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# The Impact of Quiet Time on the Sleep Quality of Cardiothoracic Surgery Patients

Kristina L. Nelson

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THE IMPACT OF QUIET TIME ON THE SLEEP QUALITY  
OF CARDIOTHORACIC SURGERY PATIENTS

KRISTINA L. NELSON

**THE IMPACT OF QUIET TIME ON THE SLEEP QUALITY  
OF CARDIOTHORACIC SURGERY PATIENTS**

**A Thesis Presented for the  
Master of Science in Nursing Degree  
Southern Adventist University  
Collegedale, Tennessee**

**Kristina L. Nelson  
December 2006**

## ABSTRACT

The purpose of this study was to observe patients' quality of sleep on a cardiothoracic step-down unit before and after institution of an "undisturbed quiet time" policy from eleven o'clock in the evening until five in the morning. It was hypothesized that these patients have improved sleep quality after institution of the Quiet Time protocol. The comparative group, quasi-experimental study utilized the Verran and Snyder-Halpern Sleep Scale and Factors Influencing Sleep Questionnaire to measure sleep disturbance, effectiveness, and supplementation. Results demonstrated a decrease in sleep disturbance with initiation of the Quiet Time, but no significant change in sleep effectiveness and supplementation. Factors most disturbing to sleep included pain and discomfort, bed and ventilation system, procedures performed upon the patient, interruptions, and talking.

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## LIST OF ABBREVIATIONS

ABBREVIATION	FULL TERM
CABG	Coronary artery bypass graft
CCU	Critical care unit
EEG	Electroencephalogram
EPA	Environmental Protection Agency
FISQ	Factors Influencing Sleep Questionnaire
ICU	Intensive care unit
IL-2	Interleukin-2
IRB	Internal Review Board
NK	Natural killer cells
NREM sleep	Non-rapid eye movement sleep
NSM	Neuman Systems Model
OSA	Obstructive sleep apnea
PACU	Post-anesthesia care unit (recovery room)
PSQI	Pittsburg Sleep Quality Index
REM sleep	Rapid eye movement sleep
SaO <sub>2</sub>	Oxygen saturation
SICU	Surgical intensive care unit
SPSS	Statistical Package for the Social Sciences
VSH Sleep Scale	Verran and Snyder-Halpern Sleep Scale

## CHAPTER 1: INTRODUCTION

Sleep remains an integral part of human life and contributes to psychological, social, and physical wellbeing. This precious commodity is often little valued until it is lacking in quantity or quality. Although the exact functions of sleep have yet to be clearly understood, multiple observations of the detrimental effects of sleep deprivation emphasize its necessity.

### Background and Significance of Problem

Sleep deprivation is a growing national problem, with 30-40% of Americans reporting difficulty with sleep at some time during the last year. In addition, approximately 10% report chronic insomnia (National Heart, Lung, and Blood Institute, n.d.).

Hospitalized patients are at even greater risk for poor sleep than their community counterparts (Topf & Thompson, 2001). Multiple stressors confront hospitalized patients, including chronic diseases, recent surgeries, new environments, and uncertain diagnoses. Obtaining adequate sleep is yet another complicating factor that interacts with and compounds other sources of stress (Topf & Thompson).

Dissatisfaction with sleep is a frequent complaint from hospitalized individuals. Southwell and Wistow (1995) report that 22% of patients who slept well at home described their hospital sleep as inadequate. A more recent study found that 30% of patients were dissatisfied with their previous night's rest (Johansson, Oleni, & Fridlund, 2005). Even after surgical patients are transferred out of the intensive care unit (ICU), they average 3.3 full awakenings each night. Hence, they get only 5.8 hours of sleep per

night (Closs, 1992), despite the recommendation of 7 to 8 hours sleep for healthy adults (Wilson, 2005).

Patients identify multiple sources of disturbances including noise (Cmiel, Karr, Gasser, Oliphant, & Neveau, 2004; Sneiderman, 2005; Tranmer, Minard, Fox, & Rebelo, 2003), interventions by the healthcare team (Freedman, Kotzer, & Schwab, 1999), pain (Southwell & Wistow, 1995), anxiety (Honkus, 2003), and uncomfortable sleeping conditions (Southwell & Wistow, 1995; Tranmer et al., 2003). Patients' perceptions of poor sleep quality largely parallel decreased time in slow-wave and REM sleep (Edell-Gustafsson, Hetta, & Aren, 1999).

To counteract the high level of sleep disturbance, the administration of sedating medication is likewise increasing. Twenty-four percent of patients report receiving sleeping medication most or every night; 13% report occasional use (Southwell & Wistow, 1995). Frighetto et al. (2004) report that 60% of inpatients have orders for bedtime sedating medication.

#### *Significance to the Patient*

Hospitalized patients are in a vulnerable state that demands the restorative and refreshing effects of sleep; thus the impact of sleep deprivation is profound. Many studies have observed decreased cognitive function associated with decreased quality or quantity of sleep (Roehrs, Burduvali, Bonahoom, Drake, & Roth, 2003). The physiologic and psychological consequences of sleep deprivation are of even greater concern in the hospitalized patient. These include psychological strain (Hodgson, 1991), poor wound healing (Altemus, Rao, Dhabhar, Ding, & Granstein, 2001), increased pain (Onen, Alloui, Gross, Eschallier, & Dubray, 2001), a blunted immune system (Ozturk et al.,

1999), and increased sleepiness with subsequent poor performance of tasks the following day (Malik & Kaplan, 2005; Wesensten, Balkin, & Belenky, 1999).

### *Significance to Nursing*

Sleep disturbance in hospitalized patients is a multifactorial phenomenon (Topf & Thompson, 2001), and thus solutions must target the multiple interacting variables including pain, noise, medical interventions, anxiety, and uncomfortable sleeping conditions. Nurses are in a position to meet this basic human need by their emphasis on wholistic care and their ability to observe and modulate the multiple factors impacting poor quality of sleep. Unfortunately, nurses fail to recognize many sources of sleep disturbances that patients report as disruptive (Southwell & Wistow, 1995). This is understandable since nursing education and the medical culture places little emphasis on the importance of sleep preservation. Generally, more emphasis is placed on “good nursing care at the expense of sleep” (Southwell & Wistow, 1995, p. 1102).

### *Significance to the Healthcare Team*

Although nurses have the greatest contact with patients during the night, every member of the healthcare team may impact patients' ability to get adequate rest. Laboratory personnel may begin making rounds to obtain specimens well before a patients' normal waking time, since physicians may demand completed lab results for early rounds. Shift change typically occurs at 7 a.m., requiring daily weights and catheter bag emptying to occur quite early. Even maintenance personnel may impact sleep through unnecessary noise production of equipment and doors.

### *Significance to the Organization*

In today's competitive world of healthcare, patient satisfaction has become a key concept standing directly beside patient outcomes. In short, it is an important measure of quality of care (Press, 2002). Identification of areas where organizations may improve is a long-term business strategy (Press, 2002). Across America, only 70% of hospitalized patients are satisfied with their sleep (Johansson et al., 2005). By improving the quality of sleep for patients, hospitals may not only decrease negative outcomes from sleep deprivation, but may also improve patient satisfaction—and thus quality of care.

A number of hospitals have successfully implemented policies and procedures to decrease sleep disruption and boost patient satisfaction. These include St. Mary's Hospital—a Mayo clinic affiliate in Rochester, Minnesota (Cmiel et al., 2004); Johns Hopkins Hospital in Baltimore (Lower, Bonsack, & Guion, 2003); and New York's Montefiore Hospital (Robinson, Weitzei, & Henderson, 2005).

### **Purpose and Hypothesis**

The purpose of this study is to observe patients' quality of sleep on a cardiothoracic step-down unit before and after institution of an "undisturbed quiet time" policy from eleven o'clock in the evening until five in the morning. It is hypothesized that these patients will have improved sleep quality after institution of the Quiet Time protocol.

## Framework

The Neuman Systems Model (NSM) will provide a theoretical framework for the proposed study. This model describes a wholistic and wellness approach to nursing in which the individual (or group) is in constant interaction with the environment. The major components of the theory are based upon the four concepts of the nursing metaparadigm—person, environment, health, and nursing.

### *Person*

Neuman refers to the person as a *client* or *client group*. The client is a system, and as such has multiple components interacting in organized complexity (Neuman, 2002). The client structure includes the basic structure, lines of resistance, normal line of defense, and flexible line of defense. Each structural component is composed of five variables, which interact with each other and the environment.

### *Five variables.*

The five variables provide the wholistic framework for the NSM. The interlinking and interacting physiological, psychological, sociocultural, developmental, and spiritual components represent the characteristics that make the individual unique.

Physiological component “refers to bodily structure and internal function” whereas the psychological “refers to mental processes and interactive environmental effects, both internally and externally” (Neuman, 2002, p. 16). The sociocultural variable is a combination of the social influence and cultural conditions that impact and shape the individual client. The developmental aspect is the life experience of a given age. The spiritual component is open to the greatest variability and interpretation. Although Neuman presents the spiritual variable from a Christian paradigm, the definition is highly



flexible and governed by the client's perceptions. Therefore, this variable "refers to spiritual beliefs and influences" and represents the innate energy in variable levels of growth (Neuman, p. 17).

*Basic structure.*

The basic structure is the core survival area and includes the genetic component of the client system, strengths and weaknesses of body organs, response patterns, temperature regulation, and ego. Survival is dependent upon the protection of the basic structure by the surrounding defense lines.

*Lines of resistance.*

These lines represent active resistance to invasion through the normal lines of defense and are only activated in that event. Examples of these protective mechanisms include the activation of immune system mechanisms. "Effectiveness of the lines of resistance in reversing the reaction to stressors allows the system to reconstitute; ineffectiveness leads to energy depletion and death" (Neuman, 2002, p. 18).

*Normal line of defense.*

Directly surrounding the basic structure and lines of resistance, the normal line of defense creates a shell of protection against harmful stressors. This represents the state of wellness and acts as a measure of system deviation from wellness. This is a dynamic line, and may expand or contract as the client matures and changes in any of the five variables and in response to a stress reaction.

*Flexible line of defense.*

The flexible line of defense surrounds the normal line of defense and acts as a "protective buffer system for the client's normal or stable state" (Neuman, 2002, p. 17).

Stressors first impact the client at this level. These include any “tension-producing stimuli occurring within the boundaries of the client system,” whether deprivation, excess, change, or intolerance (Fresse, 2002, p. 302). The interaction and strength of the five variables determines the degree to which the client is able to utilize the flexible line of defense to protect the normal wellness state (as portrayed by the normal line of defense).

All the lines of resistance and defense have the ability to be enhanced, stabilized, or changed (Neuman, 2002). Since the five variables are contained in these lines, changes in any one or in their interactions may potentially change the protective shell.

### *Environment*

The environment is any factor influencing the client system. Neuman (2002) identifies three distinct environments—internal, external, and created. The internal, or intrapersonal environment includes all forces inside the system’s boundary. The external environment (including interpersonal and extrapersonal stressors) is all factors influencing the system from outside its boundaries. Finally, the created environment is an unconsciously formed buffer used in coping. This is “dynamic in nature and mobilizes all system variables to create an insulating effect that helps the client cope with the threat of environmental stressors by changing the self or the situation” (Fresse, 2002, p. 305).

### *Stressors.*

Originating in one or more of the environments, stressors produce tension and instability within the system. These are inherently neutral and produce positive or negative influences depending upon the client’s perception of the stressor. Likewise, stressors may be perceived as negative at one point, and positive at another time of life.

### *Interaction of environment and client system.*

Interaction of environment and client is a two-way association. Either the system or the environment changes in reaction to stressors.

### *Health*

Neuman views health on a wellness continuum. Health is “optimal system stability, that is, the best possible wellness state at any given time” (Neuman, 2002, p. 23). Stability is a balanced state that allows the system to retain individual characteristics. In contrast, illness represents unmet needs. Thus, Neuman outlines a model in which a healthy individual may still move toward greater wellness along a continuum by strengthening any of the five variables.

### *Nursing*

The goal of nursing is to keep the client system stable through recognition of stressors and guidance throughout reactions to the stressors (Neuman, 2002). Thus nurses aid individuals in attaining and maintaining the highest level of wellness possible in any given situation. Nursing interventions occur on three levels, known as primary, secondary, and tertiary prevention. Primary preventions deflect stressors before instability of the system occurs. Once a stressor has impacted the system, secondary preventions protect the basic structure by strengthening lines of resistance and defense. Tertiary prevention occurs during system “reconstitution” and “represents a dynamic state of adjustment to stressors and integration of all necessary factors towards optimal use of existing resources for client system stability” (Neuman, p. 28).

### *Application to Present Research*

The proposed study observes the impact that a nursing intervention makes upon the person, environment, and health. Namely, each of these three items will be observed while nursing changes the emphasis from secondary or tertiary interventions to primary interventions through the use of Quiet Time.

#### *Nursing.*

The hospital environment has traditionally emphasized secondary and tertiary interventions. Indeed, individuals admitted to a hospital have already experienced some form of system instability (illness). In the population under study, this includes cardiothoracic surgery. Within this population, a different threat to system stability will be observed, namely sleep deprivation.

The Quiet Time protocol proposed in this study represents a shift toward primary interventions. Instead of waiting until sleep disturbance or prolonged sleep latency occurs, nurses will employ preventive measures to improve clients' sleep quality and protect them from the stress occurring from sleep disruption.

#### *Person.*

The holistic conceptualization of the client is consistent with the view that sleep deprivation, as a stressor, impacts every area of life. Although each individual views stressors differently, the impact of the hospital environment on sleep may affect any of the five variables. Within this study, measurement of physiological impact will be observed utilizing length of stay and number of complications arising pre- and post-implementation of Quiet Time (as measured by transfer back to the ICU). Psychological

impact will be measured by observing the amount of sleep disturbance attributed to anxiety.

### *Environment.*

The emphasis of primary nursing intervention through Quiet Time will be observed for the impact on the environment—internal and external. The goal of Quiet Time is to decrease the stress experienced by those recovering from cardiothoracic surgery.

Since individuals view stressors differently, a subjective measure of environmental stress is valid. In the proposed study, this will be accomplished through the use of the Factors Influencing Sleep Questionnaire (FISQ). This questionnaire addresses both internal and external environmental factors that may influence sleep.

### *Health.*

System stability may be maximized through preventing areas of negative stress while the body is healing from surgery. Although tertiary management of a client following cardiothoracic surgery is important, prevention of additional negative stressors is equally important in the improvement of health along the wellness continuum. In this study, the use of the primary prevention of Quiet Time protocol is hypothesized to prevent additional negative stressors in an already comprised client system.

## Definitions

### *Sleep Quality*

#### *Conceptual.*

Sleep quality lies along a continuum of poor to excellent sleep. Routine sleep quality for any individual may lie anywhere along the continuum, with occasional

variations from their personal norm representing change in sleep quality; measurement of “good versus bad” is therefore a subjective report comparative to previous or perceived ideal sleep quality.

Sleep quality is a measure of the feeling that a person would have of being energetic, active and ready for a new day and includes numerous quantitative and qualitative aspects. This concept includes sleep latency, time of sleep, number of waking-up times per night, depth of sleep and resting. (Dogan, Ertekin, & Dogan, 2005, p. 108)

#### *Operational.*

During the proposed study, sleep quality will be measured utilizing the Verran and Snyder-Halpern (VSH) Sleep Scale (Verran & Snyder-Halpern, 1990). Poor sleep quality is defined as any score for disturbance that falls above that of healthy adults within their normal sleep environment in the United States, or any score for effectiveness that falls below that of healthy counterparts. Data will also be compared to insomniacs reported sleep quality.

Factors impacting a patient’s location on the continuum will be described utilizing the Factors Influencing Sleep Questionnaire (FISQ). Any factor that receives a score of one or more will be considered a significant disruption.

