SHOULDER PAIN AFTER NECK DISSECTION AMONG HEAD AND NECK CANCER PATIENTS

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Submitted to the faculty of the University Graduate School
in partial fulfillment of the requirements
for the degree
Doctor of Philosophy
in the School of Nursing,
Indiana University

September 2009

Accepted by the Faculty of Indiana University, in partial
fulfillment of the requirements for the degree of Doctor of Philosophy.

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ACKNOWLEDGEMENTS

I would like to acknowledge the William and Doris Rodie Dissertation Scholarship and the Indiana University School of Nursing for their monetary support on this research project. I would like to thank all doctors, nurses, and staffs of The Center of Ear, Nose, Throat and Allergy for helping me collect data used in this study.

To my mentor and advisor, Dr. Juanita Keck, no word can be used to describe how much I appreciate your help academically and personally. Your unfaithfully belief in my ability to accomplish the PhD program has meant a great deal to me. Your guidance has given me a lot of encouragement to investigate head and neck cancer patients. Without you, I could not make this journey so far. Although you are retired, you are still my best resource of understanding "pain" in the human being.

To Dr. Susan Rawl, your intelligence and kindness to help me understand cancer population and symptom has played a major role in this project. I am indebted to you for your incredible mentorship and support. I look forward to continuing my journey of understanding science with you.

To committee members, Dr. Buelow and Dr. Mikesky, I thank you for your advice on this project. To the faculty and staff at the Indiana University School of Nursing, I thank you for making my learning environment so pleasant and conductive to success.

To my husband, Ming-Hun Teng, I thank you for the unselfish support. You always helped me open another door to see the world and believed in me even when I was not sure I believed in myself. To Hope and Wisdom, mommy can not be a fulfill person without you. Your love let mommy stronger than ever. To my dad and mom, I thank you for raising me, giving me education, and telling me I needed to focus on my interest.

To all of you, my family and friends, I thank you for all your support. I have ended this journey and am ready to my next one.

ABSTRACT

Hsiao-Lan Wang

SHOULDER PAIN AFTER NECK DISSECTION AMONG HEAD AND NECK CANCER PATIENTS

Shoulder pain was constantly reported as a problematic symptom causing dysfunction and quality of life interference after neck dissection in head and neck cancer patients. Due to a lack of conceptual framework and inconsistency of instrument selection, a comparison among previous studies was almost impossible, making it difficult to understand the phenomenon. The current study applied the University of California, San Francisco School of Nursing Symptom Management Model. The purposes of the study were to (a) describe the symptom experience of shoulder pain at 1 month after neck dissection, (b) describe the relationships among symptom experience of shoulder pain, functional status, and quality of life, and (c) identify the contextual variables, concurrent symptoms, and/or adherence predicting symptom experience of shoulder pain, functional status, and/or quality of life. This was a descriptive study with a convenience sample of head and neck cancer patients. The data were collected via a medical record review, a self-administered survey, and a physical examination. The data from 29 patients were entered for descriptive statistics, Pearson correlations, and multiple regressions. At 1 month after surgery, 62% of patients reported they had shoulder pain at some point within a week. Their shoulder pain was from mild to moderate. Fifty-nine percent complained that shoulder pain bothered them about the moderated level. In the final

model, symptom experience, shoulder pain, was significantly correlated with one outcome, active shoulder abduction, but not the other, total quality of life, generic quality of life, and head and neck quality of life. Active shoulder abduction was significantly correlated with three quality of life measures. Adding significant predictors of symptom experience and outcomes into the final model, there is a potential that the model would be useful to guide treatment strategies. Treatment for myofascial pain of the levator scapulae could relieve shoulder pain after neck dissection and improve head and neck quality of life. Those with level V dissection were high risk populations of developing shoulder pain. Risk factors of quality of life, which were depression, loss of sensation, and radiation would describe how an intervention could change or unchange the patient's life.

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ABBREVIATIONS

Abbreviations	Terms
BPI	Brief Pain Inventory
CES-D	Center For Epidemiological Studies of Depression Scale
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ECOG	Eastern Cooperative Oncology Group
FACIT-G	Functional Assessment of Chronic Illness Therapy – General Scale
FACIT-H&N	Functional Assessment of Chronic Illness Therapy – Head and Neck Scale
HNQOL	The Head and Neck Cancer-Specific Quality of Life
KPS	Karnofsky Performance Status
MOS	The Medical Outcome Study
NDII	Neck Dissection Impairment Index
PRET	Progressive Resistance Exercise Training
PSR	Performance Status Rating
RAND-36	The Dutch Version of the SF36
UCSF-SMM	The University of California, San Francisco School of Nursing Symptom Management Model
UW-QOL	The University of Washington Quality of Life questionnaire

CHAPTER 1

THE NATURE OF THE STUDY

Problem

In 2008, only 4% of all cancers were head and neck cancers (Johnson, McDonald, & Corsten, 2008). Although this number is relatively low compared with that of breast cancer or prostate cancer, head and neck cancer is often seen as the most devastating and debilitating of all cancers (Dropkin, 2001). Physical and emotional discomforts frequently accompany facial disfigurement and functional impairment resulting from head and neck cancer surgery (Dropkin, 2001). A symptom often seen among head and neck cancer patients in clinic is pain. When head and neck cancer patients were asked to prioritize treatment outcomes, "having no pain" was among the top three priorities, following "being cured" and "living as long as possible" (List et al., 2000).

Symptom of Shoulder Pain

One type of pain that these patients commonly suffer following neck dissection is shoulder pain, which was experienced by 70% of patients on the day before discharge (Dijkstra et al., 2001). At 6 months post surgery, the incidence of shoulder pain still ranged from 29% to 31% after selective neck dissection, from 36% to 56% after modified neck dissection, and from 60% to 100% after radical neck dissection (van Wilgen, Dijkstra, van der Laan, Plukker, & Roodenburg, 2004c). The intensity of the shoulder pain was either moderate or severe among 80% of patients in the first month after the neck dissection (Salerno et al., 2002). In a study at 6 months following surgery, 14 of 24 patients (58%) complained of moderate to severe shoulder pain (Shone & Yardley, 1991). Fifty-eighty percent of patients from the same study reported that they experienced

shoulder pain on most days or every day. The location of the shoulder pain was in the back and superior shoulder aspect (Salerno et al., 2002). Seventy percent of patients who complained of shoulder pain after neck dissection described their shoulder pain as a dull ache, while 30% reported sharp pain (Hillel, Kroll, Dorman, & Medieros, 1989). Similar results were seen by Cheng et al. (2000); 80% of patients complained of a dull ache in the shoulder, while 20% reported sharp pain.

Influence of Shoulder Pain on Patients

Shoulder pain following neck dissection has a significant influence on head and neck cancer patients' lives. Two domains of the Medical Outcome Study 36-Item Short Form Health Survey (SF36), "social function" and "limitations because of physical problems," were significantly worse in the neck dissection group compared with the healthy group, and these domains were significantly related to shoulder pain (van Wilgen, Dijkstra, van der Laan, Plukker, & Roodenburg, 2004b). Dijkstra et al. (2001) found that the intensity of shoulder pain was significantly related to the number of situations when shoulder pain presented ($r = 0.73$). These situations included rest, movements of the shoulder, lying on the shoulder, walking with the arm unsupported, dressing, and washing. They concluded that shoulder pain could influence activities of daily living; however, there was no information about the specific activities assessed. Among the symptoms related to neck dissection, Shah, Har-El, and Rosenfeld (2001) found that the frequency of shoulder pain had the strongest correlation with "interference of daily activities" ($R = 0.77$, $p < 0.001$). Salerno et al. (2002) found that impaired working and impaired recreational activities due to shoulder pain were reported by all patients during the first month after neck dissection. More importantly, Shone and Yardley (1991) found that 14 of 24 employed patients

(58%) stopped working after neck dissection. Eleven patients (79%) reported that they stopped working because of shoulder pain. These patients had had neck dissection at least 6 months prior to the study.

Etiologies of Shoulder Pain

Trapezius dysfunction because of nerve damage or removal during neck dissection has been described in both cadaver and electroneurography studies (H. Brown, Burns, & Kaiser, 1988; Nori, Soo, Green, Strong, & Miodownik, 1997). Without stabilization from the trapezius, the shoulder becomes displaced. The shoulder pain is due to excessive stretching of the rhomboids and the levator scapulae, initiated by an unbalanced pull of the serratus anterior. However, an electromyographic study has shown that 85% of patients with nerve excision had partial restoration of muscle function in the trapezius (i.e., reinnervation) at 15 months following neck dissection (Soo, Guiloff, Oh, Della Rovere, & Westbury, 1990). No correlation between the absence of shoulder pain and the extent of electromyographic changes was found in the same study. Patten and Hillel (1993) proposed that adhesive capsulitis of the shoulder joint, rather than nerve palsy in the trapezius, may cause shoulder pain following neck dissection. They categorized two groups of symptoms: one related to nerve palsy in the trapezius and the other to adhesive capsulitis of the shoulder joint. At 1 month postoperatively, symptoms attributable to accessory nerve palsy and those attributable to adhesive capsulitis happened with similar frequency. At 12 and 18 months, adhesive capsulitis symptoms were predominant in patients participating in the study. Moreover, electrically functional nerves in the trapezius were found among 50% of the patients, and 93% of the patients were still symptomatic at 6 months. Patten and Hillel explained that trapezius weakness

and shoulder pain right after neck dissection led to reduced use of the arms and shoulders due to accessory nerve palsy. However, immobility of the shoulders allowed capsular structures to lose their extensibility, causing fibrosis to occur. Although function of the trapezius had returned at 6 months, these patients declined to use their arms and shoulders because symptoms of adhesive capsulitis were already present.

Previous Studies on Neck Dissection

Studies in patients after neck dissection have identified several variables that influenced shoulder pain, objective shoulder function, and quality of life. These include: gender (Sobol, Jensen, Sawyer, Costiloe, & Thong, 1985), age (Terrell et al., 2000; van Wilgen et al., 2004b), body weight (Chepeha et al., 2002; Taylor et al., 2002), handedness (Short, Kaplan, Laramore, & Cummings, 1984), spinal accessory nerve resection (El Ghani et al., 2002; Erisen et al., 2004; Hillel et al., 1989; Kuntz & Weymuller, 1999; Shah et al., 2001; Short et al., 1984; Terrell et al., 2000), cervical plexus removal (Dijkstra et al., 2001), level V dissection (Chepeha et al., 2002; Kuntz & Weymuller, 1999; Sobol et al., 1985; Terrell et al., 2000), bilateral neck dissection (Laverick, Lowe, Brown, Vaughan, & Rogers, 2004), tumor stage (Shah et al., 2001), radiation (Taylor et al., 2002), chemotherapy (Shah et al., 2001), neck pain (van Wilgen, Dijkstra, van der Laan, Plukker, & Roodenburg, 2004a), myofascial pain of levator scapulae (van Wilgen et al., 2004a), joint pain of acromioclavicular joint (van Wilgen et al., 2004a), allodynia (van Wilgen et al., 2004a), loss of sensation on the face and neck skin (van Wilgen et al., 2004b), depression (van Wilgen et al., 2004b), shoulder exercise (McNeely et al., 2004), and pain medication (Terrell et al., 2000). However, these factors were studied individually. M. Dodd et al. (2001) maintained that nursing research should

not focus only on finding relationships between symptom and outcomes but should also focus on studying the factors influencing symptom and/or outcomes. In order to describe shoulder pain experience after neck dissection with the influencing factors identified in previous studies, the current study used the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) as the basis of the conceptual framework.

Conceptual Framework

The study applied the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) (see Figure 1). The UCSF-SMM describes the contextual variables that influence three interrelated dimensions: symptom experience, symptom management strategies, and outcomes. An individual with the contextual variables may have a higher risk for developing a symptom. Symptom experience involves the interaction of three components: perception of symptom, evaluation of symptom, and response to symptom. Perception of symptom is when an individual is aware of a change from the way he/she usually feels or behaves. Evaluation of symptom is how the individual judges the symptom he/she has been suffering, including its intensity (severity), affective impact (distress or bothersomeness), frequency, temporal nature (duration), and location. Response to symptom is when the individual reacts to the symptom through physiological, psychological, sociocultural, and behavioral mechanisms. Concurrent symptom experience may exist along with primary symptom experience. Symptom management strategies exist to alter or postpone the negative outcomes of the symptom

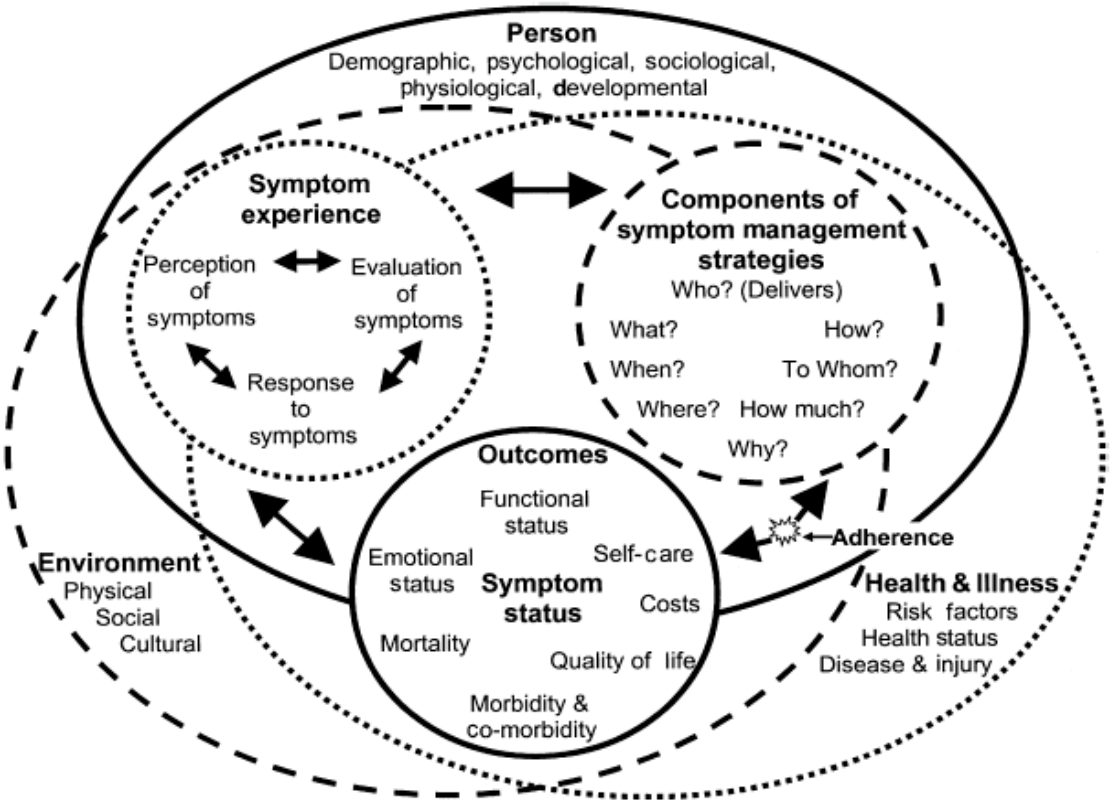


Figure 1. The University of California, San Francisco School of Nursing Symptom Management Model.

Note. From "Advancing the science of symptom management," by M. Dodd, S. Janson, N. Facione, J. Faucett, E. S. Froelicher, J. Humphreys, K. Lee, C. Miaskowsski, K. Puntillo, S. Rankin, and D. Taylor, 2001, *Journal of Advanced Nursing., 33*(5), p. 670. Copyright 2001by the Blackwell Publishing Ltd. Reprinted with permission of the copyright holder.

experience. These may be biomedical, professional, or self-care strategies. Outcomes are the consequences of the symptom experience and the symptom management strategy. These are symptom status and seven other indicators: functional status, self-care, costs, quality of life, mobility/comobility, mortality, and emotional status. One outcome may be related to another. Adherence describes whether the targeted patient uses the prescribed strategy, which is a critical factor influencing the outcome of the symptom management strategy.

Previous nurse researchers have applied the UCSF-SMM in their studies on symptoms. Dodd, Miaskowski, and Paul (2001) employed two dimensions in the model, symptom experience and outcomes, in order to determine the influence of a selected symptom cluster (pain, fatigue, and sleep insufficiency) on outcomes (symptom cluster status and functional status) among chemotherapy patients. They defined functional status operationally in a group of chemotherapy patients by measuring their scores on the Karnofsky Performance Scale (KPS). The KPS was described in the study as a scale with verbal descriptors that were rated from 100 (fully active, capable of carrying out all pre-disease performance without restriction) to 0 (dead). These researchers found significant relationships between pain and the KPS ($r = -0.32$, $p < 0.05$) and between fatigue and the KPS ($r = -0.35$, $p < 0.05$). These results supported the relationship between symptom experience and functional status. Cho (2004) investigated sleep disturbance in family caregivers of gastric cancer patients. Sleep quality was measured by the Pittsburgh Sleep Quality Index (PSQI). A total score of 5 or higher indicated moderate or severe sleep problems. Significant relationships between the PSQI and quality of life ($r = -0.34$, $p = 0.01$) and between the PSQI and depression ($r = 0.33$, $p = 0.01$) were found in family

caregivers of gastric cancer patients. The researcher identified contextual variables that were correlated with the PSQI among those caregivers, including education (r_s = -0.22, p = 0.05), financial status (r_s = -0.23, p = 0.05), and perceived health status (r_s = -0.22, p = 0.05). This study supported relationships of symptom experience with quality of life, concurrent symptom, and contextual variables.

Voss (2003) did research in fatigue among HIV/AIDS patients. Disability, drug use, and ethnicity, which were identified as contextual variables in the person domain, explained 9.9% of the total variance in fatigue among the HIV/AIDS patients in the study ($p < 0.001$). Depression, shortness of breath, diarrhea, and lipodystrophy, which were concurrent symptoms, explained 47.4% of the total variance in fatigue ($p < 0.001$). Disability was a significant predictor of physical health (B = -8.54, sr^2 = 0.03) in the SF36, a quality of life measure. Being high school graduate was a significant predictor of mental health (B = 3.79, sr^2 = 0.01) in the SF36. Depression was the only concurrent symptom that was a significant predictor for both physical health (B = -1.82, sr^2 = 0.06) and mental health (B = -1.73, sr^2 = 0.08). This study supported the fact that contextual variables and concurrent symptoms were able to predict both symptom experience and quality of life.

Corless, Nicholas, Davis, Dolan, and McGibbon (2005) found that both intensity and bothersomeness of symptoms were significantly correlated with quality of life subscales in the Medical Outcome Study (MOS) HIV instrument among HIV patients. Intensity of symptoms was negatively correlated with the "general health perception" (r = -0.42, p = 0.006), "social functioning" (r = -0.39, p = 0.012), "cognitive functioning" (r = -0.35, p = 0.023), "vitality" (r = -0.32, p = 0.036), and "health transition" (r = -0.36, p = 0.017)

subscales. Bothersomeness of symptoms was negatively correlated with the "health perception" (r = -0.48, p = 0.01), "role functioning" (r = -0.37, p = 0.01), "social functioning" (r = -0.40, p = 0.01), "cognitive functioning" (r = -0.52, $p < 0.001$), "vitality" (r = -0.41, p = 0.07), "quality of life" (r = -0.32, p = 0.04), and "health distress" (r = -0.50, p = 0.001) subscales. Two contextual variables, levels of education and CD4 lymphocyte count, were positively correlated with the "quality of life" subscale (p = 0.05 and p = 0.01) in the MOS HIV instrument. Gender was significantly related to symptom bothersomeness; that is, women were more bothered by symptoms than men (r = -0.30, p = 0.05). Moreover, this group of researchers investigated the relationship between symptom experience and adherence in the same patients. They found that symptom bothersomeness was significantly associated with "forgetting to take medications" (r = 0.45, p = 0.03) and "difficulty taking medications" (r = 0.32, p = 0.04). Both intensity and bothersomeness of symptoms were positively related to "discontinuing taking medications when feeling better" (p = 0.007 and p = 0.047). This study supported the need for measuring symptom experience multidimensionally and its relationship with adherence.

Researchers using the UCSF-SMM found relationships among symptom experience (intensity and bothersomeness), outcomes (functional status and quality of life), contextual variables, concurrent symptoms, and adherence (Cho, 2004; Corless et al., 2005; M. J. Dodd et al., 2001; Voss, 2003). These results supported the use of this model in a study of a symptom includes shoulder pain after neck dissection for the following reasons. First, in the model, symptom experience is recognized as self-perception. Pain has been described as a uniquely individual experience and is consistent in an individual

(McGuire, Kim, & Lang, 2004). According to the model, self-reporting is an appropriate method to measure shoulder pain. Second, symptom experience is portrayed multidimensionally in the UCSF-SMM. Which dimension of symptom experience is sensitive to outcomes may be identified in a study. Third, contextual variables (characteristics of persons) and concurrent symptoms are assumed to influence both symptom experience and outcomes. Identifying which contextual variables and concurrent symptoms have such an influence is necessary because any of these influences may be described as an etiology of a symptom or a confounding effect on a symptom or outcome. Fourth, outcomes are assumed to be related to each other in the UCSF-SMM. Finding these relationships can help understand the mechanism of the impact of the symptom on a person's life. Fifth, adherence is assumed to influence outcomes in the model. Research supported the relationship between adherence and symptom experience (Corless et al., 2005). There is a need to investigate the role adherence plays in symptom experience and outcomes.

The current study investigated the relationships among symptom experience and outcomes and identified the contextual variables, concurrent symptoms, and/or adherence that predicted symptom experience and/or outcomes based on the UCSF-SMM. Shoulder pain after neck dissection was identified as a symptom experience in the model. Shoulder pain intensity and shoulder pain-related distress were used to describe the symptom experience. Two selected outcomes, active shoulder abduction (i.e., functional status) and quality of life, were investigated in the study. Contextual variables and concurrent symptoms identified by previous studies and adherence to symptom

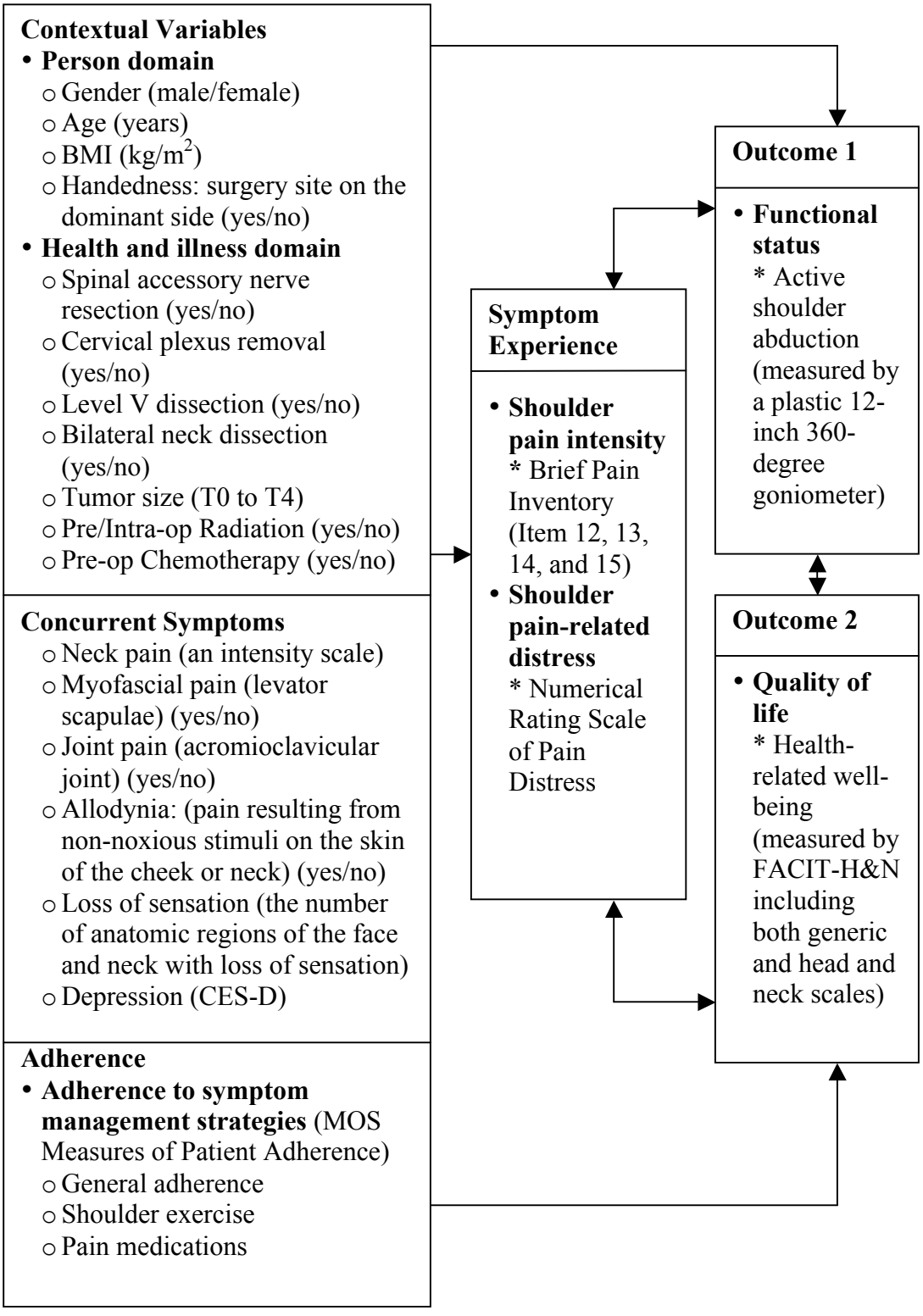


Figure 2. Conceptual framework for the current study.

management strategies were analyzed to find whether they could statistically predict symptom experience and/or outcomes. The conceptual framework of the study is illustrated in Figure 2.

Purpose

The proposed study used the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) as the conceptual framework. The purposes of the study are to (a) describe the symptom experience of shoulder pain at 1 month after neck dissection, (b) describe the relationships among symptom experience of shoulder pain, functional status, and quality of life, and (c) identify the contextual variables, concurrent symptoms, and/or adherence predicting shoulder pain, functional status, and/or quality of life.

Limitations

The UCSF-SMM conceptualizes "response to symptom" as one component in symptom experience. However, "response to symptom" is not included in the conceptual framework, and the proposed study will not test it as a variable.

Conceptual and Operational Definitions of Variables

Symptom Experience

Conceptual Definition

Symptom experience is conceptually defined by shoulder pain intensity and shoulder pain-related distress following neck dissection. Shoulder pain intensity is the severity of physical discomfort in or around the shoulder on the operated side (Daut, Cleeland, & Flanery, 1983). Shoulder pain-related distress is the degree to which an individual is bothered by intensity or degree of unpleasantness from the intensity (Good et al., 2001).

