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## The Health Impacts of Nursing Shift Work

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THE HEALTH IMPACTS OF NURSING SHIFT WORK

By

Amanda M. Shandor, R.N., B.S.N

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF SCIENCE

IN NURSING

Minnesota State University, Mankato

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## The Health Impacts of Nursing Shift Work

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This thesis has been examined and approved by the following members of the thesis committee.

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## ABSTRACT

### THE HEALTH IMPACTS OF NURSING SHIFT WORK

Amanda M. Shandor, R.N., B.S.N. Minnesota State University, Mankato, 2012, 99pp.

This descriptive pilot study was intended to evaluate negative outcomes of shift work stress in nursing. Objective analysis of waist-hip-circumference ratios (WHR) and subjective survey reports were utilized to assess whether differences existed in expressed stress, stress related health disorders, and stress associated behaviors among day shift, night shift, and rotating shift registered nurses (RNs). Statistical analysis of the WHRs indicates that no statistical difference exists in the results from this study across the three nursing shifts.

Nonetheless, survey reports do suggest that variance exists between nursing shifts.

For example, stress related health problems appear to be most prevalent with night shift and rotating shift nurses. Rotating shift RNs had the highest percentage of nurses with one or more health disorders, the highest percentage of bacterial or viral infections over the past 12 months, and the highest number of sick calls in the past 12 months.

Rotating shift RNs also reported the highest prevalence of stress associated behaviors with the exception of motor vehicle crashes, which were reported most often from day shift nurses.

The literature reviewed as well as the data collected in this study supports that expressed stress does vary among day shift, night shift, and rotating shift RNs. Although the quantifiable data supports the presence of higher stress on day shifts, the WHR tool is unfortunately affected by many variables and as such may have provided unreliable

results. This tool needs to be further analyzed with a larger sample size and possibly with a better control of variables prior to accepting results of the collected WHR data.

The results indicate that nurses, particularly those working rotating shifts, could benefit from stress reduction interventions. Moreover, future research should continue evaluating deleterious health effects of nursing shift work, and efficacy of stress reduction interventions in nursing. Stress reduction interventions including education and practice changes should be implemented at individual, facility, community, and federal levels to improve the health of nurses as well as the safety of patients.

## TABLE OF CONTENTS

Chapter		
I.	INTRODUCTION TO THE PROBLEM .....	1
	Problem Statement .....	1
	Purpose of the Study .....	2
	Research Questions .....	2
	Operational Definitions .....	3
	Assumptions .....	3
	Summary .....	4
II.	REVIEW OF THE LITERATURE .....	5
	Shift Work Stress .....	5
	Hyperactive HPA Axis Resulting from Shift Work .....	7
	Physical Expression of Elevated Cortisol Levels .....	8
	Waist-Hip-Circumference Ratios as Tool for Identification of Chronic Stress .....	10
	Concerns Regarding Nursing Shift Work .....	10
	Personal Safety of the Nurse .....	11

Patient Safety .....	11
Implications .....	12
Theoretical Framework .....	14
The Neumann Systems Model .....	14
Primary Prevention as Intervention .....	17
The Theoretical Framework as it Applies to This Study .....	18
Summary .....	19
III. RESEARCH METHODS AND DESIGN .....	20
Design .....	20
Sample and Setting .....	21
Setting .....	21
Ethical Consideration .....	21
Instruments .....	22
Data Collection Procedure .....	25
Data Analysis .....	26
Limitations .....	26



Summary .....	28
IV. RESULTS OF ANALYSIS.....	29
Description of Sample .....	29
Data Analysis.....	32
Research Question One.....	32
Research Question Two.....	33
Research Question Three.....	37
Variations in Nursing Stress at Work and Home.....	38
Summary.....	40
V. DISCUSSION AND CONCLUSION.....	41
Description of the Sample .....	41
Discussion and Conclusions.....	42
Research Question One.....	43
Research Question Two .....	44
Research Question Three .....	47
Likert Stress Scale.....	50

Scope and Limitations . . . . .	50
Concept Map . . . . .	53
Implications for Education. . . . .	55
Implications for Practice . . . . .	57
Implications for Research. . . . .	58
Summary . . . . .	59
References . . . . .	61
Appendixes . . . . .	66
A. The Health Impact of Nursing Shift Work Survey . . . . .	67
B. IRB Letter of Approval - Mayo Clinic Health Systems – Mankato. . . . .	72
C. IRB Letter of Approval – Minnesota State University . . . . .	82
D. Consent for Participation. . . . .	84
E. Letter of Support from Mayo Clinic Health System – Mankato. . . . .	87

## LIST OF TABLES

## Table

1. Participant Demographics .....	30
2. Nursing Shift Demographics .....	31
3. Waist Hip Circumference Ratios.....	33
4. ANOVA Analysis of WHR Results.....	33
5. Medical Conditions Affiliated with Shift Work Stress.....	34
6. Health Outcomes .....	36
7. Stress Associated Behaviors.....	37
8. Likert Stress Scales.....	39

LIST OF FIGURES

Figure 1

1 The Neumann Systems Model .....	15
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## **CHAPTER I**

### **INTRODUCTION TO THE PROBLEM**

According to the Bureau of Labor Statistics, almost 20% of all American workers are engaged in shift work (McMenamin, 2004). “Studies have documented that the effects of night shift work include decreased psychosocial and physiological health of the individual, as well as decreased job performance” (Parikh, Taukari, & Bhattacharya, 2010). More than 50% of full-time shift workers surveyed by the Bureau of Labor reported doing so “because it was the ‘nature of the job’” (McMenamin, 2004). The ‘nature of the job’ in the field of nursing demands round-the-clock care for patients. Consequently, nurses may be at risk for decreased personal health and increased errors in patient care resulting from the cumulative stressful effects of shift work.

#### **Problem Statement**

An abundance of research has been conducted to identify health risks associated with shift work stress in various occupations. However, research has only recently begun studying the risks and effects of nursing shift work (“Shift Work Stress,” 1996). Shift work is extremely prevalent in the field of nursing and may have been overlooked thus far as a result of the societal expectation and perception of nursing shift work as the norm. Previous studies have implicated shift work as a noteworthy source of stress for nurses. In addition, researchers have identified that up to a 3% chance in medical error can result from the stress associated with shift work (Parikh et al., 2010; Rogers, 2008).

Nurses involved in shift work who are at risk for decreased health and poor job performance resulting from stress need to be identified before changes can be made to reduce their stress and improve patient safety. The development of a cost-effective, easy-to-use tool for detection of chronic stress accumulation in individual nurses would allow for recognition of potential harm to the nurse and the patients they encounter. It is important to identify such a tool for the evaluation of future stress prevention interventions prior to initiating those interventions. Furthermore, documentation of adverse health effects affiliated with nursing shift work may prompt the individual, and employers, to take actions directed at preventing negative health effects.

### **Purpose of the Study**

The purposes of this study are to 1) quantify and compare the levels of stress between night shift, day shift, and rotating shift registered nurses (RNs), and 2) to identify whether night shift, day shift, or rotating RNs experiences more health problems associated with chronic work stress when compared to each other.

### **Research Questions**

The specific questions being addressed in this study were:

1. Is there a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by waist-hip-circumference ratios (WHR)?
2. Is there a difference in the prevalence of stress related health problems between night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?

3. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report surveys?

### **Operational Definitions**

- **Hypothalamus-pituitary-adrenal (HPA) axis response.** A physiological response to perceived stress resulting in cortisol release from the adrenal glands (Bjorntorp, 2010). A chronically stimulated HPA axis will result in chronically elevated cortisol levels (Bjorntorp, 2010).
- **Waist-hip-circumference ratio (WHR).** This ratio functions as an indicator of the central fat accumulation which occurs with cortisol release from chronic HPA axis activation (Bjorntorp, 1996). Individuals with greater stress exposure may express greater amounts of central fat (Adler, Epel, Castellazzo, & Ickovics, 2000). WHRs strongly correlate with *salivary* cortisol levels, which been proven to correlate with *serum* cortisol levels. Current data suggests that high WHRs in women may be stronger predictors of mortality than their BMI (Adler et al., 2000).
- **Nursing day shift.** Four, eight, or 12 hour workdays which consistently occur within 7 a.m. to 7 p.m.
- **Nursing night shift.** Four, eight, or 12 hour workdays which consistently occur within 7 p.m. to 7 a.m.
- **Nursing rotating shift.** Any other work schedule with shifts that fall within 7 a.m. to 7 p.m., *and* 7 p.m. to 7a.m.

### **Assumptions**

This study assumes that nurses will answer the self-report surveys truthfully. It also assumes that nurses will be willing to participate in the study; including the self-

report survey and WHR measurements. Furthermore, it assumes that measuring WHRs over one layer of clothing will provide minimal variance.

### **Summary**

Night shift RNs and rotating shift RNs may be at greater risk for acquiring health disorders and providing insufficient patient care as a result of chronic exposure to shift work stressors. The WHR may prove to be a convenient and inexpensive measurement to identify nurses at risk for chronic stress exposure from shift work, and also for identifying those who need stress reduction interventions. The recognition of, and reduction in, shift work stress for nursing is important not only to the individual nurse, but to the community they care for as well.



## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

This chapter will apprise the reader of current research available in the area of chronic stress exposure. The content will more specifically explore current data on the effects of shift work stress across various occupations, on shift work stress specific to the field of nursing, and on the mechanisms by which stress can contribute to disease. Information from a variety of occupations outside of nursing have already studied numerous adverse health effects affiliated with shift work stress and will be reviewed here. The WHR tool developed to evaluate stress exposure and risk for health disorders requires attention and will also be discussed. The Neumann Systems Model, and more specifically Primary Prevention as Intervention, is the theoretical framework upon which this study was based and as such will be explored further in this section.

#### **Shift Work Stress**

According to the Center for Disease Control (CDC), 25% of American employees view their job as the number one stressor in their life (National Institute for Occupational Safety and Health [NIOSH], 1999). Job stress has been defined by the CDC as “harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker.” Job stress “can lead to poor health and even injury” (NIOSH, 1999, p.6).

As of 2004, 20% of Americans and 20% of international employees were involved in shift work (McMenamin, 2004; Wong, Wong, Wong, & Lee, 2010).

Shift work is recognized as work that occurs outside of the typical 7:00 a.m. to 6:00 p.m. workday (Fuller, 2010). As a result of working these unusual hours, shift workers experience “significantly higher job and life stress” than their coworkers on day shift (Srivastava, 2010, p.173). Shift work has recently been of great interest due to the implications it has for personal well-being of the employee and subsequent effects on the health of the general public resulting from the unique stress it produces (Clancy & McVicar, 1994).

According to researchers, three main sources of stress are affiliated with shift work: disruption of circadian rhythms, disruption of sleep resulting in fatigue, and disruption of social/family life (Chung & Chung, 2009; & “Shift-work Stress Impedes Health, Performance,” 1996). Ultimately, these changes negatively affect quality of life (Chung & Chung, 2009; Labyak, 1996). The body’s responses to the chronic stress perceived with these disruptions involves overstimulation of the hypothalamic-pituitary-adrenal (HPA) axis, the sympathetic-adrenal-medullary (SAM) system, and inflammation (Ganster, 2008; Sjogren, Leanderson, & Kristenson, 2006). The body releases hormones such as cortisol (from the HPA axis) and adrenaline (from the SAM system) as a result of this overstimulation process, not just in reaction to stress, but also to an anticipation of future stress. Cortisol has been identified as an interesting indicator of stress exposure due to the number of body systems, and therefore health disorders, which are affected by its dysregulation (Ganster, 2008). The accumulated effects from these hormones accounts for the deterioration in health associated with chronic stress exposure.