Sleep quality may be measured through objective outcomes including polysomnography and observance of daytime somnolence. Since subjective reports of sleep quality have been shown to parallel polysomnography, the sole use of subjective data collection in this study is valid (Edéll-Gustafsson et al., 1999).

## *Quiet Time Protocol*

### *Conceptual.*

The “undisturbed quiet time,” known as the Quiet Time protocol, will be a time of patient-directed care in which the patient guides interaction between hospital staff and him or herself. Outside stimuli will be minimized in order for Quiet Time to provide uninterrupted sleep from eleven o’clock in the evening until five in the morning. Reevaluation of care delivery and reorganization of daily routines will decrease the required nocturnal interventions.

### *Operational.*

The Quiet Time protocol is a multi-departmental policy that impacts nursing staff, unit secretaries, respiratory therapy, laboratory, physicians, and radiology personnel. Each section of this policy can be applied independently of the other, but for the purpose of this study, only patients meeting criteria for the complete Quiet Time protocol will be included.

Although inclusion in Quiet Time protocol is physician ordered, nursing staff will be responsible for evaluating eligibility for inclusion. Nurses will minimize disruption of sleep through decreasing stimuli known to disrupt sleep. Although nursing rounds will continue to occur at least every two hours, nurses will utilize penlights or flashlights to check on patients. Noise will be kept to a minimum through noise reduction activities including: (a) turning pagers to vibrate, (b) use of quiet voices at the nurses station, (c) closing of doors to patient rooms, (d) use of telephones at the nurses station instead of hallway phones, (e) anticipation of intravenous infusion pump alarms, (f) closure of medicine carts to avoid alarms, (g) prompt notification to maintenance regarding

squeaking doors or equipment wheels, and (h) identification of pharmacy schedules that may be modified to avoid disrupting sleep.

Other hospital personnel will be involved in sleep maintenance by modifying usual routines. Nursing assistants will wait until 5 a.m. to start daily weights, baths, and catheter emptying. Laboratory personnel will start routine morning phlebotomy no earlier than five o'clock. Respiratory therapy will provide 10 p.m. and 6 a.m. treatments, omitting the 2 a.m. treatment if the patient meets criteria for inclusion in Quiet Time. However, prompt response to as needed (PRN) calls will be provided. Pharmacy will continue to allow nurses to rescan medication administration records in order to switch medication schedules to meet the patient's routine schedule or to decrease sleep disruption.

Nurses will also provide patients with an information pamphlet outlining Quiet Time procedures (Appendix A). This will be given to each patient the first evening they qualify for Quiet Time with clear instructions that if medical stability changes, they may be removed from Quiet Time.

#### Assumptions

This study assumes that patients will accurately report their perceptions of sleep disturbances, past sleep habits, and use of sedative-hypnotic medications. In addition, evaluation of Quiet Time assumes that individuals who are alert and oriented and who can read and write English are also able to accurately complete abstract tasks such as a visual analog scale.



Implementation of Quiet Time makes the assumption that healthcare providers will change style of night care. Without an actual change, evaluation of Quiet Time is useless.

### Limitations

A number of limitations exist in this study. These include both theoretical and methodological limitations.

#### *Theoretical*

Although the Neuman Systems Model provides a wholistic view to wellness and a client-driven perception of stressors, a description of the phenomenon of sleep is lacking. Because of this, the unique impact of sleep deprivation on a client system is not explored.

#### *Methodological*

This study relies totally on subjective data collection. Although polysomnography has been found to correlate with subjective reports (Edéll-Gustafsson et al., 1999), lack of objective data may weaken study conclusions.

### Summary

Sleep deprivation affects many Americans, and hospitalized individuals experience even greater amounts of sleep disruption. Multiple factors contribute to the poor sleep quality. Use of the Quiet Time protocol is hypothesized to decrease sleep disturbance among cardiothoracic surgery patients.

## CHAPTER 2: REVIEW OF LITERATURE

Since the time of Florence Nightingale, sleep during illness has been a topic of nursing research. A review of literature from 1989 to 2006 reveals an ongoing concern with quality of sleep in hospitalized patients, etiologies and deleterious effects of poor sleep quality in hospitals, and possible solutions to the problem.

Key terms used for this literature search included sleep deprivation, sleep in the hospitalized patient, sleep after cardiac surgery, and etiology of sleep deprivation. Primary search sites were EBSCO database, PubMed, Erlanger Medical Library, Southern Adventist University library, and Loma Linda University library.

### *Theoretical Review of Literature*

Sleep has been defined as a “state of unconsciousness from which individuals can be aroused by sensory or other stimuli” (Topf & Thompson, 2001, p. 239). It is distinguishable from other forms of unconsciousness by its reversible and cyclic nature (Russo, 2005). It is a basic human drive from which one cannot willfully deprive oneself to the point of death. Unlike food and water deprivation, a person will drift into sleep before they die from sleep deprivation (Rosenthal, 1998).

### Stages of Sleep

This cyclic phenomenon progresses through four stages of non-rapid eye movement (NREM) to rapid eye movement (REM) sleep with each complete cycle lasting approximately 90 minutes. On average, four to six cycles occur each night. During the first part of the night, the vast majority of sleep is NREM, but toward morning REM sleep predominates.

### *NREM Sleep*

NREM sleep cycles through four stages. Stage one (light sleep) represents 5-10% of total sleep (Russo, 2005). This stage occurs at sleep initiation and also accounts for the transient wakeful periods throughout the night.

Stage 2 accounts for 40-50% of total sleep (Russo, 2005). Sleep spindles and K complexes characterize this stage on electroencephalogram (EEG).

Stages 3 and 4 (slow-wave or delta-wave sleep) comprise the deepest part of NREM sleep; arousal is difficult during this time. These stages decrease in duration throughout the night, becoming almost non-existent by morning. Growth hormone and parathyroid hormones have increased secretion during these stages (Izak, 2006). Stage 4 is considered the restorative part of sleep, as it “provides a rest period for the skeletal muscles and increased activity for the housekeeping systems of the body that maintain the internal environment” (Izak, p. 34). Protein synthesis and tissue healing occur during this stage (Honkus, 2003). Both stage 3 and 4 are so important to physiologic wellbeing that disruption of them is a predictor for poorer overall health (Edéll-Gustaffson et al., 2003).

### *REM Sleep*

REM sleep comprises approximately 25% of total sleep during which time an individual is easily arousable (Izak, 2006; Rosenthal, 1998). This stage is characterized by burst of rapid eye movement, generalized muscle atonia, and EEG desynchronization.

Although dreams may occur during any stage of sleep, they predominate during REM sleep. These are thought to contribute to emotional wellbeing (Honkus, 2003). The anabolism of stage 4 is continued into REM sleep. The most important role of REM sleep

is its contribution to cognitive performance; indeed, the absolute amount of REM sleep during the night correlates with intellectual functioning (Izak, 2006).

### *Neurochemical Control of Sleep Stages*

Multiple neuronal controls are evidently involved in sleep, although they have yet to be completely elucidated. Serotonin and norepinephrine suppress REM sleep in opposition to acetylcholine promoting REM (Izak, 2006).

### *Developmental Impact on Sleep Stages*

Developmental stages significantly affect sleep. The deep stages of NREM sleep decrease with age, and the elder may have virtually no stage 4 (Izak, 2006). REM sleep predominates in the young infant, but decreases into young adulthood. The elder keeps approximately the same percentage of REM sleep, but total REM decreases as total sleep declines.

## Role of Sleep

Although the function of sleep remains poorly understood, even Shakespeare recognized its importance when he wrote “sleep . . . chief nourisher in life's feast” (Shakespeare, *MacBeth*, 2.2.46-51). During more modern times, various hypotheses have been proposed regarding sleep's roles in health and healing; despite ongoing research, these remain largely speculative. Observing the outcomes of sleep deprivation is a clearer way to demonstrate the necessity of sleep.

### *The Sleep Experience of Hospitalized Patients*

A review of current literature regarding sleep among hospitalized patients reveals a struggle with sleep deprivation. The sleep experience varies among different populations. Although sleep in various hospitalized populations will be discussed, an

emphasis will be placed on the sleep of cardiothoracic surgery patients. In addition, the etiology and effects of sleep deprivation will be discussed.

### Sleep Among Various Hospitalized Populations

#### *Nurses' and Patients' Perception of Sleep*

Southwell and Wistow (1995) conducted a study in three large metropolitan hospitals, utilizing 454 patients and 129 nurses. They explored both patients' beliefs about their quality of sleep and nurses' perceptions of the same night of sleep.

Insufficient sleep was reported by half of the patients. Consistent with other studies, increased age was negatively correlated with sleep (Frighetto et al., 2004). Within the sample of patients over 75 years of age, poor sleep was identical to reported sleep quality at home. However, hospital sleep was significantly worse in the hospital for younger population (Southwell & Wistow, 1995).

In the three study hospitals, waking times were between 6 and 7 a.m., regardless of the time lights were dimmed for the night. The last round with medication was at 10 p.m. In some instances, ward activity continued until after midnight. Although sleep needs are highly personal, well-accepted requirement for adults are between 7 and 8 hours per night (Wilson, 2005), but patients in need of restorative and reparative properties of sleep may need more (Southwell & Wistow, 1995). In view of this study, these needs were rarely met.

The perceptions of nurses regarding quality and quantity of patients' sleep paralleled that of the patients. However, the identified etiologies of sleep disruption were dissimilar. Specific reasons for sleep disturbances found in this study will be discussed later.

### *Comparing Psychiatric, Internal Medicine, and Surgical Populations*

Dogan, Ertekin, and Dogan (2005) researched sleep quality in a large hospital in Turkey. Participants were inpatients of at least one week duration in the following subspecialty areas: psychiatry (n = 50); orthopaedic, general, cardiovascular, and urological surgery combined (n = 50); internal medicine, chest diseases, infectious diseases, physical therapy, and rehabilitation combined (n = 50). A control group of 50 healthy individuals was employed.

Demographic data were reviewed, and the control group was found to be comparable in age, gender, marital status, educational level, and profession. While reviewing the general information, Dogan et al. (2005) found that 22.7% of the participants had subjective, pre-hospitalization sleep problems.

The researchers utilized the validated Pittsburg Sleep Quality Index (PSQI). This self-administered questionnaire was used to compare pre-illness sleep to sleep during the last week of hospitalization.

This demonstrated a significantly decreased quality of sleep in hospitalized patients compared to the control group ( $p < 0.05$ ). Psychiatric patients had significantly worse quality of sleep compared to their internal medicine counterparts. No significant difference existed in quality of sleep in pre- and post-surgical patients. The researchers hypothesized that the pre-surgical fear and worry balance with the post-surgical pain to create equally disruptive sleep patterns.

Statistically significant difference was observed for gender (greater female perception of poor sleep quality). This parallels other literature (National Heart, Lung, and Blood Institute, n.d). No significant difference was found for educational level or

marital status. The variable length of stay was likewise not significant for difference in quality of sleep.

The exact methodology behind this study was nebulous. Specifically, the utilization of the PSQI was unclear regarding sleep in the last week and pre-illness sleep. If patients were required to complete the same questionnaire twice—once for subjective pre-illness and again for current sleep quality—a limitation arises as to the quality of subjective data gathered simultaneously, but representing two different time periods.

Another limitation to the study is that of generalizability. This study occurred in a culture much different from North America; demographic differences are likewise probable compared to the proposed study. Socioeconomic difference may create different views of sleep quality, although results from this study failed to reach statistically significant levels for sleep differences by educational levels.

This study does contribute to the literature and suggests the need for more research. The authors suggest that further research should observe factors that disrupt sleep (specifically temperature, light, noise, and medication dispensing) for their impact on sleep quality. In response, nursing interventions targeting these observations need applied and evaluated for effectiveness.

### *Sleep After Coronary Artery Bypass Graft Surgery*

#### *Edéll-Gustafsson et al. study.*

Moving to a more specific population, Edéll-Gustafsson, Hetta, and Aren (1999) studied sleep in patients undergoing coronary artery bypass grafting (CABG). Utilizing polysomnography, they sought to objectively measure sleep before and after surgery. In

addition, they measured quality of life utilizing the Nottingham Health Profile. The objective and subjective reports of sleep were then observed for correlation.

Participants ( $n = 38$ ) were all male, ages 45-68. Polysomnographic recordings were gathered for 24 hours pre-operatively; a 48-hour recording began three hours post-operatively, and a 24-hour recording was collected at one month after surgery. Quality of life questionnaires were given pre-operatively, at the 1-month follow-up, and again at 6 months.

Results demonstrated that night-time sleep was reduced by 50% immediately following surgery, but daytime sleeping increased so that total sleep time was not significantly altered. By one month, the sleep distribution had returned to pre-operative levels. The quality of life questionnaire demonstrated an improvement by the 1-month mark in all areas except for sleep, which became significantly worse. Subjective sleep disruption was negatively correlated with nocturnal sleep stages 3 and 4 on polysomnography (total minutes and percentage) ( $r = -0.45, p = 0.01$ ).

All but two of the patients in this study were transferred to an intermediate care unit by the day after surgery. This, the authors believe, improved the ability for patients to lessen the sleep deprivation from the previous night better than previous studies where the patients were kept in the ICU for longer periods.

Edéll-Gustafsson et al. (1999) propose that nursing should structure the day to allow for daytime napping to counteract nocturnal sleep loss. Unfortunately, daytime napping is fragmented due to the daily routines of an intermediate care unit. Thus, it may be proposed that improved ability to sleep throughout the night may decrease the need for napping and improve overall sleep quality.



This study contributes to the literature by describing sleep patterns throughout the 48-hours postoperative period. The resulting discovery of stage 3 and 4 sleep suppression has implications to postoperative recovery, since these stages are important to the body's physiologic recovery.

A limitation to this study is the inability to accurately measure preoperative sleep. This study demonstrated an already poor sleep efficacy preoperatively (79.3%). "Sleep was more fragmented prior to surgery compared to a normal population, with increase in stage 1 and 2 sleep, REM sleep latency and suppressed REM sleep" (Edéll-Gustafsson et al., 1999, p. 1218). Most patients were already hospitalized, and all patients anticipated major surgery within 24 hours. Since hospitalization (Topf & Thompson, 2001) and psychological stress (Hodgson, 1991) are known to negatively impact sleep, these measurements may not accurately reflect this population's baseline and thus minimize the difference in preoperative and follow-up sleep evaluations.

A further limitation is a lack of generalizability of this study. The research was conducted in Sweden, and thus the hospital experience may have been quite different than that experienced by participants in the current study.

*Simpson and Lee study.*

Simpson and Lee (1996) observed the sleep quality of 102 cardiac surgery patients (CABG or valve replacement). During an interview conducted a few days before patients' discharge, questionnaires were given to evaluate sleep before hospitalization and the night before the study.

Instruments included the VSH Sleep Scale and the History of Sleep Prior to Admission Questionnaire, a six-question Likert-scale questionnaire reflecting sleep for a

month prior to hospitalization. Use of different types of scales was the methodological attempt to avoid similar responses for questionnaires administered at the same time.

The mean age of participants was 62 years. Seventy-seven percent were male, and 23% were female. Demographic data included ethnicity, level of education, and occupation. ICU length of stay, type of surgery, time on cardiopulmonary bypass pump, aortic cross-clamp time, and the relation of interview to time of transfer from ICU were also recorded.

Length of sleep was significantly less after cardiac surgery ( $M = 5.1$  hours  $\pm 2.6$ ) compared to pre-hospitalization ( $M = 7.0$  hours  $\pm 1.4$ ). However, no difference in depth of sleep, refreshment on awakening, sufficiency of sleep, or overall quality of sleep was seen between hospitalization and pre-hospitalization.

### *Summary*

The sleep experience of hospitalized patients varies among different populations. Overall, sleep quality is poor. Several studies have specifically observed sleep among cardiothoracic surgery patients. As with other populations, cardiothoracic surgery patients suffer from sleep disturbance.