Operational Definition

Shoulder pain intensity was operationalized by 4 items (items 12 to 15) in the Brief Pain Inventory (BPI) (Daut et al., 1983) (Appendix A). Shoulder pain-related distress was operationalized by a numerical rating scale of pain distress (Good et al., 2001) (Appendix A). Item 12 to 15 of the BPI were four 0-10 intensity scales (Daut et al., 1983). Each scale ranged from 0 to 10 with verbal anchors at either end (0 = "no pain;" 10 = "pain as bad as you can imagine"). Item 12 asked the patient to rate the pain at its "worst" in the last week; item 13 asked the patient to rate the pain at its "least" in the last week; item 14 asked the patient to rate the pain on "average" in the last week; and item 15 asked the patient to rate how much pain he/she has "right now." The patient circled a number from 0 to 10 to indicate the intensity of the shoulder pain. The numerical rating scale of pain distress was a scale numbered from 0 to 10 at equal intervals. At each end, "0" had verbal anchors of "no distress" and "10" had verbal anchors of "most distress imaginable." The patient circled a number indicating the degree of distress associated with the shoulder pain experienced. For both the 0-10 scale and numerical rating scale, a higher number indicated a worse intensity of, or distress associated with, shoulder pain.

Outcomes

Conceptual Definition

Outcomes are conceptually defined by indicators influenced by shoulder pain at 1 month after neck dissection. These are functional status and quality of life. Functional status is conceptualized by an objective measure of active shoulder abduction. Active shoulder abduction is defined by a voluntary movement of the arm in a lateral direction of the body through the zero anatomical position and on to the 180-degree overhead

position (Norkin & White, 1995). Quality of life is conceptualized by the subjective state of physical, psychological, and social role well-being, and disease-related symptoms (Varricchio, 2006).

Operational Definition

Active shoulder abduction was operationally defined by the degree of voluntary movement of the arm in a lateral direction of the body through the zero anatomical position. The degree of movement was defined using a plastic 12-inch 360-degree goniometer. Quality of life was operationalized by the Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N) (List et al., 1996) (Appendix A). The FACIT-H&N contained both a generic scale (27 items) and a head and neck scale (12 items). Patients answered the questions in the FACIT-H&N by selecting a number from a 0-4 Likert scale with descriptions from "not at all"(0) to "very much" (4). The generic scale contained four subscales. Items on the subscales of social/family well-being and functional well-being were scored by responses from the 0-4 Likert scale. Those on the subscales of physical well-being and emotional well-being were reverse-scored. In the head and neck scale (H&N), 4 items were reverse-scored (H&N items 2, 3, 6, and 12). A higher score on the FACIT-H&N indicated a better quality of life.

Contextual Variables

Conceptual Definition

A contextual variable is a variable that has a significant relationship with or a significant influence on symptom experience (shoulder pain) and/or outcomes (active shoulder abduction and/or quality of life) based on previous neck dissection studies ($p \leq 0.05$). The identified contextual variables are categorized into the person domain, health

and illness domain, or environment domain (M. Dodd et al., 2001). The person domain includes gender (Sobol et al., 1985), age (Terrell et al., 2000; van Wilgen et al., 2004b), body mass index (body weight) (Chepeha et al., 2002; Taylor et al., 2002), and handedness(Short et al., 1984). The health and illness domain includes spinal accessory nerve resection (El Ghani et al., 2002; Erisen et al., 2004; Hillel et al., 1989; Kuntz & Weymuller, 1999; Shah et al., 2001; Short et al., 1984; Terrell et al., 2000), cervical plexus removal (Dijkstra et al., 2001), level V dissection (Chepeha et al., 2002; Kuntz & Weymuller, 1999; Sobol et al., 1985; Terrell et al., 2000), bilateral neck dissection (Laverick et al., 2004), tumor size (Shah et al., 2001), pre/intra-operative radiation (Taylor et al., 2002), and pre-operative chemotherapy (Shah et al., 2001). No contextual variable in the previous neck dissection studies could be classified under the environment domain.

Operational Definition

The contextual variables were operationally defined in the Demographic Survey and Medical Record Review (Appendix A). Gender was defined by a binary item: "male" is coded as 1 and "female" is coded as 0. The other binary items included handedness (whether or not the surgery was done on the dominant side), spinal accessory nerve resection, cervical plexus removal, Level V dissection, bilateral neck dissection, pre/intra-operative radiation, and pre-operative chemotherapy ("yes" = 1, "no" = 0). Age and body mass index were defined by two ratio items (years of age and kilograms per square meter). Tumor size was defined by an ordinal item. There were five options in this item: T0, T1, T2, T3, and T4.

Concurrent Symptoms

Conceptual Definition

A concurrent symptom is a somatic or affective discomfort statistically associated with or influencing symptom experience (shoulder pain) and/or outcomes (active shoulder abduction and/or quality of life) found in previous neck dissection studies ($p \leq 0.05$). They include neck pain (van Wilgen et al., 2004a), myofascial pain of the levator scapulae (pain elicited by stimulating myofascial trigger points) (van Wilgen et al., 2004a), joint pain of the acromioclavicular joint (pain elicited by testing joint translation, passive movement of one joint member shifted on a straight path relative to the other stationary member) (van Wilgen et al., 2004a), allodynia (pain elicited by non-noxious stimuli on the skin of the cheek or neck) (van Wilgen et al., 2004a), loss of sensation (loss of sensation on the face and neck skin) (van Wilgen et al., 2004b), and depression (van Wilgen et al., 2004b).

Operational Definition

Concurrent symptoms were operationalized in the Patient Survey and Physical Exam Record (Appendix A). Neck pain was defined using item 14 of the Brief Pain Inventory (BPI) (Daut et al., 1983). Item 14 asked patients to rate the pain on "average" on a 0-10 intensity scale. The scale ranged from 0 to 10, with verbal anchors at either end (0 = "no pain;" 10 = "pain as bad as you can imagine"). The patient circled a number from 0 to 10 to indicate the intensity of the neck pain. Myofascial pain of the levator scapulae, joint pain of the acromioclavicular joists, and allodynia were operationalized by three binary items corresponding with three physical test results (Frisch, 1994; Simons, Travell, & Simons, 1998; van Wilgen et al., 2004a). If a patient responded "having pain" in the test procedure, the test result was positive and coded as 1. If the result is negative, 0 was

selected for this item. Loss of sensation was operationalized by numbers of the anatomic area of the face and neck skin with loss of sensation (Saffold et al., 2000; van Wilgen et al., 2004a). Depression was operationalized by the Center for Epidemiological Studies of Depression Scale (CES-D) (Radloff, 1977). The CES-D consisted of 20 items. Each item was scored from 0 (rarely or none of the time: less than 1 day) to 3 (most or all of the time: 5 - 7 days). Four items had reversed scores (Items 4, 8, 12, and 16). A higher score on CES-D indicated more impairment.

Adherence

Conceptual Definition

Adherence describes the self-reporting tendency to follow the provider's medical recommendations (DiMatteo, Hays, & Sherbourne, 1992; Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992). These recommendations are defined by symptom management strategies to reduce shoulder pain after neck dissection. Two types of symptom management strategies that may help reduce shoulder pain after neck dissection are: shoulder exercise taught by the physical therapist (McNeely et al., 2004) and pain medications prescribed by the physician (Terrell et al., 2000).

Operational Definition

Adherence was operationally defined by the Medical Outcome Study (MOS) Measures of Patient Adherence (DiMatteo et al., 1992; R. G. Hayes, 1994) (Appendix A). It contained 5 items of the general adherence scale. The other two items were from the specific adherence scale: item 3 (exercised regularly) and item 5 (took prescribed medications). Patients were instructed that "exercise regularly" means shoulder exercise taught by the physical therapist and "took prescribed medications" means pain

medications. They responded to each item by selecting a number from a 1-6 scale, with descriptions from "none of the time" (1) to "all of the time" (6). Items 1 and 3 in the general adherence scale were reverse-scored. A higher score on the MOS Measures of Patient Adherence indicated a greater tendency to follow the provider's medical recommendations.

Research Questions

The following research questions were derived from the conceptual framework specified for this study. Studying a population of head and neck cancer patients at 1 month after neck dissection:

1. What is the experience of shoulder pain as measured by intensity and distress among head and neck cancer patients at 1 month after neck dissection?
2. What are the relationships among symptom experience, functional status, and quality of life?
3. Which contextual variables are related to symptom experience, functional status, and/or quality of life?
4. Which concurrent symptoms are related to symptom experience, functional status, and/or quality of life?
5. Is adherence related to symptom experience, functional status, and/or quality of life?
6. How do contextual variables, concurrent symptoms, and adherence predict symptom experience, functional status, and quality of life?

Significance to Nursing

Nurses play an important role in the recovery phase after oncology surgery, especially when the surgery causes symptoms and alternation of physical function, such as head and neck cancer surgery. Yet most oncology nursing studies have focused on symptoms from chemotherapy and radiation. Relatively few studies have been conducted by nurses in head and neck cancer patients. Head and neck cancer patients need a multidisciplinary team to help them make the transition from post-operative status to normal life (Clarke & Dropkin, 2006). Nurses can be patient advocates and care coordinators on such teams. The results of this study may enhance the knowledge about morbidity and the physical limitations after neck dissection and their association with demographic characteristics, clinical factors, and adherence behaviors. Nurses can use this information to evaluate their patients, intervene to improve symptom control and symptom related distress, and communicate with other disciplinary members regarding patient needs, such as surgeons, physical therapists, or occupational therapists.

CHAPTER 2

REVIEW OF THE LITERATURE

Previous studies focused on shoulder pain experienced by patients undergoing various types of neck dissection, such as radical neck dissection, modified neck dissection, and/or selective neck dissection (Dijkstra et al., 2001; El Ghani et al., 2002; Leipzig, Suen, English, Barnes, & Hooper, 1983; Pinsolle et al., 1997; Terrell et al., 2000). However, for the purpose of this study, a general classification might not be useful because it did not address the actual anatomy involved in the surgery. The current study applied a conceptual framework driven by the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994). In the proposed conceptual framework, the contextual variables/concurrent symptoms/adherence to symptom management strategies were clinical factors that contributed to symptom experience and/or outcomes. The symptom experience that this study examined was the shoulder pain intensity and shoulder pain-related distress after neck dissection. Outcomes included functional status and quality of life.

This chapter reviews the literature on neck dissection. The review focuses on current knowledge about the contextual variables, concurrent symptoms, and symptom management strategies that are related to or influence shoulder pain, shoulder functional status, and quality of life. Studies examining relationships among shoulder pain, shoulder functional status, and quality of life after neck dissection are reviewed.

An electronic database search was performed in order to select the relevant literature. Keywords for searching included “neck dissection,” “shoulder pain,” “range of motion,” and “quality of life.” In Ovid Databases, Medline and Cumulative Index to Nursing and

Allied Health Literature (CINAHL) were applied, with no year limitation. The function of "Combine Searches" was also used to pair "neck dissection" with each of the other keywords. Studies were selected if the researchers had identified variables, symptoms, or treatments which were statistically related to or significantly influenced shoulder pain, active shoulder abduction, or quality of life ($p \leq 0.05$). If studies tested relationships among shoulder pain, shoulder functional status, and quality of life, they also were included in the review.

Studies on Contextual Variables or Concurrent Symptoms

Contextual Variables

Gender

One study identified gender as having a significant influence on shoulder functional status (Sobol et al., 1985). The purpose of this study was to investigate differences in shoulder function postoperatively among patients undergoing various types of neck dissection. Patients in the study were classified into three groups: radical neck dissection ($n = 11$), modified radical neck dissection ($n = 21$), and supraomohyoid neck dissection ($n = 6$). Their ages ranged from 21 to 82 years old, with a mean age of 56 years. They were evaluated before the procedure and 11 to 39 weeks after the procedure ($M = 16.5$ weeks). Shoulder range of motion was measured by using a goniometer. Both abduction and flexion were examined in the study. After the neck dissection, the mean loss of abduction was 54° in the radical neck dissection group, 42° in the modified radical neck dissection group, and 14° in the supraomohyoid neck dissection group. The mean loss of flexion was 23° in the radical neck dissection, 19.5° in the modified radical neck dissection, and 8° in the supraomohyoid neck dissection. The supraomohyoid neck

dissection group was significantly different from both the radical and modified radical neck dissection groups in the abduction and flexion measures ($p < 0.05$). The researchers conducted an analysis of covariance and reported that gender had a significant influence on range of motion. The numeric results from the analysis were not shown in this study. It is not known which gender did significantly better than the other on range of motion. The type of range of motion affected by gender was also unclear. Men (71%, $n = 25$) were the majority in this group of patients.

Age

Age was found to be a significant predictor of shoulder pain and was significantly related to quality of life (Terrell et al., 2000; van Wilgen et al., 2004b). Terrell et al. (2000) surveyed 397 patients, 175 of whom had neck dissections. Seventy-five percent of these patients were men ($n = 132$). The interval between the surgery and the survey time was not reported in the study. The Head and Neck Cancer-Specific Quality of Life (HNQOL) instrument, established by Terrell et al. (1997), was applied in order to evaluate quality of life in patients with head and neck cancer. The items in the four domains of the HNQOL were related to head and neck cancer symptoms and disabilities. The four domains were "communication," "eating," "emotion," and "pain," with 0 being the worst and 100 being the best possible score. Construct validity of the HNQOL was demonstrated by significant correlations with the SF-12 Physical and Mental Component scores ($r = 0.44$ - 0.60, $p < 0.01$). The Cronbach alpha of each domain was from 0.79 to 0.93. Terrell et al. (2000) conducted multivariate analyses to identify which factors predicted the "shoulder or neck pain" item in the "pain" domain of the HNQOL. This item was operationalized as an ordinal variable, with a greater score representing less

pain. In the analyses, age was identified as a significant predictor of the "shoulder or neck pain" item among the patients with spinal accessory nerve preserved neck dissection (B = -0.48, $p = 0.02$). Elder patients existed worse shoulder or neck pain in these patients. Compared with the patients with spinal accessory nerve resected neck dissection, those with the nerve preserved procedure had higher scores on the item, "shoulder or neck pain" ($M = 51.1$ vs. 66.3, $p = 0.003$). This means patients with the nerve preserved procedure experienced less shoulder and neck pain than the other group. The mean age was 60.6 years in the nerve resection group ($n = 46$) and 61.4 years in the nerve preservation group ($n = 129$).

Even though it is not clear whether age was inversely related to the total quality of life scores in neck dissection studies, age was correlated with some domains in a generic quality of life questionnaire. A study with 155 patients was aimed at determining which factors were related to quality of life after neck dissection (van Wilgen et al., 2004b). The sociodemographic factors analyzed in Pearson's correlations with domains in the Dutch version of the SF-36 (RAND-36), a quality of life instrument, were sex, age, education, marital status, employment or social welfare, and disability. There were nine domains in the RAND-36: "physical functioning," "social functioning," "limitations from physical problems," "role limitations from emotional problems," "general mental health," "vitality," "body pain," "general health perception," and "health change." The domain of "health change" was not included in the original version of the SF36. Items in the RAND-36 were interval variables, with options from 0% (poor health) to 100% (excellent health). Padilla, Frank-Stromgborg, and Koresawa (2004) summarized the validity and reliability of the SF36. Numerous studies across a variety of patient groups

supported the content, concurrent, criterion, construct, and predictive validity of the SF36. The SF36 had internal consistency alphas at 0.70 or greater across the eight domains reported by over 25 studies. In the study by van Wilgen et al. (2004b), the domains of "physical function" and "health changes" in the RAND-36 were inversely related to age, but their correlation coefficients were low (both: $r = -0.20$, $p < 0.05$). No result showed whether other sociodemographic factors had significant correlations with the quality of life measure. The age of this group was 61.3 ± 11.9 years old. There were 104 men (67%) and 51 women (33%). The study was done at a mean of 3.0 years (*SD* = 1.7) after neck dissection in the patients.

Body Weight

Studies suggested body weight might predict shoulder functional status and disease-specific quality of life (Chepeha et al., 2002; Taylor et al., 2002). A group of post neck dissection patients was evaluated by Chepeha et al. (2002). The purpose of the study was to determine which demographic and clinical factors would contribute to shoulder dysfunction after neck dissection. The post-op time period ranged from 11 to 120 months, with an average of 33.7 months. Shoulder functional status was operationalized by the Constant Shoulder Scale with four parameters: "pain," "activities of daily living," "range of motion," and "power" (Constant & Murley, 1987). "Pain" was operationalized as an interval item. The "range of motion" included shoulder abduction, flexion, internal rotation, and external rotation. The validity and reliability of the Constant Shoulder Scale were not provided. Chepeha et al. (2002) found that body weight was a significant positive predictor of the total Constant score (B = 0.60 kg, $p < 0.0001$). However, the analyses were conducted with the total scores but not scores of each parameter in the

Constant Shoulder Scale. The researchers did not state how range of motion was measured. Average body weight was 75.3 kg in the selective neck dissection group (n = 32) and 85.6 kg in the modified radical neck dissection group (n = 32) in the study. The mean age in both groups was similar (56 years vs. 57.6 years).

It is not clear whether body weight influenced general quality of life in neck dissection patients, but body weight was an important factor in disease-specific quality of life. Taylor et al. (2002) conducted a study to develop a disease-specific quality of life instrument, the Neck Dissection Impairment Index (NDII), and identify factors predicting the scores. The 10 items in this self-administered index were negatively related to shoulder symptom distress and shoulder function limitation after neck dissection. Shoulder pain distress was one of the items. For each item, a Likert scale was used, with 5 response options from "not at all" to "a lot." An equation to standardize for a score of 100 was illustrated. The higher the score, the better the quality of life. The convergent validation test yielded a high and positive correlation with the Constant Shoulder Scale (r = 0.85, $p < 0.01$), which indicated a positive relation between disease-specific quality of life and shoulder function. However, the relationships of the NDII with the domains in the SF36 were moderate (r = 0.32 - 0.62, $p \leq 0.05$). Internal reliability and test-retest reliability were acceptable ($\alpha = 0.95$; r = 0.91, $p < 0.01$). In a convenience sample of 54 patients with neck dissection, researchers found that body weight in kilograms was a significant predictor of the total score on the NDII (B = 0.82, $p < 0.01$). The post-op time was a mean of 33.7 months, with a range from 11 to 120 months. The average age of the patients was 56.8 years (SD = 11.7). There were 39 men (54%) and 15 women (46%). The average weight in the patients was 73.5 ± 14.9 kg. However, the study did not report

whether body weight could predict individual items on the NDII, such as the item, "shoulder pain distress."

Handedness

Handedness was a factor affecting shoulder pain when the neck dissection included spinal accessory nerve preservation. Thirty-five patients who had neck dissection were evaluated by Short et al. (1984). Twenty-seven patients (77%) were male. One of the aims in the study was to evaluate the difference in shoulder pain between patients with spinal accessory nerve perseveration and patients with nerve scarification. The patients' surgeries were performed at least 6 weeks prior to the study. Shoulder pain was operationalized using a 0-5 scale, with verbal anchors at "0" (no pain) and "5" (severe pain). There were two groups in the study. One had spinal accessory nerve preserved procedures in their neck dissections (n = 23), while the other had spinal accessory nerve sacrificed procedures (n = 12). The average age of the patients was 60 years (range = 22 - 86) in the nerve preserved group and 60 years (range = 49 - 75) in the nerve sacrificed group. The patients were then categorized into whether their neck dissection was on the same side or the opposite side of their dominant handedness. In the nerve preserved patients, the shoulder pain score was higher in the dominant handedness group (n = 10, M = 2.4) compared to the non-dominant handedness group (n = 13, M = 0.9) at a p value of less than 0.05. However, no significance was evident in the nerve sacrificed patients. Shoulder pain scores were significantly lower in the nerve preserved group (M = 1.6) than in the nerve sacrificed group (M = 2.7).

Spinal Accessory Nerve Resection

Both age and handedness had a significant influence on shoulder pain in spinal accessory nerve preserved patients but not in nerve resected patients (Short et al., 1984; Terrell et al., 2000). The spinal accessory nerve resection played an important role in shoulder pain after neck dissection. Compared to patients with the nerve preserved procedure, those with the resected procedure had significantly higher shoulder pain scores in both studies. The mean difference between groups was 1.1 on a 0-5 scale ($p < 0.05$) in the study by Short et al. (1984) and was 15.2 on a 0-100 scale ($p = 0.003$) in the one by Terrell et al. (2000).

Spinal accessory nerve resection significantly influenced shoulder abduction (El Ghani et al., 2002; Erisen et al., 2004; Hillel et al., 1989). El Ghani et al. (2002) described shoulder function after either unilateral or bilateral neck dissections. A total of 38 patients had unilateral neck dissections. Their ages ranged from 42 to 75 years (*Mdn* = 59). The researchers did not describe the gender distribution of the unilateral group. The shoulder range of motion was measured by an inclinometer. Patients were evaluated between 4 months and 5 years after their surgeries. Ten patients had spinal accessory nerve sacrificed procedures and 23 had nerve preserved procedures. Differences in active shoulder abduction between the non-operated side and the operated side were illustrated in the study. The nerve sacrificed group lost significantly more degrees of abduction (*M* = 76.1) than the nerve preserved group ($M = 28.2$, $p = 0.009$). In another study, Erisen et al. (2004) observed the influence of neck dissection with spinal accessory nerve sacrificed or preserved procedures on shoulder function. They compared 57 neck dissection patients with 15 healthy controls. Both the patient and control groups were evaluated by a goniometer. The total number of neck dissections in the patient group was

92 because 22 patients had unilateral neck dissections while 35 had bilateral dissections. Among the 92 neck dissections, 23 were spinal accessory nerve sacrificed procedures and 69 were spinal accessory nerve preserved procedures. The patient group was investigated at least 6 months after surgery. The mean age was 57 years old in the patient group and 50 in the control group. The percentage of men was 84% ($n = 47$) in the patient group and 87% ($n = 13$) in the control group. The mean difference in shoulder abduction between the spinal nerve sacrificed neck dissection and healthy controls was 64.1°, and between the nerve preserved neck dissection and healthy control was 28.1°. The patients with nerve sacrificed dissections had lost significantly more degrees of shoulder abduction than those with nerve preserved dissections ($p < 0.001$). Hillel et al. (1989) evaluated shoulder range of motion in 11 patients who had the unilateral radical neck dissection with a spinal accessory nerve sacrificed procedure in the previous 5 years. Six (55%) men and 5 women (45%) were in the study. Their ages ranged from 52 to 67 years, with a mean age of 59.2 years. The average active shoulder abduction on the operated side was 74.0° compared with 148.0° for the non-operated side ($p < 0.01$). The range of motion was measured by a Cybex II exercise dynamometer.

Spinal accessory nerve resection significantly affected disease-specific quality of life in neck dissection studies (Kuntz & Weymuller, 1999; Shah et al., 2001; Terrell et al., 2000). Kuntz and Weymuller (1999) applied the University of Washington Quality of Life questionnaire (UW-QOL) to measure disease-specific quality of life in patients before neck dissection and at 6 months and 12 months after neck dissection. The UW-QOL was a self-administered questionnaire and contained nine disease-specific functional items: “pain,” “appearance,” “activity,” “recreation,” “employment,”

"chewing," "swallowing," "speech," and "shoulder disability" (D'Antonio, Zimmerman, Cella, & Long, 1996). Each item had 3 to 5 options that allowed patients to describe their current function. The scores ranged from 100 (normal function) to 0 (the greatest dysfunction). The total score on the UW-QOL was moderately correlated with the Functional Assessment of Cancer Therapy Head and Neck Subscale ($r = 0.68$, $p < 0.01$) and three items on the Performance Status Subscales for Head and Neck Cancer ($r = 0.50 - 0.69$, $p \leq 0.01$). In addition, it was significantly correlated with the Functional Assessment of Cancer Therapy Generic Scale, but the correlation coefficient ($r = 0.43$, $p = 0.05$) was weaker than that of the Head and Neck Subscale. The internal consistency of the UW-QOL was still satisfactory across a 36-month follow-up period in the head and neck cancer patients ($\alpha = 0.78 - 0.84$) (Weymuller, Alsarraf, Yueh, Deleyiannis, & Coltrera, 2001). In Kuntz and Weymuller's study (1999), they found that the shoulder disability scores were significantly lower in the spinal accessory nerve sacrificed patients compared to the nerve preserved patients at 12 months after neck dissection ($p < 0.05$). This means that the nerve sacrificed patients had more difficulties in the shoulders than the nerve preserved patients. The difference between the groups at 6 months was not shown in the study. The nerve sacrificed patients had significantly lower shoulder disability scores than their pre-treatment scores at 6 and 12 months ($p < 0.003$). Therefore, shoulder function in those with sacrificed procedures declined after the procedure and did not return to the baseline over time. The number of patients in the nerve sacrificed group ($n = 9$) was relatively small compared with those in the nerve preserved group ($n = 75$). The patients were 57 men (68%) and 27 (32%) women. They ranged in age from 16 to 85 years. No total score on the UW-QOL was shown.

Another study found a relationship between the spinal accessory nerve preservation and quality of life (Shah et al., 2001). The disease-specific quality of life in the study was measured by a six-item neck dissection-specific quality of life survey. The six items were, predominantly, symptoms happening after neck dissection: "numbness, burning of part of neck or ear," "neck pain," "shoulder discomfort," "neck tightness," "lower lip weakness," and "cosmetic concern." The survey asked about symptom frequency and symptom interference (i.e., distress to daily activities) for each item. A 7-point ordinal response scale with semantic anchors (1 = never; 7 = always) was used in the survey to quantify frequency and interference of the symptoms. The total scores of frequency and the total scores of interference were applied for statistical analyses. Discussions with otolaryngologists, head and neck surgeons, and patients supported face validity. The test-retest reliability (Spearman rank correlation, r_s) was satisfactory across the items (r_s = 0.71 - 0.99). The correlations of the total score of frequency and the total score of interference with the mental component scale of SF12 were significant (r_s = -0.46 and -0.49, p = 0.001), but they were not correlated with the physical component scale of SF12. One of the aims of the study was to identify factors related to scores of symptom frequency and/or interference in the survey. The multivariate analysis of the total interference score showed that the spinal accessory nerve resection in radical neck dissection was a significant predictor of higher level of interference ($\beta = 0.81$, $p = 0.03$). The study was conducted between 5 to 90 months postoperatively among 51 neck dissection patients. The mean age of the patients, of whom 62% were men (n = 32), was 62 years (range = 27 - 91).

The other disease-specific quality of life instrument applied to compare the spinal accessory nerve resection and the nerve preservation groups in a neck dissection study was the Head and Neck Cancer-Specific Quality of Life instrument (HNQOL) (Terrell et al., 2000). There were four domains in the HNQOL: "communication," "eating," "emotion," and "pain." Items in the four domains were related to head and neck cancer symptoms and disabilities. The validity and reliability of the HNQOL were documented (Terrell et al., 1997). There were a total of 175 neck dissection patients in the study by Terrell et al. (2000). Forty-six of these patients had nerve resected neck dissection. Their mean age was 60.6 years. Eighty-five percent of these patients were men (n = 39). There were 129 patients who received the nerve preserved neck dissection. Their mean age was 61.4 years and 93% were men (n = 93). Compared with patients who received the spinal accessory nerve resection, those with nerve preserved procedures had significantly higher scores on the "pain" domain (M = 51.7 vs. 66.3, p = 0.002). This means the nerve preserved patients had better quality in the "pain" domain than the nerve resected patients because the scale in the HQOL was from 0 being the worst to 100 being the best possible score. Multivariate analyses showed that spinal accessory nerve resection was a significant predictor of the "pain" domain (B = -20.2, p = 0.0001). The "pain" domain contained 4 items: "shoulder or neck pain," "general physical problems," "pain/burning in the mouth," and "frequency of pain medication use." The nerve resection patients had lower scores on "shoulder or neck pain" (M = 51.1 vs. 66.3, p = 0.003) than the nerve preserved patients, so the nerve resection patients had more "shoulder and neck pain" than their counterparts. Spinal accessory nerve resection was also a significant predictor of the "shoulder or neck pain" item (B = -24.6, p = 0.0001). No information about the

post-op time period was shown in this study. Whether the total scores on the instrument differed between groups was unclear.