### **Hyperactive HPA Axis Resulting from Shift Work**

Researchers believe that a “defeat reaction” occurs when a stressor is perceived as overwhelming, and the fight-or-flight reaction is regarded as impossible (Bjorntorp, 1996, p.295). During this defeat reaction, the body saves energy via stimulus of the HPA axis, in contrast to the fight-or-flight reaction which rapidly utilizes energy (Bjorntorp, 1996). The hyperactive HPA axis then contributes to elevated cortisol and insulin levels, and decreased growth and sex steroid hormones (Bjorntorp, 1996). One of the cumulative effects of these changes over a chronic period is an increase in visceral adipose tissue to allow for readily available energy stores (Bjorntorp, 1996).

Chronic stress can also create pathophysiological changes in the body via circadian rhythm desynchronization (Skipper, Jung, & Coffey, 1990). Alteration of the circadian rhythm is recognized as one of the most certain physiological consequences of shift work (Parikh, Taukari, & Bhattacharya, 2010). The circadian rhythm is a 24 hour cycle regulated by the hypothalamus in response to light and daily routines (Apostolopoulos, Sonmez, Shattell, & Belzer, 2010; Furlan et al., 2000). Researchers have found that more than a five hour alteration in “light-dark/sleep-wake” cycles for five or more consecutive days results in circadian rhythm desynchronization (West, Boughton, & Byrnes, 2008, p.111; Lac & Chamoux, 2004). Moreover, shift workers tend to revert back to their initial circadian rhythms on their days off and with the absenteeism that often occurs as a result of a fatigue (Clancy & McVicar, 1994). As a result, researchers have concluded that no shift other than the normal day shift can produce a synchronized circadian rhythm (Clancy & McVicar, 1994). The

unsynchronized circadian rhythms are referred to as free running rhythms, and ultimately result in a hyperactive HPA axis and elevated cortisol levels (Clancy & McVicar, 1994).

### **Physical Expression of Elevated Cortisol Levels**

The glucocorticoid cortisol has previously been established as a valid indicator of stress exposure (Selander et al., 2006). Typical cortisol patterns follow a diurnal pattern of elevation in the morning upon waking, followed by a general decline throughout the day (Ganster, 2008). However, chronic stress exposure inhibits the body's ability to down-regulate cortisol levels, thereby leading to elevated cortisol levels throughout the day (Selander et al., 2006). A normal circadian rhythm produces higher levels of cortisol and a more elevated body temperature during the day when the individual is active and lower values at night when the worker is asleep. However, research shows that shift workers have free running rhythms resulting in higher cortisol levels and body temperatures when the person is sleeping, and lower values while they are working (Furlan et al., 2000). These lower cortisol levels and body temperatures during work increase the likelihood of sleepiness and decreased mental alertness (Furlan et al., 2000). Furthermore, the elevated cortisol levels and body temperatures during sleep reduce the quality of sleep (Adler, Epel, Castellazzo, & Ickovics, 2000). Morning measurements of cortisol have been designated as the best indicator of stress, whereas evening cortisol level measurements have been designated as the best predictor of health disorders (Ganster, 2008). Irregardless, WHRs will not vary throughout the day and are a good physiological marker of stress exposure.

Chronically elevated cortisol levels, affiliated with chronic exposure to stress, result in metabolic changes that predispose shift workers to increased risk for diseases

(Sjogren et al., 2006). Many of these disease risks are related to the central fat accumulation that occurs with elevated cortisol levels from a hyperactive HPA axis. The documented health risks attributed to elevated cortisol levels include dyslipidemia, hypertension, obesity, non-insulin dependent diabetes, and stroke (Kroenke et al., 2006; Bjorntorp, 1996).

To date, the effects of shift work have been studied in a number of occupations requiring round- the- clock employment including: flight attendants (Chung & Chung, 2009), truck drivers (Apostolopoulos et al., 2010), auto factory employees (Caruso, 1999), dairy laborers, petrochemical staff, shoe factory workers, nuclear power plant employees, textile workforce, and security guards (Srivastava, 2010). The results from each individual study differed slightly when compared between occupations, however the cumulative results portray a clear depiction of health risks which can be affiliated with shift work stress. The resultant health concerns for shift workers include increased risks for colorectal cancer, breast cancer, traffic accidents, chronic fatigue, anxiety, depression, coronary heart disease, reduced sleep quality, poor social relationships, peptic ulcer disease, gastroduodenitis, headaches, neck pain, back pain, palpitations, low birth weight deliveries, miscarriages, hypertension, infertility, decreased sperm count, divorce, impaired immunity, obesity, diabetes, myocardial infarctions, schizophrenia, irritation, alcohol and drug use, hypercholesterolemia, and prostate cancer (Apostolopoulos et al., 2010; Parikh et al., 2010; Srivastava, 2010; Wong et al., 2010; Willis, O'Connor, & Smith, 2008; Chan, 2008; Croteau, Marcoux, & Brisson, 2006; Kubo et al., 2006; Twarog, 2005; Caruso et al., 2004; Clancy & McVicar, 1994; Labyak, 1996). Additional

studies concluded that conditions such as diabetes, epilepsy, and psychological disorders can be exacerbated by shift work (Apostolopoulos et al., 2010).

### **Waist-Hip-Circumference Ratios as Tool for Identification of Chronic Stress**

Thus far, minimal research has been conducted on the stress effects of nursing shift work as indicated by HPA axis activity and cortisol levels. Measuring changes in central fat accumulation via the WHR is a noninvasive method to assess for these chronically elevated cortisol levels. WHRs have been strongly correlated with elevated salivary cortisol levels. In addition, salivary cortisol levels have been strongly correlated with free serum cortisol levels (Adler et al., 2000; Selander et al., 2009). As a result, the WHR has been indicated as a valid, sensitive, reliable, and non-invasive indicator of chronic HPA axis activation and elevated cortisol levels (Bjorntorp, 1996). Because WHRs are such good indicators of chronic stress exposure, they may be helpful in studying whether shift work puts nurses at increased risk for decreased health.

### **Concerns Regarding Nursing Shift Work**

Occupational stress in nursing can have profound consequences not only on the worker themselves, but also on patients (Golubic, Milosevic, Knezevic, & Mustajbegovic, 2009). Work ability is a term used to convey a worker's capacity to fulfill their work expectations, and is generally affected by work demands and available resources (Golubic et al., 2009). Physical, mental, and social health are listed among the resources which can contribute to work ability; all of which can be affected by occupational stress (Golubic et al., 2009). Nurses working night shifts or rotating shifts are noted to have higher stress than their daytime co-workers, ultimately placing them at increased risk for compromised health and work ability (Fuller, 2010).

### **Personal Safety of the Nurse**

Previous research on the stress of nursing shift work has identified a variety of factors which may impede nurses' personal safety. For example, the American Nurses Association's (ANA) 2001 Health and Safety Survey found that in a sample of 4,826 nurses, more than one in ten had been in a motor vehicle accident as a result of fatigue from shift work (Slavin, 2008). Abnormal eating behaviors have also been associated with nursing shift work. Nurses' report eating more to cope with stress, and eating more high sugar foods in order to stay awake (Wong et al., 2010). Conversely, Inoue, Kakehashi, Oomori, and Koizumi (2004) found that in a sample of 538 shift working nurses, more than 10% were working under the stress of hypoglycemia. Chan (2008) discovered that nurses involved in shift work take more sick days. He also reported that in a sample of 163 nurses in shift work, 72% reported insufficient sleep (Chan, 2008). Similarly, Fuller (2010) found that rotating and night shift nurses get less hours of sleep than those working day or evening shifts. West, Ahern, Nyren, and Kwanten (2007) discovered that shift nurses coping with poor sleep quality are more prone to depression. In addition, Twarong (2005) found that nurses working specifically rotating shifts have an increased risk of breast cancer after 30 or more years, an increased risk of coronary heart disease after only six years, and an increased occurrence of low birth weight deliveries and miscarriages.

### **Patient Safety**

In addition to the decrease in nursing safety, decreased patient safety has also been related to shift work. A survey of nursing supervisors reported that shift working nurses demonstrated lower job performance (Parikh et al., 2010; Laydak, 1996). Inoue

et al. (2004) and Clancy and McVicar (1994) discovered that the majority of nursing errors are made by nurses in the early morning hours, (i.e. during their shift). In fact, Fuller (2010) found that nurses involved in shift work are about twice as likely to make errors or incur job related injuries.

### **Implications**

Hospital administration should be concerned for their employees' and patients' safety. Changes need to be made by both nurses and hospital organizations (Parikh et al., 2010). For example, organizations can implement interventions such as “chronobiotic agent[s]” in the workplace such as bright lights, which can help shift workers cope with circadian rhythm changes (Labyak, 1996). Work schedules could reflect minimal risk assignments. Research indicates that more than 16 hours between shifts is necessary for nurses to obtain at least seven hours of sleep, therefore shorter eight hour shifts are healthier than the popular 12 hour shifts (Parikh et al., 2010; Kuhn, 1997). If 12 hour shifts are unavoidable, research indicates that 3:00 a.m. to 3:00 p.m. shifts are less detrimental than 7:00 p.m. to 7:00 a.m. shifts (Parikh et al., 2010). Moreover, shift working nurses who perceive control over the days and hours they worked report lower stress at work and home. Therefore, self-scheduling is another option that hospitals could afford their workers (Fuller, 2010; Parikh et al., 2010). Organizations could also provide healthy snack options at night to encourage proper nutrition, whether via cafeterias with extended hours of operation or refrigerated vending machines (Wong et al., 2010). Hospitals could also provide nap time facilities for employees. Twarong (2005) found that facilities that already have report better nursing morale and improved motivation. Research also indicates that napping is extremely



successful in helping workers maintain high degrees of alertness and making quick decisions, which undoubtedly includes nurses (Twarong, 2005).

It is important for nurses to be aware of these risks and to implement interventions suggested in numerous studies over the last two decades that can minimize untoward effects of working night shifts. Chronobiologists recommend that shift workers exercise, nap, and rotate shifts in a clockwise manner (Clancy & McVicar, 1994). Kuhn (1997) suggests that shift workers also avoid alcohol, sleep medications, and fatty foods because they can disrupt sleep quality. Nozaki et al. (2009) recommends proper nutrition to decrease signs and symptoms of fatigue. Nurses should utilize ear plugs, maintain temperatures around 75 degrees Fahrenheit, and avoid televisions and radios while sleeping to improve the quality of sleep obtained (Kuhn, 1997). Kuhn (1997) encourages exposure to bright light for several hours upon awaking because it can assist with improving circadian rhythm imbalances. Social support reduces HPA axis stimulation and subsequently the risk of disease; therefore, quality time with family and friends is beneficial (Sjogren et al., 2006). Furthermore, daily exercise can improve immunologic function, psychological health, and quality of sleep (Kuhn, 1997). Nearby health care facilities, County Public Health Centers, and hospital human resource departments could initiate community awareness programs to disperse the above mentioned information.

Public policies and programs could also be of benefit in the management of shift work stress. Public policies could implement fitness center discounts or price reductions on health foods (Apostolopoulos et al., 2010). These policies could also mandate that hospitals maintain 24 hour cafeterias, or provide a cart of healthy food choices that travels throughout the hospital during the night shift. Public programs could improve

organizational and individual knowledge about the side effects of shift work stress. For example, the ANA and NIOSH are currently working on the development of a training program to help nurses adjust to shift work (Slavin, 2008).

## **Theoretical Framework**

### **The Neumann Systems Model**

The theoretical framework used in this study is the Neumann Systems Model (NSM). This model is useful in that it emphasizes nursing interventions to reduce stress and improve the homeostasis of the individual or group in order to optimize health (Gunusen, Ustun, & Gigliotti, 2009). The individual or group is identified as an open system which is surrounded by concentric rings whose purpose is to maintain system stability from stressor invasion. The normal line of defense (NLD) is a standard of health by which changes in stability or wellness can be measured. It is represented as the middle of the three concentric rings. The NLD represents the accumulation of various coping mechanisms over time, which maintains system stability, or wellness. This line of defense is flexible, with expansion reflecting improved wellness, and contraction reflecting diminished wellness or illness. The flexible line of defense (FLD) is the outermost ring which protects the NLD and maintains wellness. This ring is described as being “accordion-like” in that during expansion it provides increased protection, whereas less protection is available when it draws closer (Fawcett, 2005, p.172). The third concentric ring resides closest to the basic system structure and is known as the lines of resistance (LOR). The LOR function to stabilize and return the system to wellness following exposure to an environmental stressor (Fawcett, 2005).