### Etiologies of Sleep Disturbance

Several factors may contribute to poor sleep in the hospital, including environmental, psychological, and physical stressors. In addition, these factors may interact to create an increased risk for poor sleep quality.

### *Environmental.*

Environmental factors include auditory, visual, and tactile stimuli that disrupt sleep. These may come from a variety of locations, some within the control of the patient or nurse, and some innate to the hospital environment.

#### *Noise.*

Multiple researchers have identified noise as a significant factor in poor sleep quality in critical care units (CCU) (Honkus, 2003; Topf, Bookman, & Arand, 1996). Fewer studies explore the effect of noise in intermediate care units. The research that has been done confirms that noise is an ongoing problem in hospitalized patients complaining of sleep disruption, even outside the ICU. Surgical patients name noise as a factor disturbing sleep, second only to pain/discomfort (Closs, 1992). This parallels findings among cardiac surgery patients (Simpson, Lee, & Cameron, 1996).

Sound greater than 35 decibels has the potential for awaking a person, depending upon their location in the sleep cycle (Aitken, 1982). For this reason, the World Health Organization encourages noise levels to remain below 30 decibels in bedrooms and less than 35 decibels in indoor dwellings (World Health Organization, 2001). In more specific guidelines for hospitals, the Environmental Protection Agency (EPA) recommends daytime levels to remain below 45 decibels and nighttime less than 35 decibels (Kahn et al., 1998).

In marked contrast to these guidelines, a study on a thoracic surgery intermediate care unit found noise levels to be significantly greater than the EPA standards (Cmiel et al., 2004). The average sound level inside an empty patient room was 45 decibels during the night, and in an occupied room it was 53 decibels. The highest levels of sound

reached 113 decibels; both sudden noise bursts and plateaus of higher noise levels occurred around shift changes.

Other studies report slightly lower sound levels, but they still present levels well above EPA recommendation. Sneiderman (2005) measured hospital noise levels up to 72 decibels and noted that this represented a rise from the average 57 decibels in 1960. Likewise, nighttime noise increased from 42 to 60 decibels during the same time period.

This closely parallels findings by Christensen (2005). Although the average noise level was within a normal background noise level (42 decibels), spikes reached 70 decibels. The quietest period was in the early morning with a measurement of 36 decibels. Christensen found that staff created the greatest amount of noise, with the nurses' station contributing the most.

The significance of these findings lies in the potential for noise to decrease REM sleep. Kawada and Suzuki (1999) found that constant noise of 45 decibels significantly decreased REM sleep, increased stage 2, and decreased subjective measures of sleep quality. In contrast, transient noise could reach 60 decibels before disrupting REM sleep. However, transient noise levels of 45-50 decibels could move a patient from stage 3 to lower levels of sleep.

### *Light.*

Bright lights may represent a source of sleep disturbance for some patients. Simpson et al. (1996) report moderate disturbance of sleep from lights among cardiac surgery patients.

### *Tactile stimuli.*

To some extent, patient care activities parallel noise, but tactile stimuli may also contribute to poor sleep. Dressing changes, vital signs, respiratory treatments, and medication administration may all contribute to sleep fragmentation. Simpson et al. (1996) report moderate disturbance from procedures performed on postoperative cardiac surgery patients. Responses had a mean score of 2.0 on the FISQ scale (Likert-scale question with range of answers from 0 to 4).

### *Temperature.*

Ventilation systems and temperature regulation is moderately disturbing to sleep of cardiac surgery patients (Simpson et al., 1996). Due to the loss of thermoregulation, hot or cold environments may disrupt REM sleep (Honkus, 2003).

### *Psychological*

Depression and anxiety have been known etiologies in sleep disturbances for many years. Sleep disruption may either precede or succeed psychological stress, including depression (Nordin, Knutsson, Sundborn, & Stegmayr, 2005). Hospitalized patients are also at risk for psychologically induced sleep disturbance due to a perceived loss of control, unknown diagnoses and outcomes, and lack of social support. Specifically, anxiety may increase sleep latency (Honkus, 2003).

Interestingly, social interaction also plays a part in subjective sleep quality. Nordin et al. (2005) found that lack of social support and social integration impacts perception of sleep, especially in women. More research is needed to ascertain whether these findings can be replicated in the hospital environment.

### *Physiological*

Physical factors impacting sleep are highly specific to the actual disease process or surgical intervention. On the cardiothoracic service, factors implicated in sleep disturbance include pain, medications administered, the disease processes themselves.

#### *Pain.*

Not surprisingly pain is linked with poor quality of sleep (Frighetto et al., 2004; Nordin et al., 2005). Surgical patients identify pain as the most common cause of sleep disturbance (Closs, 1992). Likewise, cardiothoracic surgery patients are at risk for high levels of pain; they rate pain and discomfort as the cause for the greatest amount of sleep disturbance in the ICU and step-down unit (Simpson et al., 1996).

#### *Medications.*

Multiple medications are known to disrupt sleep or reduce the slow-wave and REM sleep, including medications commonly given to the cardiothoracic population. These include benzodiazepines, certain antidepressants, corticosteroids, and diuretics.

#### *Disease processes.*

BaHammam (2006) is one of the few researchers who has attempted to eradicate the known disruptors of sleep in order to observe the effects of a disease process on sleep. Specifically, he observed the sleep quality of patients following an acute myocardial infarction. In order to minimize the sleep disrupting factors inherent to a CCU, he studied these patients in a sleep laboratory.

Participants were first-time acute myocardial infarction patients treated with thrombolytic therapy. Those who received narcotics or sedatives within the previous 48

hours, were post-cardiac arrest, had chronic obstructive pulmonary disease, history of stroke, sepsis, insomnia, or psychiatric disorders were excluded from the study.

Polysomnographic assessment occurred for one night within a few days admission to the coronary care unit and six months later in a subsequent overnight admission.

“Despite controlling for all these factors [daytime napping, light-dark exposures, environmental noise, pain, and care-providers interruptions], we found that sleep architecture was clearly worse in the immediate post-AMI period than at follow-up” (BaHammam, 2006, p. CR170).

Many patients undergoing cardiac surgery have experienced myocardial infarction. Therefore, the BaHammam study demonstrates another confounding variable that should be considered in the proposed study.

#### *Interaction of Factors*

Topf & Thompson (2001) delved further into the etiology of sleep deprivation in the hospitalized patient by looking for interactions between causes of sleep disturbance. They hypothesized that patients' perceptions of noise-induced stress interacts with other environmental sources of stress and with personal stressors in producing poor sleep. Specific variables measured included subjective noise, the hospital bed, light stress, subjective pain, and subjective anxiety.

They utilized a convenience sample of 97 postoperative cardiac surgery patients who had been transferred out of the CCU. Through use of multiple regression, the multivariate hypothesis was tested. All study variables showed significant negative correlation with sleep except for light stress ( $p < 0.01$ ). Variables interacted significantly,

with subjective noise stress, hospital bed stress, pain, and anxiety explaining 12% of variance in sleep. Bed stress and pain explained 5% of the remaining variance in sleep.

This study supports the hypothesis that sleep disturbance is a multifactoral phenomenon, and thus solutions must target the multiple interacting variables. Study limitations include the use of totally subjective data. Physiologic measurements, such as polysomnography, may produce different results, although polysomnography has been found to parallel many subjective sleep quality scales (Edéll-Gustafsson et al., 1999). In addition, the sample's lack of ethnic diversity limits the generalizability of the test due to differences in perception of sleep disruption between cultures. For many populations, the demographics may be representative (90 White participants, 4 African Americans, 1 Native American, and 1 Filipino).

#### Effects of Sleep Deprivation

Sleep deprivation occurs as a result of quantitative or qualitative deficiency of sleep. Sleep deprivation has multiple negative influences on the recovery of hospitalized patients. These include psychological, physiological, and cognitive effects.

#### *Psychological Effects*

Hospitals may produce anxiety for multiple reasons. Sleep deprivation is yet another. Although anxiety or depression may lead to sleep deprivation (Hodgson, 1991), poor sleep itself can augment or produce negative psychological effects.

A recent study by Edéll-Gustafsson, Gustavsson, and Uhlin (2003) found that sleep fragmentation and decreased efficacy among patients with coronary artery disease leads to increased emotional responses and predicted poorer quality of life. Specifically,



stage 1 sleep and awakenings greater than three minutes were positively correlated with anxiety.

### *Physiologic Effects*

Multiple physiological effects result from decreased sleep quality or quantity. Those that have undergone the most study include decreased pain tolerance, poor tissue healing, and immune function.

#### *Pain tolerance.*

Pain is expected following any surgery, including cardiothoracic surgeries. Pain management is a primary goal of postoperative care since pain may lead to decreased mobility, respiratory compromise, and disrupted sleep (Closs, 1992). Although the physiology regarding pain tolerance and sleep deprivation remains largely unknown, poor quality of sleep adversely affects pain and pain tolerance.

Onen et al. (2001) studied nine healthy individuals in an attempt to pinpoint certain stages of sleep that most contributed to pain tolerance. Total sleep deprivation created the largest decrease in pain tolerance, but deprivation of specific sleep stages failed to reach statistical significance. Interestingly, sleep restoration increased pain tolerance tremendously; slow-wave sleep restoration showed a 15.8% increase in mechanical pain tolerance. This is significantly higher than the increased pain threshold observed following analgesic medications such as aspirin, acetaminophen, or ibuprofen.

This study presents several limitations. This study included only male participants, although gender is known to influence pain perception as well as sleep (Nordin et al., 2005; National Heart, Lung, and Blood Institute, n.d.). Furthermore, the participation of only healthy, young adults (ages 26–43 years) may limit generalizability

to hospitalized postoperative patients. The small sample size may contribute to the lack of significant differences in selective sleep deprivation. Further research is needed utilizing a larger sample, female subjects, and older individuals in order to fully understand the relationship between pain and sleep.

#### *Tissue healing.*

Physical as well as psychological stress is known to impact skin physiology and tissue healing. The specific contribution of sleep deprivation on skin physiology is the matter of some study. Altemus et al. (2001) compared the effects of psychological stress, sleep deprivation, and exercise on skin healing. They demonstrated that “one night of sleep deprivation can inhibit recovery skin barrier function in humans” (p. 313).

However, this study necessitates cautious application in hospitalized patients due to the study design. Often, hospitalized patients experience partial sleep deprivation for several nights instead of total sleep deprivation. Therefore, further research is needed to determine the amount of sleep deprivation needed before tissue healing is adversely affected.

Much of the ongoing research in this area is performed on animals. In a study done on rats, results indicated that sleep deprivation leads to poor tissue healing (Gumustekin et al., 2004). More research is needed on human subjects in order to fully understand the implications for postoperative patients.

#### *Immune function.*

For many years, the idea that sleep deprivation leads to poor immune function has been part of conventional understanding. In the last several decades, researchers have

started exploring the relationship and have found that sleep and immune modulators have a complex relationship, each impacting the other.

Although many studies focus on the effects of total sleep deprivation, partial sleep deprivation also has “significant detrimental effects on immune functioning” (Rogers et al., 2001, para. 1). When studying the relationship between immune function and partial sleep deprivation, Irwin et al. (1996) observed immune function in terms of natural killer (NK) cell number and cytotoxicity, lymphokine-activated killer cell number and activity, and stimulated interleukin-2 (IL-2). They demonstrated that “even modest disturbance of sleep produces a reduction of natural immune responses and T cell cytokine production” (p. 643). After a recovery night of sleep, NK cell numbers returned to baseline, but IL-2 production remained suppressed. This parallels findings by Ozturk et al. (1999).

Although the above studies utilized healthy subject, DeKeyser (2003) demonstrated that sleep deprivation among ICU patients is likewise associated with decreased immune functioning, even when allowing for confounding factors. Data from intermediate care units are lacking.

### *Cognitive Function*

Sleep deprivation has been linked with decreased cognitive function. Recent studies have compared cognitive effects of sleep deprivation to alcohol intoxication. Lamond and Dawson (1999) found “that moderate levels of fatigue produce performance impairment equivalent to or greater than those observed at levels of alcohol intoxication deemed unacceptable when driving, working and/or operating dangerous equipment” (p. 255). The greatest amount of cognitive impairment occurred between 17-27 hours of sleep deprivation. At the 20-hour mark, neurobehavioral measurements were equal to that

of 0.10% alcohol intoxication. This study included young individuals (ages 19-26 years); therefore age differences remain speculative.

A study by Nilsson et al. (2005) specifically observed the effects of sleep deprivation on the prefrontal cortex and executive functioning. They observed sleep-deprived individuals' responses to novel situations, multi-tasking, planning, and organization. Overall, they found that "one night of sleep loss impairs integrative executive functioning" (Nilsson et al., p. 5).

Wesensten et al. (1999) found that sleep fragmentation, even with consistent total sleep time, profoundly impaired alertness and performance the following day. Thus, sleep continuity may be as important as total sleep time. While cognitive function is important to hospitalized individuals, the impact that the decreased alertness has on rehabilitation is the most worrisome.

### *Summary*

Sleep is a complex phenomenon that is still poorly understood. Despite ongoing research in various hospitalized populations, the etiology and effects of sleep disruption are poorly understood. A review of current literature reveals several areas needing further research.

At this time, minimal sleep research has focused on thoracic surgery patients. Although this population is often linked with cardiac surgery, they have a unique set of stressors including possible respiratory compromise and difficult pain management. Research is needed to clarify the effects and etiology of sleep deprivation in these patients.

Although ICU populations have been observed for sleep quality, research on intermediate care units is needed to further elucidate the postoperative sleep experience. This research should utilize both subjective and objective means in order to further validate the use of subjective reports of sleep.

Finally, more studies observing the specific effects of sleep deprivation on hospitalized patients are needed. These should include observation of performance in rehabilitation, pain management, subjective anxiety, and postoperative infection rates. Although human subjects bring a multitude of difficulties, studies that mimic the hospital environment are imperative in understanding the need for sleep enhancing interventions.

## CHAPTER 3: METHODS AND PROCEDURES

As the previous paragraphs portray, multiple fields of research are open to sleep quality in the hospitalized patient. In order to investigate one area lacking research, the following study examined cardiothoracic surgery patients' sleep quality during hospitalization before and after institution of a Quiet Time protocol.

### Research Design

The proposed study utilized a comparative group quasi-experimental design. This study design allowed for non-probability sampling techniques. The research setting offered a small number of patients from which to gain a sample during the study period. Due to this difficulty, a more lenient study design was chosen at this time; future studies may utilize more stringent study designs.

### Population and Sample

The population for this study was cardiothoracic patients in an intermediate care unit. The sample was drawn from patients on the cardiothoracic surgery step-down unit. Every eligible patient was offered the opportunity to participate in the study until an adequate sample was obtained during each of the three study periods. A sample of 36 participants was obtained for a power of 0.80, medium effect size,  $p < 0.05$  in a one-tailed test. This is consistent with the literature (Tranmer et al., 2003).

Inclusion criteria were as follows: (a) cardiothoracic surgery during this admission, (b) greater than 24 hours post-PACU or upon transfer from another unit, (c) systolic blood pressure  $>100$  mm Hg for three consecutive readings, (d) oxygen per nasal cannula at 4 liters or less, (e)  $SaO_2 > 92\%$  during last 24 hours, (f) normal sinus rhythm, chronic atrial fibrillation or atrial flutter on telemetry, (g) ability to read and write

English, (h) alert and oriented to person, place, and time as evidenced by nursing assessment.

Exclusion criteria included: (a) wheezing at 10 p.m. respiratory therapy assessment, (b) use of > 4 liter oxygen, (c) systolic blood pressure > 190 mm Hg any time during last 24 hours, and (d) medically diagnosed sleep disorder such as obstructive sleep apnea and chronic insomnia.