Cervical Plexus Removal

A Dutch study found cervical plexus removal significantly influenced shoulder pain and active shoulder abduction in neck dissection patients (Dijkstra et al., 2001). The purpose of the study was to identify risk factors for developing shoulder pain and restricted range of motion after neck dissection. A total of 171 patients participated in the study, 60% of whom were men (n = 103). The mean age was 60.3 years (SD = 12). Twenty-one patients had procedures with cervical plexus removal and 44 had procedures with cervical plexus preservation. Shoulder pain was operationalized by a visual analog scale (100mm), while shoulder abduction was measured by an inclinometer. The patients were examined the day before discharge from the hospital. Ninety-five percent of the patients reported shoulder pain in the cervical plexus removal group, while only 57% of those in the cervical plexus preservation group did ($p < 0.05$). Restricted abduction was significantly different between the two groups: 90% of patients in the removal group and 53% of patients in the preservation group ($p < 0.05$). Restricted abduction was defined as the difference in shoulder abduction between the operated side and the non-operated side being above 20°.

Level V Dissection

Level V, one of the cervical lymph node groups, includes all lymph nodes within the posterior triangle of the neck (Cumming, 1998). The boundaries encompass the anterior border of the trapezius muscle (laterally), the posterior border of the sternocleidomastoid muscle (medially), and the clavicle (inferiorly). The spinal accessory nerve passes

through the middle and lower posterior triangle (Bailey, 1993). Therefore, the spinal accessory nerve is easily injured while the surgeon manipulates the posterior skin flap in the level V dissection.

Level V dissection was found to significantly influence shoulder functional status (Chepeha et al., 2002; Sobol et al., 1985). Chepeha et al. (2002) used the Constant Shoulder Scale to measure shoulder functional status in order to identify the variable that contributed to shoulder dysfunction after neck dissection. The Constant Shoulder Scale contained four parameters: "pain," "activities of daily living," "range of motion," and "power" (Constant & Murley, 1987). "Pain" was operationalized as an interval item. The "range of motion" included shoulder abduction, flexion, internal rotation, and external rotation. The validity and reliability of the Constant Shoulder Scale were not clearly documented. Chepeha et al. (2002) found that the selective neck dissection group ($M = 79.9$) had a significantly better total score than the modified radical neck dissection group ($M = 62.8$, $p = 0.0002$). Both groups contained 32 patients who were evaluated from 11 to 120 months after surgery ($M = 33.7$). The mean age in the two groups was similar (56 years vs. 57.6 years), but the gender distribution was not shown. The modified radical neck dissection group contained level V dissection, while the selective neck dissection did not. However, the major problem in this study was that the researchers did not display data for each item in the Constant Shoulder Scale. Although shoulder pain and active abduction were two of the items on the Scale, it was not known whether differences could be found in these two variables. Thirty-five neck dissection patients participated in a study by Sobol et al. (1985). Seventy-one percent of them were men ($n = 25$) and their mean age was 56 years, with a range from 21 to 82 years. The

purpose of the study was to evaluate shoulder functional ability among three different types of neck dissection: radical neck dissection (n = 11), modified radical neck dissection (n = 21), and supraomohyoid neck dissection (n = 6). Shoulder abduction was measured by a gomiometer preoperatively, and was repeated at 16 weeks postoperatively. After the neck dissection, the mean loss of abduction was 54° in the radical neck dissection group, 42° in the modified radical neck dissection group, and 14° in the supraomohyoid neck dissection group. The supraomohyoid neck dissection group was significantly different from both the radical and modified radical neck dissection groups ($p < 0.05$). The researchers explained that this difference was a result of the level V dissection included in the radical and modified radical neck dissections. Although frequency of pain also showed a statistical difference between the supraomhyoid neck dissection group and the other two groups, it is not clear whether this item described pain in the shoulders.

Level V dissection significantly influenced scores of items or domains in disease-specific quality of life instruments (Kuntz & Weymuller, 1999; Terrell et al., 2000). Kuntz and Weymuller (1999) used the University of Washington Quality of Life questionnaire (UW-QOL) to measure neck dissection patients preoperatively, and at 6 months and 12 months postoperatively. The UW-QOL was a self-administered questionnaire (D'Antonio et al., 1996). There were nine disease-specific functional items on the questionnaire: “pain,” “appearance,” “activity,” “recreation,” “employment,” “chewing,” “swallowing,” “speech,” and “shoulder disability.” Each item had 3 to 5 options that allowed patients to describe their current function. The scores ranged from 100 (normal function) to 0 (the greatest dysfunction). The validity and reliability of the

UW-QOL were reported by D'Antonio et al. (1996) and Weymuller et al. (2001). Forty-three patients with level V dissection and 41 without level V dissection participated in the study by Kuntz and Weymuller (1999). Sixty-eight percent were men ($n = 57$). Their ages ranged from 16 to 85 years. At 6 months, the scores for the item of "shoulder disability" were different between the two groups, with the level V dissection group having significantly greater disability than the other group ($p \leq 0.004$). Compared with the preoperative scores, patients without level V dissection had similar scores on this item at 6 months, while those with level V dissection had significantly worse scores at the same time ($p \leq 0.003$). At 12 months, while the patients without level V dissection had a similar score to their preoperative score for the item of "shoulder disability," those with level V dissection had a significantly worse score ($p < 0.001$). Compared with the preoperative scores, the "pain" scores showed significant improvement at 6 months ($p = 0.005$) and at 12 months ($p = 0.02$) among the patients without level V dissection. However, an improvement in the "pain" scores was not seen in those with level V dissection. In group comparisons, the patients without level V dissection had less "pain" than those with level V dissection at 6 months ($p < 0.05$) and 12 months ($p \leq 0.005$).

Problems with disease-specific quality of life were found among patients with level V dissection in a head and neck cancer study (Terrell et al., 2000). The researchers applied the Head and Neck Cancer-Specific Quality of Life instrument (HNQOL) to identify differences in quality of life in various types of neck dissection patients. The HNQOL, developed by Terrell et al. (1997), included four domains: "communication," "eating," "emotion," and "pain," with 0 being the worst and 100 being the best possible score. Items in the four domains were related to head and neck cancer symptoms or disabilities.

The validity and reliability were described. Sixty-one patients with level V dissection and 68 without level V dissection were recruited in the study by Terrell et al. (2000). In the group with level V dissection, the mean age of the patients was 62 years, 74 percent of them being men (n = 45). In the other group without this procedure, the mean age was 60.8 years, and 71 percent were men (n = 48). Patients with level V dissection had lower scores on the "pain" domain (M = 61.3 vs. 70.8, p = 0.03) and "eating" domain (M = 58.7 vs. 72.2, p = 0.007) than those without level V dissection. Therefore, those with level V dissection had lower quality on the "pain" and "eating" domains than those without this procedure. The "pain" domain had 4 items: "shoulder or neck pain," "general physical problems," "pain/burning in the mouth," and "frequency of pain medication use." Differences between groups (level V dissection vs. no level V dissection) were found in the items, "shoulder or neck pain" (M = 59.6 vs. 73.5, p = 0.006) and "general physical problems" (M = 57.4 vs. 69.6, p = 0.03), so the level V dissection patients experienced more difficulties with shoulder or neck pain and general physical problems. Level V dissection was a significant predictor of the "shoulder or neck pain" item score (B = -10.90, p = 0.015). The researchers did not identify when the study was done after the patients' procedures.

Bilateral Neck Dissection

Compared with unilateral neck dissection, bilateral neck dissection significantly influenced disease-specific quality of life (Laverick et al., 2004). There were a total of 278 head and neck cancer patients in this study. Their mean age was 62 ± 12 years. Sixty-five percent of these patients were men (n = 180). The self-administered University of Washington Quality of Life questionnaire (UW-QOL) was used to

operationalize disease-specific quality of life (D'Antonio et al., 1996). The questionnaire included nine disease-specific functional items: “pain,” “appearance,” “activity,” “recreation,” “employment,” “chewing,” “swallowing,” “speech,” and “shoulder disability.” Each item had 3 to 5 options that allowed patients to describe their current function. The scores ranged from 100 (normal function) to 0 (the greatest dysfunction). The validity and reliability of the UW-QOL were documented (D'Antonio et al., 1996; Weymuller et al., 2001). There were 138 patients with level III-IV dissection in the study: 114 were unilateral and 24 were bilateral (Laverick et al., 2004). The researchers found that the unilateral neck dissection group had significantly higher scores on the items, “swallowing” (M = 89 vs. 78, p = 0.02), “chewing” (M = 72 vs. 54, p = 0.008), and “speech” (M = 98 vs. 90, p = 0.002) than the bilateral group. The total scores on the UW-QOL were also significantly different between these two groups, with overall disease-specific quality of life being significantly lower in the bilateral group (p = 0.008). However, the researchers did not identify the postoperative time when these data were collected.

Tumor Size, Pre-Operative Chemotherapy, and Pre/intra-operative Radiation

Researchers have found that tumor size, pre-operative chemotherapy, and pre-intra-operative radiation were significantly related to disease-specific quality of life (Shah et al., 2001; Taylor et al., 2002). Shah et al. (2001) operationalized disease-specific quality of life by developing and applying a six-item neck dissection-specific quality of life survey. The survey included frequency and interference (i.e., distress to daily activities) of six neck dissection related symptoms: “numbness, burning of part of neck or ear,” “neck pain,” “shoulder discomfort,” “neck tightness,” “lower lip weakness,” and

"cosmetic concern." A 7-point ordinal response scale (1 = never; 7 = always) was used in the survey to quantify frequency and interference of the symptoms. The total scores of frequency and the total scores of interference were applied for statistical analyses. One of the aims in the study was to identify factors related to the score of symptom frequency and/or interference. Fifty-one patients participated in the study from 5 to 90 months after their neck dissection. Their mean age was 62 years, with a range from 27 to 91 years. Sixty percent of them were men (n = 32). Spearman rank correlations showed that the tumor size had moderate correlations with the total score of symptom frequency (r_s = 0.41, p = 0.007) and with the total score of symptom interference (r_s = 0.41, p = 0.009). However, when stepwise regression was applied, tumor size did not predict the total interference score. The researchers explained that the tumor size was confounded by the types of neck dissection procedure. The more advanced the tumor, the more invasive the surgical procedure required. However, in the clinic setting, the types of neck dissection addressed in the study were not clear. Tumor size usually would be stated in the surgery and pathology report. In the same study, multivariate analyses also were conducted. Chemotherapy was a significant predictor of the total interference score (β = 0.87, p = 0.01).

Taylor et al. (2002) found that disease-specific quality of life, measured by the Neck Dissection Impairment Index (NDII), could be predicted by radiation treatment. The NDII was a 10-item self-administered questionnaire. Items on the NDII were related to shoulder symptom distress and shoulder function limitation after neck dissection. Each item had a Likert scale, with 5 response options from "not at all" to "a lot." An equation to standardize for a score of 100 was illustrated. The higher the score, the better the

quality of life. The validity and reliability were stated in the same study. One aim of the study was to evaluate the factors that predicted disease-specific quality of life after neck dissection. A multivariate regression analysis showed that "receiving radiation treatment" significantly predicted the total score on the NDII (B = -13.45, $p = 0.04$). Fifty-four patients participated in this study between 11 and 120 months after their neck dissections. There were 39 men (54%) and 15 women (46%). Their average age was 56.8 years, with a standard deviation of 11.7 years.

Concurrent Symptoms

Neck Pain, Myofascial Pain, Joint Pain, and Allodynia

A study by van Wilgen et al. (2004a) showed that neck pain, myofascial pain , joint pain, and allodynia were associated with shoulder pain after neck dissection. A total of 153 neck dissection patients participated in the study. There were 102 men (67%) and 51 women (33%) whose mean age was 61.3 years, with a standard deviation of 11.9 years. The mean follow-up years after neck dissection was 3 ($SD = 1.7$). One aim of the study was to identify variables related to neck pain and/or shoulder pain. Shoulder pain and neck pain were operationalized by two numbered (0-10) visual analog scales. However, when both variables were added in statistical analyses, the researchers changed them to binominal (yes/no) variables. Myofascial pain, joint pain, and allodynia were three binominal (yes/no) variables. Myofascial pain was positive when the same muscle was reported as painful at least two times during palpation. Joint pain was positive when the joint was reported as painful during a method of manipulation described by Frisch (1994). van Wilgen et al. (2004a) defined positive allodynia when pain was elicited by touching the neck and cheek gently with a fingertip several times. Since all the variables

were binominal, chi square tests were applied. Significant relationships were found between shoulder pain and neck pain ($p < 0.01$) and allodynia ($p < 0.01$). Shoulder pain was significantly related to myofascial pain ($p < 0.05$). The majority of patients complained of pain when the levator scapulae were palpated (46%). Shoulder pain was also significantly related to joint pain ($p < 0.01$). Most of the patients reported pain when the acromioclavicular joint was stimulated (24%). The disadvantage of the chi square test is that no direction of the relationship can be known.

Loss of Sensation and Depression

Both loss of sensation and depression were related to domains in a generic quality of life instrument after neck dissection (van Wilgen et al., 2004b). One hundred and fifty-five patients were recruited for this study. These patients were investigated at a mean of 3 years (± 1.7) after neck dissection. There were 104 men (67%) and 51 women (33%). The age of these patients was 61.3 ± 11.9 years old. One of the aims of the study was to identify the relationship between quality of life, depression, and shoulder pain. The researchers operationalized quality of life by using the Dutch version of SF36 (RAND-36). The RAND-36 contained nine domains: "physical functioning," "social functioning," "limitations from physical problems," "role limitations from emotional problems," "general mental health," "vitality," "body pain," "general health perception," and "health change." The domain of "health change" was not in the original version of the SF36. Items in each domain were interval variables, with options from 0% (poor health) to 100% (excellent health). The validity and reliability of the SF36 were summarized by Padilla et al. (2004). van Wilgen et al. (2004b) quantified loss of sensation by calculating numbers of face and neck anatomic regions with loss of

sensation. The technique of the test was described in an article by Saffold et al. (2000). van Wilgen et al. (2004b) measured depression using the Center for Epidemiological Studies Depression Scale (CES-D). Pearson correlations revealed that loss of sensibility had low but significant correlations with the domains of "physical functioning" (r = -0.22, $p < 0.01$), "limitations from physical problems" (r = -0.23, $p < 0.01$), and "health changes" (r = -0.17, $p < 0.05$) on the RAND-36. Depression scores on the CES-D were significantly related to all nine domains on the RAND-36. The domain with the highest correlation with depression was "vitality" (r = -0.75, $p < 0.01$), while the one with the lowest correlation was "health changes" (r = -0.19, $p < 0.05$). Shoulder pain was measured by using a numbered visual analog scale. It was positively correlated with the CES-D score (r = 0.31, $p < 0.01$).

Studies on Symptom Management Strategies

Shoulder Exercise

McNeely et al. (2004) found that a 12-week progressive resistance exercise training (PRET) program reduced shoulder pain among patients with an injured or resected spinal accessory nerve caused by neck dissection. The purpose of this pilot study was to assess whether patients were willing and able to participate in a 12-week PRET program for the shoulders after neck dissection, and to determine the effectiveness of the intervention. Twenty-five eligible patients were approached. Due to time conflicts, 5 patients were excluded. The remaining 20 patients were enrolled in the study (the recruitment rate was 80%). In addition, 3 patients dropped out of the study because of cancer recurrence or radiation side effect. A total of 17 patients participated in the study within 8 weeks after their neck dissections. Their mean age was 61 years old. Eighty-two percent of them

were men (n = 14). The participating patients were randomly assigned into two groups: exercise group (n = 8) and control group, which received standard care (n = 9). Shoulder pain was measured by a 0-100 scale, with higher scores indicating greater impairment. Shoulder pain significantly reduced in the exercise group at the 12th week compared with in the control group (p = 0.038). The exercise group completed 93% of scheduled exercise sessions. According to the researchers, the adherence rate of 93% in the PRET in these head and neck patients was higher than the rate in breast cancer patients in a physical exercise trial as well as in prostate cancer patients in a resistance exercise program. One of the eligible criteria for sample selection in the study was that the patients must have a Karnofsky Performance Status (KPS) of 60% or higher. The KPS has been frequently used in cancer research to measure patient's functional status (Frank-Stromborg & Olsen, 2004). However, McNeely et al. (2004) did not discuss whether the high KPS would contribute to the high adherence rate in the study.

Pain Medications

The study by Terrell et al. (2000) showed patients having more shoulder or neck pain had more frequency of pain medication use. A disease-specific quality of life instrument, the Head and Neck Cancer-Specific Quality of Life (HNQOL), was applied in the study. The purpose of the study was to investigate disease-specific quality of life in various neck dissection patients. The HNQOL contained four domains: "communication," "eating," "emotion," and "pain," with 0 being the worst and 100 being the best possible score (Terrell et al., 1997). Items in the four domains were related to head and neck cancer symptoms or disabilities. The validity and reliability were reported. There were 4 items in the "pain" domain: "shoulder or neck pain," "general physical problems,"

"pain/burning in the mouth," and "frequency of pain medication use." Terrell et al. (2000) found that the patients with spinal accessory resections had significantly more "shoulder and neck pain" than those with nerve preservations ($p = 0.003$). In addition, the patients with nerve resections had significantly more "frequency of pain medication use" than the other group ($p = 0.004$). However, the association between "shoulder and neck pain" and "frequency of pain medication use" was not illustrated in the study. Forty-six patients had nerve resection procedures and their mean age was 60.6 years. One hundred and twenty-nine patients had nerve preservation procedures and their mean age was 61.2 years. In both groups, men were in the majority (85% and 93%). The time when the study was done after the procedures was not documented.

Relationships Among Shoulder Pain, Functional Status, and Quality of Life

Studies in neck dissection patients consistently demonstrated relationships among shoulder pain, functional status, and quality of life (Salerno et al., 2002; van Wilgen et al., 2004b). However, the ways that the researchers operationalized these variables were very different.

Salerno et al. (2002) determined that both functional status and quality of life predict shoulder pain. A total of 60 patients with functional neck dissection participated in the study. Their ages ranged from 41 to 80 years old. Eighty-seven percent were men ($n = 52$). The purpose of the study was to investigate the impact of shoulder pain on quality of life after functional neck dissection. Patients were examined preoperatively and at 1, 3, and 6 months after neck dissection. The Constant Shoulder Scale was adapted in the study. There were four parameters in the Constant Shoulder Scale: "pain," "activities of daily living," "range of motion," and "power" (Constant & Murley, 1987). The purpose

of using the Constant Shoulder Scale was to evaluate shoulder function in the clinic. However, Salerno et al. (2002) modified the Constant Shoulder Scale, called the Modified Constant Questionnaire. They explained that there were four domains in the Modified Constant Questionnaire: "passive forward elevation," "global shoulder active mobility," "pain," and "working and recreational activity." "Pain" in the shoulders was operationalized as an interval variable (0 - 15 points). A higher score meant less severe pain. The "global shoulder active mobility" included active shoulder abduction, flexion, internal rotation, and external rotation. Each movement was quantified as an interval variable (0 - 10 points). A higher score meant better movement. The score of "global shoulder active mobility" was the sum of four movement scores (0 - 40 points). The researchers operationally defined the total score on the Modified Constant Questionnaire (0 - 85 points) as the level of quality of life. A multivariate analysis illustrated that both the score of "global shoulder active mobility" (B = 2.9; $p = 0.005$) and the total score on the Modified Constant Questionnaire (B = 40; $p < 0.001$) were able to predict the score of the "pain" domain. In the domain of "global shoulder active mobility," active shoulder forward elevation, abduction, external rotation with the arm at 90 degrees, and internal rotation with the hand placed behind the back were all predictors of the "pain" domain (B = 7.7 - 9.9, $p < 0.01$). No information was given about what kind of instrument, such as a goniometer, was used to measure these active movements. Another problem in the study was defining quality of life as the Modified Constant Questionnaire. The original Constant Shoulder Scale was designed only for shoulder function assessment (Constant & Murley, 1987). The Modified Constant Questionnaire contained both subjective ("pain" and "working and recreational activity ") and objective ("passive forward

elevation" and "global shoulder active mobility") domains (Salerno et al., 2002). This concept does not fit the definition of quality of life in nursing science. The accepted definitions of quality of life in nursing consist of several components, such as "a person's sense of well-being" and "a state of complete physical, mental, and social well-being" (Varricchio, 2006). Therefore, measurement of quality of life should be subjective and multidimensional, and the Modified Constant Questionnaire does not meet these criteria. In addition, no data have clearly supported its validity and reliability.

van Wilgen et al. (2004b) found that both shoulder pain and functional status were related domains in a generic quality of life instrument after neck dissection. One hundred and fifty-five patients participated in this study. Sixty percent of them were men (n = 104). Their mean age was 61.3 (SD = 11.9) years old. These patients were investigated at a mean of 3 years after neck dissection, with a standard deviation of 1.7 years. One aim of the study was to determine which factors in shoulder mobility, including shoulder pain and active shoulder abduction, were related to quality of life. Shoulder pain was operationalized by a numbered visual analog scale. Active shoulder abduction, functional status, was measured by an inclinometer. Quality of life was operationalized by using the Dutch version of SF36 (RAND-36), a generic quality of life instrument. There were nine domains on the RAND-36. Thirty-six items on the RAND-36 were interval variables with options from 0% (poor health) to 100% (excellent health). Padilla et al. (2004) summarized the validity and reliability of the SF36. van Wilgen et al. (2004b) found significant correlations between shoulder pain and eight out of nine domains in the Dutch version of the SF36 (RAND-36) (r = -0.18 to -0.68, $p < 0.05$). The eight domains on the RAND-36 were "physical functioning," "social functioning,"

"limitations from physical problems," "role limitations from emotional problems," "general mental health," "vitality," "body pain," and "general health perception." The only domain not related to shoulder pain was "health change," which was not included in the original version of the SF36. On the other hand, five out of nine domains on the RAND-36 were significantly related to active shoulder abduction ($r = 0.23 - 0.55$, $p < 0.01$). These domains were "physical functioning," "limitations from physical problems," "vitality," "body pain," and "general health perception." However, the total score on the RAND-36 was not included in the analyses. Neither the SF-36 nor the RAND-36 has a head and neck cancer-specific subscale.

Summary

This chapter has reviewed the current knowledge about shoulder pain, shoulder functional status, and quality of life after neck dissection. The deficits in the literature created the need for a study with a sound conceptual framework to investigate shoulder pain after neck dissection.

Previous neck dissection studies have identified factors or symptoms related to or affecting shoulder pain, shoulder abduction, and quality of life. However, none of these studies was guided systematically by a conceptual framework. A comparison across these studies was almost impossible because the instruments used in these studies were not the same, particularly when measuring quality of life. Five quality of life instruments were applied in the neck dissection studies: the Dutch version of the SF36 (RAND-36) (van Wilgen et al., 2004b), the Head and Neck Cancer-Specific Quality of Life (HNQOL) (Terrell et al., 2000), the Neck Dissection Impairment Index (NDII) (Taylor et al., 2002), the neck dissection-specific quality of life survey (Shah et al., 2001), and the University

of Washington Quality of Life questionnaire (UW-QOL) (Kuntz & Weymuller, 1999; Laverick et al., 2004). The HNQOL, the UW-QOL, the NDII, and the neck dissection-specific quality of life survey were only disease-specific quality of life measurements. The RAND-36 was a typical generic measurement. A multi-item instrument with both generic and disease-specific scales was recommended because it would give more information about the impact of disease and treatment and its contributing factors so that a more meaningful interpretation could be made (Varricchio, 2006). A study applying the Constant Shoulder Scale as a shoulder function instrument did not analyze parameters individually, such as "pain" and "active shoulder abduction" (Chepeha et al., 2002). Other problems in the reviewed studies were found in the statistical analyses. Use of a binominal (yes/no) variable to measure pain was inadequate. Pain could not be quantified in its variety and real impact on patients if it was only termed "positive" or "negative." Applying chi square tests to examine relationships among binominal variables could not illustrate the direction of the relationships.

The relationships among shoulder pain, active shoulder abduction, and quality of life were demonstrated in two neck dissection studies, one of which was a cross-sectional study (van Wilgen et al., 2004b). There were various time points of data collection among the sample patients in the study. A lack of appropriate instruments to measure quality of life was apparent in the study: applying the Modified Constant Questionnaire to measure quality of life (Salerno et al., 2002). The Modified Constant Questionnaire could not qualify as a quality of life questionnaire because it included objective measures and focuses on shoulder function only. Comparisons between these two studies were not

possible because the cross-sectional time points were dissimilar and the variables were operationalized differently.

The current study aimed to solve these problems by using the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) as a conceptual framework in a descriptive and correlational study at the cross-sectional time of 1 month after neck dissection. The Brief Pain Inventory, numerical rating scales of pain distress, and Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N) were applied in the current study. The Brief Pain Inventory was frequently used in measuring cancer-related pain (Daut et al., 1983; Du Pen et al., 1999; Serlin, Mendoza, Nakamura, Edwards, & Cleeland, 1995) or non-cancer pain (Keller et al., 2004; Yu, Chae, Walker, & Fang, 2001; Zalon, 1999). The numerical rating scale was used in nursing research (Good et al., 2001). The FACIT-H&N contained both generic and disease-specific (i.e., head and neck cancer) quality of life measurements (List et al., 1996). Correlations and multiple regression analyses were performed to find relationships among shoulder pain, active shoulder abduction, and quality of life and to identify factors that predicted these three dimensions. In addition, the UCSF-SMM included adherence, which could have an influence on symptoms and/or outcomes (M. Dodd et al., 2001). The Medical Outcomes Study (MOS) Measures of Patient Adherence was applied in the study in order to determine whether adherence had relationships with shoulder pain, active shoulder abduction, and/or quality of life. Therefore, the results of this study would help in future treatment protocol design.

CHAPTER 3

METHODOLOGY

This chapter explains the research methods applied in the study. The research design, sample selection, and instruments measuring the variables in the study are described first. Then the data collection procedure and human rights protection follow. The chapter concludes with a description of the data analyses that was conducted.

Research Design

This was a descriptive, correlational study with a convenience sample of head and neck cancer patients from a surgery floor of a medical center in the Midwest. The time point for the cross-sectional design was at 1 month after neck dissection. Data were collected via medical record review, self-administered surveys and physical examinations conducted at the one-month follow-up appointment in the physician's office.