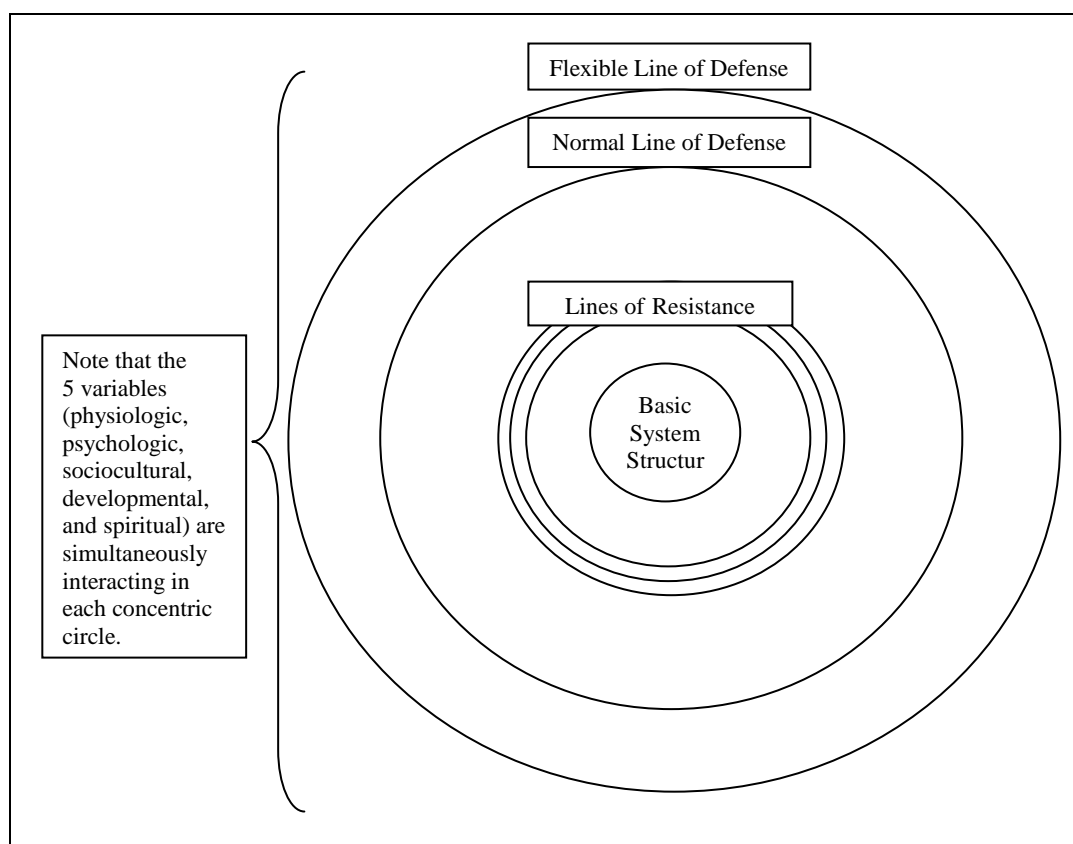


Figure 1 – The Neumann Systems Model

The NSM views systems as holistic entities that are in constant interaction with the environment. Stressors existing in that environment are capable of invading the NLD, if they are not adequately buffered by the FLD. If the NLD is invaded, then the LOR is activated as a result. Stress is the initial response to stressors which invade the LOR, however if the stress is not alleviated it can result in strain identified by Neumann as a core response (Gunusen, Ustun, & Gigliotti, 2009). When the LOR is activated during NLD invasion, various coping mechanisms obtained over time which are physiological, psychological, sociocultural, developmental, and spiritual in nature are utilized in a stress response. If the coping strategies are effective, a core response is prevented. However, if the stressors are too strong or the coping mechanisms too weak,

then burnout will eventually result and one of the consequences of burnout is “poor health outcomes” (Gunusen, Ustun, & Gigliotti, 2009, p.201). Individuals with burnout have been found to have higher cortisol levels, more sleep problems, increased anxiety, and are more prone to smoking and alcohol use (Gunusen, Ustun, & Gigliotti, 2009).

Neumann describes five interacting variables: physiological, psychological, sociocultural, developmental, and spiritual. The variables are simultaneously reacting within in each line of defense and during core responses. As previously mentioned, the variables are influential in individual coping mechanisms and account for variation in stress reactions from person to person (Gunusen, Ustun, & Gigliotti, 2009).

The environment is subdivided into internal, external, and created environments. The internal environment is comprised of forces within the boundaries of the system structure itself. The external environment is defined as factors lying outside the system boundaries. Lastly, the created environment is unconsciously constructed via manipulation of the system variables in an effort to maintain or return system stability. It has been referred to as a “protective coping shield” which can be increased or decreased based on unconscious knowledge of need to adjust for available energy utilized by the system for preservation of wellness (Fawcett, 2005, p.174).

Three types of stressors exist within the environment: intrapersonal, interpersonal, and extrapersonal. Intrapersonal stressors are those that reside within the boundaries of the system (Fawcett, 2005). Examples of intrapersonal stressors include Type A and neurotic personalities (Gunusen, Ustun, & Gigliotti, 2009, p.202). Interpersonal stressors are those that arise outside the system boundaries but at a “proximal range” (Fawcett, 2005, p.174). An example of interpersonal stressors would be “workplace conflicts,

relationships with colleagues, and communication problems with patients and relatives” (Gunusen, Ustun, & Gigliotti, 2009, p.202). Extrapersonal stressors also arise outside the system boundaries but at a “distal range” (Fawcett, 2005, p.174). Examples of extrapersonal stressors include “reduced staff, long work hours, unclear job descriptions,” and shift work (Gunusen, Ustun, & Gigliotti, 2009, p.202).

### **Primary Prevention as Intervention**

Prevention as Intervention is a middle range theory derived from the NSM involving improved health resulting from stress reduction. The goal within this theory is to “‘retain’ optimal stability or wellness” primarily through “health promotion” (Aylward, 2006, p.289). Neumann asserts that health is established when the energy available is greater than the energy output, therefore efforts are directed at preventing or reducing energy loss. Prevention as intervention involves primary, secondary, and tertiary prevention; these interventions should be initiated as soon as a stressor is suspected in order to *prevent* a reaction from occurring. Primary prevention is directed at preventing stressors and reducing risk for stress in order to protect the NLD and strengthen the FLD (Aylward, 2006). Primary intervention is used when the NLD has not yet been penetrated and no symptoms exist (August-Brady, 2000). If a primary intervention was unsuccessful (or not initiated) and a stressor reaction has already occurred which has penetrated the NLD, then secondary intervention should be utilized to strengthen the ILD and protect the system. Secondary intervention involves the use of internal and external system resources to “‘attain’ optimal client-system stability” in order to conserve energy and achieve “reconstitution” (Aylward, 2006, p.289). Reconstitution is defined as the return to stability after a nursing intervention directed

at stress reduction, and may result in “a state of wellness ...higher, the same, or lower than ...before the system was stabilized” (Aylward, 2006, p.289). Death can occur when secondary prevention is ineffective. Tertiary prevention can be initiated at any time during reconstitution and is directed at *maintaining* wellness by supporting strengths and preserving system energy. Neumann asserted that tertiary prevention is connected to primary prevention in a circular relationship, and that these three prevention strategies can be used synergistically (Aylward, 2006).

### **The Theoretical Framework as it Applies in this Study**

This particular theoretical framework will be used in this study to identify the need for primary, secondary, and/or tertiary prevention as it relates to shift work stress amongst nurses. Minimally, there will be opportunity for primary prevention to prevent system instability related to work stress. However, previous research has identified a need for secondary intervention to improve health disorders that have already occurred in nursing as a result of shift work stress. Furthermore, tertiary prevention can be utilized to maintain any gain on nurses’ health (or system stability) achieved as a result of the study, for instance at it relates to nurses’ increased awareness of shift work stress.

This study will evaluate for NLD invasion resulting from insufficient FLDs and LORs as a result of poor coping mechanisms or insurmountable work stress. It will also assess the subsequent morbidity that arises from that invasion. That data will be then evaluated and used to indicate whether a particular shift has a greater need for stress reduction interventions to prevent future NLD invasion.

### **Summary**

Waist –hip-circumference ratios reflective of cortisol levels may prove to be valid indicators of health risks resulting from chronic exposure to environmental stressors in shift work (Bjorntorp, 1996). Abdominal fat has a higher sensitivity to elevated cortisol levels than peripheral fat, therefore indicating that individuals with higher stress exposure resulting in elevated cortisol levels will present with increased abdominal fat, and lower WHR ratios (Adler et al., 2000). The identification of stress indicators via this tool can assist with recognizing individuals who are at risk for compromised health associated with exposure to shift work stress. Furthermore, the data collected on the WHR tool in this study provides a foundation for future research to use in evaluation of stress reduction interventions targeted at nurses in order to improve nursing and patient safety within our communities.

## **CHAPTER III**

### **RESEARCH METHODS AND DESIGN**

Chapter III addresses the methodology used in this study's research including the design, population, sample, setting, data collection, data analysis, and limitations. The instruments and procedures that were used in this study are outlined in this section. Furthermore, ethical considerations and study limitations are also discussed.

#### **Design**

This exploratory, descriptive pilot study is designed to report any variations in the indicators and side-effects of work stress between dayshift, nightshift, and rotating shift RNs, as well as to identify nursing shifts at risk for stress related health disorders. The study should also provide information about the ease of using the WHR tool for use in future evaluations of stress reduction implementations. Previous research has concluded that a combination of subjective and objective data provides the most effective analysis of work stress and strain (Ganster, 2008). As a result, RNs were recruited voluntarily to complete a real time self-report survey on a hospital provided laptop computer in a private area of the hospital unit on days that they were working on, on the days of data collection. These same nurses also had their WHRs measured objectively by a single data collector throughout the study, in a private area of the hospital unit, on the days of data collection.



## **Sample and Setting**

The convenience sample included full-time and part-time RNs who work day shifts, night shifts, and rotating shifts. Day shift nurses are defined as those consistently working any shift from 7 a.m. to 7 p.m.; and, night shift nurses are defined as those consistently working any shift from 7 p.m. to 7 a.m. Rotating shifts are defined as any combination of the two. The goal for participation was more than 75 volunteers, with no more than 200 involved. Nurses were recruited voluntarily in the nursing stations during the days of data collection. No incentives were offered with this study. A sheet was provided for RNs to provide their e-mail address if they wished to receive a copy of the compiled anonymous results of the study. Results were available to all RNs at the hospital where the study took place, irregardless of participation in the study.

### **Setting**

Data was collected at a single private, rural teaching hospital licensed for 272 beds. This level three trauma facility currently employs 125 full-time RNs and an unknown number of part-time RNs. After approval was obtained from the International Review Boards of the university and hospital, nurses were recruited voluntarily during day shifts and night shifts in nursing stations on the pediatric, women's, intensive care, medical/surgical, cardiac, and orthopedic units, as well as in the emergency department.

### **Ethical Consideration**

Human subject consent was obtained via signed consent forms from every participant. In addition, participation in the research qualified as implied consent. Anonymity was maintained by excluding participant names from surveys; instead, they were represented by numbers in the excel database. Self-report surveys were set up at a

workstation in a private area of the hospital unit in which that RN was working in order to provide maximum privacy and limited visibility by bystanders. Furthermore, WHR measurements were taken discreetly within that same private area of the hospital unit, over one layer of clothing (in addition to undergarments), along the mid-axillary line, and with minimal visibility of the tape measure by bystanders. The information was then secured in a password protected computer and in a password protected online site. The risks and benefits of this research were presented to participants in writing prior to data collection, including their right to withdraw from the study at any time. Risks were less than minimal and included privacy from bystanders. There were no individual benefits for participating in the study. However, there may be a benefit of increased awareness of potential side effects of shift work stress, interventions to minimize those side effects, and future use of a tool for quantification of work stress exposure for the nursing community as a whole.