Weaknesses of this sampling method include the non-random nature. By offering the opportunity to every eligible patient during the study period, selection bias was kept to a minimum. However, the participants were still self-selected. In addition, the sample was drawn from one nursing unit, thus limiting the generalizability of results.

#### Setting

The setting for this study was a cardiothoracic intermediate care unit in a 365-bed, acute-care facility in Chattanooga, TN. The 32-bed unit (with private rooms exclusively) accepts a multitude of diagnoses, but primarily admits cardiothoracic surgery patients. Many thoracic patients are admitted from the PACU after surgery. Patients requiring increased nursing supervision and all CABGs and valve replacements are first admitted to the surgical intensive care unit (SICU) and then transferred to the intermediate care unit 24-72 hours later, depending upon stability.

Weaknesses of this setting include the limitation of data obtained from only one unit, the inability to institute the Quiet Time protocol for the entire unit, and internal obstacles with compliance from staff.

## Instrumentation

### *Verran and Snyder-Halpern Sleep Scale*

The Verran and Snyder-Halpern Sleep Scale (VSH Sleep Scale) is a visual analog scale that provides a subjective measure of sleep quality in hospitalized patients through analysis of sleep disturbance, effectiveness, and supplementation (Appendix B) (Verran & Snyder-Halpern, 1990). The 15-item scale has been widely used in the literature to evaluate sleep in medical and surgical patients (Frighetto et al., 2004; Richardson, 2003; Smith, Kemp, Hemphill, & Vojir, 2002; Tranmer et al., 2003) including one study of cardiac surgery patients (Topf & Thompson, 2001).

Validity of the VSH Sleep Scale is evidenced by observing convergence ( $p < 0.001$ ) with St. Mary's Hospital Sleep Questionnaire and Baekeland and Hoy Sleep Log. Validity was also examined utilizing factor analysis (Snyder-Halpern & Verran, 1987).

Reliability was demonstrated among cardiac surgery patients with a *theta* reliability coefficient of 0.82 (Topf & Thompson, 2001). The scale developers likewise reported a *theta* coefficient of 0.82 (Snyder-Halpern & Verran, 1987).

The VSH Sleep Scale includes a demographic form (Appendix B). This form was altered very slightly to reflect the population under study. Specifically, #14 originally read "Service: Medical vs. Surgical" (Verran & Snyder-Halpern, 1990, p. 11). This was altered to read "Surgical service: CABG, Valve, Valve and CABG, Thoracotomy, Thoracoscopy, or Other." In no way did this change the validity or reliability of the instrument, but rather made demographic description more specific.



### *Factors Influencing Sleep Questionnaire*

The Factors Influencing Sleep Questionnaire (FISQ) was used to measure patients' perception of etiology of sleep disturbances through the use of 5-point Likert scale questions (Appendix B). This tool has been validated in the literature, including use with cardiac surgery patients (Tranmer et al., 2003).

### Plan for Data Collection

The proposed study occurred during a four-month period. Pre-intervention data collection occurred after approval from the hospital's IRB. Participants were selected by the same criteria used for Quiet Time protocol. The researcher distributed the VSH Sleep Scale and FISQ to all eligible patients on the day of their discharge. The primary nurse or researcher gathered completed forms and immediately attached them to demographic data gathered from the medical record. These forms were kept in a locked office until completion of the study.

Once adequate pre-intervention participants were obtained, the Quiet Time protocol was initiated. Education occurred for staff at the cardiothoracic intermediate care unit. During these breakfast meetings, night staff was instructed on the Quiet Time protocol including a presentation of the problem (sleep deprivation among hospitalized patients), common etiologies of sleep disturbance, a plan for decreased sleep disturbance for all patients, and eligibility criteria for full Quiet Time protocol. Unit secretaries were given instruction on ordering laboratory testing on those qualifying for Quiet Time. Laboratory and respiratory personnel were notified, unit secretaries reminded of parameters, and nursing staff updated. Reminders were posted in staff lounge areas including contact information of the researcher.

When a nurse, physician, or nurse practitioner for thoracic services identified an eligible patient, a sign was hung on the patient's door notifying staff of Quiet Time. If at any time the patient failed to meet criteria for any portion of the Quiet Time, the sign was removed. In order to communicate status to the unit secretaries, a list of all participating patients was kept at the nursing station. This was updated daily when the computer system automatically printed a list patients on Quiet Time.

Once the Quiet Time protocol was in place for six weeks, another set of data was collected in the same manner as the pre-intervention data. All completed forms were labeled as Section B in order to be kept separate from the pre-intervention data. At this time, further educational sessions will occur as needed to answer questions regarding the policy.

#### Ethical Considerations

Consent was gained by patient agreement to complete a survey. No names or room numbers were attached to the patient questionnaires. Results were connected to the demographic survey immediately after obtaining from the patient, so as to negate the need for identifying information being present. These forms stayed in the possession of the researcher until the completion of the study. No list of patient names was kept. At the conclusion of the study period, all information was shredded; only aggregate material was retained.

#### Plan for Data Analysis

Demographic data were analyzed utilizing descriptive statistics. The age, gender, type of surgery, pre-hospitalization use of sedative-hypnotics, hospitalization use of sedative-hypnotics, current length of stay were coded into SPSS.

Data from the VSH Sleep Scale will be analyzed using  $t$  test to determine if there is a statistical difference between patients' perceived sleep quality before and after institution of a Quiet Time policy. Pearson  $r$  will be used to find significant correlation between demographic data and sleep quality. Although data from Likert scales are technically ordinal level data, aggregate results are often treated as interval level (Simpson et al., 1996). Therefore, data from the FISQ will be analyzed utilizing means for each of the 35 items. Comparison between pre- and post-institution of Quiet Time will be accomplished using independent sample  $t$  test. Significant factors will be correlated with the sleep quality results from the VSH.

## CHAPTER 4: DATA ANALYSIS

The purpose of this four-month study was to observe patients' quality of sleep on a cardiothoracic step-down unit before and after institution of an "undisturbed quiet time" policy. The demographic data, VSH Sleep Scale results, and FISQ results were analyzed utilizing SPSS program. Results are presented in terms of the hypothesis that patients have improved sleep quality after institution of the Quiet Time protocol.

### Participation

Forty-five individuals participated in the study with almost equal pre-Quiet Time participants ( $n = 23$ ) and Quiet Time ( $n = 22$ ). Ten additional surveys were distributed for the study, but within the pre-Quiet Time group, three declined to complete the questionnaires and one admitted to having obstructive sleep apnea (OSA). Three other questionnaires were discarded due to incomplete data or failure to meet inclusion criteria. After Quiet Time was initiated, one refused to complete the survey and two were found to have OSA upon further questioning.

### Demographic Data

Demographic data were analyzed using descriptive statistics. In addition, variables were observed for significant correlations among themselves and with the VSH Sleep Scale and FISQ.

### *Variables Observed*

The demographic data described in this study included age, gender, and marital status. In addition, several other variables were recorded including normal bedtime and arising time, hours in sleep, presence of pre-hospitalization sleep disruption due to illness, length of stay, length of stay after surgery, previous use of sleeping medication,

use of sleeping medication in the hospital, and use of other sedating medication in the hospital.

#### *Age.*

The mean age of participants was 65.7 years with a range of 31 to 86 years. A significant difference of age existed between pre-Quiet Time and Quiet Time participants ( $p = 0.02$ ). The mean age of pre-Quiet Time participants was 69.35 years, whereas the Quiet Time participants had an average age of 61.95 years. Data were slightly negatively skewed (pre-Quiet Time -0.311 vs. Quiet Time of -0.859).

#### *Gender.*

Of the total participants, 29% were female and 71% were male. Among pre-Quiet Time participants, 39% were female ( $n = 9$ ) and 61% were male ( $n = 14$ ). Those on Quiet Time were 18% female ( $n = 4$ ) and 82% male ( $n = 18$ ).

#### *Marital status.*

The majority of participants were married (80%), and only nine participants were single, widowed, or divorced (20%). Seventy-four percent of pre-Quiet Time participants were married and 26% were single, divorced, or widowed. Of those participating in Quiet Time, 86% were married ( $n = 19$ ) and 14% were single, divorced, or widowed ( $n = 3$ ).

#### *Sleep and bedtime routines.*

The average bedtime was 10 p.m. with no significant difference between the two groups. The mean arising time of 6 a.m. was likewise not significantly different between groups. Before hospitalization, participants slept an average 7.7 hours; pre-Quiet Time individuals slept 8.02 hours, and those on Quiet Time slept 7.34 hours ( $p = 0.053$ ). Of the pre-Quiet Time group, 22% ( $n = 5$ ) reported decreased sleep quality or quantity before

hospitalization due to their disease process (i.e. angina, orthopnea, or pain). For those on Quiet Time, 9% had sleep difficulties due to their disease prior to hospitalization ( $n = 2$ ).

Participants were also questioned regarding bedtime routines. In the pre-Quiet-Time group, 47% stated that they had a bedtime routine ( $n = 11$ ) and 41% of Quiet Time participants had a routine ( $n = 9$ ). Routines included watching television, eating a snack, reading, and working on the computer.

#### *Length of stay.*

A significant difference in total length of stay was seen between the two groups ( $p = 0.04$ ). Pre-Quiet Time individuals were in the hospital an average 8.74 days, whereas patients on Quiet Time were in the hospital only 6.50 days. Length of stay after surgery was 6.95 days for pre-Quiet Time and 5.82 days for patients on Quiet Time. This failed to reach significant difference, however ( $p = 0.21$ ).

#### *Diagnoses and type of surgery.*

By far the most prevalent diagnosis in both groups was coronary artery disease with 74% of pre-Quiet Time participants ( $n = 15$ ) and 59% of Quiet Time participants ( $n = 13$ ). Lung masses represented 4.3% of pre-Quiet Time diagnoses and 13.6% of Quiet Time. Aortic stenosis was the admitting diagnosis for 8.7% of pre-Time ( $n = 2$ ) and 9.1% of Quiet Time ( $n = 2$ ). One case of aortic aneurysm was found in both pre-Quiet Time and Quiet Time groups. One case of pleural effusion and one case of prosthetic aortic valve endocarditis were included in the pre-Quiet Time group.

Paralleling the diagnoses, the type of surgery for each group spanned a range of cardiothoracic interventions. Within the broad categories of cardiac versus thoracic surgery, 39 cases were cardiac (85%) and 7 were thoracic (15%).

Of the pre-Quiet Time participants, 22 cases were cardiac (92%) and 2 were thoracic (8%). Fifteen had a CABG (67%) and one participant had a CABG and valve replacement. Three individuals had valve replacement only. Two had thoracoscopy, and one had a CABG and carotid endarterectomy, and one had an aortic arch aneurysm repair.

Within in the Quiet Time group, 17 had cardiac surgery (77%) and 5 had thoracic surgery (23%). Eleven participants had a CABG (50%) and one had a CABG and valve replacement. Two individuals had valve replacements. Three had a thoracotomy (14%) and two had a thoracoscopy (9%). One individual had a CABG and lobectomy (through the mediastinal approach), one had a pericardial window, and one had an aortic aneurysm repair.

For those undergoing CABG, the mean number of grafts was  $3.45 \pm 1.05$ . For pre-Quiet Time, the average was  $3.75 \pm 1.24$  whereas Quiet Time was  $3.08 \pm 0.64$ . There was no significant difference between the two groups ( $t = 1.88, p > 0.05$ ).

#### *Use of medication.*

Of the pre-Quiet Time participants, 22% utilized sleeping medication at home, but only 9% of Quiet Time participants admitted to home use of sleep-enhancement medications. Forty-four percent of pre-Quiet Time participants had sleeping medication (such as zolpidem and temazepam) the night before the study, and 74% had other sedating medication (such as oxycodone, hydrocodone, or propoxyphene). Of Quiet Time participants, 23% had sleeping medication, and 86% had other sedating medication.

### *Correlation Between Demographic Data*

Various correlations were found between the demographic data. These were observed as a total group ( $N = 45$ ) and for pre-Quiet Time ( $n = 23$ ) and Quiet Time ( $n = 22$ ) respectively.

#### *Age.*

Age was significantly correlated with length of stay ( $r = 0.388, p < 0.01$ ), but not with length of stay after surgery. When separated, pre-Quiet Time group demonstrated significant correlation between age and length of stay ( $r = 0.514, p < 0.01$ ), but Quiet Time did not ( $r = 0.194$ ).

#### *Gender and marital status.*

Gender and marital status were not significantly correlated with sleep quality for any concept of the VSH Sleep Scale. Kendall's tau and Spearman's rho were utilized in data analysis.

#### *Sleep.*

Not surprisingly, arising time in the morning was weakly correlated with hours of sleep ( $r = .380, p < 0.01$ ); bedtime was not correlated. These results were likewise seen when the pre-Quiet Time group was analyzed separately, but not with the Quiet Time group.

#### *Length of stay.*

The length of stay was positively correlated with age ( $r = 0.388, p < 0.01$ ), although this was not true for length of stay after surgery. This correlation was likewise true for the pre-Quiet Time group ( $r = 0.514, p < 0.01$ ), but not for the Quiet Time group.



## Performance and Reliability of Instruments

Instruments utilized in this study included the VSH Sleep Scale and the FISQ. These were analyzed for reliability utilizing Cronbach's coefficient alpha.

The VSH Sleep Scale demonstrated varying reliability. The Cronbach coefficient alpha was 0.75 for sleep effectiveness, 0.63 for sleep disturbance, and 0.51 for supplementation. Within the subgroups, results were as follows: fragmentation (0.36), latency (0.68), quality (0.80), and length (0.80).

The FISQ questionnaire demonstrated exceptionally high reliability with a Cronbach coefficient of 0.92. Even within the separate groups (pre-Quiet Time and Quiet Time), coefficients were 0.92 and 0.91 respectively.

### VSH Sleep Scale

It was hypothesized that patients have improved sleep quality after institution of the Quiet Time protocol. Sleep quality was primary measured through the VSH Sleep Scale. This 15-item scale is divided into three major sections: sleep disturbance, effectiveness, and supplementation. A higher score in each section represents greater sleep disturbance, effectiveness, or supplementation. Total scores were not utilized due to the nature of independent concepts. Within these major concepts, further divisions are made. Sleep disturbance includes sleep latency and fragmentation. Effectiveness includes length and quality. Sleep supplementation is not further divided (see Appendix B for taxonomy).

## Results

Sleep disturbance demonstrated a marked improvement between pre-Quiet Time and Quiet Time groups. The mean score for disturbance was 346.57 compared to 290.59 ( $t = 1.746, p = 0.044$ , one-tailed). Within this concept, sleep latency had mean scores of 96.22 and 61.86 for the two groups ( $t = 2.43, p = 0.009$ ). Sleep fragmentation failed to reach significance ( $p = 0.16$ ).

No significant difference in sleep effectiveness existed between the two groups. Pre-Quiet Time had a mean score of 296.87 compared to Quiet Time average score of 315.00 ( $t = -0.579, p = 0.28$ ). Sleep supplementation was likewise not significantly different between the two groups ( $t = 0.984, p = 0.17$ ).

Results were compared to those of healthy United States citizens, insomniacs, and hospitalized patients (see Table 1). Data for healthy U.S. citizens, insomniacs, and hospitalized individuals in the U.S. were compiled from Verrans and Snyder-Halpern (1990). Medical and surgical patients responses were from Tranmer et al. (2003). The range in scores from this source represents scores from three consecutive days of reports by the same participants.