Sample Selection

Eligibility criteria included the following: patients should (a) have had their first neck dissection surgery; (b) have not had chronic shoulder pain or limited range of motion of the shoulders before the neck dissection; (c) be able to understand English; (d) be able to verbally or non-verbally report their scores on the questionnaires; and (e) be able to provide informed consent. The rationale for selecting patients with a first time neck dissection was to eliminate potential shoulder pathology resulting from previous surgeries.

The sample size was determined by a sample size table for Pearson correlations (Cohen, 1988). Polit and Hungler (1999) suggested that a power of 0.80 and an effect size of 0.50 are acceptable for nursing studies. Based on these criteria, with an alpha (α)

of 0.05 for a two-tailed test, a sample size of 28 was identified from the sample size table. The proposed sample size was 30 for this study. The power was recalculated after multiple regression analyses, and the sample size would be adjusted if more than 30 participants were needed.

The sample patients were selected from a hospital unit. There were 34 general surgery patient beds and 2 head and neck surgery progressive care patient beds in the unit. Based on data collected from January to April in 2004 (S. Brown, 2005), the total number of head and neck cancer patients who were hospitalized in the unit was 40. The majority were male (73%, $n = 29$) with ages ranging from 39 to 89 years and a mean of 61 years ($SD = \pm 12$). Ninety percent of these patients were white ($n = 36$), 8% were African Americans ($n = 3$), and 2% were Asian Americans ($n = 1$). The mean length of stay was 11 days ($SD = \pm 8$), with a range of 3 to 42 days.

Instrumentation

Three types of data collection methods were used: medical record review, self-administered survey, and physical exam. The Medical Record Review was used to document tumor stage and whether the patient had spinal accessory nerve resection, cervical plexus removal, level V dissection, bilateral neck dissection, radiation, and/or chemotherapy. The Patient Survey included: the Demographic Survey, Brief Pain Inventory (Shoulder Pain), Numerical Rating Scale of Pain Distress (Shoulder Pain), Brief Pain Inventory (Neck Pain), Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N), Center for Epidemiological Studies of Depression Scale (CES-D), and Medical Outcomes Study (MOS) Measures of Patient Adherence. The Physical Exam Record was used to document degrees of active shoulder abduction

measured by a plastic 12-inch 360-degree goniometer, the number of anatomic regions loss of sensation, and whether the patient had myofascial pain of the levator scapulae, joint pain of the acromioclavicular joists, and allodynia.

Medical Record Review

A medical record review was conducted to collect data on some contextual variables in the conceptual framework, including body weight in kilograms (kg), body height in meters (m), whether a patient had spinal accessory nerve resection, cervical plexus removal, level V resection, and/or bilateral neck dissection; tumor size; and whether a patient had pre/intra-operative radiation and/or pre-operative chemotherapy. If a patient did not have bilateral neck dissection, then the side of the neck dissection was obtained from the medical record. If the body weight and body height were collected in pounds and inches, they were translated into kilograms and centimeters. Body mass index ($kg \bullet m^{-2}$) was calculated and then entered for statistical analyses. Body mass index illustrated a somewhat higher association between body fat and disease risk than body weight alone (McArdle, Katch, & Katch, 2001). The results of review were document in the Medical Record Review form (see Appendix A).

Demographic Survey

The Demographic Survey (Appendix A) was self-administered by patients. It was used to collect contextual variables in the conceptual framework, including gender (male or female), age in years, and handedness (whether the surgery was done on the dominant side). Body weight and body height was asked in the survey if they could not be obtained from the medical record. In addition, some other items were included in the survey in order to describe the sample population. These included marital status (married, living

with partner, single, separated, divorced, or widowed), race (Caucasian, African American, Native American, Asian, Latino/Hispanic, biracial, or other), the highest level of education (less than high school, high school or GED, some college, bachelors, masters, some graduate college, or doctorate/professional), job status (full-time, part-time, homemaker, retired, unemployed, or other), and discharge status (home, rehab center, assisted living, nursing home, or hospital).

Brief Pain Inventory and Numerical Rating Scale of Pain Distress

The Brief Pain Inventory (BPI) and numerical rating scale of pain distress measuring shoulder pain were included in the self-administered Patient Survey (see Appendix A). The four items in the BPI were 0-10 intensity scales and ranged from 0 to 10, with verbal anchors at either end (0 = "no pain;" 10 = "pain as bad as you can imagine") (Daut et al., 1983). The first item asked the patient to rate the pain at its "worst" in the previous week; the second asked the patient to rate the pain at its "least" in the previous week; the third asked the patient to rate the pain on "average" in the previous week, and the fourth asked the patient to rate how much pain he/she has "right now." Patients were asked to think about their shoulder pain. They circled a number from 0 to 10 to indicate the intensity of the shoulder pain. The last item was a numerical rating scale of pain distress. The numerical rating scale of pain distress was a scale numbered from 0 to 10 at equal intervals. At each end, "0" had verbal anchors of "no distress" and "10" had verbal anchors of "most distress imaginable." Patients were asked to mark the number indicating the amount of distress from shoulder pain experienced in the previous week. The definitions of distress were illustrated. For both the 0-10 scale and the numerical

rating scale, a higher number indicated a worse intensity of or distress associated with shoulder pain.

Neck pain, one of concurrent symptoms, was measured by a 0-10 intensity scale, which was item 14 of the BPI asking neck pain on "average" in the previous 7 days. This item was a part of the self-administered Patient Survey.

Validity and Reliability of the Brief Pain Inventory (BPI)

The validity and reliability of the BPI were investigated in patients with either cancer pain (Daut et al., 1983) or non-cancer pain (Keller et al., 2004). In the study by Daut et al. (1983), 1169 cancer patients participated. The validity of BPI was supported by significant correspondences between increased pain medication use and higher average pain ratings for both narcotic ($x^2 = 52.88$, $df = 3$, $p < 0.002$) and non-narcotic ($x^2 = 39.40$, $df = 3$, $p < 0.002$) pain medications. The test-retest correlations of worst pain ($r = 0.93$), usual pain ($r = 0.78$), and pain now ($r = 0.59$) were satisfactory.

In the study by Keller et al. (2004), 250 patients with either arthritis or low back pain were enrolled. Exploratory factor analysis showed a factor with the eigenvalue of 6.9. This factor contained four items: worst pain (factor loading = 0.65), least pain (factor loading 0.76), average pain (factor loading = 0.71), and pain right now (factor loading 0.80). The researchers identified this factor as "severity." The total score of "severity" was significantly correlated to the score of intensity scale in the Chronic Pain Grade ($r = 0.77$ in the arthritis patients and $r = 0.60$ in the low back pain patients) and to the body pain score in SF-36 Health Survey ($r = 0.74$ in the arthritis patients and $r = 0.61$ in the low back pain patients). The ANOVA revealed that patients with varying grades by the Chronic Pain Grade had significantly different "severity" scores ($F [3, 92] = 19.01$, $p <$

0.0001 in the arthritis patients and F [3, 103] = 12.47, $p < 0.0001$ in the low back pain patients). Reliability coefficient alphas of the "severity" score were acceptable in both the arthritis group ($\alpha = 0.89$) and the low back pain group ($\alpha = 0.82$).

The BPI was considered a short, easy-to-understand, and easy-to-score instrument to measure pain (Frank-Stromborg & Olsen, 2004). Because of its readability level and comprehensive nature, it was used frequently in clinical research. The BPI was used in the head and neck cancer populations (Chua, Reddy, Lee, & Patt, 1999; Watt-Watson & Graydon, 1995). Internal consistency reliability was assessed in the current study.

Validity and Reliability of the Numerical Rating Scale

Good et al. (2001) measured two pain constructs (pain sensation and pain distress) with two different measures (visual analog scale and numerical rating scale) at the same time in a group of post-operative patients. Convergent validity was supported by high correlations between the visual analog scale and the numerical rating scale for pain sensation ($r = 0.85$ in chronic pain; $r = 0.89$ in acute pain) and for pain distress ($r = 0.91$ in chronic pain; $r = 0.91$ in acute pain). Construct validity was supported by lower coefficients than those for convergent validity when the visual analog scale measures of pain sensation and pain distress were correlated ($r = 0.48$ in chronic pain; $r = 0.81$ in acute pain), and when the numerical rating scale measures of these two constructs were correlated ($r = 0.51$ in chronic pain; $r = 0.80$ in acute pain). Discriminate validity was supported by lower coefficients than those for construct validity between the pain sensation visual analog scale and the pain distress numerical rating scale ($r = 0.43$ in chronic pain; $r = 0.75$ in acute pain), and between the pain distress visual analog scale and the pain sensation numerical rating scale ($r = 0.39$ in chronic pain; $r = 0.75$ in acute

pain). The reliability coefficients of the numerical rating scales for pain sensation (r = 0.72, $p < 0.01$) and pain distress ($r = 0.75$, $p < 0.01$) were satisfactory.

Good et al. (2001) indicated that pain sensation and pain distress are two different constructs. Paired t-tests showed that the pain sensation was significantly greater than the pain distress in both chronic pain and acute pain in the same study ($p < 0.01$). The majority of neck dissection studies have applied a uni-dimensional 0-10 scale (Soo et al., 1990; van Wilgen, Dijkstra, van der Laan, Plukker, & Roodenburg, 2003; van Wilgen et al., 2004a). In the study by Good et al.(2001), they correlated between a one-dimensional 0-10 scale and a numerical rating scale of pain sensation and a numerical rating scale of pain distress in chronic pain. They found that the one-dimensional scale corresponded to pain sensation ($r = 0.71$) more than to distress ($r = 0.35$). Therefore, it was necessary to apply a pain distress scale in a study of pain. The current study did not use the pain sensation scale employed in the study by Good et al. because the two anchors on the pain sensation scale, "no sensation" and "most sensation imaginable," were confusing and did not clearly indicate whether there was a severity/intensity of pain.

Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N)

The FACIT-H&N version 4 (List et al., 1996) was applied to measure quality of life, one of the outcomes in the conceptual framework (see Appendix A). The FACIT-H&N contained both a generic scale (27 items) and a head and neck scale (12 items). The generic scale was made up of four subscales: physical well-being (7 items), emotional well-being (6 items), functional well-being (7 items), and social/family well-being (7 items). Patients were asked to indicate how true each statement (item) has been for them during the previous 7 days by responding to a 0-4 Likert scale (0 = "not at all," 1 = "a

little bit," 2 = "somewhat," 3 = "quite a bit," and 4 = very much). Items on the physical well-being subscale, emotional well-being subscale, and four items on the head and neck scale (Items 2, 3, 6, and 12) were reverse-scored. A higher score meant a better quality of life as perceived by the patient. The FACIT-H&N was a part of the self-administered Patient Survey.

Validity and Reliability

Validity and reliability of the FACIT generic scale (FACIT-G) were supported by Cella et al. (1993). The latest version, version 4, was examined in a mixed sample of 99 cancer patients (Webster, Odom, Peterman, Lent, & Cella, 1999). Its concurrent validity was demonstrated by significant correlations between the FACIT-G subscales and the RAND-36 item health survey subscales ($r = 0.21 - 0.73$, $p < 0.05$). Significant sensitivity to change on the Eastern Cooperative Oncology Group (ECOG) performance status rating (PSR) was found in the total score ($p = 0.002$), physical well-being subscale ($p = 0.0007$), and functional well-being subscale ($p = 0.01$). Internal consistency coefficients ranged from 0.63 to 0.89 for the subscales and 0.89 for the total. When the FACIT-G was used in older cancer patients (i.e., aged 65 and older), its total and subscale scores also had significant correlations with the MOS Short Form Health Survey (SF-36) in all the subscales except "vitality" (Overcash, Extermann, Parr, Perry, & Balducci, 2001). The FACIT-G was able to discriminate between the older cancer patients and the community-dwelling elderly without cancer ($p < 0.002$). The internal consistency coefficient was from 0.60 to 0.85 in the subscales and was 0.86 for the total scores in these older cancer patients. In addition, the head and neck scale (HNS) in the FACIT-H&N was evaluated in head and neck cancer patients (List et al., 1996). The correlations

between the HNS and subscales of the Performance Status Scale for Head and Neck Patients were all significant (r_s = 0.17 - 0.66, $p < 0.05$). Based on the scores of the Karnofsky Performance Status (KPS), these head and neck cancer patients were separated into a good performance group and a poor performance group. The HNS scores were significantly different between the groups ($p < 0.0001$). The HNS distinguished an off-treatment group and on-treatment group in these patients ($p < 0.001$). The internal consistency alpha was 0.63 in the HNS.

The FACIT-H&N was applied in head and neck cancer patients (D'Antonio et al., 1996; List et al., 1996) and patients after neck dissection (McNeely et al., 2004). The advantages of the FACIT was described on the website (http://www.facit.org/qspecific/benefits.aspx). The FACIT provided both generic and disease-specific quality of life measurements. It was written at a 4th grade reading level (9 - 10 year olds) and could be completed in 5 - 10 minutes. Its validity, reliability, and sensitivity to change were supported in the studies. Therefore, it was expected that the FACIT-H&N could be able to yield good quality data in a study.

Center for Epidemiological Studies of Depression Scale (CES-D)

The CES-D (Radloff, 1977) was used to measure depression, one of the concurrent symptoms in the conceptual framework (see Appendix A). There were 20 items related to depression symptoms in the scale. The six categories were identified as the following: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Patients answered each item by indicating how often they have felt this way (symptom) during the past week. The responses included 0 (rarely or none of the time: less than 1 day), 1

(some or a little of the time: 1 - 2 days), 2 (occasionally or a moderate amount of time: 3 - 4 days), and 3 (most or all of the time: 5 - 7 days). Four positive items had reversed scores (Items 4, 8, 12, and 16). The purpose of the CES-D was not to make a diagnosis of depression but to measure depressive symptomatology in the general population. A higher score indicated more impairment. The CES-D was a part of the self-administered Patient Survey.

Validity and Reliability

Radloff (1977) first established the validity and reliability of the CES-D in a general population. The principal component factor analysis of the 20-item scale in the general population yielded four factors with item loading above 0.40: (a) depressive affect (blues, depressed, lonely, cry, and sad), (b) positive affect (good, hopeful, happy, and enjoy), (c) somatic and restarted activity (bothered, appetite, effort, sleep, and get going), and (d) interpersonal (unfriendly, dislike). Comparing the CES-D with other self-report scales, the higher correlation coefficients were found in those designed to measure symptoms of depression: the Brandburn Balance scale ($r = 0.61$), the Brandburn Negative Affect scale ($r = 0.60$), and the Lubin scale ($r = 0.51$). The CES-D had a negative correlation with the Brandburn Positive Affect scale ($r = -0.21$). When the CES-D was applied in a general population and a group of psychiatric inpatients, the scores between these two groups were significantly different ($t = 9.36$, $p < 0.01$). The internal consistency coefficients of the CES-D were high in both the general population ($\alpha = 0.85$) and the patient groups ($\alpha = 0.90$). The test-retest correlation was 0.54 among people in the general population group who reported no negative life events at both interviews. The CES-D was examined in women undergoing treatment for breast cancer (Hann, Winter, & Jacobsen, 1999).

Scores on the CES-D were significantly correlated with the Profile of Mood State Fatigue ($r = 0.66$, $p < 0.01$), the State version of the State-Trait Anxiety Inventory ($r = 0.77$, $p < 0.01$), and the Mental Health Summary Scale from the Short Form 36 Health Survey ($r = -0.65$, $p < 0.01$). Group comparisons were made between those women with breast cancer (the patient group) and the women without a cancer history (the healthy comparison group). These groups were significantly different before the treatment of the patient group ($F = 4.17$, $p < 0.05$) and at 3 weeks after treatment or at 3 weeks after the first interview ($F = 11.72$, $p < 0.001$). The alpha coefficient in the patient group was 0.89. The test-retest correlation coefficient was 0.57 ($p < 0.01$).

The CES-D primarily measured cognitive and affective components of depression rather than the physical manifestation of depression; therefore, it was an appropriate tool to use in medically ill populations, such as cancer patients (Hann et al., 1999). The CES-D was applied in head and neck cancer patients (Derks, De Leeuw, Hordijk, & Winnubst, 2003, 2005; Derks, Leeuw, Hordijk, & Winnubst, 2005; List et al., 1997) and neck dissection patients (van Wilgen et al., 2004b).

The Medical Outcome Study (MOS) Measures of Patient Adherence

Seven items from the MOS Measures of Patient Adherence (R. G. Hayes, 1994) were applied to measure adherence in the conceptual framework (see Appendix A). The first five items were related to the general measures of adherence , regardless of the type of treatment recommended: “I had a hard time doing what the doctor suggested I do”; “I follow my doctor’s suggestions exactly”; “I was unable to do what was necessary to follow my doctor’s treatment plans”; “I found it easy to do the things my doctor suggested I do”; and “generally speaking, how often during the past 4 weeks were you

able to do what the doctor told you." The remaining two items were item 3 (exercised regularly) and item 5 (took prescribed medications) from the specific measures of adherence in the MOS Measures of Patient Adherence. Patients were instructed that "exercised regularly" means shoulder exercise taught by the physical therapist and "took prescribed medications" means pain medications. They responded to each item by selecting a number from a 1-6 scale with descriptions from "none of the time" (1) to "all of the time" (6). Items 1 and 3 in the general adherence scale were reverse-scored. A higher score on the MOS Measures of Patient Adherence indicated a greater tendency to follow the provider's medical recommendations. The MOS Measures of Patient Adherence was carefully designed as a self-report assessment. Therefore, it was administered by the patient.

Validity and Reliability

The MOS Measures of Patient Adherence was designed for patient self-reports and originally applied in the Medical Outcome Study (Sherbourne et al., 1992). This was an observational study of variations in physician practice styles and patient outcomes in one of three systems of care: health maintenance organization, large multispecialty group, and solo fee-for-service. In the MOS longitudinal panel (n = 2,181), the researchers found out that some indicators of health complications were significantly correlated with self-report general adherence behaviors, which were measured by the general adherence scale in the MOS Measures of Patient Adherence (DiMatteo et al., 1992). These indicators were glycolated hemoglobin (r = -0.11, $p < 0.05$), blood glucose (r = -0.13, $p < 0.01$), the Hyperglycemia Symptom Scale, (r = -0.16, $p < 0.01$), body mass index (r = -0.24, $p <$ 0.01), frequency of chest pain (r = -0.08, $p < 0.01$), and the Dyspnea Scale (r = -0.11, $p <$

0.01). The hypertension-specific adherence was measured by four items in the specific adherence scale of the MOS Measures of Patient Adherence. The four items were "a low-salt diet," "a low-fat diet," "taking prescribed medications" and "exercising regularly." The clinical indicators, significantly related to the hypertension-specific adherence, were diastolic blood pressure (r = -0.15, $p < 0.001$) and body mass index (r = -0.12, $p < 0.001$). The correlations between the general adherence and specific adherence measures were small, ranging from -0.12 to 0.29 (R. G. Hayes, 1994). The potential bias from social desirable response was tested by correlation analyses between the MOS Social Desirable Response Scale (SDRS) and MOS Measures of Patient Adherence. The correlation coefficient between the SDRS and general adherence scale was 0.15, and those between the SRDS and specific adherence items ranged from -0.14 to 0.22. The researcher suggested that small associations between the general and specific adherence measures were because they captured different information but not from differential susceptibility to response bias. The internal consistency for the general adherence scale was 0.78 and for the hypertension-specific adherence items was 0.5 (Sherbourne et al., 1992).

Physical Exam Record

The Physical Exam Record (see Appendix A) was used to document the following variables: myofascial pain of the levator scapulae, joint pain of the acromioclavicular joints, allodynia, loss of sensibility, and active shoulder abduction. Myofascial pain of the levator scapulae, joint pain of the acromioclavicular joints, allodynia, and loss of sensibility were concurrent symptoms which were measured by four physical tests. Active shoulder abduction was measured by a goniometer.

Myofascial Pain

Myofascial pain of the levator scapulae was elicited by palpating the trigger points of the muscle (Sist, Miner, & Lema, 1999; van Wilgen et al., 2004a). The levator scapulae develops two trigger points: one is at the angle of the neck and the other is above the superior angle of the scapulae (Simons et al., 1998). If a patient reported pain when two trigger points were stimulated, the test of myofascial pain was positive.

Joint Pain

The joint pain of the acromioclavicular joint was elicited by passive movement of the joint when one joint member was shifted on a straight path relative to the other stationary member (joint translation) (Frisch, 1994; van Wilgen et al., 2004a). The test procedure was described by Frisch (1994). The thumb of the examiner (i.e., the research nurse) slid laterally along the superior aspect of a patient's clavicle to the acromion. Then both the thumb and index finger grasped the clavicle directly adjacent to the joint line. The other hand of the examiner fixed the acromion. The thumb and index finger of the examiner applied an anteriorly directed force to slightly glide the acromioclavicular joint. If the patient reported having pain when the acromioclavicular joint was passively moved, then this test result was positive.

Allodynia

Allodynia was elicited by gently touching the neck and cheek skin with a cotton swab several times (Sist et al., 1999; van Wilgen et al., 2004a). If a patient reported pain at the site touched, the test of allodynia was positive.

Loss of Sensation

The test of sensibility was to examine the 14 anatomic regions: the right and left lower ear, right and left middle face, right and left lower face, right and left upper posterior neck, right and left upper anterolateral neck, right and left lower posterior neck, upper anterior neck, and lower anterior neck (Saffold et al., 2000; van Wilgen et al., 2004a). A patient was examined for sense of touch using a cotton ball and with the eyes closed. The patient first experienced the nature of the stimulus by putting a cotton ball on the skin of an unoperated and nonirradiated body part, such as the leg. In the test, the patient was requested to respond each time he or she feels the cotton ball on the skin of the tested region. All regions were tested five times. When 50% of the attempts on a region (i.e., three out of five times) were not felt, that region was identified as having a loss of sensation. The numbers of anatomic areas with loss of sensation were documented.

Goniometer

A plastic 12-inch 360-degree goniometer was used to measure active shoulder abduction which operationalizes functional status, one of the outcomes in the conceptual framework. The application of a goniometer on shoulder abduction was shown by Norkin and White (1995). A patient was positioned as standing with the arm along the body (i.e., the zero anatomical position). The body of the goniometer was placed over the posterior aspect of the acromion process, and the two arms of the goniometer were aligned along the posterior midline of the humerus and paralleled to the vertebral column. Then, the patient was asked to abduct the arm (i.e., voluntarily move the arm in a lateral direction). At the end of the abduction, the moving arm of the goniometer was aligned

along the lateral midline of the humerus, and the stationary arm of the goniometer was free to hang perpendicular to the floor and paralleled to the patient's vertebral column. The actual arc of motion was recorded by reading the number on the scale of the body of the goniometer. Both the arms were measured, and the degree of active abduction were recorded on the Physical Exam Record (see Appendix A).

At the 16th week, 100% of the patients in the radical neck dissection group, 65% in the modified radical dissection group, and 22% in the supramohyoid neck dissection group had either moderate or severe abnormalities in the trapezius muscle as found by electromyograms (Sobol et al., 1985). Active shoulder abduction had a better correlation ($r = 0.64$, $p < 0.0005$) with the electromyograms than active shoulder flexion ($r = 0.52$, $p < 0.005$) in the same study. Patten and Hillel (1993) suggested using a goniometer to evaluate shoulder function after neck dissection. Some neck dissection studies have applied goniometers to measure shoulder abduction (Erisen et al., 2004; McNeely et al., 2004; Sobol et al., 1985). The intra-rater reliability of active shoulder abduction in a sitting position was 0.97 by using a goniometer in a group of volunteers without any shoulder pathologic history (Sabari, Maltzev, Lubarsky, Liszkay, & Homel, 1998).

Experts have stated that physical therapists are able to judge the validity of most range of motion measurements because of their anatomical knowledge and their skills of visual inspection, palpation of bony landmarks, and accurate alignment of the goniometer (Gajdosik & Bohannon, 1987). They concluded that application of correct knowledge and skills and interpretation of the results as a measurement of range of motion can provide sufficient evidence to ensure content validity. Inter-rater reliability with a physical therapist was established in the current study with ten healthy employees in a

hospital in order to train the research nurse. K. Hayes, Walton, Szomor, and Murrell (2001) applied two-way random effect intra-class correlation coefficients in their inter-rater reliability trails. They used five methods to measure shoulder range of motion. One method was goniometer. In the study, four raters measured eight volunteers. The inter-rater reliability was 0.69 for shoulder abduction measured by goniometer. Fleiss in 1986, cited in an article of Delitto and Strube (1991), suggested an intra-class correlation coefficient above 0.75 as excellent reliability.

Procedure for Recruitment and Data Collection

The research nurse was trained to use of a goniometer by a physical therapist before the data collection procedure. The physical therapist and research nurse measured shoulder abduction in ten voluntary employees at a hospital for the training purpose. The supporting letter from a physical therapy is attached (see Appendix B).

The nurse practitioner who was responsible for follow-up care of this patient population at the hospital identified potentially eligible participants. She approached these patients and asked if they would be willing to talk with the research nurse, who was also the Principal Investigator, about the study, assuring them that participation was completely voluntary. If patients were willing to talk to the research nurse, the nurse practitioner would release their name and room number to the research nurse. Patients who had given their permission to be approached were visited in their private hospital room by the research nurse within 24 - 48 hours prior to being discharged from the hospital. The research nurse explained the study and what participation meant. For patients who were interested in joining, she determined eligibility, reviewed the written informed consent, and answered any questions the patient might have. Patients were

asked to sign two copies of the informed consent and authorization and were given one copy of each for their records. They were informed that the research nurse would meet them at a follow-up appointment about a month after their surgery. A medical record review was done at the hospital. The nurse practitioner provided information about the time and place of the patient's follow up appointment to the research nurse. Then the research nurse visited the patients at the physician's office.

In a quiet and private room at the physician's office, the self-administered Patient Survey was given to the patient. The research nurse was available to assist patient on the survey. Then, the physical exams were conducted. A small grant allowed for each patient to receive monetary compensation of $25 for his or her time participating in the study. The supporting letters from the Nurse Practitioner and physicians of the Head and Neck Surgery are attached (see Appendix B).

Protection of Human Rights

The study proposal was reviewed and approved by the Institutional Review Board (IRB). Patients were enrolled in the study only after they were fully informed and had given written consent. All paper documents were secured in a locked drawer and were shredded after the study was completed. The computer was locked by a password which the research nurse kept confidential.

It has been suggested that the patients experienced depressive or dysthymic disorder when they had a score of 16 or higher on the Center for Epidemiological Studies of Depression Scale (CES-D) (Radloff, 1977). Therefore, if any patient in the current study had a score of 16 or higher on the CES-D, the research nurse would encourage the patient to talk the healthcare provider.

Statistical Analysis

The SPSS statistical package was used for all analyses in order to answer the research questions. Results from the analyses were considered significant if the *p* value was equal to or less than 0.05.

