		Difficulty tasting food	Difficulty swallowing	Sore throat	Loss of appetite for food	Sticky saliva	Difficulty chewing	Pain in the mouth	Dryness of the mouth	Nausea	Loss of appetite for liquid	Vomiting	Constipation	Others
wk	n	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)	$\overline{X}$ (S.D.)
1	60	2.0 (1.8)	1.9 (1.8)	1.7 (1.8)	1.5 (1.8)	1.5 (1.7)	1.2 (1.7)	1.4 (2.0)	1.1 (1.5)	.5 (1.2)	.4 (1.1)	.3 (0.8)	.3 (.9.0)	3.5 (0.7)
2	60	1.4 (1.7)	1.6 (1.7)	1.5 (1.7)	1.5 (1.7)	1.3 (1.6)	1.4 (1.8)	0.9 (1.4)	1.0 (1.3)	.3 (0.9)	.3 (1.2)	.3 (0.9)	.3 (1.0)	2.3 (1.6)
3	60	2.2 (1.7)	2.0 (1.8)	1.8 (1.7)	1.7 (1.9)	1.6 (1.7)	1.5 (1.8)	1.3 (1.8)	1.2 (1.5)	.8 (1.3)	.6 (1.2)	.6 (1.3)	.2 (0.7)	2.2 (1.7)
4	60	2.3 (1.8)	2.0 (1.8)	2.0 (1.7)	2.1 (1.8)	1.9 (1.7)	1.6 (2.0)	1.3 (1.7)	1.3 (1.6)	.7 (1.2)	.7 (1.3)	.6 (1.3)	.4 (1.0)	1.8 (1.7)
5	60	2.0 (1.8)	1.9 (1.8)	1.6 (1.7)	1.7 (1.8)	1.7 (1.8)	1.2 (1.8)	1.0 (1.7)	1.3 (1.5)	.6 (1.2)	.5 (1.3)	.4 (1.1)	.4 (1.0)	2.5 (1.7)
6	52	2.0(1.7)	1.9 (1.8)	1.7 (1.8)	1.5 (1.8)	1.5 (1.7)	1.2 (1.6)	1.4 (2.0)	1.1 (1.5)	.5 (1.2)	.4 (1.1)	.3 (0.8)	.3 (0.9)	. 3.5 (1.7)
7	34	2.1 (1.7)	1.7 (2.0)	2.1 (1.7)	1.2 (1.6)	2.0 (1.7)	1.1 (1.7)	1.8 (2.0)	1.7 (1.6)	.3 (1.0)	.5 (1.1)	.2 (0.8)	.4 (1.1)	-

Table 16. Spearman's rho correlation coefficients between fatigue and symptoms interfering with eating during radiation therapy

wk	n	r
1	60	.717**
2	60	.758**
3	60	.649**
4	60	.811**
5	60	.655**
6	52	.665**
7	34	.727*

** P<.01

Table 17. Ranges, means, and standard deviations of body weight before and during radiation therapy

Wk	n	Min-Max	Mean	S.D.
0	60	37.6 – 86.1	53.1	10.3
1	60	37.2 – 86.7	52.7	10.1
2	60	38.5 – 86.8	52.4	9.8
3	60	38.3 – 83.4	51.6	9.5
4	60	38.0 – 80.3	51.2	9.1
5	60	37.3 – 79.9	50.6	9.0
6	52	37.5 – 76.7	50.7	9.0
7	34	37.5 – 75.7	50.8	8.7

Table 18. Percentage of body weight change during radiation therapy (n =60)

Body weight Loss (kg)	n (%)	Body weight gain (kg)	n (%)	No body weight change (kg)	n (%)
0.1 - 5.0	31 (51.7)	0.1 – 1.0	7 (11.7)		1 (1.7)
5.1 -10.0	10 (16.6)	1.1 – 2	5 (8.3)		
> 10	5 (8.3)	> 2	1 (1.7)		
min=0.1 max=13.9		min=0.1 max=9.4			
Total	46 (76.6)	Total	13 (21.7)	Total	1 (1.7)

Table 19. Ranges, means, and standard deviations of hematocrit level of males during radiation therapy

Wk	n	Hct < 35 n (%)	Hct ⩾ 35 n (%)	Range	Mean	S.D.
1	37	12 (32.4)	25 (67.6)	25 – 45	36.9	4.6
2	47	19 (40.4)	28 (59.6)	23 – 50	36.8	5.0
3	49	18 (36.7)	31 (63.3)	30 – 52	37.2	4.4
4	48	21 (43.8)	27 (56.3)	29 – 54	36.9	4.7
5	43	18 (41.9)	25 (58.1)	30 – 54	36.5	4.5
6	31	15 (48.4)	16 (51.6)	28 – 50	36.3	4.6
7	3	1 (33.3)	2 (66.7)	34 - 39	36.3	2.5

Table 20. Ranges, means, and standard deviations of hematocrit level of females during radiation therapy

Wk	n	Hct < 30 n (%)	Hct ⩾ 30 n (%)	Range	Mean	S.D.
1	7	2 (28.6)	5 (71.4)	28-42	33.9	4.5
2	7	1 (14.3)	6 (85.7)	30.42	35.9	4.2
3	8	1 (12.5)	7 (87.5)	29-44	36.8	4.5
4	7	1 (14.3)	6 (85.7)	28-42	35.6	4.5
5	7	2 (28.6)	5 (71.4)	29-40	34.3	4.5
6	3	-	3 (100)	32-41	36.3	4.5

APPENDIX D

LIST OF EXPERTS CONSULTED ON VALIDATION OF THE INSTRUMENTS

The content validity of questionnaires were determined by five consulting experts included

1. Lieutenant-colonel. Thiti Swangsilpa

   Division of Radiotherapy, Department of Radiology,

   Phra Mongkutklao Hospital.

2. Associate Professor Darunee Junhavat

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3. Associate Professor Pongsri Srimoragot

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4. Miss. Manmana Jirajaras

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5. Miss. Nanta Kiatgungwalgri

   Siriraj Hospital, Mahidol University

BIOGRAPHY

NAME	Miss Aimorn Saejew
DATE OF BIRTH	6 October 1964
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INSTITUTIONS ATTENDED	Prince of Songkla University, 1982-1985 Bachelor of Science (Nursing and Midwifery) Mahidol University, 1999-2001 Master of Nursing (Adult Nursing)
GRADUATE STUDY FUNDED	University Development Committee (UDC)
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