Table 1  
*VSH Sleep Scale Results Compared to Norms*

	<u>Disturbance</u>	<u>Effectiveness</u>
Healthy U.S. citizens	186.7	360.2
Insomniacs	246.6	260.9
Hospitalized in U.S.	331.4	319.2
Hospitalized - medical	231.6 – 291.6	251.0 – 264.4
- surgical	301.5 – 342.9	195.9 – 215.0
Pre-Quiet Time	346.6	296.8
Quiet Time	290.6	315.0

Pre-Quiet Time participants were equivalent to insomniacs in the amount of sleep disturbance noted, but upon initiation of Quiet Time, scores dropped below those of hospitalized individuals in the United States. Sleep effectiveness for pre-Quiet Time individuals was worse than hospitalized individuals, but Quiet Time showed equivalent scores. Supplementation demonstrated such low reliability that it was not compared to the norms.

*Comparison by type of surgical intervention.*

When separating sleep effectiveness, disturbance, and supplementation by type of surgery, no significant difference existed between intervention type when grouped regardless of pre-Quiet Time or Quiet Time. No difference was seen between cardiac and thoracic surgery.

Amid the pre-Quiet Time group, a significant difference was seen in sleep disturbance between cardiac and thoracic surgery patients ( $t = 1.98, p < 0.05$ ). The variability of surgical interventions makes further comparison impractical due to the small sample size for several specific interventions.

When comparing those on Quiet Time, individuals undergoing CABG reported longer sleep length than those who had a thoracotomy (176.36 and 100.00 respectively,  $t = 2.37, p < 0.05$ ). Furthermore, those who underwent thoracoscopy demonstrated shorter sleep latency compared to CABG patients (31.81 and 48.10,  $t = -2.24, p < 0.05$ ) and less sleep disturbance (26.16 vs. 112.71,  $t = -2.12, p < 0.05$ ). There was no significant difference when cardiac surgeries and thoracic surgeries were grouped.

*Comparison by medication use.*

No significant difference in VSH scores was seen between groups when separated by chronic sleep medication. However, those who utilized sedating medication (sleeping medication or other sedating medication) in the hospital demonstrated decreased sleep length (148.41 vs. 190.33 without medications,  $t = -1.86$ ,  $p = 0.03$ , one-tailed). This was enough to significantly decrease sleep effectiveness as well (294.30 vs. 380.00,  $t = -1.93$ ,  $p = 0.03$ , one-tailed). This was mainly due to the effect of other sedating medications, rather than sleeping medication. Analysis of sleeping medication alone saw no significant change in quality of sleep, including sleep length and effectiveness ( $p = 0.34$ , one-tailed).

When observing correlation between sedating medication and sleep length, Kendall's tau was 0.301 ( $p = 0.02$ ). Sleep effectiveness was likewise significantly correlated with sedating medication (Kendall's tau = 0.251,  $p = 0.04$ ).

*Comparison by pre-hospitalization sleep disturbance from disease.*

No difference in sleep effectiveness or supplementation was seen between those who had pre-hospital sleep disturbance ( $n = 7$ ) and those who did not ( $n = 38$ ). Sleep disturbance was worse, however in those with pre-hospital sleep disturbance (326.79 vs. 278.00,  $t = -1.08$ ,  $p < 0.05$ ). When separated by pre-Quiet Time and Quiet Time, this difference disappeared for Quiet Time group, but was still seen in the pre-Quiet Time participants.

### *Correlations within Demographic Data*

A weak negative correlation between bedtime and sleep length was seen ( $r = -0.313, p < 0.05$ ). This was not evident in the pre-Quiet Time group, but was seen in the Quiet Time group ( $r = -0.514, p < 0.05$ ). For the Quiet Time group, sleep length from the VSH Sleep Scale was also correlated with reported hours of sleep at home ( $r = 0.436, p < 0.05$ ).

Among the Quiet Time group, sleep effectiveness was negatively correlated with bedtime ( $r = -0.555, p < 0.01$ ). This was not seen in the total responses or pre-Quiet Time group.

### **Factors Influencing Sleep Quality**

The FISQ questionnaire (Appendix B) enabled the researcher to better understand factors that impacted the sleep quality of cardiothoracic surgery patients. Some known sleep depleting factors were addressed through Quiet Time protocol, while others were not. Observing for differences between pre-Quiet Time participants and those on Quiet Time provided additional understandings as to the sleep quality experienced by these patients.

Data were analyzed using parametric statistics. Factors that significantly influence the sleep of cardiothoracic patients were also correlated with data from the VSH Sleep Scale and demographic data.

### *Variables*

The FISQ measured the amount of disturbance to sleep attributed to 36 different items, zero being “did not affect sleep at all” to four being “extremely impacted sleep.”

Only the highest scoring items will be discussed; these include pain and discomfort, bed and ventilation system, procedures performed upon the patient, interruptions, and talking.

*Pain and discomfort.*

Pain ( $M = 1.20$ ) and discomfort ( $M = 1.33$ ) rated the highest for sleep disturbance among all patients. After Quiet Time institution, these remained the highest scoring; no significant drop in score was observed.

*Bed and ventilation system.*

Patients reported that the bed ( $M = 1.11$ ) and ventilation system ( $M = 0.87$ ) somewhat disturbed sleep. Once again, no significant change was noted once Quiet Time began, although a slightly decreased disturbance from bed and increased disturbance from ventilation system was noted.

*Procedures performed upon patient.*

Procedures (such as daily weight, venipuncture, and vital signs) were noted to be somewhat disturbing to sleep ( $M = 0.98$ ). Once again, no significant change occurred with initiation of Quiet Time.

*Interruptions.*

Interruptions by nurses ( $M = 0.93$ ) and other hospital personnel ( $M = 0.89$ ) somewhat impacted patients' sleep. No significant change was noted with Quiet Time.

*Talking.*

Conversational disturbances were measured with questions one, three, and nine on the FISQ. These observed different aspects of talking ranging from bedside conversations to hallway talking. The general question on "talking" was the highest scoring among

these three questions ( $M = 0.84$ ). No difference was seen between pre-Quiet Time and Quiet Time responses.

### *Correlations*

The above variables were correlated with other factors influencing sleep. In addition, correlations with demographic information and VSH Sleep Scale results were observed.

#### *Other factors influencing sleep.*

Multiple correlations existed between elements impacting sleep. Several questions regarding talking were highly correlated, as would be expected between similar concepts.

#### *VSH Sleep Scale responses.*

Not surprisingly, multiple factors influencing sleep were correlated with sleep disturbance (see Table 2a and 2b). Pain and procedures performed on the patient were not significantly correlated with sleep disturbance, although discomfort was weakly correlated. Sleep effectiveness was not significantly correlated with items from the FISQ.

Table 2a  
*Sleep Disturbance Correlations*

		(N = 45)				
		Talking	Hall talking	Bed	Interruptions by RN	Interruptions by others
Talking	Pearson Correlation		.754	.462	.546	.530
	<i>p</i> value (two-tailed)		.000	.001	.000	.000
Hall talking	Pearson Correlation	.754		.615	.641	.457
	<i>p</i> value (two-tailed)	.000		.000	.000	.002
Bed	Pearson Correlation	.462	.615		.728	.356
	<i>p</i> value (two-tailed)	.001	.000		.000	.017
Interruptions by RN	Pearson Correlation	.548	.641	.728		.558
	<i>p</i> value (two-tailed)	.000	.000	.000		.000
Interruptions by others	Pearson Correlation	.530	.457	.356	.558	
	<i>p</i> value (two-tailed)	.000	.002	.017	.000	
Pain	Pearson Correlation	.332	.193	.395	.296	.408
	<i>p</i> value (two-tailed)	.026	.204	.007	.049	.005
Procedures	Pearson Correlation	.083	.126	.356	.272	.386
	<i>p</i> value (two-tailed)	.590	.409	.016	.071	.009
Discomfort	Pearson Correlation	.329	.456	.496	.329	.306
	<i>p</i> value (two-tailed)	.027	.002	.001	.027	.041
Disturbance	Pearson Correlation	.411	.327	.406	.319	.297
	<i>p</i> value (two-tailed)	.005	.028	.006	.033	.048

Table 2b  
*Sleep Disturbance Correlations*

		(N = 45)			
		Pain	Procedures	Discomfort	Disturbance
Talking	Pearson Correlation	.332	.063	.329	.411
	<i>p</i> value (two-tailed)	.026	.590	.027	.005
Hall talking	Pearson Correlation	.193	.126	.456	.327
	<i>p</i> value (two-tailed)	.204	.409	.002	.025
Bed	Pearson Correlation	.395	.356	.496	.406
	<i>p</i> value (two-tailed)	.007	.016	.001	.008
Interruptions by RN	Pearson Correlation	.296	.272	.329	.319
	<i>p</i> value (two-tailed)	.049	.071	.027	.033
Interruptions by others	Pearson Correlation	.408	.386	.306	.297
	<i>p</i> value (two-tailed)	.005	.009	.041	.048
Pain	Pearson Correlation		.512	.316	.275
	<i>p</i> value (two-tailed)		.000	.034	.067
Procedures	Pearson Correlation	.512		.264	.279
	<i>p</i> value (two-tailed)	.000		.080	.064
Discomfort	Pearson Correlation	.316	.264		.345
	<i>p</i> value (two-tailed)	.034	.080		.020
Disturbance	Pearson Correlation	.275	.279	.345	
	<i>p</i> value (two-tailed)	.067	.064	.020	



## Summary

The study observed the sleep quality of cardiothoracic patients before and after institution of a Quiet Time protocol. Results from VSH Sleep Scale and FISQ responses were reported and compared in relationship to the hypothesis that individuals on Quiet Time had improved sleep. Confounding factors were also observed in the form of demographic data. Correlations were made between the variables being observed and reported sleep quality.

## CHAPTER 5: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to observe patients' quality of sleep on a cardiothoracic step-down unit before and after institution of an "undisturbed quiet time" policy from eleven o'clock in the evening until five o'clock in the morning. Results are discussed in terms of the hypothesis that patients on Quiet Time had better sleep quality than patients before institution of Quiet Time. This chapter includes discussion of the results, conclusions, and recommendations for further research and program design.

### *Discussion of Results*

Results of the study are discussed in terms of the hypothesis. This discussion will include review of the design and methods, demographic data, and sleep quality data.

### *Design and Method*

Discussion of the design and method will focus on the research design, population and sample, setting, and instrumentation. In addition, process analysis will review data collection, data analysis, ethical practices, and dispersion of results.

### *Research Design*

The choice of comparative group, quasi-experimental design allowed for non-probability sampling. The lenient nature of this design allowed for preliminary study in this area. Future research should utilize a more stringent design.

### *Population and Sample*

The sample size ( $N = 45$ ) was greater than the required 36 participants needed for a power of 0.80, medium effect size,  $p < 0.05$  in a one-tailed test. These values are consistent with the literature (Tranmer et al., 2003). The sub-group of thoracic surgery patients was not large enough for comparison between pre-Quiet Time and Quiet Time.

Inclusion and exclusion criteria were similar to the literature (Simpson & Lee, 1996). However, use of blood pressure parameters failed to account for patients whose baseline blood pressures were low. As a result, patients were excluded from the study who were stable, but had ongoing systolic blood pressure readings in the 90s. Likewise, setting an oxygen saturation parameter may have excluded otherwise stable patients who naturally tolerated low saturations (i.e. those with chronic obstructive pulmonary disease). Finally, the exclusion criteria of sleep apnea or chronic insomnia was applied only to those with medically diagnosed sleep apnea or chronic insomnia. Some patients were known to be at risk for sleep apnea and chronic insomnia, although diagnosis had never been made according to the medical record and/or patient report. These individuals were included in the study and may have contributed to poorer sleep measurements.

### *Setting*

The sample was drawn entirely from a 32-bed hospital unit in a medium-sized, private, metropolitan hospital. While the nature of this setting made institution of Quiet Time feasible, it also created limitations. These included lack of generalizability, staffing compliance, and limited thoracic surgery sampling.

Because of the limited geographic setting, generalizability to different regions of the United States and the world remains limited. Perception of sleep and healthcare may vary among cultures and geographic regions, thus potentially impacting the results. The VSH Sleep Scale, however, has been utilized in other cultures with comparable results (Verran & Snyder-Halpern, 1990).

Staffing at this particular location may have tremendously impacted results. Night shift was primary responsible for institution of Quiet Time. Although noise reduction was

emphasized in multiple staff meetings, certain combinations of boisterous personalities on night shift made noise reduction difficult. While some staff abided by the new protocol, others continued loud socializing at the nurses' station. This likely contributed to the stability of FISQ ratings for sleep disturbance from talking before and after institution of Quiet Time.

The setting offered limited thoracic surgeries during the study period for several different reasons. During the last year, the thoracic center at this institution had undergone a major initiative to utilize minimally invasive thoracic surgery such as video assisted thoracic surgery (VATS), thus cutting the length of stay to one postoperative day. Thus most patients spent only the first night on the intermediate-care unit and were never eligible for Quiet Time. Those who did stay longer usually had other complications that disqualified them for Quiet Time. This setting also contributed to a small thoracic surgery sample due a lower than average number of thoracic surgeries during the study period. Vacation time for several lead thoracic surgeons fell during this period.

#### *Instrumentation*

Instruments used for the study included the VSH Sleep Scale and the FISQ. These have been widely used in the literature, including use in cardiac surgery patients with good validity and reliability (Topf & Thompson, 2001). Results from this study were compared to the literature.

#### *Validity.*

Validity of the VSH Sleep Scale is evidenced by observing convergence ( $p < 0.001$ ) with St. Mary's Hospital Sleep Questionnaire and Baekeland and Hoy Sleep Log (Topf & Thompson, 2001). The FISQ has likewise been utilized in the literature "to

measure the amount of and severity of sleep-disturbing factors” among cardiac surgery patients (Tramner et al., 2003, p. 161). Thus use among cardiothoracic surgery patients is valid.

*Reliability measurement.*

In this study, the VSH Sleep Scale did not demonstrate as high reliability as in the literature. Cronbach’s coefficient alpha was 0.75 for sleep effectiveness, 0.63 for sleep disturbance, and 0.51 for supplementation. When Simpson and Lee (1996) utilized this instrument among cardiac surgery patients, they reported reliability coefficients of 0.83 for effectiveness, 0.86 for disturbance, and 0.72 for supplementation. Tranmer et al. (2003) reported Cronbach’s alpha levels of 0.70 for effectiveness, 0.87 for disturbance, 0.80 for supplementation among surgical and medical patients. Topf and Thompson (2001) obtained a *theta* reliability coefficient of 0.82 among a group of cardiac surgery patients. Verran and Snyder-Halpern, the developers of the VSH Sleep Scale, report *theta* reliability coefficients of 0.82 (Verran & Snyder-Halpern, 1987).

Cronbach’s alpha coefficient scores of 0.70 or higher are generally considered adequate in research, and levels as low as 0.60 are sometimes accepted (UCLA Academic Technology Services, n.d.) The sleep effectiveness and disturbance scales reached this level, but supplementation did not. The supplementation scale was already known to have lower reliability, according to the authors of the VSH Sleep Scale (Verran & Snyder-Halpern, 1990).

Several factors may have impacted the reliability. Participants reported not fully understanding the scale despite repeated instructions. Although each participant could read and write English, comparison of educational level with previous studies was not

possible. Other factors that may have impacted the decreased reliability included small sample size and the hurry of patients to finish the questionnaire in anticipation of discharge home.

Sleep effectiveness demonstrated adequate reliability. However, results of the sleep disturbance and supplementation scales must be viewed carefully in light of the reliability measurements.

In contrast, the FISQ demonstrated extremely high reliability with a Cronbach's alpha of 0.92. Even within the separate groups (pre-Quiet Time and Quiet Time), coefficients were 0.92 and 0.91 respectively.

The relative simplicity of understanding a Likert-style questionnaire may have contributed to the high reliability. Patients reported easier use of the FISQ compared to the VSH Sleep Scale. However, no questions were negatively keyed, and this may have encouraged response bias (Burns & Grove, 2005).