1. *Research question:* What is shoulder pain experience as measured by intensity and distress among head and neck cancer patients at 1 month after neck dissection? Descriptive statistics was applied to depict the results from four items of the Brief Pain Inventory (BPI) and numerical rating scale of pain distress from shoulder pain at 1 month after neck dissection. Mean, standard deviation, minimum, and maximum were illustrated.
2. *Research question: What are the relationships among symptom experience, functional status, and quality of life?* Descriptive statistics were used to depict variables of symptom experience, functional status, and quality of life. Pearson correlations were used to check collinearity before multiple regression analyses were conducted. The total score of four shoulder pain intensity items in the Brief Pain Inventory (BPI) and the score of the numeric rating scale of pain distress from shoulder pain were analyzed separately. The generic scale score, the head and neck scale score, and the total score on the Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N) were analyzed individually. The degree of active shoulder abduction was the reading on a goniometer.
3. *Research question: Which contextual variables are related to symptom experience, functional status, and/or quality of life?* Contextual variables included gender, age, body mass index ($kg \bullet m^{-2}$), handedness, spinal accessory

nerve resection, cervical plexus removal, level V dissection, bilateral neck dissection, pre-operative chemotherapy, pre/intra-operative radiation, and tumor size. They were either a binary item, an ordinal item, or a ratio item. For binary items, point biserial correlations were applied. For ordinal and ratio items, Pearson correlations were used. These methods yielded the correlation coefficients among contextual variables and these with the shoulder pain, active shoulder abduction, generic quality of life, head and neck quality of life, and total quality of life, of which they were either interval or ratio variables. Descriptive statistics and frequencies were examined for each contextual variable.

4. *Research question: Which concurrent symptoms are related to symptom experience, functional status, and/or quality of life?* Concurrent symptoms included neck pain sensation, myofascial pain of the levator scapulae, joint pain of the acromioclavicular joint, allodynia, loss of sensation, and depression. Neck pain was quantified by item 14 from the BPI and depression was quantified by the Center for Epidemiological Studies of Depression Scale. Concurrent symptom variables were either binary or interval. For binary variables, point biserial correlations were applied. For interval variables, Pearson correlations were used. These methods yielded the correlation coefficients among concurrent symptoms and these with shoulder pain, active shoulder abduction, generic quality of life, head and neck quality of life, and total quality of life, of which they were either interval or ratio variables. Descriptive statistics and frequencies were applied to depict each concurrent symptom.

5. *Research question: Is adherence related to symptom experience, functional status, and/or quality of life?* Adherence was measured by the Medical Outcome Study (MOS) Measures of Patient Adherence, which contained the general adherence scales and two items from the specific adherence scale. All the items were interval variables. Pearson correlations were used. These methods yielded the correlation coefficients among variables of adherence and these with shoulder pain, active shoulder abduction, generic quality of life, head and neck quality of life, and total quality of life, of which they were either interval or ratio variables. Descriptive statistics were applied to depict the general adherence and the specific adherence.
6. *Research question: How do contextual variables, concurrent symptoms, and adherence predict symptom experience, functional status, and quality of life?* From the correlation analyses, variables among contextual variables, concurrent symptom, and adherence were selected as predictor variables if they were significantly correlated to symptom experience, functional status, and quality of life, which were dependent variables. The predictor variables to a dependent variable were entered into the same block while the stepwise method was used in the multiple regression analysis. However, if two predictor variables were significantly correlated with each other, they would be entered into multiple regression analyses respectively in order to avoid collinearity effect. The combination of predictor variables which generated the greatest R^2 was identified. Their coefficients were shown in the results.

CHAPTER 4

RESULTS

This chapter presents the results of the data analysis and is divided into three sections. The first section addresses the inter-rater reliability of active shoulder abduction measurement with use of a goniometer and psychometric analyses of the measures. The second section describes the sample. The third section gives the results of the statistical analyses of the research questions.

Inter-rater Reliability of Active Shoulder Abduction

Before the data collection, the research nurse and an inpatient physical therapist established the inter-rater reliability of the goniometer, which measures active shoulder abduction. The data from 10 healthy employees in a hospital were subjected to intra-class correlations by SPSS. A two-way mixed model was selected because the rater factor was treated as a fixed factor (Yaffee, 1998). The systematic variability from the raters was treated as relevant in the analyses, so the absolute agreement measure was used. Both of the participants' arms were tested. For the right arm, the intra-class correlation of single measures was 0.86 and the correlation of average measures was 0.94. The Cronbach's alpha was 0.94. For the left arm, the intra-class correlation of the single measure was 0.76 and the correlation of the average measure was 0.87. The Cronbach's alpha was 0.91. These results support the inter-rater reliability of the shoulder abduction based on the suggestions by Delitto and Strube (1991).

Psychometric Analyses of Measures

Internal consistency reliabilities of the Brief Pain Inventory (BPI), the Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT), the Center for

Epidemiological Studies of Depression Scale (CES-D) and the general measures of adherence in the Medical Outcome Study (MOS) Measures of Patient Adherence were assessed by Cronbach's alpha among the patients in the current study. The Cronbach's alpha of the 4-item in BPI was 0.90. The FACIT-H&N included the 27-item generic scale (Cronbach's alpha = 0.85), the 12-item head and neck scale (Cronbach's alpha = 0.77), and the total scale combining both (Cronbach's alpha = 0.88). There were four subscales in the generic scale on the FACIT-H&N: the 7-item physical well-being (Cronbach's alpha = 0.74), the 7-item social well-being (Cronbach's alpha = 0.69), the 6-item emotional well-being (Cronbach's alpha = 0.68), and the 7-item functional well-being (Cronbach's alpha = 0.79). All of the scales demonstrated adequate internal consistency reliability. The Cronbach's alphas were satisfactory for the 20-item CES-D and for the 5-item general measures of adherence in the MOS Measures of Patient Adherence. Their Cronbach's alphas were 0.86 and 0.69 respectively.

Description of the Sample

A total of 34 patients from a Head and Neck Cancer Surgery Unit of a Midwest hospital were enrolled in the study. Of these, four patients were dropped from the study because they did not meet eligibility criteria. One patient had had a previous neck dissection, two were due for radiation or chemotherapy within the first month after surgery, and the fourth one had a history of multiple sclerosis. This last patient had spent three weeks in a rehab center due to an illness but not due to the surgery. Among the 30 patients who completed the study, data from one patient were not entered for analysis because his surgery report indicated that he had not had a neck dissection. Therefore, this study consisted of a convenience sample of 29 head and neck cancer patients who had

Table 1

Descriptive Statistics of Sample

	M (*SD)*	*n* (%)
Age	60.34 (12.43)	
Gender		
Male		21 (72)
Female		8 (28)
Race		
Caucasian		27 (93)
African American		2 (7)
Marital Status		
Married		16 (56)
Single/never married		3 (10)
Separated		2 (7)
Divorced		3 (10)
Widowed		5 (17)

Table 1 (continued)

Descriptive Statistics of Sample

	M (*SD*)	*n* (%)
Educational Background		
Less than high school		8 (28)
High school/GED		11 (38)
Some college		8 (28)
Completed 4-year college degree		1 (3)
Completed a graduate or professional degree		1 (3)
Job Status		
Employed, full-time		9 (31)
Retired		11 (38)
Unemployed		7 (24)
Self-employed		2 (7)
Destination after hospitalization		
Home		29 (91)
Rehabilitation center		1 (3)
Assisted living		1 (3)
Nursing home		1 (3)

had neck dissection approximately 1 month before the data collection procedure. The descriptive statistics of age, gender, race, marital status, educational background, job status, and destination after hospitalization are shown in Table 1.

Results of Statistical Analyses Answering Research Questions

The aim of the statistical analyses was to establish a model in order to describe the phenomenon of shoulder pain after neck dissection among the sample patients in the study. The research questions were driven by a conceptual framework from the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) and the literature review. The conceptual framework is illustrated in Figure 2. There were two interrelated dimensions and three types of predictors in the conceptual framework. The two dimensions included one symptom experience and two outcomes. Symptom experience was represented by shoulder pain after neck dissection. Shoulder pain was described by shoulder pain intensity and shoulder pain-related distress. Outcomes included functional status and quality of life. Functional status was determined by active shoulder abduction, while quality of life included generic quality of life and head and neck quality of life. The three types of predictors in the current study were contextual variables, concurrent symptoms, and adherence. The contextual variables included the person domain and the health illness domain. There were four variables in the person domain: gender, age, body mass index, and handedness (i.e. whether the surgery was done on the dominant side). Seven contextual variables were included in the health and illness domain. These were spinal nerve resection, cervical plexus removal, level V dissection, bilateral neck dissection, tumor size, pre/intra-operative radiation, and pre-operative chemotherapy. Concurrent

symptoms consisted of neck pain, myofascial pain of the levator scapulae, joint pain of the acromioclavicular joint, allodynia, loss of sensation, and depression. Adherence meant the self-reported general tendency to follow medical recommendations and to follow symptom management strategies for shoulder pain, including adherence to shoulder exercises and adherence to pain medications.

Research Question 1: What is shoulder pain experience as measured by intensity and distress among head and neck cancer patients at 1 month after neck dissection?

Shoulder pain intensity and shoulder pain-related distress were conceptualized as components of the shoulder pain experience. The scores from the four intensity items on the Brief Pain Inventory (BPI) and one item on the numerical rating scale of pain distress were entered for statistical analyses. Some patients reported a "0" score, meaning "no pain," on the 0-10 intensity scale and/or the 0-10 distress scale. In the BPI, 38% (n = 11) of the patients reported no pain for the item, "shoulder pain at its worst" in the past 7 days; 55% (n = 16) for the item, "shoulder pain at its least"; and 38% (n = 11) for the item, "shoulder pain on the average." Sixty-six percent of the patients (n = 16) had no pain when the research nurse asked them at the time of the interview how much shoulder pain they had. Twelve patients (41%) responded "no distress" on the numerical rating scale of pain distress. The pain intensity and distress scores from the rest of the patients reporting other than a "0" score were entered for descriptive statistics. If the 0-10 scale was conceptualized as follows: 0 = no pain, 1-3 = mild pain, 4-6 = moderate pain, 7-10 = severe ("Pain Intensity Instruments," 2003), the scores reported by these patients had moderate pain intensity and pain distress. The results of the descriptive statistics for those reporting intensity and distress are shown in Table 2.

Table 2

Shoulder Pain Intensity and Shoulder Pain-related Distress Among Patients Having Shoulder Pain

	n (%)	Minimum	Maximum	*M*	*SD*
Shoulder Pain Intensity					
Shoulder pain at its worst	18 (62)	1	10	6.33	2.70
Shoulder pain at its least	13 (45)	1	5	2.54	1.33
Shoulder pain on the average	18 (62)	1	9	4.50	2.15
Shoulder pain right now	10 (33)	1	7	3.30	2.00
Shoulder Pain-related Distress	17 (59)	1	10	4.89	3.04

Research Question 2: What are the Relationships Among Symptom Experience, Functional Status, and Quality of Life?

Based on the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994), symptom experience is related to outcomes, and outcomes are related to each other. The focus of this research question was to examine the relationships between symptom experience and functional status, between symptom experience and quality of life, and between functional status and quality of life. Descriptive statistics were applied to describe each variable under symptom experience, functional status, and quality of life. Pearson correlations were then used to illustrate the relationships between the variables. Both analyses included data from all 29 patients despite some patients reporting "no shoulder pain" in the interview.

Symptom experience was defined by shoulder pain after neck dissection, including shoulder pain intensity and shoulder pain-related distress. Shoulder pain intensity was computed by the total score of the four items on the Brief Pain Inventory (BPI). Shoulder pain-related distress was calculated from the score on the numeric rating scale of pain distress. Functional status was measured by active shoulder abduction. The average degree of active shoulder abduction from both arms was calculated. Quality of life was evaluated using the Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N). The scores from the generic scale, head and neck scale, and total score combining both were calculated respectively. There were four subscales in the generic scale on the FACIT-H&N: physical well-being, social well-being, emotional

well-being, and functional well-being. The individual subscale score was computed in the analyses. The results from the descriptive statistics are shown in Table 3.

Pearson correlations were first used to determine if multi-collinearity could be a problem in symptom experience or in quality of life because there was more than one variable. The results indicated that shoulder pain intensity and shoulder pain-related distress were positively correlated with each other in symptom experience ($r = 0.93$, $p \leq 0.01$). Total quality of life was positively correlated with generic quality of life ($r = 0.93$, $p \leq 0.01$), and head and neck quality of life ($r = 0.82$, $p \leq 0.01$). Generic quality of life and head and neck quality of life were positively correlated with each other ($r = 0.56$, $p \leq 0.01$). Therefore, collinearity did occur in symptom experience and quality of life.

To test the relationships between symptom experience and functional status, between symptom experience and quality of life, and between functional status and quality of life, three Pearson correlations were conducted (see Table 4). Both shoulder pain intensity ($r = -0.55$, $p \leq 0.01$) and shoulder pain distress ($r = -0.61$, $p \leq 0.01$) were negatively correlated with active shoulder abduction. The negative correlation indicated that those with higher levels of shoulder pain intensity or shoulder pain-related distress exhibited lower degrees of active shoulder abduction. Active shoulder abduction was positively correlated with total quality of life ($r = 0.49$, $p \leq 0.01$), generic quality of life ($r = 0.39$, $p \leq 0.05$), and head and neck quality of life ($r = 0.52$, $p \leq 0.01$), respectively, indicating that the greater the degree of active shoulder abduction, the better the quality of life.

Scores on the subscales for generic quality of life were entered into the Pearson correlations to examine the relationships among the subscales, symptom experience, and

Table 3

Descriptive Statistics of Symptom Experience, Functional Status, and Quality of Life

	Minimum	Maximum	*M*	*SD*
Symptom Experience				
[a]Shoulder pain intensity	0	29	9.00	9.36
Shoulder pain-related distress	0	10	2.86	3.36
Functional Status				
Active shoulder abduction (Average)	80	165	120.81	21.35
Right arm	60	158	118.28	24.98
Left arm	55	172	123.34	29.11
Quality of Life				
Total quality of life	56	143	100.28	19.96
Generic quality of life	48	103	77.83	13.84
Physical well-being	7	28	18.97	5.77
Emotional well-being	14	24	20.31	3.34
Functional well-being	5	27	17.83	6.04
Social/Family well-being	7	24	20.72	4.03
Head and neck quality of life	6	40	22.45	8.60

Note. $N = 29$

[a] This was computed from the total score of four 0-10 scales on the Brief Pain Inventory.

Table 4

Correlations Between Symptom Experience and Functional Status (A), Between Functional Status and Quality of Life (B), and Between Quality of Life and Symptom Experience (C)

A	1	2	3
1. Shoulder pain intensity	-	0.92**	-0.55**
2. Shoulder pain-related distress		-	-0.61**
3. Active shoulder abduction			-

B	1	2	3	4
1. Active shoulder abduction	-	0.49**	0.39*	0.52**
2. Total quality of life		-	0.93**	0.82**
3. Generic quality of life			-	0.56**
4. Head and neck quality of life				-

C	1	2	3	4	5
1. Total quality of life	-	0.93**	0.82**	-0.33	-0.36
2. Generic quality of life		-	0.56**	-0.26	-0.31
3. Head and neck quality of life			-	-0.34	-0.33
4. Shoulder pain intensity				-	0.92**
5. Shoulder pain-related distress					-

*$p \leq 0.05$ **$p \leq 0.01$

Note. $N = 29$

Table 5

Correlations Among Subscales in Generic Quality of Life, Symptom Experience, and Functional Status

Subscales	Symptom Experience	
	Shoulder Pain Intensity	Shoulder Pain-related Distress
Physical well-being	-0.50**	-0.57**
Social well-being	0.24	0.22
Emotional well-being	-0.17	-0.18
Functional well-being	-0.19	-0.21
	Functional Status	
	Active Shoulder Abduction	
Physical well-being	0.41*	
Social well-being	-0.14	
Emotional well-being	0.12	
Functional well-being	0.53**	

*$p \leq 0.05$ **$p \leq 0.01$

functional status (see Table 5). Physical well-being was negatively correlated with both shoulder pain intensity (r = -0.50, $p \leq 0.01$) and shoulder pain-related distress (r = -0.57, $p \leq 0.01$). When patients reported higher scores on either shoulder pain intensity or shoulder pain-related distress, they experienced worse physical well-being in their quality of life. Active shoulder abduction was positively correlated with physical well-being (r = 0.41, $p \leq 0.05$) and functional well-being (r = 0.53, $p \leq 0.01$). This result indicated that patients with greater degrees of active shoulder abduction reported better physical well-being and functional well-being in their quality of life.

Research Question 3: Which Contextual Variables Are Related to Symptom Experience, Functional Status, and/or Quality of Life?

The contextual variables included the person domain and the health and illness domain. There were four variables in the personal domain: gender, age, body mass index, and handedness (i.e. whether the surgery was done on the dominant side). The health and illness domain was comprised of seven contextual variables in the conceptual framework. However, two variables were eliminated from the analyses due to the small number of patients: spinal accessory nerve resection (n = 3) and cervical plexus removal (n = 1). The remaining variables were level V dissection, bilateral neck dissection, tumor size (at the time of surgery), pre/intra-operative radiation, and pre-operative chemotherapy. Ten patients (34%) had T0 of tumor size because they had had only neck dissection without tumor resection. The purpose of the neck dissection was for removing residual cancerous lymph nodes or tissues in the neck after radiation or chemotherapy among these patients. Therefore, they did not have a tumor size described in their

Table 6

Descriptive Statistics of Contextual Variables (Person Domain)

	M (*SD*)	*n* (%)
Handedness		
Yes		20 (69)
No		9 (31)
BMI	24.99 (5.13)	

Table 6 (continued)

Descriptive Statistics of Contextual Variables (Health and Illness Domain)

	M (*SD*)	*n* (%)
Level V Dissection		
Yes		9 (31)
No		20 (69)
Bilateral Neck Dissection		
Yes		10 (34)
No		19 (66)
Tumor Size (At the Time of Surgery)		
T0		10 (34)
T1		5 (17)
T2		8 (28)
T3		2 (7)
T4		4 (14)
Pre/intra-operative Radiation		
Yes		15 (52)
No		14 (48)
Pre-operative Chemotherapy		
Yes		11 (38)
No		18 (62)

Table 7

Correlations Among Contextual Variables, Shoulder Pain Intensity (A), Shoulder Pain-related Distress (B), Active Shoulder Abduction (C), Total Quality of Life (D), Generic Quality of Life (E), and Head and Neck Quality of Life (F)

	A	B	C	D	E	F
Person Domain						
Gender	0.39*	0.40*	-0.28	-0.13	-0.04	-0.22
Age	-0.14	-0.04	-0.19	-0.05	-0.06	-0.02
BMI	0.07	0.10	0.09	0.17	0.11	0.22
Handedness	0.07	-0.05	0.11	0.03	0.03	0.02
Health and Illness Domain						
Level V dissection	0.46*	0.39*	-0.08	-0.12	-0.17	-0.01
Bilateral neck dissection	0.02	-0.06	0.08	-0.18	-0.26	-0.01
Tumor stage (at the time of surgery)	-0.11	-0.07	-0.08	-0.35	-0.35	-0.26
Pre/intra-operative Radiation	0.12	0.11	-0.21	-0.44*	-0.27	-0.57**
Pre-operative Chemotherapy	0.12	0.12	-0.10	-0.26	-0.09	-0.45*

*$p \leq 0.05$ **$p \leq 0.01$

Note. $N = 29$

pathology reports at the time of surgery. The descriptive statistics are illustrated in Table 6.

To identify the relationships among the contextual variables, shoulder pain intensity, shoulder pain-related distress, active shoulder abduction, total quality of life, generic quality of life, and head and neck quality of life, Pearson correlations and point-biserial correlations were computed. The point-biserial correlations were estimated by Pearson correlations in the SPSS program. As shown in Table 7, in the person domain, only gender was correlated with shoulder pain intensity ($r_{pbs} = 0.39$, $p \leq 0.05$) and shoulder pain-related distress ($r_{pbs} = 0.40$, $p \leq 0.05$). Male patients had worse pain intensity and pain-related distress. In the health and illness domain, level V dissection was positively correlated with shoulder pain intensity ($r_{pbs} = 0.46$, $p \leq 0.05$) and shoulder pain-related distress ($r_{pbs} = 0.39$, $p \leq 0.05$). Patients with level V dissection exhibited worse shoulder pain intensity and shoulder pain-related distress. Pre/intra-operative radiation had negative relationships with total quality of life ($r_{pbs} = -0.44$, $p \leq 0.05$) and head and neck quality of life ($r_{pbs} = -0.57$, $p \leq 0.01$). Patients who had had pre/intra-operative radiation had lower total quality of life scores and head and neck quality scores. Pre-operative chemotherapy had a negative relationship with head and neck quality of life ($r_{pbs} = -0.45$, $p \leq 0.05$). Those who had had pre-operative chemotherapy had worse head and neck quality of life scores. These correlation coefficients are shown in Table 7.

Research Question 4: Which Concurrent Symptoms Are Related to Symptom Experience, Functional Status, and/or Quality of Life?

The concurrent symptoms included neck pain, myofascial pain of the levator scapulae, joint pain of the acromioclavicular joint, allodynia, loss of sensation, and

depression. Allodynia was eliminated from the analyses due to the small number of patients reporting this symptom ($n = 2$). Sixteen patients (55%) had no neck pain in the previous 7 days with the remaining 13 (44%) reporting mild to moderate pain in the neck on a 0-10 intensity scale. One third of the patients ($n = 9$) experienced myofascial pain of the levator scapulae. Two fifths of the patients ($n = 13$) experienced joint pain of the acromioclavicular joint. Loss of sensation was measured to test the sensibility of 14 face and neck anatomic regions. Four patients (14%) had no region with loss of sensation, but one patient had 7 regions with loss of sensation. For all 29 patients, the mean score on the Center for Epidemiological Studies of Depression Scale (CES-D) was 10.97 (SD = 8.67). Six patients (21%) had a score of 16 or higher in the current study indicating the possible presence of a depressive or dysthymic disorder (Radloff, 1977). The descriptive statistics of the concurrent symptoms are illustrated in Table 8.

The Pearson correlations and point biserial correlations were calculated to examine the relationships among the concurrent symptoms, shoulder pain intensity, shoulder pain-related distress, active shoulder abduction, total quality of life, generic quality of life, and head and neck quality of life. Again, the point-biserial correlations were estimated by the Pearson correlations. Neck pain scores were positively correlated with shoulder pain intensity scores ($r = 0.45$, $p \leq 0.05$) and shoulder pain-related distress scores ($r = 0.41$, $p \leq 0.05$), but were negatively correlated with total quality of life scores ($r = -0.41$, $p \leq 0.05$) and head and neck quality of life scores ($r = -0.48$, $p \leq 0.01$). Patients who experienced worse neck pain reported worse shoulder pain intensity and shoulder pain-related distress, and they had worse total quality of life and head and neck quality of life

Table 8

Descriptive Statistics of Concurrent Symptoms

	M (*SD*)	*n* (%)
Neck Pain	3.38 (1.94)	13 (45)
Depression	10.97 (8.67)	29 (100)
Myofascial Pain		
Yes		9 (31)
No		20 (69)
Joint Pain		
Yes		13 (45)
No		16 (55)
Loss of Sensation (Anatomic Regions)		
0		4 (14)
1		7 (24)
2		8 (28)
3		4 (14)
4		2 (7)
5		3 (10)
7		1 (3)

Table 9

Correlations Among Concurrent Symptoms, Shoulder Pain Intensity (A), Shoulder Pain-related Distress (B), Active Shoulder Abduction (C), Total Quality of Life (D), Generic Quality of Life (E), and Head and Neck Quality of Life (F)

	A	B	C	D	E	F
Neck pain	0.45*	0.41*	-0.26	-0.41*	-0.30	-0.48**
Myofascial pain	0.42*	0.41*	-0.21	-0.45*	-0.35	-0.49**
Joint pain	0.38*	0.27	-0.31	-0.24	-0.17	-0.29
Loss of sensation	0.32	0.25	-0.24	-0.42*	-0.29	-0.50**
Depression	0.32	0.34	-0.17	-0.68**	-0.78**	-0.34

*$p \leq 0.05$ **$p \leq 0.01$

Note. $N = 29$

as well. Similarly, patients with myofascial pain had worse shoulder pain intensity (r_{pbs} = 0.42, $p \leq 0.05$) and shoulder pain-related distress (r_{pbs} = 0.41, $p \leq 0.05$). They experienced worse total quality of life (r_{pbs} = -0.45, $p \leq 0.05$), and head and neck quality of life (r_{pbs} = -0.49, $p \leq 0.01$). Patients with joint pain had worse shoulder pain intensity (r_{pbs} = 0.38, $p \leq 0.05$). Loss of sensation was found to be negatively correlated with total quality of life (r = -0.42, $p \leq 0.05$) and head and neck quality of life (r = -0.50, $p \leq 0.01$). Patients who lost more regions of sensation exhibited worse total quality of life and head and neck quality of life. Patients with greater depression scores had worse total quality of life (r = -0.68, $p \leq 0.01$) and generic quality of life (r = -0.78, $p \leq 0.01$). These correlation coefficients are shown in Table 9.

Research Question 5: Is Adherence Related to Symptom Experience, Functional Status, and/or Quality of Life?

Adherence was measured by the Medical Outcome Study (MOS) Measures of Patient Adherence. There were 7 items on the MOS Measures of Patient Adherence. Each item was quantified on a 1-6 scale with descriptions from "none of the time" (1) to "all of the time" (6). The first 5 items were included in general adherence. The first item was "had a hard time doing what the doctor suggested to do." The second item was "follow the doctor's suggestions." The third item was "unable to follow the doctor's treatment plan." The fourth item was "easy to do what the doctor suggested to do." The last item was "how often I am able to do what the doctor told me." Two subscales included "exercised regularly" and "took prescribed meds." "Exercised regularly" meant shoulder exercise under the instruction of a physical therapist at the hospital. Six missing values were

Table 10

Descriptive Statistics of Adherence

	Minimum	Maximum	*M*	*SD*
General Adherence (Total Score)	19	30	28.38	2.74
Item 1: "had a hard time doing what the doctor suggested to do"	1	3	1.07	0.37
Item 2: "follow the doctor's suggestions"	3	6	5.52	0.87
Item 3: "unable to follow the doctor's treatment plan"	1	5	1.21	0.82
Item 4: "easy to do what the doctor suggested to do"	1	6	5.41	1.27
Item 5: "how often I am able to do what the doctor told me"	5	6	5.72	0.45
(Shoulder) Exercised Regularly	1	6	3.96	1.40
Took Prescribed (Pain) Meds	2	6	5.68	0.94

Table 11

Correlations Among Adherence Variables, Shoulder Pain Intensity (A), Shoulder Pain-related Distress (B), Active Shoulder Abduction (C), Total Quality of Life (D), Generic Quality of Life (E), and Head and Neck Quality of Life (F)

	A	B	C	D	E	F
General adherence	-0.08	0.04	0.12	0.17	0.18	0.10
(Shoulder) exercised regularly	-0.14	-0.07	0.08	-0.22	-0.17	-0.24
Took prescribed (pain) meds	0.25	0.22	-0.37	-0.43*	-0.39*	-0.34

*$p \leq 0.05$ **$p \leq 0.01$

Note. $N = 29$

found due to no physical therapist instructing in shoulder exercise after surgery. "Took prescribed meds" meant taking prescribed pain medications. One missing value was found due to no prescribed pain med after discharge. The descriptive statistics of the adherence variables are illustrated in Table 10.