### **Instruments**

Data was collected using two tools: the WHR and a self-report survey. The survey is available in Appendix A and includes data about issues that may places nurses at increased risk for job stress, behaviors associated with exposure to stress, and health disorders affiliated with chronic stress exposure. Questions asked included:

1. What is your current full-time equivalent (FTE)?
2. Which percentage of your nursing shifts fall between 0700 and 1900 (day shift) on average?
3. Which percentage of your nursing shifts fall between 1900 and 0700 (night shift) on average?

4. How many years have you worked this shift?
5. How many total years of experience do you have working in nursing?  
(Isikhan, Comez, & Danis, 2004)
6. Are you male or female?
7. What is your age? (Isikhan, Comez, & Danis, 2004)
8. Are you currently married? (Isikhan, Comez, & Danis, 2004)
9. If you have been divorced, did this occur after working in nursing?
10. Do you have any of the following conditions:
  - a. Thyroid disorder
  - b. Gastroesophageal reflux
  - c. Peptic ulcer disease or gastritis (Isikhan, Comez, & Danis, 2004)
  - d. Hypercholesterolemia (Ganster, 2008)
  - e. Hypertension (McNeely, 2005)
  - f. History of heart attack
  - g. Palpitations
  - h. Type 2 diabetes (Ganster, 2008)
  - i. History of stroke
  - j. Obesity (McNeely, 2005)
  - k. Infertility
  - l. Anxiety
  - m. Depression (McNeely, 2005)
  - n. Breast cancer
  - o. Colon cancer

- p. Prostate cancer
  - q. Sleep disorders (i.e. Insomnia/Narcolepsy) (Isikhan, Comez, & Danis, 2004)
  - r. Chronic headaches (Isikhan, Comez, & Danis, 2004)
  - s. Excessive nervousness (Isikhan, Comez, & Danis, 2004)
  - t. History of or current substance abuse (McNeely, 2005)
  - u. Coronary artery disease (Ganster, 2008)
  - v. Other
11. How many times have you been ill with a viral or bacterial infection in the past 12 months? (McNeely, 2005)
12. How many shifts have you called in sick for in the past 12 months? (McNeely, 2005)
13. How many miscarriages or low birth weight deliveries have you had since working in nursing?
14. How many alcoholic beverages do you consume on a typical day when you are drinking (1 serving equals 1 beer, 1 glass of wine, or 1 shot of liquor) (Gunusen, Ustun, Gigliotti, 2009)?
15. On average, how many days per week do you drink alcohol?
16. How many motor vehicle accidents have you been in since you started nursing?
17. Do you smoke cigarettes? (Gunusen, Ustun, Gigliotti, 2009).
18. How stressful would you rate your life at home?
19. How stressful would you rate your life at work?

An individual's WHR accounts for their central fat accumulation which may be affected by a hyperactive HPA axis. Research indicates that a chronically hyperactive HPA axis is a "cardinal sign" of chronic perceived stress (Bjorntorp, 1996). Abdominal fat has a greater response to cortisol than peripheral fat which is why researchers have concluded that increased exposure to stressful events increases central fat accumulation (Adler et al., 2000). For that reason, the WHR is a valid indicator of chronic perceived work stress; it has also been established as a valid indicator of disease prevalence (Bjorntorp, 1996). Keep in mind that many conditions other than stress can contribute to increased visceral adipose tissue such as metabolic disorders and this will be discussed further under limitations.

### **Data Collection Procedure**

Volunteer day shift and night shift nurses participated in anonymous self-report surveys available on a hospital provided laptop computer which were completed in real time in private settings in the nursing units on days of data collection only. Each individual nurse was also physically measured, and remeasured for accuracy, at the waist and hip by only one data collector throughout the study to minimize human error. Waist circumference was measured between the upper iliac crest and lower costal margin in the midaxillary line (Adler, et al., 2000). Hip circumference was measured at the maximum width of the buttocks, or gluteofemoral fold (Adler et al., 2000). The nurses were measured over a single layer of clothing (in addition to their undergarments) with a tape measure in a private area of the hospital unit on which the RNs were working on the days of data collection. Individual WHRs were calculated by dividing the mean waist

circumference by the mean hip circumference and this information was also entered into the computerized data collection system (Adler et al., 2000).

### **Data Analysis**

Descriptive statistics were then used to describe the results. Analysis of WHR assessments involved comparison of the mean WHR results for day shift, night shift, and rotating shift RNs. The survey information was tabulated in an Excel format to organize the results obtained from the self-report survey. A table of results was constructed to compare the prevalence of shift work related diseases for employees on night shift, day shift, and rotating shifts.

### **Limitations**

The WHR results can be altered by a number of conditions. For example, smoking and alcohol intake by participants can elevate cortisol levels through HPA axis activation, thereby altering WHRs as a result (Bjorntorp, 1996). Testosterone inhibits cortisol secretion, and as a result may result in inaccurate WHR observations in male participants and those with conditions such as polycystic ovarian disease (PCOS) (Bjorntorp, 1996). Estrogen deficiency can induce visceral fat accumulation which may alter WHRs for women with low estrogen levels (Bjorntorp, 1996). Visceral adipose tissue can also be affected by a number of lifestyle choices including, but not limited to, eating habits, food choices, heredity, and insufficient exercise. False positive elevations may be seen in patients with obesity, depression, pregnancy, Cushing's disease or syndrome, hypertension, and diabetes mellitus; as well as in patients receiving glucocorticoid treatment, estrogen replacement therapy, and oral contraceptives (Dunphy,

2011). There may also be a number of other conditions that exact changes on cortisol expression which are as yet unknown.

Unfortunately stress exposure is multifactorial and involves stress at home as well as work. Therefore, work related stress associated with shift work may be difficult to evaluate with a small sample size. Some factors known to increase work related stress, other than shift work, include high workloads, ambiguous role demands, low control or autonomy, negative interactions with coworkers, frequent interruptions, precepting students or new employees, dealing with dying patients, years of work experience, low or no perceived support from coworkers or supervisors, and inadequate staffing (Ganster, 2008; Isikhan, Comez, & Danis, 2004; & McNeely, 2005). Furthermore, these factors are difficult to quantify or account for as variables within the sample. Various stressors also exist within a nurse's personal life, which will also contribute to higher stress levels. Previous research has found that marital status affects job stress. For example, married nurses experience more job stress than single or divorced nurses, and divorced nurses experience the least amount of job stress (Isikhan, Comez, & Danis, 2004). Social support in the form of having someone to talk to or having someone help with tasks at home have also been affiliated with improved well-being and reduced stress; whereas a lack of social support at home can increase the effects of job stress by reducing that person's coping abilities (McNeely, 2005). Age has also been found to be a significant factor in mean job stress scores as stress scores tend to decrease with increased age (Isikhan, Comez, & Danis, 2004).

Limitations may also include the small sample size and possible inaccuracy of self-reports. Nurses may not be forthright with their answers if they are concerned that

others can see their responses, even though as much privacy as possible will be provided. The sample size is appropriate for a pilot study; however, it should be expanded upon in future studies to reduce the effects of these limitations on results. The layer of clothing, in addition to undergarments, over which the WHR was obtained may result in minimally inaccurate measurements. Nurses may have also been unwilling to participate in the study, especially nurses who currently work alongside the researcher. Another limitation involves the survey question addressing marital status because no alternatives were offered to participants such as significant other, life partner, fiancé, etc due to the previously established correlation between marital status and shift work by prior research.

### **Summary**

This study evaluated stress exposure in volunteer day shift, night shift, and rotating shift nurses in a variety of nursing units within the same hospital facility. WHRs and self-report survey results were collected and compiled via a descriptive pilot study design. The data was then presented in excel tabulations for ease of comparison of WHRs, and data from self-report surveys including the prevalence of stress associated health problems between nurses working various shifts. This information should be helpful in identifying nursing shifts at risk for shift related health disorders. When designing the study, limitations were minimized as much as possible without compromising participant privacy. However, stress is multifactorial and various stressors outside the work environment may exact a significant effect in such a small sample size. Nonetheless, this study should provide some insight into the health impact arising from nursing shift work.



## **CHAPTER IV**

### **RESULTS OF ANALYSIS**

Chapter four will explore the results available from this descriptive pilot study. The sample of volunteers will be discussed, the data analysis will be explained, and research questions will be re-addressed. The data obtained from the research will also be presented in tabular format.

#### **Description of Sample**

The volunteer sample for this study consisted of 77 RNs from one rural teaching hospital. Seventy-six RNs were included in the survey component of the study, and 75 were included in the WHR component. Exclusion criteria from the survey involved vague reporting of the nursing shift worked, and involved only one RN. Exclusion criteria from the WHR consisted of pregnancy, and also only included one RN. Four participants were male, and 72 were female. Twenty-eight participants were between 18 and 30 years of age. Twenty-three were between 31 and 40 years of age. Ten were ages 41 to 50 years old. Eight were 51 to 60 years old. Seven were older than 60 years (see Table 1).

Table 1

*Participant Demographics*

	N	%	N	%	N	%	N	%
			Days	Days	Nights	Nights	Rotating	Rotating
<b>Age</b>								
18 - 30 years	28	36.8	1	5.6	12	38.7	15	55.6
31 - 40 years	23	30.3	6	33.3	11	35.5	6	22.2
41 - 50 years	10	13.2	4	22.2	3	9.7	3	11.1
51 - 60 years	8	10.5	4	22.2	2	6.5	2	7.4
>60 years	7	9.2	3	16.7	3	9.7	1	3.7
<b>Years of Nursing Experience</b>								
0 – 5 years	32	42.1	1	5.6	15	48.4	16	59.3
6 – 10 years	13	17.1	4	22.2	5	16.1	4	14.8
11 – 20 years	14	18.4	5	27.8	5	16.1	4	14.8
20 - 30 years	8	10.5	4	22.2	3	9.7	1	3.7
>30 years	9	11.8	4	22.2	3	9.7	2	7.4
<b>Married</b>								
No, I've never been married	13	17.1	0	0	6	19.4	7	25.9
No, I'm divorced	5	6.6	2	11.1	2	6.5	1	3.7
Yes, I'm married	58	76.3	16	88.9	23	74.2	19	70.4
<b>Divorced After Working In Nursing</b>								
Yes	6	7.9	4	22.2	2	6.5	0	0
No	24	31.6	3	16.7	9	29.0	12	44.4
Not applicable	46	60.5	11	61.1	20	64.5	15	83.3
<b>Gender</b>								
Female	72	94.7	18	100	28	90.3	26	96.3
Male	4	5.3	0	0	3	9.7	1	3.7

Eighteen RNs worked day shifts between the hours of 7:00 am and 7:00 pm.

Thirty-one worked night shifts from 7:00 pm to 7:00 am. Twenty-seven worked rotating

shifts defined as less than 90% of shifts worked either between 7:00 am to 7:00 pm, or 7:00 pm to 7:00 am. Four participants worked a 1.0 full-time equivalent (FTE). Thirty-seven worked a 0.9 FTE. Fourteen worked 0.8. Four worked 0.7. Thirteen were contracted for a 0.6 FTE. Four were working less than a 0.6 FTE including per diem staff (see Table 2). Per diem means that these nurses are only required to work 18 hours per calendar month, but are allowed to work as many hours as are available.