#### *Data Collection*

Data were collected as described in chapter 3. After Quiet Time was officially adopted at the institution's practice council and approval was gained from the (IRB), data collection began on June 20, 2006. Once pre-data collection was completed, three breakfast meetings were held for unit secretaries, nursing assistants, and nurses that outlined the plans for the Quiet Time protocol. Meetings were not held during the pre-Quiet Time data collection in order to avoid having staff institute changes before Quiet Time officially began. In addition, the cardiothoracic surgeons received a lunchtime in-service and packet of information regarding Quiet Time. Unfortunately, this meeting did occur prior to completion of pre-Quiet Time data collection. One physician began

ordering Quiet Time prior to initiation of Quiet Time. These patients were excluded from the data collection. This decreased the number of thoracic surgery participants eligible for the study.

During data collection, inclusion and exclusion criteria were strictly followed. Several response sets were discarded when further information was found to discredit their inclusion (i.e. discharge did not occur on that day despite previous plans).

Although discharges were anticipated through reading doctors' progress notes or dictation, some dismissals occurred prior to participation in Quiet Time evaluation. This was mainly due to weekend or late discharges. Although this could have impacted results, the likelihood of significantly different responses from these individuals is minimal.

Timing of data collection could represent a limitation. Questionnaires were completed between 6:30 a.m. and 1 p.m., depending upon timing of discharge and researcher's presence. This may have impacted the results due to a variation in patients' reaction to the previous night's sleep.

#### *Data Analysis*

Data were analyzed utilizing SPSS 14.0 for Windows. Results were recorded for demographic data, VSH Sleep Scale, and the FISQ. Utilization of independent-sample  $t$  test is appropriate for comparing the mean scores of two groups on a given variable. The independent-sample  $t$  test makes several assumptions including normal distribution of the dependent variable, equal variance of the dependent variable, and use between two independent samples. Levene's Test for Equality of Variances demonstrated equal variance between the two groups. The two samples demonstrated relatively normal distribution.

### *Ethical Consideration*

Compliance with ethical practices was strictly observed throughout the study. Responses remained in the sole possession of the researcher. In accordance with agreement to utilize the VSH Sleep Scale, response data from the VSH Sleep Scale were forwarded to the developers of the instrument to aid in the formation of a normative database for specific clinical populations. No identifiable information was contained on these papers. Exact location of the hospital was likewise not given.

### *Data Dispersion*

Dispersion of data will occur through reporting back to the institution IRB committee and co-management committee. In addition, paper presentation will occur at the 2007 International Neuman Convention in Florida. Other forms of dispersion of data are probable.

### *Demographic Data*

The demographic data recorded in this study included age, gender, marital status. In addition, sleep and bedtime routines were observed including normal bedtime and arising time, hours in sleep, presence of pre-hospitalization sleep disruption due to illness. Length of stay, length of stay after surgery, previous use of sleeping medication, use of sleeping medication in the hospital, and use of other sedating medication in the hospital were likewise documented.

### *Age*

The effects of aging on sleep are well documented in the literature. The deep stages of NREM sleep decrease with age, and the elder may have virtually no stage 4 (Izak, 2006). Fragmentation and advanced sleep cycles may occur (Yoon et al., 2003). As



a result, insomnia is more prevalent among the elderly (National Heart, Lung, and Blood Institute, n.d.)

The current study included primarily elders with other known risks for poor sleep. Interestingly, age was not significantly correlated with sleep quality, unlike much of the literature (Frighetto et al., 2004; Southwell & Wistow, 1995). A study among cardiac surgery patients found that older patients reported poorer sleep quality than their younger counterparts (Tranmer et al., 2003). Snyder-Halpern & Verrans (1987) likewise state that “elderly . . . have more complaints about sleep. Ratings of subjective sleep quality . . . are lower among the elderly than in younger age groups” (p. 161).

When compared to sleep at home, however, Southwell & Wistow (1995) found that elders sleep about the same in the hospital—poorly. In patients over 75 years of age, poor sleep was identical to reported sleep quality at home. However, sleep was significantly worse in the hospital for younger individuals.

Among the participants of the current study, the lack of correlation between age and sleep quality may be due to the plethora of other factors contributing to poor sleep. It may also reflect increased difficulty understanding the instruments utilized to measure sleep quality.

### *Gender*

Differences in sleep quality for male versus female were not seen in the study. This parallels the literature regarding cardiac surgery patients (Simpson & Lee, 1996), although many authors report gender differences in other populations.

While gender differences are seen in subjective and objective sleep quality across all age groups, controversy exists regarding the nature of the difference. Goel, Kim, and Lao (2005) report that women have subjectively poorer sleep, although objective measurement portrayed that they have better sleep than men. Women report insomnia more frequently. Voderholzer, Al-Shajlawi, Weske, Feige, and Riemann (2003) found no difference in sleep by gender in healthy individuals, and they believe that the greater occurrence of poor sleep among female insomniacs is primarily due to the parallel amount of anxiety and depression in this group. Physiologic changes (e.g. menstrual cycles, pregnancy, and menopause) may also play a role in women's sleep quality (Krishnan, 2006).

#### *Marital Status*

Marital status was not significantly correlated with sleep quality. This parallels findings by Dogan et al. (2005). In contrast, Prigerson (1999) describes an association between marital harmony and better sleep as compared to single counterparts. Since participants were largely over 60 years of age and only female, generalizability is limited from the Prigerson study.

#### *Sleep and Bedtime Routines*

Before hospitalization, participants slept an average of 7.7 hours. This represents a greater amount than the general population. The National Sleep Foundation (2005) reports that Americans sleep an average 6.8 hours per night on weekdays and 7.4 hours on weekends. The percentage of those sleeping greater than 8 hours a night has been steadily decreasing, and Americans now average 1.5 hours less sleep per night than they did 100 years ago. When observing sleep in older adults (ages 55-84), average sleep

duration was 7.0 hours during the week and 7.1 hours on weekends (National Sleep Foundation, 2003). Even when allowing for differences by age, participants in the present research reported more pre-hospitalization sleep than the average American. The significance of this difference is unknown. Self-reported amount of sleep may be impacted by dissatisfaction with the amount of sleep received while hospitalized. Sleep at home may suddenly appear better when compared to fragmented sleep in the hospital.

When separating the amount of sleep by groups, Pre-Quiet Time individuals slept more before hospitalization than those on Quiet Time (8.02 hours vs. 7.34 hours,  $p = 0.05$ ). It is unknown whether this affected the amount of sleep in the hospital or the reported sleep quality. VSH Sleep Scale results, specifically sleep effectiveness, could potentially be impacted by greater amounts of pre-hospitalization sleep. Those who expect longer sleep may have greater disappointment in short sleep sessions than those patients who already had shorter nights.

The average bedtime was 10 p.m. with no significant difference between the two groups. The mean arising time of 6 a.m. was likewise not significantly different between groups. This parallels the average bedtime and arising time in the United States (National Sleep Foundation, 2005).

### *Length of Stay*

Although a significant difference in total length of stay was seen between the two groups, this was not due to Quiet Time interventions since the difference was not seen in the length of stay postoperatively when Quiet Time was applied. Although a decrease in length of stay was seen postoperatively, it was not statistically significant (6.95 days

for pre-Quiet Time vs. 5.82 days for Quiet Time,  $p = 0.10$  in a one-tailed test). However, decreases of more than a day are very interesting to clinicians.

Length of stay for both groups was lower than the national benchmarks and the reported length of stay in the city where the study occurred (personal correspondence with Stacey Potter, data collection coordinator from Alliance of Cardiovascular and Thoracic Surgeons). Comparison of the CABG subset is seen in Table 3. The decreased length of stay was probably due to the exclusion of patients with complications.

**Table 3**  
*Length of Stay for CABG (days)*

	Total LOS	LOS after Surgery
National Benchmarks (STS)	9.1	6.9
Chattanooga	8.9	7.2
Current Study – pre-Quiet Time	7.6	6.3
Quiet Time	6.9	5.8

The total length of stay is significant, however, in its possible impact on overall sleep quality. Tranmer et al. (2003) reported VSH Sleep Scale results for surgical and medical patients over three days of hospitalization. They found that “as hospital length of stay increased, sleep quality improved” (p. 170). Patients with long hospitalizations may become “more desensitized to the unfamiliar noises and environmental factors of the hospitalized environment” (p. 170). Therefore, it is possible that patients in the pre-Quiet Time group reported better sleep quality due to the longer hospitalization than their Quiet Time counterparts with overall shorter hospitalizations.

#### *Previous Use of Sleeping Medication*

Of the pre-Quiet Time participants, 22% utilized sleeping medication at home, but only 9% of Quiet Time participants admitted to home use of sleep-enhancement medications. The numbers compare somewhat to national averages.

### *Use of Sedating Medications*

Forty-four percent of pre-Quiet Time participants had sleeping (such as zolpidem and temazepam) the night before the study, and 74% had other sedating medication (such as oxycodone, hydrocodone, or propoxyphene). Of Quiet Time participants, 23% had sleeping medication, and 86% had other sedating medication.

A significant drop in usage of sleeping medication occurred between the two groups, to the extent that the Quiet Time group utilized sleeping medications slightly less than reported for hospitalized individuals in the literature. Southwell & Wistow (1995) reported that 24% of patients received sleeping medication most or every night, and 13% reported occasional use. It is unknown whether the decrease from pre-Quiet Time usage of sleeping medication was due to nurses failing to offer medication or patients not feeling a need for sleeping aids.

Sleep effectiveness and length are both significantly impacted by the use of sedating medication (specifically other sedating medication such as pain medication). Therefore comparison between pre-Quiet Time and Quiet Time results of the VSH Sleep Study was impacted by an unequal percentage of patients on sedating medication.

### *Quality of Sleep*

Quality of sleep among cardiothoracic surgery patients was primarily measured through the VSH Sleep Scale. Scores were divided into three major sections including sleep disturbance, effectiveness, and supplementation. The sleep disturbance section was further explored through the use of the FISQ. Overall, the results from both the VSH Sleep Scale and the FISQ supported the hypothesis, but left room for discussion—as well as a need for further research.

### *Disturbance*

Participants of Quiet Time had significantly less sleep disturbance than those before Quiet Time was instituted. The disturbance scores dropped from 346.57 to 290.59 after initiation of Quiet Time ( $t = 1.746, p < 0.05$ ), thus supporting the hypothesis. A large portion of this was due to the decreased sleep latency. This is especially important since increased sleep latency has been significantly correlated with poorer overall health ( $r = 0.50, p < 0.001$ ) (Edéll-Gustaffson et al., 2001).

Interestingly, these results were not mirrored in the FISQ questionnaire, where there was no corresponding change in the impact various factors had on participants' sleep. Various items may have contributed to the relative stability of scores; many of these factors will be discussed in the section on confounding variables.

### *Pain and discomfort.*

Pain ( $M = 1.20$ ) and discomfort ( $M = 1.33$ ) rated the highest for sleep disturbance among all patients. After Quiet Time institution, these remained the highest scoring; no significant drop in score was observed.

Due to the postoperative status of the population being studied, pain and discomfort were expected to remain the top factors disturbing sleep. Although sleep deprivation can impact pain tolerance, the analgesic effect of sleep restoration is still relatively small compared to pain experienced after cardiothoracic surgery (Onen et al., 2001).

Due to the decreased presence of staff entering patients' rooms throughout the night, some concern was voiced regarding timely administration of pain medication. The

stability of the pain ratings is rather assuring in this regard; patients did not experience worse pain management after institution of Quiet Time.

*Interruptions.*

Interruptions by nurses ( $M = 0.93$ ) and other hospital personnel ( $M = 0.89$ ) somewhat impacted patients sleep. No significant change was noted with Quiet Time.

Even before Quiet Time, patients ratings failed to reach the "somewhat" disturbing mark. This was significantly less disturbance than previously reported in the literature. Simpson et al. (1996) found that patients rated interruptions by nurses and other hospital personnel as somewhat to moderately disturbing ( $M = 1.8$  for both items). The lower disturbance from interruptions seen during this study may reflect night shift nurses who were already incorporating many aspects of the Quiet Time protocol. For example, nurses reported already skipping the midnight vital signs in stable patients.

*Bed and ventilation system.*

Patients noted that the bed ( $M = 1.11$ ) and ventilation system ( $M = 0.87$ ) somewhat disturbed sleep. Once again, no significant change was noted once Quiet Time began, although a slightly decreased disturbance from bed and increased disturbance from ventilation system was seen. Since these items were not targeted by the Quiet Time protocol, the scores were not expected to change.

*Procedures performed upon patient.*

Procedures performed upon the patient (such as daily weight, venipuncture, and vital signs) were noted to be somewhat disturbing to sleep ( $M = 0.98$ ). Once again, no significant change occurred with initiation of Quiet Time. The sleep disturbance from

procedures was well below the mean score of 2.0 reported in the literature (Simpson et al., 1996).

Several items may have contributed to the lack of improvement in ratings, although the score was already low. These factors will be discussed in the confounding variables section a little later.

### *Talking.*

Conversational disturbances were measured with questions one, three, and nine of the FISQ. These included different aspects of talking ranging from bedside conversations to hallway talking. The general question on “talking” was the highest scoring among these three questions ( $M = 0.84$ ). Although no difference was seen between pre-Quiet Time and Quiet Time responses, the average disturbance score was far lower than the 2.1 found by Simpson et al. (1996).

### *Effectiveness*

The second concept measured by the VSH Sleep Scale was the effectiveness of sleep. Although sleep effectiveness scores increased after institution of Quiet Time, they failed to reach statistical significance (296.87 and 315.00,  $t = -0.579$ ,  $p = 0.14$ , one-tailed). However, sleep effectiveness was significantly impacted by the use of sedating medication during the night before the study.

Those who utilized sedating medication in the hospital (sleeping medication or other sedating medication) demonstrated decreased sleep length (148.41 vs. 190.33 without medications,  $t = -1.86$ ,  $p = 0.03$ , one-tailed). This created a significant decrease in sleep effectiveness as well (294.30 vs. 380.00,  $t = -1.93$ ,  $p = 0.03$ , one-tailed). This was mainly due to the effect of other sedating medications, rather than sleeping medication,



since analysis of sleeping medication alone saw no significant change in quality of sleep, including sleep length and effectiveness ( $p = 0.34$ , one-tailed). Sedating medication and sleep length were significantly correlated (Kendall's tau = 0.301,  $p = 0.02$ ), as were sleep effectiveness and sedating medication (Kendall's tau 0.251,  $p = 0.04$ ).

The effects of medication on sleep quality would impact results of this study since use of other sedating medications increased during Quiet Time (86% of participants compared to 74% during pre-Quiet Time). Although no change in sleep effectiveness was seen between pre-Quiet Time and Quiet Time, the effects of use of sedating medications could have lowered sleep efficacy scores for the Quiet Time group. Thus, a significant change may have occurred if the groups were equally matched for medication use.

### *Supplementation*

Like sleep effectiveness, supplementation was not significantly different between pre-Quiet Time and Quiet Time ( $t = 0.984$ ,  $p = 0.17$ ). Since Quiet Time was primarily impacting nighttime sleep, the supplementation scale had little relevance to the hypothesis. In addition, this scale demonstrated low reliability in the literature, and even lower in this study (Cronbach's alpha = 0.51).

### *Comparison with Norms*

Results from the VSH Sleep Scale were compared to data from healthy U.S. citizens, hospitalized individuals, and insomniacs. While Quiet Time failed to improve sleep disturbance to the level of healthy, community-dwelling individuals, the scores improved from levels near that of insomniacs' reports to equivalent or slightly better than other hospitalized individuals (Tranmer et al., 2003; Verrans & Snyder-Halpern, 1990). Comparison to surgical patients studied by Tranmer et al. (2003) must be made

cautiously since this sample only included those recovering from total knee or hip replacement or transurethral prostatectomy. Cardiothoracic surgery patients may have unknown factors influencing sleep that are not present in the previous study (i.e chest tubes, higher usage of oxygen, etc.).