The Pearson correlations were applied to the variables of general adherence, "(shoulder) exercised regularly," and "took prescribed (pain) meds" and symptom experience and outcomes. Only "took prescribed (pain) meds" was negatively correlated with total quality of life (r = -0.43, $p \leq 0.05$) and generic quality of life (r = -0.39, $p \leq 0.05$). Patients who took prescribed pain medications more often reported worse total quality of life and generic quality of life. The correlation coefficients are shown in Table 11.

Research Question 6: How Do Contextual Variables, Concurrent Symptoms, and Adherence Predict Symptom Experience, Functional Status, and Quality of Life?

There were a total of 20 potential predictors in the conceptual framework, including 11 contextual variables, 6 concurrent symptoms, and 3 adherence variables. Due to the sample size in the study (N = 29), there was a need to reduce the number of predictors entered into the multiple regression analyses to develop predictive models. First, 3 variables were eliminated before the correlation analyses due to few patients possessing these contextual variables and concurrent symptom, including spinal accessory nerve resection (n = 3), cervical plexus removal (n = 1), and allodynia (n = 2). Second, there were 6 dependent variables in the conceptual model: shoulder pain intensity, shoulder pain-related distress, active shoulder abduction, total quality of life, generic quality of life, and head and neck quality of life. After correlation analyses, it was found that each

dependent variable had a group of predictor variables that were significantly correlated with the dependent variable ($p \leq 0.05$). The next step was to eliminate the predictor variables that could be predicted by other predictor variables, i.e. collinearity. Therefore, correlation analyses were conducted in the contextual variables of person domain, in the contextual variables of health and illness domain, in the concurrent symptoms, and in the variables of adherence. For shoulder pain intensity, the predictor variables included gender, level V dissection, neck pain, myofascial pain, and joint pain. However, neck pain was positively correlated with myofascial pain ($r_{pbs} = 0.72$, $p < 0.01$) and joint pain ($r_{pbs} = 0.37$, $p = 0.05$). Neck pain and myofascial pain were collinear, and neck pain and joint pain were collinear. The relationship between myofascial pain and joint pain was not significant. For shoulder pain-related distress, the predictor variables were gender, level V dissection, neck pain, and myofascial pain. Again, neck pain and myofascial pain had collinearity. No variable was significantly correlated with active shoulder abduction, so no predictor variable to functional status was identified in the current study. For total quality of life, the predictor variables were pre/intra-operative radiation, neck pain, myofascial pain, loss of sensation, depression, and "took prescribed (pain) meds" in adherence. Neck pain and myofascial pain were collinear. For generic quality of life, depression and "took prescribed (pain) meds" in adherence were the predictor variables. For head and neck quality of life, the predictor variables were pre/intra-operative radiation, pre-operative chemotherapy, neck pain, myofascial pain, and loss of sensation. However, pre/intra-operative radiation and pre-operative chemotherapy were collinear ($r = 0.76$, $p < 0.01$), and so were neck pain and myofascial pain.

Each group of predictor variables was entered into the same block using a stepwise method in the multiple regression analysis. However, when two predictor variables were significantly inter-correlated in the same group, individual multiple regressions contained only one of the collinear variables in each to avoid the collinearity effect. The greatest R^2 of the predictor combination was selected.

In symptom experience, when shoulder pain intensity was the dependent variable, the predictor combination of level V dissection and myofascial pain had the greatest R^2. This model explained 45% of the variance in shoulder pain intensity ($F(2, 26) = 10.56$, $p < 0.01$). Gender and joint pain were dropped from the model. The result of the power analysis for this model was 0.99. When shoulder pain-related distress was the dependent variable, the predictor combination of myofascial pain and level V dissection had greater R^2. Approximately 37% of the variance in shoulder pain-related distress was explained by this model ($F(2, 26) = 7.60$, $p < 0.01$). Gender was dropped from the model. The power was 0.94. No predictor variable of active shoulder abduction was found in the previous correlation analyses. In quality of life, when total quality of life was entered as the dependent variable in the multiple regressions, the predictor combination of depression and loss of sensation had the greatest R^2. This model accounted for 55% of the variance in total quality of life ($F(2, 25) = 15.45$, $p < 0.01$). "Took prescribed (pain) meds" in adherence was excluded from the model, as were both neck pain and myofascial pain. The power value was 0.99. When generic quality of life was entered as the dependent variable, depression was the only predictor variable identified in the multiple regression analysis. It accounted for 57% of the variance in generic quality of life ($F(1, 26) = 35.05$, $p < 0.01$). "Took prescribed (pain) meds" in adherence was excluded from

Table 12

The Coefficient Table of Multiple Regressions

Variables	R^2	B	*SE* B	β	*t*	*p*
Shoulder Pain Intensity	0.45					
(constant)		2.75	1.91		1.44	0.16
Level V dissection		10.42	2.92	0.52	3.57	< 0.01
Myofascial pain		9.71	2.92	0.49	3.33	< 0.01
Shoulder Pain-related Distress	0.37					
(constant)		0.83	0.73		1.13	0.27
Myofascial pain		3.35	1.12	0.47	2.99	< 0.01
Level V dissection		3.21	1.12	0.45	2.86	< 0.01
Total Quality of Life	0.55					
(constant)		122.87	5.18		23.72	< 0.01
Depression		-1.40	0.29	-0.65	-4.89	< 0.01
Loss of sensation		-3.58	1.44	-0.33	-2.49	< 0.01
Generic Quality of Life	0.57					
(constant)		89.98	2.76		32.62	< 0.01
Depression		-1.16	0.20	-0.76	-5.92	< 0.01
Head and Neck Quality of Life	0.57					
(constant)		31.56	2.03		15.54	< 0.01
Radiation		-7.76	2.30	-0.46	-3.37	< 0.01
Loss of sensation		-1.51	0.69	-0.31	-2.19	0.04
Myofascial pain		-5.53	2.55	-0.30	-2.17	0.04

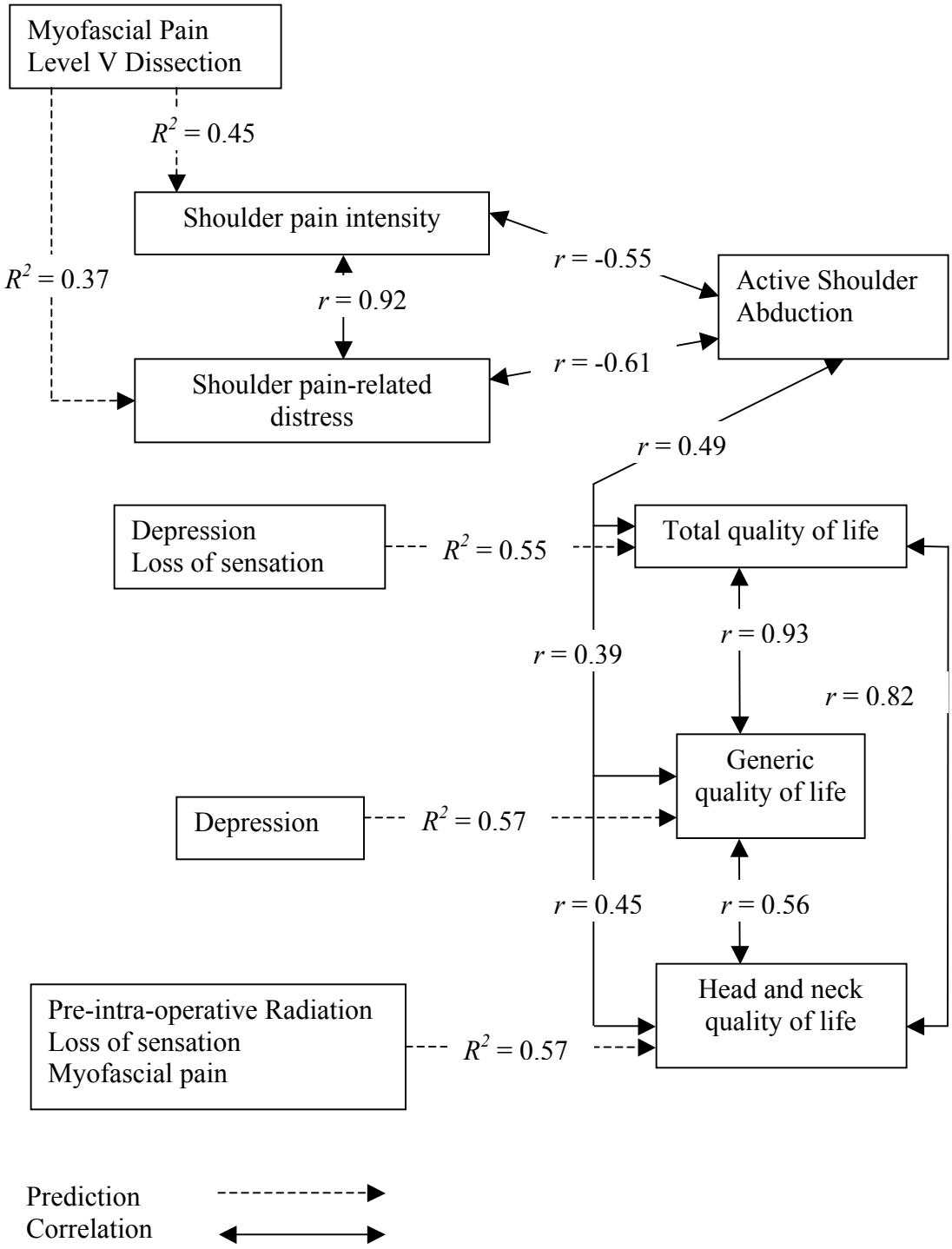


Figure 3. The revised model.

the model. The result of the power analysis was 0.99. When head and neck quality of life was the dependent variable, the predictor combination of pre/intra-operative radiation, loss of sensation, and myofascial pain generated the greatest R^2. This model explained 57% of the variance in head and neck quality of life ($F(3, 25) = 10.92$, $p < 0.01$). Pre-operative chemotherapy and neck pain were excluded. The power value was 0.99. The coefficient table of these models described above is shown in Table 12. Figure 3 illustrates the revised model concluded from the statistical analyses, including the relationships among symptom experience, functional status, and quality of life and their predictors. Adherence was not included in the figure because its influence on symptom experience and outcomes was not significant based on multiple regression analyses.

Summary of Statistical Analyses on Research Questions

Twenty-nine patients participated in this study approximately one month after neck dissection. In the Brief Pain Inventory (BPI), about one-third to two-thirds of the patients reported that they had moderate shoulder pain when they were asked about shoulder pain intensity at its least, at its worst, on the average, or at the time of the interview. The rest of the patients answered that they were expressing no pain. Two thirds of the patients reported that they were bothered by shoulder pain. The level of distress was moderate as well.

The relationships among symptom experience, functional status, and quality of life were determined by the Pearson correlations. Patients with more severe shoulder pain intensity exhibited more severe shoulder pain-related distress, and they demonstrated a lower degree of active shoulder abduction. Patients who had greater degrees of active shoulder abduction reported better total quality of life, generic quality of life, and head

and neck quality of life scores. When patients perceived better total quality of life, they reported better generic quality of life and head and neck quality of life as well.

The Pearson correlations were used to identify the predictor variables of symptom experience, functional status, and quality of life among the contextual variables, concurrent symptoms, and adherence. In addition, the significant inter-correlation between the two predictor variables in the same category was evaluated in order to avoid multi-collinearity in the next multiple regression analyses. Predictor combinations which had the greatest variance in explaining the dependent variable in the multiple regression model were selected: level V dissection and myofascial pain of the levator scapulae to shoulder pain intensity; myofascial pain of the levator scapulae and level V dissection to shoulder pain-related distress; depression and loss of sensation to total quality of life; depression to generic quality of life; and pre/intra-operative radiation, loss of sensation, myofascial pain of the levator scapulae to head and neck quality of life. If a patient has level V dissection and myofascial pain of the levator scapulae, it could be predicted that this patient will have worse shoulder pain intensity and shoulder pain-related distress. If a patient is more depressed, it could be predicted that this patient will experience a worse generic quality of life. If a patient is more depressed and loses more anatomic regions of sensation, it could be predicted that this patient will perceive worse total quality of life. If a patient has pre/intra-operative radiation, has myofascial pain of the levator scapulae, and loses more anatomic regions of sensation, it could be predicted that this patient will experience worse head and neck quality of life. No predictor variable to active shoulder abduction was found in the analyses. The regression models identified in the analyses R^2

ranged from 0.37 to 0.57. The results from the power analyses indicated that the sample size was adequate.

CHAPTER 5

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter begins with a summary of the study and its limitations and is followed by a discussion of the major findings. Conclusions and recommendations for future research comprise the final part of this chapter. Figure 4 shows a model suggested as a guide for future studies.

Summary of the Study

The number of patients with head and neck cancer is relatively low compared with those with breast cancer and prostate cancer. However, head and neck cancer not only brings physical discomfort and emotional distress, but the treatment plan also causes facial disfigurement and functional impairment. One of the frequent problems after head and neck cancer surgery is shoulder pain, which has been found to have a significant influence on head and neck cancer patients' lives. This pain is caused by trapezius dysfunction from nerve damage or removal during neck dissection or by adhesive capsulitis after prolonged immobility.

Shoulder pain has been reported in studies among patients with neck dissection as having an influence on shoulder function and quality of life. Some researchers have identified factors or symptoms related to or affecting shoulder pain, shoulder function, and quality of life (Chepeha et al., 2002; Dijkstra et al., 2001; El Ghani et al., 2002; Erisen et al., 2004; Hillel et al., 1989; Kuntz & Weymuller, 1999; Laverick et al., 2004; McNeely et al., 2004; Shah et al., 2001; Short et al., 1984; Sobol et al., 1985; Taylor et al., 2002; Terrell et al., 2000; van Wilgen et al., 2004a, 2004b). However, none of these studies has been systematically guided by a conceptual framework. Another problem

with these studies is that quality of life and shoulder pain were not operationalized consistently. Therefore, a comparison among these studies is almost impossible, making it difficult to understand the phenomenon of shoulder pain after neck dissection among head and neck cancer patients.

The current study applied the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) (see Figure 1) as a conceptual framework. This model has been used in studies among cancer and HIV/AIDS patients and cancer patients' families. There are some benefits of using this model for a study of a symptom. Symptom experience in the model is described as a self-perceived and multidimensional experience. Various outcomes driven by the symptom experience may be related to each other. Characteristics of the person (contextual variables) and concurrent symptoms may represent several possible etiologies of the symptom or may have confounding effects on the outcomes. The influence of adherence to symptom management strategies on symptom experience and outcomes are considered. Therefore, the UCSF-SMM has potential to help in an understanding of how symptoms impact a person's life.

The purposes of the current study were to: (a) describe the symptom experience of shoulder pain at 1 month after neck dissection; (b) describe the relationships among symptom experience of shoulder pain, functional status, and quality of life; and (c) identify the contextual variables, concurrent symptoms, and/or adherence predicting symptom experience of shoulder pain, functional status, and/or quality of life. The conceptual framework is illustrated in Figure 2. Contextual variables and concurrent symptoms were selected based on preceding neck dissection studies. To address the

instrument issues in previous studies, the current study used four pain intensity items from the Brief Pain Inventory (BPI) as well as the numerical rating scale of pain distress. The Functional Assessment of Chronic Illness Therapy-Head and Neck (FACIT-H&N) was applied in the study because it has both generic and disease-specific (head and neck) quality of life scales. A goniometer was used to measure active shoulder abduction, defined as functional status. Inter-rater reliability of the goniometer was adequately established in this study with ten healthy employees of a hospital. The internal consistency reliabilities of the 4-item Brief Pain Inventory (BPI), the Functional Assessment of Chronic Illness Therapy-Head and Neck Scale (FACIT-H&N), the Center for Epidemiological Studies of Depression Scale (CES-D), and the general measures of adherence in the Medical Outcome Study (MOS) Measures of Patient Adherence were satisfactory.

This was a descriptive study with a convenience sample of head and neck cancer patients. The timing for data collection was set at 1 month after neck dissection. Data were collected via a medical record review. In addition, a self-administered survey and a physical examination were conducted at a follow-up appointment in the physician's office. A total of 30 patients provided information for the data collection, although one was found in the surgery report not to have had neck dissection. Therefore, the data from 29 patients were entered for statistical analyses. Descriptive statistics, Pearson correlations, and multiple regression analyses were used in addressing the research questions.

The average age among the 29 patients was 60.34 years old, and the majority of the patients were male and Caucasian. Most of the patients were married. Over 60% were

employed full-time or retired. Seventy-two percent had a high school degree/GED or higher degree. Thirty-four percent of the patients had a tumor size at T0 at the time of surgery. The tumor size of the remaining patients ranged from T1 to T4. Fifty-two percent had pre/intra-operative radiation and 38% had pre-operative chemotherapy. Over 90% of the patients went home directly after being discharged from the hospital.

Shoulder pain at 1 month after neck dissection was reported by 62% of the sample patients, who reported that their average shoulder pain was above a "0" score in the current study. Four 0-10 pain intensity scales on the BPI were used to register "shoulder pain at its worst," "shoulder pain at its least," "shoulder pain on the average," and "shoulder pain right now (at the time of the interview)." Among the patients who reported other than a "0" score, these four items had means ranging from 2.54 to 6.33. More than half of the patients (59%) complained that shoulder pain bothered them. The average of shoulder pain-related distress was 4.89 on a 0-10 scale among the patients reporting other than a "0" score.

Based on the conceptual framework, there were three reciprocal relationships: (a) between symptom experience and functional status, (b) between symptom experience and quality of life, and (c) between functional status and quality of life. To test these relationships, three Pearson correlations were applied. The results showed patients who reported worse symptom experience had significantly worse functional status, and those who had worse functional status experienced significantly worse quality of life (r = 0.39 - 0.92). In symptom experience, the correlation coefficient between the two shoulder pain variables (intensity and distress) was 0.92, which suggested collinearity. Shoulder pain intensity and shoulder pain-related distress had negative relationships with active

shoulder abduction as the term of functional status. In quality of life, the correlation coefficient between total quality of life and generic quality of life was 0.93; between total quality of life and head and neck quality of life was 0.82; and between generic quality of life and head and neck quality of life was 0.56. Again, due to the significant correlation coefficients between them, this suggested collinearity existing in quality of life. Total quality of life, generic quality of life, and head and neck quality of life were positively correlated with active shoulder abduction. Neither shoulder pain intensity nor shoulder pain-related distress had a significant *p* value in their correlation coefficients with the three quality of life scores, but they did have a negative relationship with a subscale of physical well-being in the FACIT-H&N. Active shoulder function was positively correlated with two subscales: physical well-being and functional well-being.

There were a total of 20 potential predictor variables in the contextual variables, concurrent symptoms, and adherence in the conceptual framework. Reducing the number of predictors entered into the multiple regression analyses was necessary to develop predicting models. Three variables, spinal accessory nerve resection, cervical plexus removal, and allodynia, were removed from the analyses due to the small number of patients. Pearson correlations were applied to identify predictor variables that had significant correlation coefficients with the dependent variables. The dependent variables in the conceptual framework included shoulder pain intensity, shoulder pain-related distress, active shoulder abduction, total quality of life, generic quality of life, and head and neck quality of life. The results of the Pearson correlations showed that each dependent variable had a group of predictor variables. In addition, the Pearson correlations were applied to detect if the two predictor variables in the same category

correlated with each other, i.e. collinearity. In order to avoid the collinearity effect, when two predictor variables of a dependent variable were significantly correlated, individual multiple regressions contained only one of the collinear variables in each. The greatest R^2 of the predictor combination was selected. The results of the multiple regression analyses showed that patients with level V dissection and myofascial pain of the levator scapulae had more severe shoulder pain intensity ($R^2 = 0.45$) and shoulder pain distress ($R^2 = 0.37$). When patients had higher scores on the Center for Epidemiological Studies of Depression Scale (CES-D) and more anatomic regions with loss of sensation, they had worse scores on the FACIT-H&N, which contained both the generic scale and head and neck scale ($R^2 = 0.55$). Patients with higher scores on the CES-D had worse scores on the generic scale in the FACIT-H&N ($R^2 = 0.57$). Patients who had pre/intra-operative radiation, had lost more anatomic regions of sensation, and had myofascial pain tended to have worse head and neck quality of life scores on the FACIT-H&N ($R^2 = 0.57$). No predictor was related to active shoulder abduction. Figure 3 illustrates the revised model concluded from the statistical analyses, including the relationships among symptom experience, functional status, and quality of life and their predictors. Adherence was not included in the figure because its influence on symptom experience and outcomes was not significant based on multiple regression analyses.

Limitations

The sample size was relatively small, along with the total of 213 correlation analyses performed in this data set, so there is a strong possibility that some analyses were significant only by chance in meeting the conventional significance level, which was 0.05 in this study. Therefore, it may be that the *p* value should be adjusted.

The spinal accessory nerve resection (n = 3) and cervical plexus removal (n =1) in the contextual variables were removed from the statistical analyses due to the small number of patients who had had these procedures. Patients with spinal accessory nerve resection and/or cervical plexus removal represented those with modified or radical neck dissection. Although data from these patients were included in the study, the amount was small. People at high risk for head and neck cancer tend to be single/never married and/or having less than a high school education (Johnson et al., 2008). Patients in the current study were not randomly selected from a larger population but were all from the same private practice physician group. Only 10% of these patients were single/never married and 28% had less than a high school education. Thus, whether the results from these sample patients could be generalized to another group of head and neck cancer patients is uncertain. In addition, a number of clinical characteristics were not described in the current study, such as the primary tumor site, cancer (TMN) stage, and history of tobacco and/or alcohol use. The results of the current study may not be generalized to include these characteristics.

Seven percent of the patients (n = 2) in the current study experienced allodynia, i.e. pain was initiated by non-painful stimuli. The Leeds Assessment of Neuropathic Symptoms and Sign Scale used to identify neuropathic pain contained allodynia as one of the items in the scoring system (Potter, Higginson, Scadding, & Quigley, 2003). The researchers developed this scale in a post-treatment head and neck cancer group, in which most of the patients had had radiation and surgery. They found that 56% of the patients experienced neuropathic pain. This number is much higher than the number of patients with allodynia in the current study, which is probably because the patients in the current

study had less radical procedures. It remains unknown whether better information might be produced by measuring neoropathic pain instead of allodynia.

Discussion

Age, Gender, and Race: Study Comparison

The age, gender, and race distribution among the patients in the current study was similar to that in a study conducted in 2004 among the head and neck cancer patients from the same physician group as in the current study (S. Brown, 2005), as well as a in a study investigating quality of life in the first 3 months after head and neck cancer surgery in the Netherlands (van den Brink et al., 2006). The mean age in the current study was 60.34 years, with a minimum of 36 years and a maximum of 89 years. Male patients made up 72% of the patients. Ninety-three percent of the patients were Caucasian. In the study by Brown (2005), the mean age was 61 years and the ages ranged from 39 to 89 years. Seventy-three percent of the patients were male and 90% were Caucasian. Therefore, age, gender, and race distributions in the sample patients of the current study represented characteristics of patients that this head and neck surgery physician group usually treated. In a study by van den Brink et al. (2006), conducted in the Netherlands, the mean age was 61 years and the ages ranged from 29 to 84 years. Male patients made up 77% of the patients. In contrast, the current study was conducted in the United States. The age and gender distribution in the head and neck cancer patients was similar in the studies done in both countries.

Shoulder Pain Experience

Four 0-10 scales of the Brief Pain Inventory were applied to describe patients' experience of shoulder pain intensity in the past 7 days and at the time of the interviews.

The patients who did have shoulder pain in the current study experienced moderate shoulder pain intensity at its worst (M = 6.33) and mild shoulder pain intensity at its least (M = 2.54) during the week at 1 month after neck dissection. They reported having moderate shoulder pain intensity on average (M = 4.50). At the time of the interview, they tended to have moderate shoulder pain intensity (M = 3.30). They said that their shoulder pain-related distress was about moderate on a 0-10 scale as well (M = 4.89).

A fairly large portion of the sample patients (38%) reported no pain at the time of data collection. This was not expected, but is possibly due to the small number of patients who had had modified radical or radical neck dissection. In addition, their pain was possibly well controlled by pain medication because the majority of these patients responded that they were taking their pain medications. The current study did not collect data about the types and frequency of pain medications that the patients used after surgery. Therefore, it is not possible to address the influence of pain medication on shoulder pain.

Salerno et al. (2002) found that 80% of the patients reported moderate to severe shoulder pain 1 month after neck dissection. They used a 0-15 point scale, with "0" meaning "severe pain" and "15" meaning "no pain." A mean of 5.03 in the group receiving physical therapy and 5.07 in the control group was reported. All the patients in their study had had laryngectomy with neck dissection. Therefore, the laryngectomy might have played an important role in the shoulder pain experience.

Relationship Between Shoulder Pain Intensity and Shoulder Pain Distress

Patients with worse shoulder pain intensity reported in the current study that they had worse shoulder pain-related distress. The correlation coefficient between shoulder pain

intensity and shoulder pain-related distress was very high (r = 0.92), which indicated that a collinearity effect happened between these two variables. This result may raise a question about whether shoulder pain after neck dissection could just be measured by one dimension. It is possible that shoulder pain intensity may be more sensitive to change because of its relationship with shoulder function.

Good et al. (2001) reported that pain intensity and pain distress were strongly correlated constructs. The correlation coefficient was 0.80 for acute pain, as measured the first day after surgery. The correlation coefficient for chronic pain was much lower, at 0.51. The researchers did not clearly define chronic pain. The magnitude of the correlation coefficient between shoulder pain intensity and shoulder pain-related distress in the current study is similar to the one for acute pain in the study by Good et al.. Shoulder pain happening at 1 month after neck dissection may more closely reflect acute pain experiences.

Active Shoulder Abduction

In previous neck dissection studies, researchers described differences of active shoulder abduction between the operated side and the non-operated side among patients with unilateral neck dissection (Dijkstra et al., 2001; El Ghani et al., 2002; Hillel et al., 1989) or changes of active shoulder abduction over time in longitudinal studies (Sobol et al., 1985; Stuiver et al., 2008). In the current study, active shoulder abduction was analyzed as its average in both arms. The design of the current study was cross-sectional without baseline data for comparison, and 34% of patients had bilateral neck dissection. Therefore, it would be meaningful to compare the data from the current study with that of an age-similar healthy group. Walker, Sue, Miles-Elkousy, Ford, and Trevelyan (1984)

investigated active range of motion among 60 healthy subjects between the ages of 60 and 85 years old, measured by goniometry. They reported a mean of active shoulder abduction at 155.00 degrees with a standard deviation of 22.00. Among the patients after neck dissection in the current study, their average of active shoulder abduction was lower (M = 120.81 ± 21.35), which may be a result of the reciprocal relationship between shoulder pain and active shoulder abduction. The mean age among patients in the current study was 60.34 years old, with a range from 36 to 89. In addition, neither study found that gender or age could significantly account for the variance in active shoulder abduction.