Table 2

*Nursing Shift Demographics*

	N	%	N	%	N	%	N	%
			Days	Days	Nights	Nights	Rotating	Rotating
Current FTE								
1.0	4	5.3	1	5.6	0	0	3	11.1
0.9	37	46.7	12	66.7	15	48.4	10	37.0
0.8	14	18.4	2	11.1	5	16.1	7	25.9
0.7	4	5.3	0	0	1	3.2	3	11.1
0.6	13	17.1	3	16.7	7	22.6	3	11.1
< 0.6	4	5.3	0	0	3	9.7	1	3.7
Works $\geq$ 90% Hours Between 0700 and 1900	18	23.7	-	-	-	-	-	-
Works $\geq$ 90% Hours Between 1900 and 0700	31	40.8	-	-	-	-	-	-
Rotating Shifts	27	35.5	-	-	-	-	-	-
Years on This Shift								
0 – 5 years	41	54.0	5	27.8	19	61.3	17	63.0
6 – 10 years	16	21.1	8	44.4	2	6.5	6	22.2
11 – 20 years	13	17.1	4	22.2	7	22.6	2	7.4
>20 year	7	9.2	2	11.1	3	9.7	2	7.4

## Data Analysis

The questions addressed in this study were:

1. Is there a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by waist-hip-circumference ratios (WHR)?
2. Is there a difference in the prevalence of stress related health problems between night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?
3. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report surveys?

### Research Question One

The differences in expressed stress between day, night, and rotating shift RNs were evaluated by obtaining two waist and two hip circumference measurements from each volunteer, which were measured to the nearest quarter inch using a standard tape measure. The two waist measurements for each individual were added together and divided by two to obtain an average. The same was done for the hips. The average hip measurement was then divided by the average waist measurement to get the WHR. The average WHR for day shift RNs was 0.78228, night shift RNs was 0.80262, and rotating shifts RNs was 0.79157 (see Table 3). Analysis of the data using an ANOVA table was then calculated to determine whether any statistical difference existed between the nursing shifts (see Table 4).

Table 3

*Waist Hip Circumference Ratios*

	N	Mean	Range
<b>WHR</b>			
Day Shift	18	0.782285883	0.6849315 - 0.8682635
Night Shift	31	0.802623719	0.6717791 - 1.0405728
Rotating Shift	27	0.79156825	0.6977492 - 0.8815789

Table 4

*ANOVA Analysis of WHR Results*

Source	Sum of Squares	df	Mean Squares	F ratio	Critical F <sub>95</sub>
Between Group Variance	0.004928535	2	0.002464268	.494511003	3.15
Within Group Variance	0.3587934	72	0.004983242	-	-
Total Variance	0.36372193	74	-	-	-

**Research Question Two**

Differences in the prevalence of stress related health problems between day, night, and rotating shift RNs was collected from subjective self-report surveys completed in real time after WHRs were obtained. Various medical conditions found to be prevalent in other shift working professions were listed on the surveys and participants were asked to check the box next to the health disorder if they suffered from any of them. Volunteers were also asked to list any additional medical conditions they had which were not listed under the “Other” option. The results were then compiled for each shift (see Table 5).

Table 5

*Medical Conditions Affiliated with Shift Work Stress*

S	N	%	N	%	N	%	N	%
			Day	Days	Nights	Nights	Rotate	Rotate
Thyroid Disorder	1	1.3	0	0	1	3.2	0	0
GERD	8	10.5	2	11.1	2	6.5	4	14.8
PUD/ Gastritis	1	1.3	1	5.6	0	0	0	0
Hypercholesterolemia	5	6.6	1	5.6	1	3.2	3	11.1
Hypertension	1	1.3	0	0	1	3.2	0	0
History MI	1	1.3	0	0	0	0	1	3.7
Palpitations	2	2.6	0	0	2	6.5	0	0
Type 2 Diabetes	0	0	0	0	0	0	0	0
History Stroke	0	0	0	0	0	0	0	0
Obesity	7	9.2	1	5.6	4	12.9	2	7.4
Infertility	1	1.3	0	0	1	3.2	0	0
Anxiety	7	9.2	0	0	4	12.9	3	11.1
Depression	7	9.2	0	0	3	9.7	4	14.8
Breast Cancer	0	0	0	0	0	0	0	0
Colon Cancer	0	0	0	0	0	0	0	0
Sleep Disorders Insomnia/Narcolepsy	3	4	2	11.1	0	0	1	3.7
Chronic Headaches	8	10.5	0	0	2	6.5	6	22.2
Excessive Nervousness	2	2.6	0	0	0	0	2	7.4

Table 5 continued

*Medical Conditions Affiliated with Shift Work Stress*

	N	%	N	%	N	%	N	%
			Day	Days	Nights	Nights	Rotate	Rotate
History of/Current Substance Abuse	0	0	0	0	0	0	0	0
Coronary Artery Disease	1	1.3	0	0	0	0	1	3.7
None	30	39.5	12	66.7	12	38.7	6	22.2
Other	-	-	*	-	**	-	***	-

\* Day Shift – Chronic polneuropathy.

\*\* Night Shift – Multiple Sclerosis, endometrial cancer, anemia, skin cancer, and chronic back/leg pain.

\*\*\* Rotating Shift- Myofascial pain syndrome, celiac sprue, endometriosis, and chronic back pain.

Stress related health problems were further assessed with three additional questions on the self-report survey. These questions assessed the number of viral or bacterial infections experienced over the past 12 months, the numbers of shifts called in sick for over the past 12 months, and the number of miscarriages or low birth weight deliveries (LBW) experienced after working in nursing. The information for this section was also evaluated according to the shift the participant worked (see Table 6).







Table 7 continued

*Stress Associated Behaviors*

	N	%	N	%	N	%	N	%
			Days	Days	Nights	Nights	Rotate	Rotate
How many motor vehicle accidents have you been in since you started nursing?								
0	55	72.4	13	72.2	23	74.2	19	70.4
1	16	21.1	2	11.1	7	22.6	7	25.9
2	4	5.3	2	11.1	1	3.2	1	3.7
3	1	1.3	1	5.6	0	0	0	0
>= 4	0	0	0	0	0	0	0	0
Do you smoke cigarettes?								
Yes	3	3.9	1	5.6	1	3.2	1	3.7
No, I quit	18	23.7	4	22.2	5	16.1	9	33.3
No, I have never smoked	55	72.4	13	72.2	25	80.6	17	63.0

**Variations in Nursing Stress at Work and Home**

Likert scales were utilized to evaluate the degree of stress each volunteer was experiencing at work and at home. Unfortunately stress exposure is multifactorial which makes it difficult to study. The Likert scales were collected to gain a sense of the degree of stress each participant felt they were undergoing at home versus work. The data was separated according to nursing shift affiliated with each participant and results are presented in Table 8.



## **Summary**

This study sought to evaluate expressed stress, stress related health disorders, and high risk behaviors associated with stress exposure from nursing shift work. The data from waist and hip measurements and are an attempt to evaluate the cortisol exposure participants experience as a result of shift work stress (see Table 3 and Table 4). Health disorders affiliated with stress from nursing shift work has not been evaluated or catalogued thus far. As a result, this study has also attempted to evaluate whether nurses involved in shift work are more prone to suffering from various medical conditions (see Table 5 and Table 6). Certain high risk behaviors have been associated with increased stress exposure and these behaviors were also evaluated to further assess stress exposure between various nursing shifts (see Table 7). Lastly, Likert Scales were utilized to evaluate the level of stress nurses were experiencing at home and were compared with the stress experienced at work in order to gain a sense of where nursing stress exposure may be coming from (see Table 8).

## CHAPTER V

### DISCUSSION AND CONCLUSION

This chapter will further elaborate upon the results presented in Chapter 4.

The sample which was studied will be described in more detail. The discussions and conclusions surrounding the research questions will be addressed. Limitations that may have affected the study will be expounded upon. The conceptual theory and its applicability to this study's conclusions will be discussed. Furthermore, the implications for practice, education, and research derived from this study will be explored.

#### Description of the Sample

The largest participating age group in this study fell between 18 and 30 years old. In fact, more than 67% fell between 18 and 40 years old. In addition, more than 40% of the sample studied had only zero to five years of experience working in nursing. This sample may have been too young to understand the stress of some situations such as insufficient staffing, or scheduling shifts too close together to provide adequate rest. However, the question also arises as to whether or not they have had time to develop coping mechanisms sufficient to deal with the stresses they *do* recognize; i.e. patient death, high patient to staff ratios, etc.

Isikhan, Comez, & Danis (2004) found that married nurses experience more job stress than single or divorced nurses, and divorced nurses experience the least amount of job stress. The majority of our sample is comprised of married nurses (58%) and the

minority (5%) is divorced nurses. Therefore in theory, the sample studied should reflect some of the nurses most at risk of stress exposure according to the literature.

The sample size overall is relatively small when compared to other studies involving shift work stress; the smallest published sample size was reported at 163, but some involved more than 4,000 nurses. However, this study was intended as a pilot study, and as such has provided sufficient data to that means; especially considering that a good mix of nurses from all three shifts were included. Roughly 24% were day shift RNs, 41% were night shifts RNs, and 36% were rotating shift RNs.

The majority of the RNs (55%) were employed full time, working 32 or more hours per week (or a 0.8 full-time equivalent [FTE] or higher). The rest worked anywhere from per diem to 28 hours per week. This may have skewed results in that night and rotating shifts workers not employed at a full-time basis may have more time available to adjust their sleep schedules and maintain their balance of stress and health. Future studies may consider studying only full-time RNs.

### **Discussion and Conclusions**

The purposes of this study were to 1) quantify and compare the levels of stress between night shift, day shift, and rotating shift RNs, and 2) to identify whether day shift, night shift, or rotating RNs experiences more health problems associated with chronic work stress when compared to each other. The specific questions addressed in this study were:

1. Is there a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by waist-hip-circumference ratios (WHR)?
2. Is there a difference in the prevalence of stress related health problems between

night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?

3. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report surveys?

Keep in mind that previous research in shift work indicates that shift workers tend to revert back to their initial circadian rhythms on their days off and with the absenteeism that often occurs as a result of fatigue (Clancy & McVicar, 1994). As a result, researchers have concluded that no shift other than the normal day shift can produce a synchronized circadian rhythm (Clancy & McVicar, 1994). As a result, both night and rotating shifts should theoretically have higher exposure to stress resulting from shift work.

### **Research Question One**

According to the data collected, day shift RNs had the lowest WHR. The literature indicates that WHRs are a valid indicator of chronic stress exposure. Therefore, the WHR tool should indicate the nursing group with the highest stress exposure and the group at highest risk of poor health outcomes resulting from that stress. This result was most unexpected after reading so much research on shift work stress. However, nurses undergo many forms of stress exposure, only one of which is related to shift work and this may have played a part in the results. It should also be mentioned that night shifts had the widest range of WHRs possibly indicating a varying level of coping skills that may have also affected the outcomes. As previously mentioned, this nursing sample was comprised of a very young population, many of whom worked the night and rotating shifts. This could have affected the results if their cumulative stress was still relatively

low as a result of inexperience or lower stress at home. There are a number of other limitations affecting WHR results which will be discussed later in the limitations section.

The ANOVA evaluation of WHRs across the nursing shifts in this study indicates that no significant difference exists between day shift, night shift, and rotating shift. An ANOVA analysis was used because there were three groups involved in the calculation. The null hypothesis was that there would be no significant statistical difference between WHR values for nurses on various shifts. The calculated F ratio is less than the critical F at an alpha of 0.05, indicating that the null hypothesis was accepted at a 95 percent confidence interval. All in all, the WHR analysis should be studied with a larger sample size in order to get more definitive results.

### **Research Question Two**

Although results from the WHR component of the study did not meet the expectations that higher stress existed for shift workers, results from the survey regarding health disorders across nursing shifts did. Fuller (2010) reported that nurses working night shifts or rotating shifts are noted to have higher stress than their daytime co-workers, ultimately placing them at increased risk for compromised health and work ability. The health concerns already raised for shift workers in various occupations other than nursing include increased risks for colorectal cancer, breast cancer, traffic accidents, chronic fatigue, anxiety, depression, coronary heart disease, reduced sleep quality, poor social relationships, peptic ulcer disease, gastroduodenitis, headaches, neck pain, back pain, palpitations, low birth weight deliveries, miscarriages, hypertension, infertility, decreased sperm count, divorce, impaired immunity, obesity, diabetes, myocardial infarctions, schizophrenia, irritation, alcohol and drug use, hypercholesterolemia, and



prostate cancer (Apostolopoulos et al., 2010; Parikh et al., 2010; Srivastava, 2010; Wong et al., 2010; Willis, O'Connor, & Smith, 2008; Chan, 2008; Croteau, Marcoux, & Brisson, 2006; Kubo et al., 2006; Twarog, 2005; Caruso et al., 2004; Clancy & McVicar, 1994; Labyak, 1996).