### *Confounding Variables Impacting Sleep Quality*

As part of the discussion of results from this study, extraneous and non-modifiable factors must be considered for their possible impact on the results. Indeed, several such variables were present during this study including overall patient satisfaction, raised expectations, and lack of staff cooperation.

Overall patient satisfaction was extremely high during the pre-Quiet Time data collection. Participants commented on how much they appreciated their nurses, and did not want to reflect poorly on their care. For unknown, and thus uncontrollable reasons, the patient satisfaction scores dropped during the Quiet Time data collection period. The impact of the overall satisfaction of patients on their rating of sleep is unknown, but cannot be overlooked in relation to the results of this study.

The extent to which patient education regarding Quiet Time raised expectations for improved sleep is likewise unknown. Quiet Time may have raised expectations for sleep unreasonably high for postoperative, hospitalized, predominately elderly individuals. Variables affecting sleep that could not be totally eradicated were still present, and may have subjectively impacted sleep to a greater degree after patients started focusing on improving sleep.

In addition, gaining staff support was slow during implementation of Quiet Time. Even after eight weeks, the program was still undergoing revisions. Staff still needed

assistance implementing Quiet Time, including proper identification of eligible patients. Patients were not always started on Quiet Time as soon as possible, since the researcher was not present every day. This could have impacted results due to patients participating in Quiet Time for shorter periods of time.

### Strengths and Limitations

#### *Strengths*

This study presented several strengths. All instruments were fully validated and had been used among similar populations. In addition, the data were acquired by one researcher, thus avoiding variance in questionnaire administration.

#### *Limitations*

Several limitations were inherent to the study design. Strict inclusion/exclusion criteria limited collection to a small segment of cardiothoracic surgery patients. This may have led to a lack of generalizability to all cardiothoracic surgery patients. In addition, the small sample of thoracic surgery patients limits generalizability to that population.

The sole use of subjective instrumentation may lead to an inaccurate view of sleep quality in this population. Many variables may impact subjective reports, including overall patient satisfaction. Although subjective sleep scales have been validated, further understanding of the specific sleep experience through the use of polysomnography is required.

### Summary

Review of the data supports the use of programs such as Quiet Time and suggests a need to expand the program into non-surgical areas. The current study adds to the body of knowledge regarding a sub-group of surgical patients.

The overall sleep disturbance decreased through implementation of Quiet Time, but the FISQ failed to find specific factors that were improved through Quiet Time. Although sleep effectiveness did not significantly improve, multiple factors may have contributed to the lack of change.

### *Recommendations*

Results from this study suggest a need for further research. In addition, results lead to recommendations for improved design and implementation of sleep-promoting initiatives.

### *Further Research*

Upon completion of this study, several areas requiring additional research were evident. These include exploration of sleep quality of thoracic surgery patients, comparison of results with objective measurements of sleep, utilization of a larger sample and more stringent study design among the same population, and use of Quiet Time protocol in other hospital environments.

### *Thoracic Surgery*

Although sleep quality following cardiac surgery has been studied since the 1940s, thoracic surgery remains a subset of surgical patients who have received limited study regarding sleep. Cmiel et al. (2004) described noise-reduction and sleep-enhancement measures on a thoracic surgery step-down unit. Otherwise, sleep following thoracic surgery remains an area for further exploration.

The present study has limited application to the understanding of sleep following thoracic surgery. This is due to the small number of thoracic surgery patients and the strict inclusion criteria. Only 15% of participants were thoracic surgery patients, and the

majority of those were in the Quiet Time group. Only those who were hospitalized for greater than one postoperative day and had high oxygen saturation were included in the study. This excluded many patients who underwent minimally invasive thoracic surgery, since length of stay is often only one day. Furthermore, it excluded patients who were utilizing > 4 liters of oxygen, or who had oxygen saturation levels below 92%.

Further research should emphasize gathering sleep data among thoracic surgery patients, without regard to sleep promoting interventions such as Quiet Time. The research should include all thoracic surgery patients, regardless of relative stability, oxygenation needs, or length of stay.

#### *Comparison with Objective Data*

Sleep quality may be measured through objective outcomes including polysomnography and observance of daytime somnolence. Although subjective reports of sleep quality have been shown to parallel polysomnography (Edéll-Gustafsson et al., 1999), some variation in reported sleep and actual sleep is expected. Indeed, Goel et al. (2005) found a significant difference in women's subjective sleep compared to objective measurement. Although this study utilized a valid form of measurement, further research should clarify any differences that may exist between subjective and objective reports.

#### *Sampling and Study Design*

In order to further validate the results of this study, a larger sample should be obtained, ideally from multiple healthcare centers. This would allow for greater generalizability of results.

Furthermore, utilization of an experimental study design would offer a more rigorous design. Although less stringent designs are often utilized in medical research due

to the difficulty obtaining a truly randomized sample, the experimental design is considered the ultimate standard. Use of less stringent designs is considered to be a methodological compromise, although unavoidable at times (Dannehl, 1997). Experimental design is imperative in establishing causality between an intervention and the results.

#### *Use of Quiet Time Among Different Populations*

Quiet Time should be observed for efficacy in other populations, including the general medical patient. Due to the large number of confounding factors (including diagnoses, patient acuity, interventions, and staffing), other environments may produce varying results for the Quiet Time protocol. As the Quiet Time protocol is instituted in other hospital units, ongoing evaluation of efficacy among various patient populations is imperative.

#### **Program Design and Implementation**

Recommendations for program design and implementation guide a current program to maturation. Recommendations for Quiet Time protocol include restructuring computer entry, ongoing evaluation, and consideration of inclusion/exclusion criteria for various populations.

The initial method of entering computer orders was tedious. Subsequent poor performance by unit secretaries demonstrated a need for reformatting. Much of this restructuring was accomplished prior to data collection for Quiet Time participation. However, some ongoing process evaluation continued into Quiet Time data collection. Evaluation of ease and accuracy of computer entry should continue.

Ongoing evaluation of sleep quality should occur at this location. As Quiet Time intervention matures, data may reflect improved sleep. In addition, it may serve as a guide to further implement changes in Quiet Time. Specifically, the FISQ may portray areas where sleep disruption may be decreased.

As was previously discussed, inclusion and exclusion criteria were extremely cautious for this population. These same criteria cannot be applied for all populations due to variance in risks for complications. Restructuring of criteria should occur prior to implementation in other areas of the hospital. In addition, the inclusion criteria of ability to read and write English is not applicable now that data collection has ceased in this population.

#### *Summary*

Sleep is a complex phenomenon that is still poorly understood. Although many Americans suffer poor sleep, hospitalized patients are at higher risk for sleep disturbance and deprivation. Short and long-term effects of this disturbance are quite negative.

Although further research is needed in multiple areas, data from this study added to the body of knowledge regarding the sleep experience of cardiothoracic surgery patients. Data from this study demonstrated initial support for a program to decrease hospitalized patients' sleep disturbance.

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## APPENDIX A: FORMS FOR IMPLEMENTATION OF QUIET TIME

1. Patient Educational Pamphlet
2. Sign for Door

*Quiet Time*

PATIENT EDUCATIONAL PAMPHLET

# Quiet Time

Sleep is an important part of your recovery from surgery. Because of this, Memorial Hospital seeks to give you the rest you need through Quiet Time. Although medical care often interrupts sleep, we wish to decrease these disturbances by giving you rest time from 11 p.m. to 5 a.m.

Unfortunately, not all patients are able to have Quiet Time due to the severity of illness. We will start Quiet Time for each patient as soon as possible.

*What to expect:*

- A sign will be placed on your door notifying staff of Quiet Time.
- Nurses will make rounds at least every two hours, but will not wake you, if possible.
- Blood pressures and weights will be taken after 5 a.m.
- Blood draws will occur after 5 a.m.
- Noise will be reduced.
- Doors will be kept closed, unless you request them to be left open.



*How you may help:*

- If you awaken with pain, call immediately. Post-operative pain rarely disappears without changing positions or taking pain medication. The sooner you call, the sooner we can help you get back to sleep.
- Tell your nurse if you have bedtime habits that help you sleep better (such as a hot drink before bed).
- Ask that the blinds be closed and the TV turned off when you are ready to sleep.

If you have any questions or concerns about Quiet Time, please ask your nurse. Questions may also be directed to the Patient Care Coordinator.

## APPENDIX SIGN FOR PATIENT DOOR



# QUIET TIME



Please do not disturb  
between 11 p.m. and 5 a.m.

Check with the nurse before entering room  
during these times.



## APPENDIX B: INSTRUMENTS AND FORMS

1. **Demographic Questionnaire**
2. **VSH Sleep Scale**
3. **Taxonomy of VSH Sleep Scale Concepts**
4. **Factors Influencing Sleep Questionnaire**

## DEMOGRAPHIC DATA QUESTIONNAIRE

### Sleep Quality in the Cardiothoracic Surgery Patient

Subject Number: \_\_\_\_\_ Date: \_\_\_\_\_

1. What is your sex? 1. Female 2. Male
2. What is your age? \_\_\_\_\_
3. What is your marital status? \_\_\_\_\_
4. What are your normal sleeping hours: \_\_\_\_ to \_\_\_\_
5. During the last two months, has your illness led to sleep loss or disruption in your normal sleep time? YES NO
6. Do you have any routine assistance for achieving sleep? YES NO  
(e.g., a radio, TV, reading, etc.) If YES, please list below:  
\_\_\_\_\_

7. Day of Hospitalization: \_\_\_\_\_  
Transfer from SICU: \_\_\_\_\_
8. Day of Week: \_\_\_\_\_
9. Diagnosis: \_\_\_\_\_
10. Service:
  1. CABG
  2. Valve replacement
  3. Both CABG/Valve
  4. Thoracotomy
  5. Thoracoscopy
  6. Other \_\_\_\_\_

11. Sleeping medication the night before study: YES NO  
Medication: \_\_\_\_\_  
Dose: \_\_\_\_\_  
Time: \_\_\_\_\_

12. Hypnotics/Tranquilizers administered YES NO  
Medication: \_\_\_\_\_  
Dose: \_\_\_\_\_  
Last Dose: \_\_\_\_\_  
(before study night)  
Frequency of Dose: \_\_\_\_\_  
(before study night)

13. Chronic Sleeper use: YES NO
-

## VSH SLEEP SCALE

**Directions:** Answer each question by placing a vertical mark across the answer line at a point which BEST REFLECTS YOUR OPINION. Answer all of the following questions about your last night's sleep. Consider the night's sleep to begin from the time you first tried to go to sleep to the time you were finally "up" in the morning.

- |   |       |  |
|---|-------|--|
| 1. Did not awaken                         | _____ | Was awake ten hours                          |
| 2. Had no sleep                           | _____ | Excluding time awake, had ten hours of sleep |
| 3. Did not sleep during the day yesterday | _____ | Slept ten hours during the day               |
| 4. Did not sleep yesterday morning        | _____ | Slept off and on yesterday morning           |
| 5. Did not sleep yesterday evening        | _____ | Slept off and on yesterday evening           |
| 6. Felt asleep immediately                | _____ | Did not fall asleep                          |
| 7. Slept lightly                          | _____ | Slept deeply                                 |
| 8. Had no trouble with disrupted sleep    | _____ | Had a lot of trouble with disrupted sleep    |
| 9. Didn't wake at all                     | _____ | Was awake off and on all night               |
| 10. Had no trouble falling asleep         | _____ | Had a lot of trouble falling asleep          |
| 11. Didn't move                           | _____ | Tossed all night                             |
| 12. Awoke exhausted                       | _____ | Awoke refreshed                              |
| 13. After morning dozed off and on        | _____ | After morning awakening, stayed awake        |
| 14. Had a bad night's sleep               | _____ | Had a good night's sleep                     |
| 15. Had enough sleep                      | _____ | Did not have enough sleep                    |

## TAXONOMY OF VSH SLEEP SCALE CONCEPTS

### DISTURBANCE

#### Fragmentation

- Mid-Sleep Awakening (Item 9)
- Wake After Sleep Onset (Item 1)
- Movement During Sleep (Item 11)
- Soundness of Sleep (100 - Item 7)
- Quality of Disturbance (Item 8)

#### Latency

- Sleep Latency (item 6)
- Quality of Latency (Item 10)

### EFFECTIVENESS

#### Quality

- Rest Upon Awakening (Item 12)
- Subjective Quality of Sleep (Item 14)
- Sleep Sufficiency Evaluation (100 - Item 15)

#### Length

- Total Sleep Time (Item 2)
- Total Sleep Period (Item 1 + 2)

### SUPPLEMENTATION

- Daytime Sleep (Item 3)
- Morning Sleep (Item 4)
- Afternoon Sleep (Item 5)
- Wake After Final Arousal (Item 13)

## FACTORS INFLUENCING SLEEP QUESTIONNAIRE

## Factors Influencing Sleep/Rest

Please circle the number that best describes the sleep disruption you experienced from these items.

0 - Not at all    1 - somewhat    2 - moderately    3 - quite a bit    4 - extremely

1. Loud talking in the hallway at night	0	1	2	3	4
2. Patient sounds such as coughing, snoring, gagging, moaning	0	1	2	3	4
3. Talking in the hallway	0	1	2	3	4
4. Doors opening, closing, slamming	0	1	2	3	4
5. Falling objects such as pans, patient charts	0	1	2	3	4
6. Socializing at the nurses' station	0	1	2	3	4
7. Squeaking parts on beds or equipment	0	1	2	3	4
8. Alarms on equipment	0	1	2	3	4
9. Conversations between hospital personnel at the bedside	0	1	2	3	4
10. Air conditioning, heating or ventilation systems	0	1	2	3	4
11. Telephones	0	1	2	3	4
12. Cleaning equipment such as vacuum cleaners	0	1	2	3	4
13. Intercorn and call lights	0	1	2	3	4
14. Paging system	0	1	2	3	4
15. Radios	0	1	2	3	4
16. Equipment used for patients such as suction and/or breathing machines (chest tubes)	0	1	2	3	4
17. Medicine and linen carts	0	1	2	3	4
18. Toilets flushing	0	1	2	3	4
19. Footsteps	0	1	2	3	4
20. Dinner trays and eating utensils	0	1	2	3	4
21. Visitors	0	1	2	3	4
22. Handwashing at nearby sink	0	1	2	3	4
23. Traffic outside the hospital	0	1	2	3	4

24. Televisions	0	1	2	3	4
25. Unfamiliar bed	0	1	2	3	4
26. Interruptions by nurses	0	1	2	3	4
27. Interruptions by physician	0	1	2	3	4
28. Interruptions by other health care personnel	0	1	2	3	4
29. Bright lights	0	1	2	3	4
30. Pain	0	1	2	3	4
31. Procedures performed on you	0	1	2	3	4
32. Procedures performed nearby you (on someone else)	0	1	2	3	4
33. Anxiety	0	1	2	3	4
34. Inability to lie comfortably or to get comfortable	0	1	2	3	4
35. Inability to perform my usual routine before going to sleep	0	1	2	3	4
36. Other (please list) _____	0	1	2	3	4

## APPENDIX C: IRB APPROVAL FORMS AND LETTERS

1. **Research Proposal Sent to Memorial Hospital**
2. **Approval Letter from Memorial Hospital Institutional Review Board**
3. **Certificate of Completion: Research Training Module**
4. **Approval Letter from Southern Adventist University Institutional Review Board**

## RESEARCH PROPOSAL: QUALITY OF SLEEP IN THE CARDIOTHORACIC SURGERY PATIENT

Sleep remains an integral part of human life and contributes to psychological, social, and physical wellbeing. This precious commodity is often little valued until it is lacking in either quantity or quality. Although the exact functions of sleep have yet to be clearly understood, its necessity is clear through multiple observations of the detrimental effects of sleep deprivation.