Quality of Life

Webster, Cella, and Yost (2003) developed a normative dataset of the Functional Assessment of Chronic Illness Therapy (FACIT-G) among 1,075 men and women from a normal US population. Their ages ranged from 18 to 91 years old, with a mean of 45.9 (± 16.6) years: 49.4% were male, 75.9% were Caucasian, and 87.8% had at least a high school education. In the current study, 29 patients were diagnosed with head and neck cancer. Their ages ranged from 36 to 89 years, with a mean of 60.34 (± 12.43) years: 72% were male, 93% were Caucasian, and 72% had at least a high school education. The scores for generic quality of life and its subscales from the two studies are shown in Table 13. The generic quality of life, the total score on the four well-being scales, was lower than that of the normal population (77.83 vs. 80.1), but the difference was small. The patients in the current study had similar quality of life scores compared with those of the healthy US population. Adding the fact that these patients had been diagnosed with

Table 13

Comparison of Generic Quality of Life Scores with Normative Data (Webster et al., 2003)

	Current Study *M (SD)*	Normative Data *M(SD)*
Total Generic Quality of Life	77.83 (13.84)	80.1 (18.1)
Physical well-being	18.97 (5.77)	22.7 (5.4)
Emotional well-being	20.31 (3.34)	19.9 (4.8)
Functional well-being	17.83 (6.04)	18.5 (6.8)
Social/Family well-being	20.72 (4.03)	19.1 (6.8)

and treated for head and neck cancer, they reported relatively good quality of life scores, which were not expected.

As in the current study, Ringash (2009) used FACIT-H&N, including a generic scale and head and neck scale, to measure quality of life among head and neck cancer patients undergoing radiation and chemotherapy. No numeric data were presented, only figures. Before the treatment, patients reported total quality of life scores around 110, which dropped to a low of 70 during treatment, dramatically rebounded back to the middle 90s at the second month after treatment, and gradually returned to the baseline, a low of 100, over 12 months. The mean total quality of life score in the current study was 100.28, which was similar to the one reported by patients at 12 months after treatment in Ringash's study. It is possible that 1 month after neck dissection is not appropriate timing to address quality of life issues. More importantly, if quality of life improves with time without any innovative intervention to manage the shoulder pain experience, then perhaps quality of life may not be the most appropriate distal outcome for shoulder pain experience.

Relationships Between Two Quality of Life Scores

Patients with better generic quality of life had better head and neck quality of life. The magnitude of the correlation coefficient between generic quality of life and head and neck quality of life in the current study ($r = 0.56$) was greater than the one in the study by D'Antonio et al. (1996), which was 0.37. Their study was conducted among patients 3 months to 6 years after major surgery for head and neck cancer, while the current study was conducted at 1 month after neck dissection. This result implies that generic quality

of life and disease-specific quality of life had a stronger reciprocal relationship at the early stage of the surgery recovery process.

Interestingly, in the current study, 57% of the variance in generic quality of life was explained by depression, but the same amount of variance (57%) in head and neck quality of life was explained by pre/intra-operative radiation, loss of sensation, and myofascial pain, which were related to the treatment for head and neck cancer. Whether the rest of the variance in either type of quality of life could be accounted for by each other was not analyzed in the current study. These results suggest that the generic quality of life measure and disease-specific quality of life measure each contributed unique information about quality of life.

Relationships Among Symptom Experience, Functional Status, and Quality of Life

Relationship Between Shoulder Pain Experience and Active Shoulder Abduction

Based on the results, patients who had higher levels of shoulder pain intensity had higher levels of shoulder pain-related distress, and their shoulders exhibited lower degrees of active shoulder abduction. Due to the nature of correlational analyses, results from the current study can not explain cause and effect relationships among these variables. It is possible that the relationship between shoulder pain experience and shoulder abduction were reciprocal. Shoulder pain may limit the degree to which patients are willing to abduct their shoulder, but limited shoulder abduction may cause more shoulder pain during the attempt to abduct the shoulder, such as frozen shoulder syndrome. Breaking down this negative feedback circle may be a key to managing shoulder pain after neck dissection.

The inverse relationship found between shoulder pain experience and active shoulder abduction was similar to that of previous studies (Inoue et al., 2006; Salerno et al., 2002; Stuiver et al., 2008). Inoue et al. (2006) found a significantly negative correlation between shoulder pain and shoulder abduction (r = -0.34). The weakness of this study was that shoulder pain was measured by a binominal variable, so the impact of the pain on patients could not be quantified. Stuiver et al. (2008) used a numeric rating scale to measure shoulder pain, and both subjective and objective shoulder functions were evaluated in the study. The Shoulder Disability Questionnaire was the subjective component of the shoulder function measurement. They found that either higher shoulder pain scores or lower active shoulder abduction degrees predicted greater shoulder disability. In another study by Salerno et al. (2002), active shoulder abduction was a significant predictor of shoulder pain.

Relationship Between Active Shoulder Abduction and Quality of Life

Patients who demonstrated greater degrees of active shoulder abduction had better scores on total quality of life, generic quality of life, and head and neck quality of life. Due to the cross-sectional design and use of correlational analyses, cause and effect relations can not be determined in the current study.

For generic quality of life, similar results were found in two studies (Inoue et al., 2006; Stuiver et al., 2008). Table 14 displays the correlation coefficients and significant values of these studies. Both van Wilgen et al. (2004b) and Stuiver et al. (2008) applied the Dutch version of SF 36 (RAND-36). In the study by van Wilgen et al. (2004b), shoulder abduction was positively correlated to five out of nine domains on the RAND-36: “physical functioning,” “role limitations from physical problems,” “vitality,” “body

Table 14

Comparison of Shoulder Function and Generic Quality of Life Correlations Among Variables of Three Studies

	Current Study (Wang, 2009)	
FACIT-G Subscales	Shoulder Abduction	
Physical Well-being	0.41*	
Social Well-being	-0.14	
Emotional Well-being	0.12	
Functional Well-being	0.53**	
	Stuiver et al. (2008)	Van Wilgen et al. (2004b)
RAND-36 Domains	Shoulder Disability Questionnaire	Shoulder Adduction
Physical Functioning	-0.37*	0.55**
Social Functioning	-0.11	0.09
Role Limitations from Physical Problems	-0.29*	0.44**
Role Limitations from Emotional Problems	-0.31*	0.02
General Mental Health	-0.23*	-0.20
Vitality	-0.29*	0.23**
Body Pain	-0.53*	0.45**
General Health Perception	-0.18	0.26**
Health Changes	-0.23	0.03

*$p \leq 0.05$ **$p \leq 0.01$

pain," and "general health perception." Stuiver et al. (2008) found that the responses to the Shoulder Disability Questionnaire were negatively correlated with the following six domains on the RAND-36 with *p* values less than 0.05: "physical functioning," "role limitations from physical problems," "role limitations from emotional problems," "general mental health," "vitality," and "body pain." The Shoulder Disability Questionnaire was a subjective measure of shoulder function. A higher score reflected worse shoulder function. Stuiver et al. (2008) found that lower active shoulder abduction degrees predicted greater shoulder disability as well. In the current study, Pearson correlations showed that active shoulder abduction was positively correlated with two subscales of the FACIT-G: physical well-being and functional well-being. Similarly, objective shoulder abduction was correlated to physical and functional levels of quality of life on the RAND-36 in the study by van Wilgen et al. (2004b), i.e. "physical functioning" and "role limitation from physical problems." On the other hand, subjective shoulder disability was negatively related to emotional level of quality of life on the RAND-36 in the study by Stuiver et al. (2008), i.e. "role limitations from emotional problems" and "general mental health."

For head and neck quality of life, similar results were found in the study by Inoue et al. (2006), who used the Neck Dissection Quality of Life Questionnaire to measure disease-specific quality of life. There are 12 items in this questionnaire. Each item is rated on a 1-5 scale with "5" representing better quality of life and "1" representing worse quality of life. They found that 7 items were significantly correlated with active shoulder abduction: "shoulder stiffness" ($r = 0.26$), "constriction of the neck" ($r = 0.23$), "shoulder pain" ($r = 0.34$), "numbness of the neck" ($r = 0.19$), "shoulder drop" ($r = 0.46$),

and "reach hand for above object" ($r = 0.64$). Some of these correlation coefficients were relatively small compared with that between active shoulder abduction and head and neck quality of life in the current study ($r = 0.52$). The larger sample size ($N = 155$) in the study by Inoue et al. may have contributed to the smaller correlation coefficients with statistically significant values.

Relationship Between Shoulder Pain Experience and Quality of Life

In contrast to the proposed relationships in the conceptual framework, shoulder pain was not directly related to three quality of life measures. Quality of life may be too general to be an outcome measure for pain experience. It is possible that many factors in addition to pain contributed to quality of life. More importantly, shoulder pain may have a greater influence on functional capacity than general quality of life perception because of its relationship with active shoulder abduction. Such functional capacity may be described as the ability to perform daily activities. Perhaps measurement of interference with daily activities because of the pain experience could capture more direct outcomes. One instrument measuring pain interference with daily activities is the Pain Disability Index developed by Tait, Chibnall, and Krause (1990). This Index contains 7 items, with a 0-10 scale for each item, from "no disability" to "total disability." These items describe daily routine activities including "family/home responsibilities," "recreation," "social activities," "occupation," "sexual behaviors," "self-care," and "life-support activities." Hubbard, Broome, and Antia (2005) found that pain disability among adolescents and young adults with cystic fibrosis was positively related to pain intensity and pain duration, as measured by the Pain Disability Index.

In the current study, when Pearson correlation was applied to the subscales of the FACIT-G, only the physical well-being subscale was negatively correlated with shoulder pain intensity (r = -0.50) and with shoulder pain distress (r = -0.57). Patients with worse shoulder pain experiences reported worse physical well-being. These results were different from those in the study conducted by van Wilgen et al. (2004b). They found that shoulder pain, as measured by a visual analog scale, was significantly correlated with eight of nine domains on the RAND-36: "physical functioning" (r = -0.39), "social functioning" (r = -0.18), "role limitations from physical problems" (r = -0.42), "role limitations from emotional problems" (r = -0.27), "general mental health" (r = -0.22), "vitality" (r = -0.26), "body pain" (r = -0.68), and "general health perception" (r = -0.30). The only domain not related to shoulder pain was "health change," which was not included in the original version of the SF36. In the current study, the cross-sectional time point was 1 month after neck dissection. Patients in the study by van Wilgen et al. (2004b) had had neck dissection at least a year before the study. Whether the timing after neck dissection was important in the relationship between shoulder pain and quality of life is not known. In addition, the magnitude of the correlation coefficient in the current study with 29 patients was relatively greater than the one in the study by van Wilgen et al. (2004b), which had 155.

Contextual Variables Correlated with Symptom Experience and Outcomes

Four contextual variables were found to be significantly correlated with symptom experience and outcomes in the current study: gender in the person domain; and level V dissection, pre/intra-operative radiation, and pre-operative chemotherapy in the health and illness domain.

Male patients in the current study tended to have more severe shoulder pain intensity and shoulder pain-related distress. Pain studies in gender differences show that women tend to be less tolerant of pain and more likely to take pain medications, thus resulting in lower pain perceptions (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009). This may help explain why male patients in the current study had worse shoulder pain experience. It has been suggested that anxiety may be a component of pain perception in men, although women tend to have greater sensitivity to pain. Using the State-Trait Anxiety Inventory, Jones, Zachariae, and Arendt-Nielsen (2003) found that male participants who scored above the median on anxiety reported significantly greater pain intensity and unpleasantness compared with men who scored below the median. This effect was not found in women, regardless of whether they scored above or below the median. Anxiety may have a differential effect on the pain responses of men and women. The majority of head and neck cancer patients are male, so it may be valuable to investigate the relationship between anxiety and shoulder pain experience and its outcomes after neck dissection.

Patients with level V dissection had worse shoulder pain intensity and shoulder pain-related distress. This result was consistent with the results reported by Terrell et al.(2000). They found that patients with level V dissection reported significantly worse shoulder and neck pain on the Head and Neck Cancer-Specific Quality of Life instrument. The link between level V dissection and shoulder pain is possibly due to spinal accessory nerve injury occurring when the surgeon manipulated the posterior skin flap in the level V dissection.

In the current study, patients who had either pre/intra-operative radiation or pre-op chemotherapy had significantly worse head and neck quality of life scores. A significant negative correlation was found between pre/intra-operative radiation and total quality of life as well. Similar results were found in previous studies (Rogers, Scott, & Lowe, 2007; Shah et al., 2001; Taylor et al., 2002). Taylor et al. (2002) showed that radiation could predict the scores on the Neck Dissection Impairment Index (NDII), which is a disease-specific quality of life measure. Rogers et al. (2007) found a significant association between radiation and NDII. Patients who had had radiation therapy before the surgery had worse disease-specific quality of life scores. Shah et al. (2001) developed a 6-item neck dissection-specific quality of life measure that contained a frequency score and an interference score. They found that chemotherapy was a significant predictor of the total interference score. Perhaps the complications from the radiation and the chemotherapy given before or during the surgery may still cause residual problems after the surgery, which interfere with the disease-specific quality of life.

Concurrent Symptoms Correlated with Symptom Experience and Outcomes

Patients in the current study who had neck pain or myofascial pain had worse shoulder pain intensity and shoulder pain-related distress. It is surprising that patients with joint pain had worse shoulder pain intensity but not shoulder pain-related distress because shoulder pain intensity and shoulder pain-related distress were highly correlated. These results were similar to those of a study by van Wilgen et al. (2004a), who used a binominal variable, however, to define shoulder pain, while the current study used a 0-10 scale. There was no pain-related distress measured in this study. They found that

patients with shoulder pain tended to have neck pain, myofascial pain, and joint pain. They explained that neck pain may be related to neuropathic pain from chronic nerve injury due to tumors or treatment, and that myofascial pain may be from shoulder drop due to spinal accessory nerve dysfunction after neck dissection. Joint pain may be from the process of subluxation and hypertrophy.

Patients with neck pain or myofascial pain had worse head and neck quality of life and total quality of life scores in the current study. No previous study was found that assessed relationships between these two types of pain and the quality of life measures. It is interesting that neck pain and myofascial pain were related to quality of life, but shoulder pain was not. The non-significant correlation coefficients between shoulder pain and quality of life ranged from -0.26 to -0.36. The significant correlation coefficients between neck pain or myofascial pain and quality of life ranged from -0.30 to -0.49. The magnitude of correlation coefficients was not that dissimilar. It is possible that the size of the sample or the large number of patients who did not have shoulder pain when interviewed influenced the results.

Loss of sensation and the number of anatomic regions with loss of sensation indicated how much the sensory branches of the cervical roots were sacrificed in the head and neck cancer surgery. In the current study, patients who had more regions with loss of sensation had worse head and neck quality of life as well as total quality of life. These results were similar to those of a study by van Wilgen et al. (2004b). They found that loss of sensation was significantly correlated with three domains on the RAND-36: "physical functioning," "role limitations from physical problems," and "health changes." These categories reflected the physical component of quality of life.

As expected, patients who were more depressed had worse generic quality of life and total quality of life. van Wilgen et al. (2004b) showed that depression was negatively correlated with all domains on the RAND-30, which is a generic measure of quality of life. In the current study, the mean score on the Center for Epidemiological Studies of Depression Scale (CES-D) was 10.97 (*SD* = 8.67). Radloff (1977) stated that patients may have a depressive or dysthymic disorder if they have a score of 16 or higher on the CES-D. Only 20% of the patients in the current study had a score of 16 or higher. They constituted a high risk group who had problems with quality of life after neck dissection. However, the majority of patients were in the low depression group in the current study, which corresponded to better emotional well-being found among patients in this study compared with normal populations (Webster et al., 2003). This result was quite different from the results of Karnell, Funk, Christensen, Rosenthal, & Magnuson (2006). They found that 44% of head and neck cancer patients had high levels of post-treatment depressive symptoms at the third month after treatment, including surgery. Post-treatment depression in head and neck cancer patients was strongly predicted by pretreatment depressive symptoms. Although pretreatment depression was not measured, it is possible that most of the patients in the current study did not have depressive symptoms and had a close-to-normal heath condition before the treatment.

Adherence Correlated to Symptom Experience and Outcomes

The Medical Outcome Study (MOS) Measures of Patient Adherence was used to measure the tendency to follow the provider's medical recommendations in the current study. There were 7 items used in the MOS Measures of Patient Adherence. Each item was quantified on a 1-6 scale from "none of the time" (1) to "all of the time" (6). The

first 5 general items measured adherence to any type of treatment that the patient's physician suggested. The results showed a lack of variability (*SD* = 0.37 - 1.27) in these items. These patients reported that they tended to follow the medical treatment. This led to the question as to whether social desirability played a role in the patients' answers. On the other hand, the mean for the item, "(shoulder) exercised regularly," was 3.96, with a standard deviation of 1.40. This indicated that these patients seemed to be willing to give negative answers. Future research that will include a shoulder exercise diary may help more clearly describe adherence behaviors to shoulder exercise after neck dissection.

Adherence to pain medication was negatively correlated with generic quality of life and total quality of life. Patients who took more pain medication had worse quality of life scores. Perhaps the need for pain medication indicated greater severity of the disease condition, which might then result in a lower quality of life.

Interestingly, adherence to pain medication was not related to either variable of the shoulder pain experience. Due to not measuring the amount of pain medication that patients had taken in the current study; it is not possible to conclude how pain medication influenced shoulder pain experience. It is suggested that a diary could be used to document pain medication usage in treating pain symptoms among cancer patients during their treatment (Wong et al., 2006).

The Revised Model

The current study supports the use of the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) as a conceptual framework. The purpose of using this model is to promote an understanding of shoulder pain experience and to develop a symptom

management plan applicable to patients who have experienced shoulder pain after neck dissection. To develop an adequate symptom management plan requires that one understand the context and etiologies of the symptom. This model conceptualizes the symptom of shoulder pain multidimensionally and the relationships between symptom experience and outcomes and between outcomes. The revised model, reduced by statistical analyses, contains the etiologies that predict symptom experience and outcomes. Some of these etiologies could be modified by an intervention specific to shoulder pain management in patients who had had neck dissection. Some could not, but could be described as contributing factors. Equally important may be the factors predicting outcomes that may help explain patients' responses to interventions in the future or be defined as co-variants in studies that investigate the effectiveness of an intervention in outcomes. Therefore, the revised model could guide development of future symptom management intervention. Reducing the number of factors in the revised model would avoid an unnecessarily large sample size in a future study as well.

In the current study, statistical procedures were conducted in order to identify variables that would have the most influence on symptom experience (shoulder pain intensity and shoulder pain-related distress) and outcomes (active shoulder abduction and quality of life). These procedures included eliminating variables that few patients reported, identifying collinearity among variables in the same predictor category, and selecting the predictor combinations with the greatest variance to a dependent variable.

Level V dissection and myofascial pain of the levator scapulae were significant predictors of shoulder pain intensity and shoulder pain-related distress. This result suggested that patients with level V dissection are at high risk of developing shoulder

pain because of spinal accessory nerve injury occurring during the procedure. In addition, myofascial pain of the levator scapulae was a major predictor of shoulder pain. Brown, Burns, and Kaiser (1988) theorized that shoulder pain is a result of excessive stretching of the levator scapulae, initiated by an unbalanced shoulder joint due to nerve damage in the surrounding muscles. The potential treatments for myofascial pain of the shoulder include massage of the trigger points and shoulder exercise, which have been supported in two studies (Bron, Wensing, Franssen, & Oostendorp, 2007; Gam et al., 1998).

For total quality of life, the greatest predictor combination was depression and loss of sensation. Depression explained the greatest variance in generic quality of life scores. Perhaps an effective intervention to manage depression, such as cognitive behavior therapy (Duffy et al., 2006), may help to improve generic quality of life in head and neck cancer patients. The mechanism of how depression influences quality of life in the patients was not described in the current study. A future study is necessary to analyze how depression influences the dimensions of quality of life.

In head and neck quality of life, loss of sensation, pre/intra-operative radiation, and myofascial pain explained the greatest variance. Loss of sensation indicates how much the sensory branches of the cervical roots were sacrificed/injured in the head and neck cancer surgery. Head and neck cancer patients, who have more anatomic regions with loss of sensation, may have problems with their disease-specific quality of life. In addition, the results suggested that pre/intra-operative radiation was a contributing factor for diminished head and neck quality of life. The most common complication from radiation was mucositis in head and neck patients (Nonzee et al., 2008). It is not clear

whether patients still experienced radiation-induced mucositis at the first month after surgery, which might have influenced head and neck quality of life in the patients in the current study.

None of the individual aspects of adherence predicted symptom experience or outcomes in the current study although the original UCSF-SMM described adherence influences both symptom experience and outcome. A lack of variability in the items on the Medical Outcome Study (MOS) Measures of Patient Adherence likely contributed to this result. Finding adequate instrumentation for shoulder exercise and pain medications is necessary, such as using a self-report diary to shed light on adherence behaviors.

Active shoulder abduction could not be predicted by any factors in the contextual variables, concurrent symptoms, and adherence, but it was negatively correlated with shoulder pain experience and quality of life scores. Whether the reduced active shoulder abduction was caused by avoiding use of the shoulder due to pain should be studied because this may lead to a modifiable etiology for interventions to improve shoulder function and quality of life.

Conclusion and Recommendations for Future Research

The current study has described the phenomenon of shoulder pain after neck dissection among head and neck cancer patients. At 1 month after surgery, at least 62% of the patients reported shoulder pain at some point within 1 week. Their shoulder pain was rated from mild to moderate. Fifty-nine percent reported that shoulder pain-related distress was at a moderate level. Interestingly, shoulder pain intensity and shoulder pain-related distress did not prove to be two dimensions of the shoulder pain experience among this sample of patients. Pain intensity and pain-related distress were highly

correlated with each other and were related to the physical part of quality of life. This could help explain why only physical and functional quality of life among the sample patients was impaired compared with that of a normal population.

Active shoulder abduction in the current study was worse when it was compared to a healthy, age-matched population. The relationship between active shoulder abduction and quality of life was positive, but quality of life scores were quite similar to healthy population norms. Whether the cross-sectional design of the study was appropriate or whether quality of life is a meaningful distal outcome for shoulder pain experience after neck dissection remain as important questions. A longitudinal study design with pre-operative baseline data for comparison is a possible approach for answering these questions.

Based on a concept from the University of California, San Francisco School of Nursing Symptom Management Model (UCSF-SMM) (M. Dodd et al., 2001; Larson et al., 1994) and statistical analyses, the revised model not only described the relationships between shoulder pain experience and active shoulder abduction and between active shoulder abduction and quality of life, but it also displayed their predictors. Predictors of symptom experience help explain the cause of shoulder pain after neck dissection. Since myofascial pain of the levator scapulae was one of the significant predictors of shoulder pain experience, this suggests that shoulder pain is a result of excessive stretching of the levator scapulae. Two potential intervention strategies to treat extreme tension in the muscles are trigger point massage and shoulder exercise. Level V dissection, another predictor of shoulder pain experience, needs to be performed when any cancerous involvement may occur in the level V lymph nodes of the neck, which causes shoulder

pain due to spinal accessory nerve injuries to occur in this procedure. Although this procedure cannot be avoided, it may help clinicians to identify patients with level V dissection as a high risk population for developing shoulder pain. Contributing factors to diminished quality of life scores, which are depression, loss of sensation, and pre/intra-operative radiation, will help describe how an intervention could change or not change a patient's life due to covariance effects from these variables.

The results of the current study, however, do not provide sufficient guidance for an intervention development. The injured or sacrificed spinal accessory nerve was identified as the primary etiology causing shoulder pain after neck dissection (H. Brown et al., 1988; Nori et al., 1997). However, the lack of shoulder pain in a relatively large percentage of the sample patients may be partially explained by the fact that they did not experience this etiological factor. It is possible that the sample patients in the current study were atypical head and neck cancer patients because the majority were married, better educated, and financially capable of seeking private practice physicians. A larger sample size from multiple sites is needed that will include patients who may be at high risk for poor outcomes after head and neck cancer treatment, such as those who are single, have less than a high school education, and have a history of tobacco or alcohol use (Johnson et al., 2008; Tachezy et al., 2009).

Variables which were removed from the statistical analyses should be included in a future study to confirm their role in the shoulder pain experience phenomenon. Spinal accessory nerve resection and cervical plexus removal were taken out from the analyses in the current study due to the small number of patients having had these types of procedures. While patients' physicians attempted to spare their nerves, the current study

still supported the idea that injury of the spinal accessory nerve in level V dissection and loss of sensation from injury of the cervical plexus predicted shoulder pain and disease-specific quality of life, respectively. Adding these two variables to a future study with a larger sample will enable researchers to examine the severity of problems resulting from the loss of function of these two nerves. In addition, allodynia was removed from the analyses due to the small number of patients having this symptom in the current study. Instead of only testing allodynia, the use of a standardized test is suggested to identify patients with neuropathic pain (Potter et al., 2003). Future studies should examine whether shoulder pain after head and neck surgery contains a neuropathic component because neuropathic pain requires different types of analgesics. This information could help in the development of shoulder pain management interventions.

In the contextual variables, laryngectomy should be incorporated into the model since it was found that patients with laryngectomy had more severe shoulder pain (Salerno et al., 2002). This variable should be investigated in a future study. Tumor size (at the time of surgery) was not correlated to any variables in symptom experience or outcomes in the current study. It is possible that the 34% of patients with T0 contributed to this result. These patients only had neck dissection without tumor resection after radiation and chemotherapy. Whether or not they had early stage diseases remains unclear. Instead of tumor size, cancer stage decided by the TMN system may provide more meaningful information in future studies.

Among the concurrent symptoms, radiation-induced mucositis should be included in the model. The current study supported the idea that pre/intra-operative radiation was a significant predictor of head and neck quality of life. The main complication from

radiation is mucositis. Therefore, it is necessary to test whether radiation-induced mucositis influences shoulder pain and/or its outcomes. Another symptom which may be included in the concurrent symptoms is anxiety. Male patients have been the majority in the head and neck cancer population. Male patients in the current study experienced worse shoulder pain intensity and shoulder pain-related distress. The literature suggests that men tend to perceive pain along with anxiety. Therefore, it may be valuable to investigate whether anxiety could augment shoulder pain symptom experience after neck dissection.

No aspect of adherence in the conceptual framework predicted symptom experience or outcomes. It is likely that adherence was not adequately measured in the current study. Adherence to shoulder pain management strategies needs to be measured reliably, using standardized measures or perhaps via use of a self-report diary to record the type and frequency of shoulder exercise conducted.

A revised conceptual framework that could be used to guide a future study is displayed in Figure 4. Two extra components may be included in such a study. First, in symptom experience, response to symptoms could be measured using the Pain Response Inventory (L. S. Walker, Smith, Garber, & Van Slyke, 1997), which is used in investigating how patients respond to recurrent pain. It contains 60 coping behaviors under three categories: Passive, Active, and Accommodative Coping. This could help in an understanding of head and neck patients' behaviors in responding to shoulder pain. Whether these behaviors can predict outcomes in the conceptual framework should be included in the analyses. Second, since quality of life had no direct relationship with shoulder pain, it is questioned if quality of life is too general to be an outcome because it

could be influenced by many factors. The Pain Disability Index could help in an examination of the degree to which pain interferes with various daily activities (Tait et al., 1990). The areas of daily activities which are influenced by shoulder pain could be understood. However, both instruments were designed to be used in the pediatric population. More revisions with psychometric property evaluations should be included in a future study.