Sixty-seven percent of the day shift RNs surveyed reported having no health disorders. However, 61% of night shift RNs, and 88% of rotating shift RNs reported having at least one health disorder. Day shift RNs reported gastroesophageal reflux disease (GERD), peptic ulcer disease (PUD)/gastritis, hypercholesterolemia, obesity, sleep disorders, and chronic polyneuropathy. Interestingly, day shift RNs had the largest number of participants with sleep disorders including insomnia and narcolepsy, although Chan (2008) found that nurses involved in shift work were the ones who most often reported insufficient sleep. Night shift RNs reported thyroid disorder, GERD, hypercholesterolemia, hypertension, palpitations, obesity, infertility, anxiety, depression, chronic headaches, multiple sclerosis, endometrial cancer, anemia, skin cancer, and chronic back and leg pain. Rotating shift RNs reported having GERD, hypercholesterolemia, history of a myocardial infarction, obesity, anxiety, depression, sleep disorders including insomnia and narcolepsy, chronic headaches, excessive nervousness, coronary artery disease, myofascial pain syndrome, celiac sprue, endometriosis, and chronic back pain. Rotating shift RNs had quite a large percentage of participants with chronic headaches and depression. Interestingly, West, Ahern, Nyrces, and Kwanten (2007) discovered that shift nurses coping with poor sleep quality were prone to depression. It would have been interesting to ask participants how many hours of sleep they get on average daily, and to rate the quality of that sleep on a Likert scale.

The data also indicates that rotating RNs had the highest percentage of bacterial and viral infections, and they called in sick the most when compared across the shifts. Night and day shift reported a comparable number of bacterial and viral infections over the past 12 months. Day shift called in the least number of sick days in the past 12 months, which is consistent with previous literature. Chan (2008) reported that nurses involved in shift work take more sick days than those working day shifts.

Day shift nurses had the highest overall percentage of low birth weight deliveries (LBW)/miscarriages. In fact, 22% of day shift RNs experienced one or more LBWs or miscarriages, whereas only 7% of night RNs and 11% of rotating shift RNs had LBWs or miscarriages. However, the rotating shift group was the only group with an RN who reported having three or more LBWs/miscarriages. Twarong (2005) found that nurses working specifically rotating shifts have an increased occurrence of low birth weight deliveries and miscarriage. The data from this study falls somewhat in sync with the literature, in that one rotating shift RN experienced a large number of LBWs/miscarriages. However, there is definitely more prevalence of LBWs/miscarriages in the day shift group. This may be due to the fact that the day shift RNs at this facility are comprised of a larger percentage of older nurses and have had more time in their lives to have these experiences.

Night and rotating shift RNs appear to have poorer overall health when compared to the data collected from day shift RNs in this study. However, rotating shift RNs have the highest percentage of nurses with one or more health disorders, the highest percentage of infections, and the highest number of sick calls in the past 12 months. These outcomes support previous research from Fuller (2010) who stated that nurses working night shifts

or rotating shifts are noted to have higher stress than their daytime co-workers, ultimately placing them at increased risk for compromised health. Even though the literature indicates that working 3:00 a.m. to 3:00 p.m. shifts are less detrimental than 7:00 p.m. to 7:00 a.m. shifts, the rotating shift RNs had poorer health outcomes than those night shift RNs (Parikh et al., 2010). It was found during data collection that many of the rotating RNs were working 3:00 pm to 3:00 am shifts. The literature supports that eight hour shifts are healthier than 12 hour shifts, and day shift RNs tend to work eight hour shifts more often than the other two nursing groups (Parikh et al., 2010). The inclusion of shift length would be an interesting addition to future studies on nursing shift work.

### **Research Question Three**

Nurses were also surveyed about the prevalence of stress associated behaviors, including the number of alcoholic beverages consumed on a typical day when they were drinking, the number of days per week that they consume alcohol on average, the number of motor vehicle crashes (MVC) that they have been involved in since working in nursing, and whether or not they smoke or have smoked cigarettes. Night shift had the highest percentage of RNs (23%) who consume zero alcoholic beverages on an average day of drinking. The day shift group had 11%, and the rotating shift group had 19% who also appear to abstain from drinking. Percentages for the three nursing shift groups for ranges of one to two drinks, and three to four drinks appears fairly comparable. However, 11% of the 27 rotating shift RNs ( 3 respondents) consume seven to nine drinks per typical day of drinking. They are also the only group reportedly consuming more than four drinks per day.

Surprisingly, night shift again had the highest percentage of RNs consuming alcohol only one or less days per week, 81%. Day shift had the lowest percentage of RNs drinking one or less days per week at 56%. Unfortunately zero was not provided as an option in the survey and will be listed as a limitation. The night shift group did not have any participants drinking more than 3 days per week. Day shift had 6% drinking four days per week, and 6% drinking five days per week. The rotating shift group had one RN reportedly drinking six days per week on average. It would be quite alarming if this same person was one of the rotating shift RNs who drinks seven to nine alcoholic drinks each day that they drink.

Overall, day shift RNs reported drinking more often than other groups (up to five days per week), but no more than four drinks in a sitting. Night shift RNs appear to drink the least overall, reportedly drinking less than three days per week and having no more than four drinks per day. Rotating shift RNs report drinking alcohol up to six days per week and have up to seven to nine drinks per day; thereby indicating that this group is at the highest risk for binge drinking and has the most frequent alcohol consumption. In addition, the large amounts of alcohol consumed by night shift RNs may account for the reported higher rates of absenteeism, depression, anxiety, and chronic headaches.

According to the literature, individuals with burnout secondary to stress have been found to have higher cortisol levels and are more prone to smoking and alcohol use (Gunusen, Ustun, & Gigliotti, 2009). The data on the rotating shift RNs supports this finding, but the night shift data does not. However, keep in mind that it is less convenient to drink alcohol after a night shift. Many restaurants do not serve alcohol at breakfast as they do with dinner. Also, there are less friends and coworkers going out for drinks after

a night shift as compared to a day shift. Furthermore, it is less socially acceptable to drink alcohol in the morning.

Interestingly, day shift RNs appear to be the group with the highest number of MVCs. The percentages of RNs with zero MVCs are fairly consistent across the three nursing shifts. In addition, 11% of day shift RNs, 23% of night shift RNs, and 26 % of rotating shift RNs reported having one MVC since working in nursing. However, there were 11% of day shifters who had 2 MVCs, and only 3% of night shifters and 4% of day shifters who had had two MVCs. Day shift was also the only group who reported having three MVCs. According to previous research, shift workers are at the highest risk for traffic accidents, however the literature does not fit the data found in this study (Apostolopoulos et al., 2010; Parikh et al., 2010; Srivastava, 2010; Wong et al., 2010; Willis, O'Connor, & Smith, 2008; Chan, 2008; Croteau, Marcoux, & Brisson, 2006; Kubo et al., 2006; Twarog, 2005; Caruso et al., 2004; Clancy & McVicar, 1994; Labyak, 1996).

The prevalence of smoking was fairly consistent across the nursing shifts as well, except that the majority of nurses who had quit smoking were in the rotating shift group. One participant from each nursing shift group is currently smoking. However, 33% of the rotating RNs quit smoking, compared to only 22% of day shifters and 16% of night shifters. Gunusen, Ustun, & Gigliotti (2009) claim that nurses exposed to greater amounts of stress are at highest risk for smoking. According to other research cited throughout this study, nurses involved in shift work are theoretically at a higher risk of stress exposure due to the shift working. However, keep in mind that this population consists of nurses who have seen the consequences of smoking and may refrain from

this habit due to the unhealthiness of the act. In addition, the nature of the nursing occupation, to preserve and improve health, may also explain the low overall prevalence of smoking for this sample.

### **Likert Stress Scales**

Nurses were asked to rate their stress at work and home on a 10 point Likert scale in order to get an idea of their stress at work and home. All day shift RNs except one rated their stress at home as a five or less, with an average rating of stress at home of 3.1. Night RNs rated their home stress fairly evenly between one and nine, with an average rating of 4.3. Rotating shift nurses rated their stress at home from a one to a ten, with an average rating of 4.4. The night and rotating shift nurses have reported slightly higher stress levels at home, which is to be expected according to the literature.

Day shift nurses rated work stress pretty evenly from one to nine, with an average rating of 5.4. Night shift RNs rated their work stress in a bell curve fashion from two to nine, with more than 50% selecting a five. The average work stress rating for night shift was 5.3. All rotating nurses except one rated their stress at work from five to nine, with an average rating of 6.5. Thus, the rotating shift nurses had the highest perception of work stress.

### **Scope and Limitations**

Unfortunately, there are a plethora of limitations when studying stress and cortisol in any group. For example, WHRs results can be altered by a number of medical conditions including endocrine or metabolic disorders, as well as numerous lifestyle choices. Smoking 10 or more cigarettes a day in the past two years or drinking more than seven alcoholic drinks per week can elevate cortisol levels through HPA axis activation,

and alter WHRs as a result (Adler, et al., 2000; Bjorntorp, 1996). Fortunately, there were very few participants in this sample who reported smoking (only three), although there were quite a few who reported drinking that often. Testosterone also inhibits cortisol secretion, and may contribute to inaccurate WHRs in male participants, or with conditions such as PCOS (Bjorntorp, 1996). There were four male volunteers in this study. Estrogen deficiency can also induce visceral fat accumulation and alter WHRs for women with low estrogen levels, such as in women who are menopausal (Bjorntorp, 1996). Lifestyle choices can alter visceral fat as well and includes eating habits, food choices, heredity, and insufficient exercise. False positive cortisol elevations and WHRs may be seen in patients with obesity, depression, pregnancy, Cushing's disease/syndrome, hypertension, diabetes mellitus, in patients receiving glucocorticoid treatment, estrogen replacement therapy, three or more pregnancies lasting more than 12 weeks, weight changes greater than 5% of their total body weight in the last three months, exercising more than two hours per day, current depression, alcohol or drug dependence, and use of oral contraceptives (Adler, et al., 2000; Dunphy, 2011). There may also be a number of other conditions that exact changes on cortisol expression which are as yet unknown. Furthermore, researchers still do not know how long an individual has to be exposed to stress and strain before cortisol levels are elevated to a state resulting in decreased WHR ratios.

Stress exposure is multifactorial and its deleterious effects result from the cumulative stressors experienced at home and work. The stress effects associated only with shift work may be difficult to evaluate with the small sample size used in this study. Other factors beyond shift work have been found to contribute to increased stress, such as

low autonomy, poor sense of control over scheduling, interruptions, etc., and these are difficult to quantify and account for as variables. Various stressors exist within a nurse's personal life as well, which can contribute to stress exposure. For example, researchers have found that married nurses experience more job stress than single or divorced nurses, and divorced nurses experience the least amount of job stress (Isikhan, Comez, & Danis, 2004). The majority of the nurses studied in this sample are married, so at least there is a fair amount of consistency across this variable. Social support has been associated with reduced stress, whereas a lack of social support, especially at home, can increase the effects of job stress by reducing that person's coping abilities (McNeely, 2005). This factor has not been accounted for in this study. Age has also been found to be a significant factor in mean job stress scores, as stress scores tend to decrease with increased age (Isikhan, Comez, & Danis, 2004). This sample had significantly more participants older than 40 working day shifts when compared to the other two shifts, and this should be taken into consideration.