### Background and Significance of Problem

Hospitalized patients are at greater risk for poor sleep than their community counterparts (Topf & Thompson, 2001), and dissatisfaction with sleep is a frequent complaint among hospitalized patients. Southwell and Wistow (1995) reported that 22% of patients who slept well at home described their hospital sleep as inadequate. A more recent study demonstrated that 30% of patients were dissatisfied with their previous night's rest (Johansson, Oleni, & Fridlund, 2005).

Patients identify multiple sources of sleep disturbance including noise (Tranmer, Minard, Fox, & Rebelo, 2003; Cmiel, Karr, Gasser, Oliphant, & Neveau, 2004; Sneiderman, 2005), interventions by the healthcare team (Freedman, Kotzer, & Schwab, 1999), pain (Southwell & Wistow, 1995), anxiety (Honkus, 2003), and uncomfortable sleeping conditions (Tranmer et al., 2003; Southwell & Wistow, 1995). Patients' perceptions of poor sleep quality largely parallels decreased time in slow-wave and REM sleep (Edéll-Gustafsson, Hetta, & Aren, 1999).

### *Significance to the Patient*

Hospitalized patients are in a vulnerable state that demands the restorative and refreshing qualities of sleep; thus the effects of sleep deprivation are profound. Many studies have observed the decreased cognitive function associated with decreased quality or quantity of sleep (Roehrs, Burduvali, Bonahoom, Drake, & Roth, 2003). Within acute care, the physiologic and psychological consequences of sleep deprivation are of even greater concern. These include psychological strain (Hodgson, 1991), poor wound healing (Altemus, Rao, Dhabhar, Ding, & Granstein, 2001), increased pain (Onen, Alloui, Gross, Eschallier, & Dubray, 2001), blunting of the immune system (Ozturk et al., 1999), and increased sleepiness with subsequent poor performance of tasks the following day (Malik & Kaplan, 2005; Wesensten, Balkin, & Belenky, 1999).

### *Significance to Nursing*

Sleep disturbance in hospitalized patients is a multifactorial phenomenon (Topf & Thompson, 2001), and thus solutions must target the multiple interacting variables including pain, noise, medical interventions, anxiety, and uncomfortable sleeping conditions. Nurses are in a position to meet this basic human need by their emphasis on holistic care and their ability to observe and modulate the multiple factors impacting poor quality of sleep. Unfortunately, nurses fail to recognize many sources of sleep disturbances that patients report as disruptive (Southwell & Wistow, 1995). This is understandable since little emphasis is placed on importance of sleep preservation during nursing education or within the medical culture. Generally, more emphasis is placed on "good nursing care at the expense of sleep" (Southwell & Wistow, 1995, p. 1102).



### *Significance to the Organization*

In today's competitive world of healthcare, patient satisfaction has become a key concept, almost as important as patient outcome. In short, it is an important measure of quality of care (Press, 2002). Therefore, long-term business strategies include identification of factors keeping the organization from moving beyond good, safe healthcare to excellent healthcare (Press, 2002). Sleep is often one of those factors. Across America, only 70% of hospitalized patients are satisfied with their sleep (Johansson, Oleni, & Fridlund, 2005); in addition, "patient satisfaction survey results have shown that one of patients' biggest complaints during their stay is excessive noise" (Crozer-Keystone Health System, 2005). By improving the quality of sleep for patients, the organization may not only decrease negative outcomes from sleep deprivation, but may also improve patient satisfaction—and thus quality of care.

A number of hospitals have successfully implemented policies and procedures to decrease sleep disruption and boost patient satisfaction. These include St. Mary's Hospital—a Mayo clinic affiliate in Rochester, Minnesota (Cmiel, Gasser, Neveau, 2004), Johns Hopkins Hospital in Baltimore (Lower, Bonsack, & Guion, 2003), and New York's Montefiore Hospital (Robinson, Weitzel, & Henderson, 2005).

#### *Purpose and Hypothesis*

The purpose of this study is to observe patients' quality of sleep on a cardiothoracic step-down unit before and after institution of "undisturbed quiet time" from eleven o'clock in the evening until five in the morning. It is hypothesized that these patients will have improved sleep quality after institution of the Quiet Time policy.

#### *Proposed Quiet Time Policy*

##### *Conceptual*

The Quiet Time will be a period of patient-directed care in which the patient guides interaction between hospital staff and him or herself. Outside stimuli will be minimized in order for the Quiet Time to provide uninterrupted sleep from 11 p.m. to 5 a.m. Reevaluation of care delivery and reorganization of daily routines will decrease the required nocturnal interventions.

##### *Operational*

The Quiet Time Policy is a multi-departmental policy that impacts nursing staff, respiratory therapy, laboratory, physicians, and radiology personnel. Each section of this policy can be applied independently of the other, but for the purpose of this study, only patients meeting criteria for the complete Quiet Time policy will be included (see Design and Methods).

Nursing staff will be the directors of the Quiet Time. Nurses will minimize disruption of sleep through decreasing stimuli known to disrupt sleep. Although nursing rounds will continue to occur at least every two hours, as is the standard of care, nurses will utilize pin lights or flashlights to check on patients. Noise will be kept to a minimum through noise reduction activities including: (a) turning pagers to vibrate, (b) using quiet voices at the nurses station, (c) closing doors to patient rooms, (d) using telephones at the nurses station instead of hall phones, (e) anticipating IV pump alarms, (f) closing medicine carts to avoid alarms, (g) promptly notifying maintenance personnel regarding squeaking doors or equipment wheels, and (h) identifying pharmacy schedules that may be modified to avoid sleep disruption.

Other hospital personnel will be involved in sleep maintenance by modifying usual routines. Nursing assistants will wait until 5 am to start daily weights, baths, and catheter emptying. Laboratory personnel will start routine morning phlebotomy no early than five o'clock. Respiratory therapy will provide 10 pm and 6 am treatments, omitting the 2am treatment if the patient meets criteria for inclusion in Quiet Time policy. However, prompt response to PRN calls will be provided. Pharmacy will continue to allow nurses to rescan medication administration records in order to switch medication schedules to meet the patient's routine schedule or to decrease sleep disruption.

#### Design and Method

The proposed study will utilize a comparative group quasi-experimental design. A sample of 36 will be drawn from patients on the 32-bed cardiothoracic surgery step-down unit at Memorial Hospital in Chattanooga, TN. Inclusion criteria are as follows: (a) cardiothoracic surgery during this admission, (b) greater than 24 hours post-PACU or upon transfer from another unit, (c) systolic blood pressure >100 mm Hg for three consecutive reading, (d) oxygen per nasal cannula at 4 liters or less, (e) SaO<sub>2</sub> > 90% during last 24 hours, (f) normal sinus rhythm, stable, chronic atrial fibrillation or atrial flutter on telemetry, (g) ability to read and write English, (h) alert and oriented to person, place, and time as evidenced by nursing assessment. Exclusion criteria include: (a) wheezing at 10 pm respiratory therapy assessment, (b) use of > 4 liter oxygen, (c) systolic blood pressure > 190 mm Hg any time during last 24 hours, (d) medically diagnosed sleep disorder such as obstructive sleep apnea and chronic insomnia, and (e) acute, new-onset arrhythmia since admission to the intermediate care unit.

The Verran and Snyder-Halpern Sleep Scale (VSH Sleep Scale) will be utilized as a subjective measure of sleep quality through analysis of sleep disturbance, effectiveness, and supplementation (Verran & Snyder-Halpern, 1990). The validated 15-item scale has been widely used in the literature to evaluate sleep in medical and surgical patients (Frighetto et al., 2004; Richardson, 2003; Tranmer, Minard, Fox, & Rebelo, 2003; Smith, Kemp, Hemphill, & Vojir, 2002) including cardiac surgery patients (Topf & Thompson, 2001).

The Factors Influencing Sleep Questionnaire (FISQ) will be used to measure patient perception of etiology of sleep disturbances through the use of 5-point Likert scale questions. This tool has likewise been validated in the literature, including use with cardiac surgery patients (Topf & Thompson, 2001).

#### Data Collection and Analysis

The proposed study will occur during a four-month period. Pre-study education will occur for staff at the cardiothoracic intermediate care unit. Pre-intervention data collection will occur after approval from the (IRB) at Memorial Hospital. The researcher will distribute and explain the VSH Sleep Scale and FISQ to all eligible patients until the necessary participation number is gained.

Once the pre-intervention numbers are reached, the quiet time policy will be initiated. Data will again be gathered six weeks after institution of the Quiet Time.

Once the study is complete, data will be keyed into SPSS for analysis. Demographic data will be analyzed utilizing descriptive statistics. The age, gender, type of surgery, prehospitalization use of sedative-hypnotics, hospitalization use of sedative-hypnotics, and current length of stay will be coded into SPSS.

Data from the VSH Sleep Scale will be analyzed using  $t$  test to determine if there is a statistical difference between patients' perceived sleep quality before and after institution of a Quiet Time policy. Pearson  $r$  will be used to find significant correlation between demographic data and sleep quality. Data from the FISQ will be compared utilizing independent sample  $t$  test. Significant factors will be correlated with the sleep quality results.

#### Ethical Considerations

Consent is gained by patient agreement to complete a survey. No identifying information such as names or room numbers will be attached to the VSH Sleep Scale, FISQ, or demographic survey. These forms will stay in the possession of the researcher in a locked office until the completion of the study. No lists of participants' names will be kept. At the conclusion of the study period, all forms will be shredded; only aggregate data will be retained.

APPROVAL LETTER FROM MEMORIAL HOSPITAL  
INSTITUTIONAL REVIEW BOARD

Memorial  
Health Care System  
MEMORIAL HOSPITAL

June 14, 2006

Kristina Nelson, RN  
Memorial Hospital  
2525 deSales Avenue  
Chattanooga, TN 37404

RE: Study number 06 06 01  
Quality of Sleep in the Cardiothoracic Surgery Patient

Dear Ms. Nelson:

Your study number is 06 06 01. Your request for approval of the new study listed above was reviewed at the 6/13/2006, meeting of the Memorial Hospital Institutional Review Board.

Memorial Hospital's federal wide assurance number is FWA00000418 which assures compliance with federal regulation. As Chairman of the Memorial Hospital IRB, I hereby certify that this action of the Board was taken in accordance with these regulations for the protections of human subjects.

This is to confirm that your application was approved as submitted. The requirement for obtaining informed consent is waived.

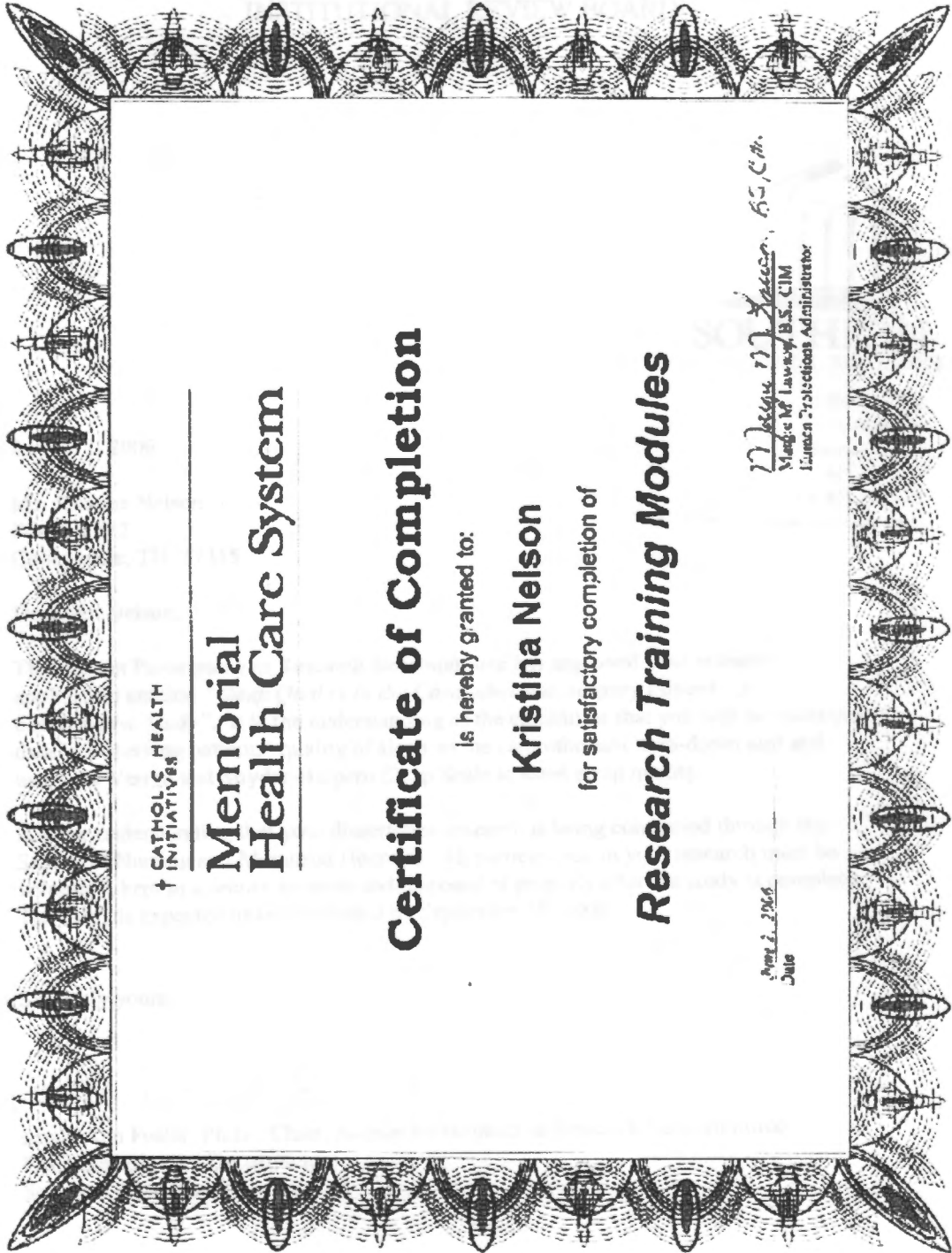
You are granted permission to conduct your study as described in your application effective immediately. The study is subject to continuing review on or before 6/13/2007, unless closed before that date.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Margie Lawson at 423-495-6198 if you have any questions or require further information.

Sincerely,

  
Kent Groleferndt, MD  
IRB Chairperson

CERTIFICATE OF COMPLETION: RESEARCH TRAINING MODULE



† CATHOLIC HEALTH INITIATIVES

**Memorial Health Care System**

**Certificate of Completion**

is hereby granted to:

**Kristina Nelson**

for satisfactory completion of

**Research Training Modules**

APR 1 2006  
Date

17 August 17 Xaxxon, MS, CM  
Vivian M. Lawson, B.S., CIM  
Human Protections Administrator

**APPROVAL LETTER FROM SOUTHERN ADVENTIST UNIVERSITY  
INSTITUTIONAL REVIEW BOARD**



P.O. Box 370  
Collegedale  
Tennessee 37315  
423.238.2111  
Fax 423.238.3001

E-mail: [postmaster@southern.edu](mailto:postmaster@southern.edu)

August 1, 2006

Ms. Kristina Nelson  
PO Box 672  
Collegedale, TN 37315

Dear Ms. Nelson,

The Human Participants in Research Subcommittee has approved your research application entitled "*Sleep Quality in the Cardiothoracic Surgery Patient: A Comparative Study*". It is the understanding of the committee that you will be collecting data by observing patients' quality of sleep on the cardiothoracic step-down unit and using the Verran and Snyder-Halpern Sleep Scale to assess sleep quality.

It is our understanding that your dissertation research is being conducted through the School of Nursing and Memorial Hospital. All participation in your research must be voluntary, kept in a secure location and disposed of properly after the study is complete. The study is expected to be concluded by September 30, 2006.

Sincerely yours,

Linda Ann Foster, Ph.D., Chair, Human Participants in Research Subcommittee  
Professor, Biology Department  
Southern Adventist University