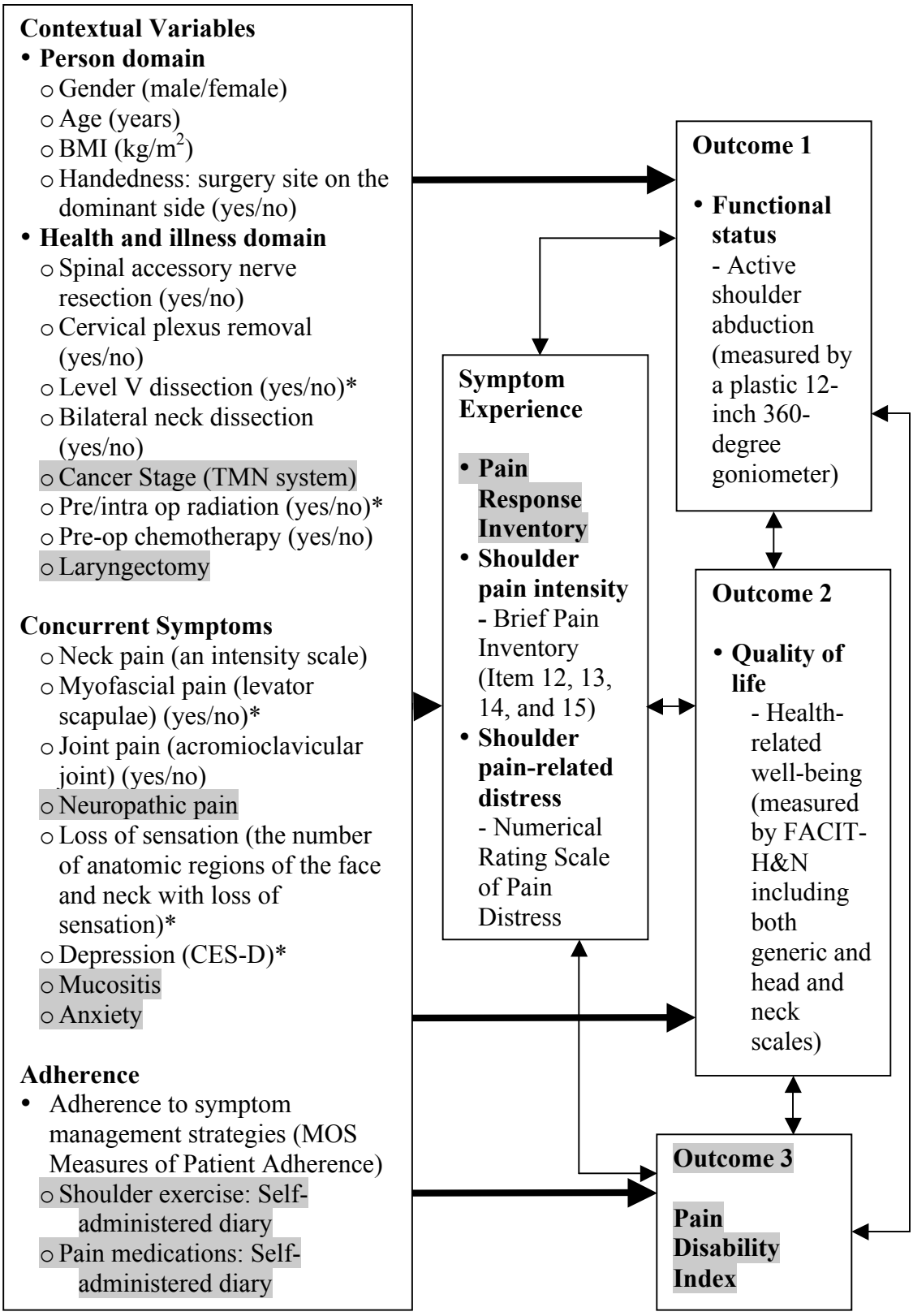


Figure 4. The future model ("*" means significant predictors in the current study. Gray areas mean new additions.)

APPENDIX A: INSTRUMENTS

Medical Record Review

1. Patient's height and weight.

Body Height: _____ m.

Body Weight: _____ kg.

2. Spinal accessory nerve resection or removal (Circle one number)

   Yes ……1

   No ……2

3. Cervical plexus removal (Circle one number)

   Yes ……1

   No ……2

4. Level V dissection (Circle one number)

   Yes ……1

   No ……2

5. Bilateral neck dissection (Circle one number)

   Yes ……1

   No ……2

   On which side? _____.

6. Tumor Stage (Circle one number)

   T0 ……..1

   T1 ……..2

   T2 ……..3

   T3 ……..4

   T4 ……..5

7. Radiation (Circle one number)

Yes ……1

No ……2

8. Chemotherapy (Circle one number)

Yes ……1

No ……2

Patient Survey

Instruction:

<u>Please do not write your name anywhere on the survey.</u>
The following questions ask about you, how much pain you have been having in your shoulders and neck, your quality of life, your mood since surgery, and your activities. If you feel uncomfortable or do not care to answer any specific question, you can skip that question. However, all information will be kept confidential. Please be honest when answering and try not to skip any of the questions.

Demographic Survey

1. Are you…… (circle one number)

   Male ….....1

   Female 2

2. How old are you?

   _____ (Years).

3. How do you weigh?

   _____ (Pounds)

4. How tall are you?

   _____ (Feet) _____ (Inches).

5. Are you right-handed or left-handed? (circle one number)

   Right-handed ……...1

   Left-handed ……2

6. Are you currently…… (circle one number)

   Married ……..…..…..1

   Not married, living with partner …….…….2

   Single/Never married …….……..……3

   Separated ……....4

   Divorced …….….5

   Widowed ...……..6

7. What is your race? (circle one number)

   Caucasian ……....1

   African American ……...2

   Native American …….3

   Asian ……...4

   Latino/Hispanic …….5

   Biracial ……...…6

   Other ……...7

   Please specify: _____.

8. What is the highest level of education you have completed? (circle one number)

   Less than high school ……..1

   High school graduate or GED ..……2

   Some college ……....3

   Completed 4 year college degree …….4

   Some graduate courses ……5

   Completed a graduate or professional degree ……...6

9. Which of the following best describes your current job status? (circle one number)

   Employed, full-time …….1

   Employed, part-time ……2

   Homemaker …….3

   Retired …….4

   Unemployed ……5

   Other ……6

   Please specify: _____.

10. Where do you live after discharge from the hospital? (circle one number)

Home (yours or family's/friend's) ……..….1

Rehab center ……2

Assistant living ……....3

Nursing home ……..4

Another hospital ……..5

The following five questions ask about the pain <u>in your shoulder</u>. Please circle a number to describe your pain in the past 7 days.

12) Please rate your pain by circling the one number that best describes your pain at its worst in the last week.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

13) Please rate your pain by circling the one number that best describes your pain at its least in the last week.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

14) Please rate your pain by circling the one number that best describes your pain on the average.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

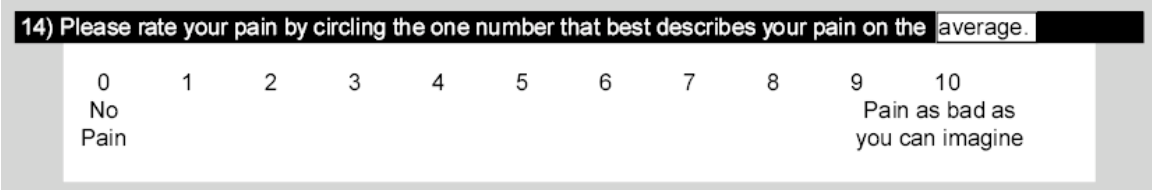
15) Please rate your pain by circling the one number that tells how much pain you have right now.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

16) How much <u>distress</u> has <u>the pain in your shoulder</u> caused in the past 7 days? By distress, I mean how much have the pain bothered you.

0	1	2	3	4	5	6	7	8	9	10
No Distress										Most Distress Imaginable

The following question asks about the pain <u>in your neck</u>. Please circle a number to describe your pain in the past 7 days.



Below is a list of statements that other people with your illness have said are important. **By circling one (1) number per line, please indicate how true each statement has been for you during the past 7 days.**

	PHYSICAL WELL-BEING	Not at all	A little bit	Some-what	Quite a bit	Very much
GP1	I have a lack of energy	0	1	2	3	4
GP2	I have nausea	0	1	2	3	4
GP3	Because of my physical condition, I have trouble meeting the needs of my family	0	1	2	3	4
GP4	I have pain	0	1	2	3	4
GP5	I am bothered by side effects of treatment	0	1	2	3	4
GP6	I feel ill	0	1	2	3	4
GP7	I am forced to spend time in bed	0	1	2	3	4

	SOCIAL/FAMILY WELL-BEING	Not at all	A little bit	Some-what	Quite a bit	Very much
GS1	I feel close to my friends	0	1	2	3	4
GS2	I get emotional support from my family	0	1	2	3	4
GS3	I get support from my friends	0	1	2	3	4
GS4	My family has accepted my illness	0	1	2	3	4
GS5	I am satisfied with family communication about my illness	0	1	2	3	4
GS6	I feel close to my partner (or the person who is my main support)	0	1	2	3	4
Q1	*Regardless of your current level of sexual activity, please answer the following question. If you prefer not to answer it, please check this box* ☐ *and go to the next section.*					
GS7	I am satisfied with my sex life	0	1	2	3	4

By circling one (1) number per line, please indicate how true each statement has been for you during the past 7 days.

	EMOTIONAL WELL-BEING	Not at all	A little bit	Some-what	Quite a bit	Very much
GE1	I feel sad	0	1	2	3	4
GE2	I am satisfied with how I am coping with my illness	0	1	2	3	4
GE3	I am losing hope in the fight against my illness	0	1	2	3	4
GE4	I feel nervous	0	1	2	3	4
GE5	I worry about dying	0	1	2	3	4
GE6	I worry that my condition will get worse	0	1	2	3	4

	FUNCTIONAL WELL-BEING	Not at all	A little bit	Some-what	Quite a bit	Very much
GF1	I am able to work (include work at home)	0	1	2	3	4
GF2	My work (include work at home) is fulfilling	0	1	2	3	4
GF3	I am able to enjoy life	0	1	2	3	4
GF4	I have accepted my illness	0	1	2	3	4
GF5	I am sleeping well	0	1	2	3	4
GF6	I am enjoying the things I usually do for fun	0	1	2	3	4
GF7	I am content with the quality of my life right now	0	1	2	3	4

By circling one (1) number per line, please indicate how true each statement has been for you during the past 7 days.

	ADDITIONAL CONCERNS	Not at all	A little bit	Some-what	Quite a bit	Very much
H&N 1	I am able to eat the foods that I like	0	1	2	3	4
H&N 2	My mouth is dry	0	1	2	3	4
H&N 3	I have trouble breathing	0	1	2	3	4
H&N 4	My voice has its usual quality and strength	0	1	2	3	4
H&N 5	I am able to eat as much food as I want	0	1	2	3	4
H&N 6	I am unhappy with how my face and neck look	0	1	2	3	4
H&N 7	I can swallow naturally and easily	0	1	2	3	4
H&N 8	I smoke cigarettes or other tobacco products	0	1	2	3	4
H&N 9	I drink alcohol (e.g. beer, wine, etc.)	0	1	2	3	4
H&N 10	I am able to communicate with others	0	1	2	3	4
H&N 11	I can eat solid foods	0	1	2	3	4
H&N 12	I have pain in my mouth, throat or neck	0	1	2	3	4

Below is a list of some of the ways you may have felt or behaved. Please indicate how often you hav felt this way during the **past week**: *(circle **one** number on each line)*

During the past week...	**Rarely or none of the time** (less than 1 day)	**Some or a little of the time** (1-2 days)	**Occasionally or a moderate amount of time** (3-4 days)	**All of the time** (5-7days)
1. I was bothered by things that usually don't bother me	0	1	2	3
2. I did not feel like eating; my appetite was poor	0	1	2	3
3. I felt that I could not shake off the blues even with help from my family	0	1	2	3
4. I felt that I was just as good as other people	0	1	2	3
5. I had trouble keeping my mind on what I was doing	0	1	2	3
6. I felt depressed	0	1	2	3
7. I felt that everything I did was an effort	0	1	2	3
8. I felt hopeful about the future	0	1	2	3
9. I thought my life had been a failure	0	1	2	3
10. I felt fearful	0	1	2	3
11. My sleep was restless	0	1	2	3
12. I was happy	0	1	2	3
13. I talked less than usual	0	1	2	3
14. I felt lonely	0	1	2	3
15. People were unfriendly	0	1	2	3
16. I enjoyed life	0	1	2	3
17. I had crying spells	0	1	2	3
18. I felt sad	0	1	2	3
19. I felt that people disliked me	0	1	2	3
20. I could not "get going"	0	1	2	3

How often was each of the following statements true for you during the past 4 weeks?

(Circle One Number on Each Line)

		None of the time	A little of the time	Some of the time	A good bit of the time	Most of the time	All of the time
1.	I had a hard time doing what the doctor suggested I do . . .	1	2	3	4	5	6
2.	I followed my doctor's suggestions exactly . . .	1	2	3	4	5	6
3.	I was unable to do what was necessary to follow my doctor's treatment plans . . .	1	2	3	4	5	6
4.	I found it easy to do the things my doctor suggested I do . . .	1	2	3	4	5	6

5. Generally speaking, how often during the past 4 weeks were you able to do what the doctor told you?

(Circle One)

None of the time..... 1
A little of the time..... 2
Some of the time 3
A good bit of the time..... 4
Most of the time..... 5
All of the time..... 6

		None of the time	A little of the time	Some of the time	A good bit of the time	Most of the time	All of the time
3.	Exercised regularly	1	2	3	4	5	6

By exercise, I mean the shoulder exercise you were taught by the physical therapist at the hospital.

5.	Took prescribed medication .	1	2	3	4	5	6

By pain medication, I mean pain medication prescribed by your doctor.

Physical Exam Record

1. Shoulder Abduction

   The left arm is _____ degree.

   The left arm is _____ degree.

2. Myofascial pain of the levator scapulae (Circle one number)

   No pain ……..1

   Having pain ……...2

3. Joint pain of the acromioclavicular joint (Circle one number)

   No pain ……..1

   Having pain ……...2

3. Allodynia: (pain resulting from non-noxious stimuli on the cheek or neck)

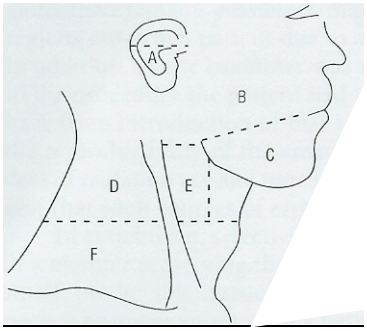
   (Circle one number)

   No pain ……..1

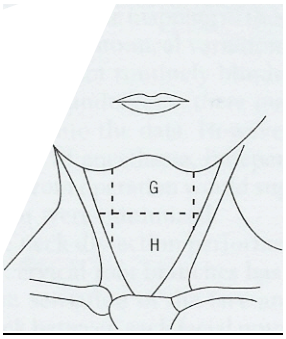
   Having pain ……...2

4. Loss of sensibility (the number of anatomic regions of the face and neck with loss of sensation) _____.

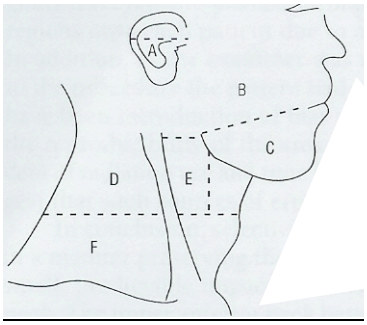
Right Side



Front



Left Side



APPENDIX B: SUPPORTING LETTERS

CENTA
Center for Ear Nose Throat & Allergy

Richard W. Borrowdale, MD
Tod C. Huntley, MD, FACS
Scott E. Phillips, MD, FACS, FAAOA
Karen M. Bunnell, NP-C
Affiliate

Stephen B. Freeman, MD, FACS, FAAOA
Edward J. Krowiak, MD
Eric D. Blom, Ph.D
Ronald C. Hamaker, MD, FACS
Founder, 1940-2005

October 8, 2007

To the Institutional Review Board committee members,

Hsiao-Lan Wang has proposed a research study she would like to conduct among patients who have undergone radical head and neck surgery for cancer. She has described the study defining the investigative factors related to shoulder pain after neck dissection. I recognize pain is an important issue related to surgery outcomes. She has extensive experience with caring for the head and neck cancer population. I have worked alongside her caring for this population at another hospital for some years. I believe her knowledge and experience makes her the ideal person to conduct this type of study. Therefore, I fully support of conducting this study on the Head and Neck Progressive Care Unit / 6 West of the St Vincent Hospital.

Sincerely,

Karen Bunnell, MSN
Nurse Practitioner
Head and Neck Program
St. Vincent Indianapolis Hospital

Carmel Indianapolis, North Avon Terre Haute

Correspondence • 12188A North Meridian Street • Suite 375 • Carmel, IN 46032 • 317-926-1056 • 800-283-1056 • 317-579-0476 (FAX)

CENTA
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Stephen B. Freeman, MD, FACS, FAAOA
Edward J. Krowiak, MD
Eric D. Blom, Ph.D
Ronald C. Hamaker, MD, FACS
Founder, 1940-2005

October 8, 2007

To the Institutional Review Board committee members,

We have read a research proposal of Hsiao-Lan Wang. We support her investigation of an important aspect of post-op symptom experienced by patients who have had head and neck surgery for cancer. We are pleased to support her access to our patient population who will be undergoing head and neck surgery for cancer within our practice. We understand she will introduce herself, explain the study, and obtain informed consent from a defined eligible patient pool of current hospitalized patients agreeable to study participation. In addition to the hospital interview, she will interview patients approximate one month post operative during their follow- up appointment in our office, CENTA 12188-A North Meridian # 375 Carmel IN. We look forward to working with her as she explores the impact of pain and radical neck dissections.

Sincerely,

Richard W. Borrowdale, M.D.

Stephen B. Freeman, M.D.

Tod C. Huntley, M.D.

Edward J. Krowiak, M.D.

Scott E. Phillps, M.D.

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www.centadocs.com

Riverview

Date: 1-3-08

Riverview Hospital
395 Westfield Rd
Noblesville, IN 46060

To the Institutional Review Board committee members,

Ms. Hsia-Lan Wang asked me to help her in the training of use of a goniometer. I am willing to teach her how to properly operate a goniometer to measure shoulder abduction. She and I will measure ten voluntary healthy employees to demonstrate appropriate inter-rater reliability.

Sincerely,

REFERENCES

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Wang, H.-L. (2009). *Shoulder pain after neck dissection among head and neck cancer patients.* (Indiana University School of Nursing).

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Yaffee, R. A. (1998). Enhancement of Reliability Analysis: Application of Intraclass Correlations with SPSS/Windows v.8 [Electronic Version], from http://www.nyu.edu/its/statistics/Docs/intracls.html

Yu, D. T., Chae, J., Walker, M. E., & Fang, Z. P. (2001). Percutaneous intramuscular neuromuscular electric stimulation for the treatment of shoulder subluxation and pain in patients with chronic hemiplegia: a pilot study. *Archives of Physical Medicine & Rehabilitation, 82*(1), 20-25.

Zalon, M. L. (1999). Comparison of pain measures in surgical patients. *Journal of Nursing Measurement, 7*(2), 135-152.

CURRICULUM VITAE

Hsiao-Lan Wang

EDUCATION AND SIGNIFICANT COURSEWORK

PhD, Nursing Science, 2009, Indiana University, Indianapolis, IN, USA
Minor: Human Physiology
MSN, Adult Clinical Nurse Specialist, 2001, Indiana University, Indianapolis, IN, USA
BS, Nursing Management, 1997, National Taipei College of Nursing, Taipei, Taiwan
Diploma in Nursing, 1991, National Taipei College of Nursing, Taipei, Taipei, Taiwan
Diploma, Nursing and Midwifery, 1989, Cardinal Tien School of Nursing and Midwifery, Taipei, Taiwan

CERTIFICATION

Certified Medical-Surgical Registered Nurse, July, 2009
Advanced Cardiovascular Life Support (ACLS) Provider Instructor, Oct. 2008

COMPUTER SKILLS

Microsoft Office (Word, Excel, Power Point), Access, SPSS, and EndNote

CLINICAL EXPERIENCE

Nursing Supervisor, Jun. 2007-present
Riverview Hospital, Noblesville
Responsibilities of Nursing Supervisor
-Assume duties at the nursing department when the administrator is absent.
- Provide quality of nursing care by interpreting and implementing established policies and procedures.
-Serve as nursing clinical resource person and intervene in difficult situations or medical crises.
-Serve as patient advocate and ensure that patients and family needs are met.
-Assume overall responsibility for adequate staffing for current and next shifts.
Responsibilities of Joint Class Coordinator
-Reform the Joint Replacement Patient Education Class by coordinating a multidisciplinary team.
-Serve as an instructor in the class.
-Evaluate the quality of the class and patient outcomes.

Other Responsibilities
-Develop reading education materials for nursing staff for the purpose of quality management. Topics include "Hand Hygiene," "Fall Risk Assessment," "Skin Assessment," "Medication Security," "Advance Directive," "Plan of Care," "Unsafe Abbreviations," "Timeout Check," "Use of Two Patient Identifiers," "Handoff Communication," and "SBAR Communication."
-Assist with quality of care control by auditing medical records and monitoring care behaviors.

Registered Nurse/Charge Nurse, Jun. 2001-Nov. 2007
Surgical Patient Unit (populations of gastrointestinal surgery, gynecology, orthopedics, otorhinolaryngology with head and neck oncology, and urology), Methodist Hospital, Clarian Health Partners, Inc.
Responsibilities of the Charge Nurse
-Maintain adequate staffing based on patient volume and acuity.
-Coordinate with the Bed Control to admit patients promptly and adequately.
-Report to the clinical manager regarding issues with patient satisfaction and policy compliance.
-Serve as an immediate resource when staff nurses need to solve clinical problems.
-Support staff nurses in patient care professionally and psychologically.

Registered Nurse, Aug.1991-Jul.1997
Department of Otorhinolaryngology and Head & Neck Oncology
National Taiwan University Hospital, Taipei, Taiwan

RESEARCH EXPERIENCE

Research Investigator, Apr. 2008-present
Indiana University School of Nursing, Indianapolis, IN
Doctoral Dissertation: "Shoulder Pain After Neck Dissection Among Head and Neck Cancer Patients."
Funding Agency: Indiana University School of Nursing

Research Investigator, Jan. 2000-May 2001
Indiana University School of Nursing, Indianapolis, IN
Master's thesis: "The Effectiveness of Foot and Hand Massage on Pain Among Postoperative Patients"

Research Assistant, Jan. 1999-May 2001
Indiana University School of Nursing, Indianapolis, IN
Project Title*: "A Comparison of Tailored Mammography Intervention"*
Principle Investigator: Dr. Victoria Champion
Funding Agency: National Institutes of Health
Project Title: "*Predictors of Adherence to Colorectal Cancer Screening and Dietary Recommendations in Individuals with Adenomatous Polyps"*
Principle Investigator: Dr. Susan Rawl
Funding Agency: Walther Cancer Institute

TEACHING EXPERIENCE

Teaching Assistant, Aug. 2004-Dec. 2004
Indiana University School of Nursing, Indianapolis, IN
Course Title: *Data Analysis in Clinical Practice and Healthcare Research*

PUBLICATIONS

Wang, H. & Keck, J. F. (2002). Massage as an Innovation for Pain Management after Surgery. Poster Abstract of the 2002 NACNS National Conference, March 14-16, 2002, Atlanta, GA. (2002). *Clinical Nurse Specialist, 16*(3), 125-139.
Wang, H., & Keck, J. F. (2004). Foot and hand massage as an intervention for postoperative pain. *Pain Management Nursing, 5*(2), 59-65.
Wang, H. (2005). Spotlight on research: Knowledge and attitudes about cancer pain management: A comparison of oncology and nononcology nurses. *ORL-Head and Neck Nursing, 23*(3), 22-24.

PRESENTATIONS

Panel discussion. *Personal Perspectives*. Nurses Caring for Nurses: An Exploration in Diversity. Clarian Health Partners Continuing Education, 2006.
Poster presentation. *Quality of Life Instrument in Neck Dissection: A Review*. The 28th Annual Congress and Nursing Symposium, The Society of Otorhinolaryngology and Neck-Neck Nurses, 2004.
Research paper presentation. *A Test of Foot and Hand Massage to Decrease Pain Among Post-Operative Patients.* The American Association of College of Nursing State of the Science Congress, 2002.
Poster presentation. *Effectiveness of the Hand and Foot Massage to Decrease Pain Among Postoperative Patients*. The American Nurse Association Convention, 2002.
Poster presentation. *Massage as an Innovation for Pain Management after Surgery*. The National Association of Clinical Nurse Specialist Conference, 2002.
Poster presentation. *The Effectiveness of the Hand and Foot Massage on Pain Among Postoperative Patients: a Research Poster*. The Midwest Nursing Research Society Conference, 2001.
Research proposal presentation. *The Effectiveness of Foot and Hand Massage Among Postoperative Patients.* The Midwest Nursing Research Society Conference, 2000.

AWARDS, FELLOWSHIPS, AND SCHOLARSHIPS

William and Doris Rodie Dissertation Scholarship Award, Indiana University School of Nursing, 2008
Clinical/Service/People Excellence Award, Surgical Patient Care Cluster, Methodist Hospital, Clarian Health Partner Inc., 2003, 2006
Surgical Cluster Champion Award, Surgical Cluster Leadership Team, Methodist Hospital, Clarian Health Partners Inc., 2005
Research Incentive Fund Fellowship, Indiana University School of Nursing, 2003
Jessie Cross Graduate Scholarship, Indiana University School of Nursing, 2002, 2003
Nominated for the Best Poster by the Midwest Nursing Research Society to the American Nurse Association Convention, 2002
Dayhoff/Lyon Outstanding Adult Health Clinical Nurse Specialist Student Award, Indiana University School of Nursing, 2001
Third Place in the Master's Student Research Poster Contest, Midwest Nursing Research Society Conference, 2001
Outstanding Student Research Poster Award, Pain Research Section of the Midwest Nursing Research Society, 2001
Travel Fellowships for Graduate Students, Indiana University School of Nursing, 2000, 2001, 2002
Helene Fuld Health Trust Fund Scholarship, Indiana University School of Nursing, 1999, 2000
Graduate Nursing Scholarship, Indiana University School of Nursing, 1999, 2000
Best Nurse Award, National Taiwan University Hospital, 1996

PROFESSIONAL VOLUNTEERING

Planning committee member for the Diversity Conference of Clarian Health Partners Continuing Education, 2005-2006
Research committee member of the Society of Otorhinolaryngology and Head-Neck Nurses, 2003-2004
Judge of the research poster award for the 27th Annual Congress and Nursing Symposium of the Society of Otorhinolaryngology and Head-Neck Nurses, 2003

PROFESSIONAL MEMBERSHIPS

Sigma Theta Tau International, Alpha Chapter
National Association of Clinical Nurse Specialists
Academy of Medical-Surgical Nurses