Limitations should also include the small sample size and possible inaccuracy of self-reporting. Nurses may not have been forthright with their answers if they were concerned that others could see their responses either during or after they took the survey. The one layer of clothing over which the WHR was measured may also have resulted in somewhat inaccurate measurements. The sample size is appropriate for a pilot study; however, it should be expanded upon in future studies to reduce the effects of these numerous limitations on results.

As far as evaluation of the pilot study, limitations existed within the survey that was constructed. For example, one question addressing marital status offered no



alternatives such as significant other, life partner, fiancé, etc. However, the decision to word the question this way was made prior to initiating data collection and was based on the previously established correlation between marital status and shift work by prior research. The survey needed a “none” option for the question inquiring about participant’s health disorders, and was unfortunately not offered. The survey should have also offered an option for zero days of drinking per week on average, but it only offered one through seven. An e-mail notifying potential participants of data collection times and locations may have increased participation, particularly on day shifts. Additionally, it would have been helpful to assess what time of day nurses were most accessible prior to initiating data collection.

### **Concept Map**

The concept map utilized for this study was derived from the theory of Primary Prevention as Intervention which is based on The Neumann Systems Model. The Neumann Systems Model is made up of concentric rings identified as the Normal Line of Defense (NLD), Flexible Line of Defense (FLD), and Lines of Resistance (LOR) all surrounding the Basic Systems Structure. The NLD is the standard of health and represents the accumulation of coping mechanisms developed over time to maintain system stability, or wellness. The FLD lies outside the NLD and provides protection and support to the NLD when it is expanded outward; however, it is unable to provide as much protection when it constricts inward, such as during times of stress. The LOR lies inside the NLD and returns the Basic Systems Structure to wellness after it has been exposed to an environmental stressor. Stress occurs when the LOR is invaded and if not alleviated, it can result in strain, or a decrease in health. Various coping mechanisms

exist to prevent that invasion which consist of physiological, psychological, sociocultural, developmental, and spiritual mechanisms. If these coping strategies are too weak, or the stressors are too strong, burnout can occur, and one of the consequences of burnout is decreased health. Stressors can arise from the environment in three forms: intrapersonal, interpersonal, or extrapersonal (Fawcett, 2005).

The goal of Primary Prevention as Intervention is to maintain system stability and wellness through health *promotion*. Neumann believed that health is maintained when available energy is greater than energy expenditure. As a result, nursing efforts are directed at preserving energy through primary, secondary, and tertiary prevention. These interventions are intended to be initiated as soon as a stressor is identified in order to *prevent* a systems reaction that could result in decreased health status. Primary prevention is directed at preventing stressors and reducing risk for stress in order to protect the NLD and strengthen the FLD (Aylward, 2006). It is used when the NLD has not yet been penetrated and no symptoms exist (August-Brady, 2000). Conversely, secondary intervention is used after stressors have penetrated the NLD and already created symptoms. Secondary intervention uses internal and external resources to attain system stability in order achieve reconstitution. Reconstitution is defined as the return to stability after a nursing intervention directed at stress reduction. It may result in “a state of wellness ... higher, the same, or lower than ... before” (Aylward, 2006, p.289). Death can occur if secondary prevention is ineffective. Tertiary prevention is directed at *maintaining* wellness by supporting strengths and encouraging energy preservation. Tertiary and primary interventions can be used synergistically (Aylward, 2006).

This study was intended to identify whether secondary intervention was

needed, or if primary and tertiary interventions were sufficient for system stability within the nursing occupation. According to the data collected, it appears that the number of stress related health disorders, stress related behaviors, and Likert scale ratings indicate a need for all three interventions to reduce stress reduction and support optimal wellness. The differences in some of the expectations, such as WHR results and signs of elevated day shift stress, may be related to variations in coping mechanisms described by Fawcett (2005). This may be most notable with the wide range of WHRs identified within the night shift group. Primary interventions can be initiated through education and practice changes. Secondary interventions should include practice changes on an individual and facility-wide level. Additional secondary interventions should be explored with more research related to shift work stress in the field of nursing. Tertiary interventions can be implemented via education and social support within the health care environment. There will be stressful factors outside of the work place which nursing may not have the opportunity to exact much change upon. However, this study does support that implementation of work place changes to reduce some of the nursing stress and improve health.

### **Implications for Education**

During data collection for this study, there was a lot of opportunity to educate nurses about shift work stress and the possible deleterious health effects that can result. It was surprising how many knowledge gaps existed regarding shift work stress including some of the side-effects of shift work stress, and ways to reduce those effects. There are many interventions that can be utilized as primary, secondary, and tertiary interventions to remedy the existing NLD invasion identified by this study, and to prevent future NLD

invasions. Some education should be provided to individual nurses, and other forms of education should be directed at health care administration, communities, and government policy makers. Individual nurses should be apprised that chronic headaches, depression, anxiety, obesity, and GERD are prominent health disorders in nursing, and that these disorders have been related to chronic stress. Nurses should be taught how to minimize their risk for these and other health disorders related to shift work stress via various stress reduction techniques. For example, Kuhn (1997) suggests that shift workers avoid alcohol, sleep medications, and fatty foods because they can disrupt sleep quality. Nurses should be taught that exercising, napping, and rotating shifts in a clockwise manner can reduce harmful side effects of shift work (Clancy & McVicar, 1994). Nurses can utilize ear plugs, maintain temperatures around 75 degrees Fahrenheit, avoid televisions and radios while sleeping to improve the quality of sleep, and allow for exposure to bright light for several hours upon awaking (Kuhn, 1997). Quality time with family and friends can reduce HPA axis activation and reduce the effects of stress (Sjogren et al., 2006). Exercising daily can improve immunologic function, psychological health, and their quality of sleep (Kuhn, 1997).

Public Health Centers and local health care facilities could be provided comparable information and encouraged to disseminate this knowledge through community awareness programs or brochures because this information can be useful to all shift workers. Government policy makers could also become involved in shift work stress reduction interventions by encouraging health facility discounts for shift workers, and mandating 24 hour cafeterias or food carts in hospitals to provide healthy food options. The National Institute for Occupational Safety and Health and the American

Nurses Association are actually developing prevention interventions at this time which consist of a training program directed at helping nurses adjust to shift work.

### **Implications for Practice**

Prevention interventions available for nursing practice include chronobiologic agents, revisions to scheduling techniques, and provision of nap facilities and healthy food. Bright lights can be utilized with shift work to help staff cope with circadian rhythm changes (Labyak, 1996). Work schedules could reflect low risk assignments such as eight hour shifts or shifts that provide more than 16 hours between shifts. These shifts have been found to allow for seven or more hours of sleep between shifts. However, if 12 shifts are unavoidable, 3:00 am to 3:00 pm shifts have been found to be less detrimental to staff's health than 7:00 pm to 7:00 am shifts (Parikh et al., 2010; Kuhn, 1997). Nurses who perceive some control over the days and hours they work have reported less stress at home and work in previous research. Therefore, self-scheduling can and should be considered to reduce negative effects of shift work stress (Fuller, 2010; Parikh et al., 2010). Healthy snack options could also be provided to shift working nurses whether via extended cafeteria hours, refrigerated vending machines, or a mobile lunch cart (Wong et al., 2010). Studies done on nap facilities in hospitals indicate that napping not only improves nursing moral and motivation, but that it also maintains high degrees of alertness and the ability to make quick decisions (Twarong, 2005). Some other factors found to increase stress at work include high workloads, ambiguous role demands, low control or autonomy, negative interactions with coworkers, frequent interruptions, precepting students or new employees, dealing with dying

patients, years of work experience, low or no perceived support from coworkers or supervisors, and inadequate staffing (Ganster, 2008; Isikhan, Comez, & Danis, 2004; & McNeely, 2005). These additional stressors should be taken into consideration by charge nurses and coworkers who could provide social support and reductions in assignments when possible.

Nurse Practitioners (NPs), as well as other providers, should keep the results from this study in mind during patient evaluations. The data implies that NPs should be assessing *when* patients work, in addition to what occupation they work. NPs should also be considering whether or not the patient's shift work is affecting any disease progression, or development of new disease processes.

### **Implications for Research**

This was a pilot study, and the data collected needs to be further evaluated with a larger sample size and if possible across multiple health care facilities.

The survey should have two corrections made if repeated: there should be a "zero" option for the number of days per week on average that alcohol is consumed, and a "none" option for the question regarding ongoing medical conditions.

Further analysis of WHR reliability as a tool will need to be considered, especially considering the number of variables that can interfere with the WHR. Perhaps, it would be wise to compare the WHR to salivary cortisol levels in order to obtain a standard. The WHR tool would be a much more cost efficient and easy to use way of quantifying shift work stress; however, its reliability is still somewhat questionable.

It would be interesting to ask participants how many hours of sleep they get on average each day, and to rate the quality of that sleep on a Likert scale in future studies.

The inclusion of shift length may be helpful to reduce some of the variables in future studies on nursing shift work. Perhaps, the RNs should be asked in the survey whether they work eight or 12 hour shifts. Or, maybe the study should only include RNs working eight *or* 12 hour shifts but not both. In theory, eight hour shifts are healthier than the popular 12 hour shifts (Parikh et al., 2010; Kuhn, 1997).

Nursing is still in need of a low cost, and easy-to-use tool that can be used not only quantify nursing stress, but also to assess successfulness of future stress reduction interventions. To date, no such tool exists. The most reliable tool to study shift work stress at this point is salivary cortisol levels, which are very expensive. Thus far, researchers still do not know the length of time an individual has to be exposed to stress and strain before cortisol levels are elevated to a state resulting in decreased WHR ratios. This could also be considered in future research.

### **Summary**

The literature reviewed as well as the data collected in this study supports that expressed stress does vary among day shift, night shift, and rotating shift RNs. Although the quantifiable data indicates that no statistical difference exists between the nursing shifts' stress, the WHR tool is unfortunately affected by many variables and as such may have provided unreliable results. This tool needs to be further analyzed with a larger sample size and possibly with a better control of variables prior to accepting the collected data as fact.

Night and rotating shift RNs seemed to have the most health problems associated with shift work stress. The majority of day shift RNs reported no health disorders in spite of older ages, whereas the majority of night and rotating shift RNs had at least one health

disorder. In fact, rotating shift RNs had the highest percentage of nurses with one or more health disorders, the highest percentage of bacterial or viral infections over the past 12 months, and the highest number of sick calls in the past 12 months.

Additionally, rotating shift RNs reported the highest prevalence of stress associated behaviors except with MVCs. As far as alcohol consumption, the rotating shift in this population has the highest risk for binge drinking and reports the most frequent alcohol consumption. Day shift RNs generally drink more often than other groups, up to five days per week, but have no more than four drinks per day. Night shift RNs drink the least overall; four or less drinks per day, less than three days per week. Rotating shift RNs drink alcohol up to seven to nine drinks per day up to six days per week. Interestingly, day shift RNs appear to have highest number of MVCs. Although RNs reporting zero to one MVC were fairly consistent across nursing shifts, the day shift group had a higher percentage of RNs with two and three MVCs. The prevalence of smoking was fairly consistent across the nursing shifts except that the majority of nurses who had quit smoking were in the rotating shift group.

The available data supports that nurses working shift work, particularly rotating shifts, could benefit from stress reduction interventions. The implementation of Primary Prevention as Intervention could improve current health problems, as well as prevent future noxious health outcomes resulting from stress accumulation. The literature already supports a number of successful stress reduction interventions that can be employed at individual, facility, community, and federal levels. Future research should continue studying the detrimental health outcomes resulting from nursing shift work stress, as well as the efficacy of stress reduction interventions for the nursing occupation.



## REFERENCES

- Adler, N.E., Epel, E.S., Castellazzo, G., & Ickovics, J.R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy white women. *Health Psychology, 19*(6), 586-592.
- Apostolopoulos, Y., Sonmez, S., Shattell, M.M., Belzer, M. (2010). Work site-induced morbidities among truck drivers in the United States. *American Association of Occupational Health Nurses, 58*(7), 285-296.
- August-Brady, M. (2000). Prevention as intervention. *Journal of Advanced Nursing, 31*(6), 1304-1308.
- Aylward, P.D. (2006). Betty Neuman: The Neuman systems model and global application. In M.E. Parker (Ed.), *Nursing Theories and Nursing Practice* (pp.281-294). Philadelphia, PA: F.A. Davis Company.
- Bjorntorp, P. (1996). Behavior and metabolic disease. *International Journal of Behavioral Medicine, 3*(4), 285-302.
- Caruso, C.C., Lusk, S.L., & Gillespie, B.W. (2004). Relationship of work schedules to gastrointestinal diagnoses, symptoms, and medication use in auto factory workers. *American Journal of Industrial Medicine, 46*, 586-598.
- Caruso, C.C. (1999). *Gastrointestinal problems in auto factory shift workers* (Doctoral dissertation). Retrieved from CINAHL. (Accession number 2005060091).
- Chan, M.F. (2008). Factors associated with perceived sleep quality of nurses working rotating shifts. *Journal of Clinical Nursing, 18*, 285-293.

- Chung, C., & Chung, U. (2009). An exploration of quality of life and related factors among female flight attendants. *Journal of Nursing Research, 17*(2), 212-219.
- Clancy, J. & McVicar, A. (1994). Circadian rhythms: Shift work and health. *British Journal of Nursing, 3*(14), 712-717.
- Croteau, A., Marcoux, S., & Brisson, C. (2006). Work activity in pregnancy, preventative measures, and the risk of delivering small-for gestational age infant. *American Journal of Public Health, 96*(5), 846-855.
- Fawcett, J. (2005). Neuman's systems model. In J. Fawcett (Ed.), *Contemporary Nursing Knowledge: Analysis and Evaluation of Nursing Models and Theories* (pp.166-222). Philadelphia, PA: F.A. Davis Company.
- Fawcett, J. (2001). The nurse theorists: 21<sup>st</sup>-century updates- betty neuman. *Nursing Science Quarterly, 14*(3), 211-214.
- Fuller, T.P. (2010). Shift workers give sleep short shrift. *American Journal of Nursing, 110*(2), 28-30.
- Furlan, R., Barbic, F., Piazza, S., Tinelli, M., Seghizzi, P., & Malliani, A. (2000). Modifications of cardiac autonomic profile associated with a shift schedule of work. *Circulation, 102*, 1912-1916.
- Ganster, D.C. (2008). Measurement challenges for studying work related stressors and strains. *Human Resources Management Review, 18*, 259-270.
- Gunusen, N.P., Ustun, B. & Gigliotti, E. (2009). Conceptualization of burnout from the Neuman systems model. *Nursing Science Quarterly, 22*(3), 200-204.

- Golubic, R., Milosevic, M., Knezevic, B., & Mustajbegovic, J. (2009). Work-related stress, education and work ability among hospital nurses. *Journal of Advanced Nursing*, 65(10), 2056-2066.
- Inoue, K., Kakehashi, Y., Oomori, S., & Koizumi, A. (2004). Biochemical hypoglycemia in female nurses during clinical shift work. *Research in Nursing & Health*, 27, 87-96.
- Isikhan, V., Comez, T., & Danis, M.Z. (2004). Job stress and coping strategies in health care professionals working with cancer patients. *European Oncology Nursing Society*, 8, 234-244.
- Kroenke, C.H., Spiegelman, D., Manson, J., Schernhammer, E.S., Colditz, G.A., & Kawachi, I. (2007). Work characteristics and incidence of type 2 diabetes in women. *American Journal of Epidemiology*, 165, 175-183.
- Kubo, T., Ozasa, K., Mikami, K., Wakai, K., Fujino, Y., Watanabe, Y., Miki, T., Nakao, M., Hayashi, K., Suzuki, K., Mori, M., Washio, M., Sakauchi, F., Ito, Y., Yoshimura, T., & Tamakoshi, A. (2006). Prospective cohort study of the risk of prostate cancer among rotating-shift workers: Findings from the Japan collaborative cohort study. *American Journal of Epidemiology*, 164(6), 549-555.
- Kuhn, W. (1997). Shift work: Circadian rhythm and survival in the ED. *Emergency Medicine*, 3, 80-83.
- Labyak, S.E. (1996). Shift work stress impedes health performance. *Hospital Employee Health*, 15(7), 78.

- McMenamin, T.M. (2007). A time to work: Recent trends in shift work and flexible schedules. *Monthly Labor Review*. Retrieved from <http://www.bls.gov/opub/mlr/2007/12/art1full.pdf>.
- McNeely, E. (2005). The consequences of job stress for nurses' health: Time for a check-up. *Nursing Outlook*, 53(6), 291-299.
- Nozaki, S., Tanaka, M., Mizuno, K., Ataka, S., Mizuma, H., Tahara, T., Sugino, T., Shirai, T., Eguchi, A., Okuyama, K., Yoshida, K., Kajimoto, Y., Kuratsune, H., Kajimoto, O., & Watanabe, Y. (2009). Mental and physical fatigue-related biochemical alterations. *Nutrition*, 25, 51-57.
- Parikh, P., Taukari, A., & Bhattacharya, T. (2004). Occupational stress and coping among nurses. *Journal of Health Management*, 6(2), 115-127.
- Rogers, A. E. (2008). The effects of fatigue and sleepiness on nurse performance and patient safety. Retrieved from <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=nursehb&part=ch40>.
- Selander, J., Bluhm, G., Theorell, T., Pershagen, G., Babisch, W., Seiffert, I., Houthujis, D., Breugelmans, O., Vigna-Taglianti, F., Antoniotti, M.C., Velonakis, E., Davou, E., Dudley, M., & Jarup, L. (2009). Saliva cortisol and exposure to aircraft noise in six European countries. *Environmental Health Perspectives*, 117(11), 1713-1717.
- Selye, H. (1946). The general adaptation syndrome and the diseases of adaptation. *The Journal of Clinical Endocrinology*, 6(2), 117-230.

- Sjogren, E., Leanderson, P., & Kristenson, M. (2006). Diurnal saliva cortisol levels and relations to psychosocial factors in a population sample of middle-aged Swedish men and women. *International Journal of Behavioral Medicine, 13*(3), 193-200.
- Slavin, K. (2008). Environment, health, and safety. *American Nurse Today, 3*(8), 30.
- Srivastava, U.R. (2010). Shift work related to stress, health, and mood states: A study of dairy workers. *Journal of Health Management, 12*(2), 173-200.
- Twarong, J. (2005). Dealing with the dangers of shift work. *Massachusetts Nurse Newsletter*. Retrieved from <http://www.massnurses.org/labor-action/labor-education-resources/health-and-safety/p/openItem/1216>.
- West, S., Boughton, M., & Byrnes, M. (2009). Juggling multiple temporalities: The shift work story of mid-life nurses. *Journal of Nursing Management, 17*, 110-119.
- West, S.H., Ahern, M., Byrnes, M., & Kwanten, L. (2007). New graduate nurses adaptation to shift work: Can we help? *Collegian, 14*(1), 23-30.
- Willis, T.A., O'Connor, D.D., & Smith, L. (2008). Investigating effort-reward imbalance and work-family conflict in relation to morningness-eveningness and shift work. *Work & Stress, 22*(2), 125-137.
- Wong H., Wong, M.C., Wong, S.Y., & Lee, A. (2010). The association between shift duty and abnormal eating behavior among nurses working in a major hospital: A cross sectional study. *International Journal of Nursing Studies, 47*, 1021-1027.

**APPENDIXES**

**Appendix A**

**The Health Impact of Nursing Shift Work Survey**

# The Health Impact of Nursing Shift Work

Thank you for your participation. The information you provide today will remain anonymous. This data will be used in a thesis studying the health associated effects of shift work stress in nursing. Please feel free to withdraw from this study at any time. Participation is not mandatory, and choosing not to participate will not negatively impact your employment with Mayo Clinic Health Systems.

<sup>\*</sup> Required

What is your current FTE? <sup>\*</sup>

Which percentage of your nursing shifts fall between 0700 and 1900 (day shift) on average? <sup>\*</sup>

*(Please enter a value from 0% to 100%)*

Which percentage of your nursing shifts currently fall between 1900 and 0700 (night shift) on average? <sup>\*</sup>

*(Please enter a value from 0% to 100%)*

How many years have you worked this shift in nursing? <sup>\*</sup>

- 0 - 5 yrs  
 6 - 10 yrs  
 11 - 20 yrs  
 >20 yrs

How many total years of experience do you have working in nursing? <sup>\*</sup>

- 0-5 yrs  
 6 - 10 yrs  
 11 - 20 yrs  
 20 - 30 yrs  
 >30 yrs

Are you male or female? <sup>\*</sup>

- Female  
 Male



What is your age? \*

- 18 - 30 yrs
- 31 - 40 yrs
- 41 - 50 yrs
- 50 - 59 yrs
- >60 yrs

Are you currently married? \*

- No, I've never been married
- No, I'm divorced
- Yes, I'm married

If you have been divorced, did this occur after working in nursing? \*

- Yes
- No
- Not applicable

How many times have you been ill with a viral or bacterial infection over the past 12 months? \*

*(This will be the number of infections [NOT the total number of days ill])*

- 0
- 1 - 5
- 6 - 10
- >10

Do you have any of the following health disorders? \*

*(Please mark all that apply -- also please list any other health disorders you may have that are not listed here under the "other" option)*

- Thyroid disorder
- Gastroesophageal reflux
- Peptic Ulcer Disease or Gastritis
- Hypercholesterolemia
- Hypertension
- History of MI
- Palpitations
- Type II Diabetes
- History of stroke
- Obesity
- Infertility
- Anxiety

- Depression
- Breast Cancer
- Colon Cancer
- Prostate Cancer
- Sleep Disorders (Insomnia or Narcolepsy)
- Chronic Headaches
- Nervousness
- History/Current Substance Abuse
- Coronary Artery Disease
- Other:

How many shifts have you called in sick for in the past 12 months? \*

- 0
- 1 - 5
- 6 - 10
- 10 - 20
- >20

How many miscarriages or low birth weight deliveries have you had since working in nursing? \*

- 0
- 1
- 2
- >= 3

How many alcoholic beverages do you consume on a typical day when you're drinking? \*

*(1 serving equals 12 oz beer, 5 oz glass of wine, or 1 shot of liquor)*

- 0
- 1 or 2
- 3 or 4
- 5 or 6
- 7 to 9
- 10 or more

On average, how many days per week do you drink alcohol? \*

- 1
- 2
- 3
- 4
- 5

- 6
- 7

How many motor vehicle accidents have you been in since you started nursing? \*

- 0
- 1
- 2
- 3
- >/= 4

Do you smoke ciagrettes? \*

- Yes
- No, I quit smoking
- No, I have never smoked

How stressful would you rate your life at home? \*

0 = not stressful, 10 = severely stressful

0 1 2 3 4 5 6 7 8 9 10  
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

How stressful would you rate your life at work? \*

0 = not stressful, 10 = severely stressful

0 1 2 3 4 5 6 7 8 9 10  
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

Waist 1 Measurement \*

Hip 1 Measurements \*

Waist 2 Measurement \*

Hip 2 Measurement \*

**Appendix B**

**IRB Letter of Approval Mayo Clinic Health Systems -Mankato**



**Mankato**  
 1025 Marsh Street, P.O. Box 8673  
 Mankato, Minnesota 56002-8673  
 507-625-4031  
 507-385-2925 TDD/TTY

May 23, 2012

Amanda Shandor, R.N.  
 1018 South Front Street  
 New Ulm, MN. 56073

RE: "The Health Impacts of Nursing Shift Work"

Dear Ms. Shandor:

Fawad M. Qureshi, M.D., Chair of the Institutional Review Board of Mayo Clinic Health System (MCHS) – Mankato reviewed the Investigator Checklist; Protocol Application; MCHS-Mankato Consent to Participate; Survey; MCHS-Mankato Leadership Approval Letter dated Feb. 24, 2012; proof of Protecting Human Research Participants training by investigators; Conflict of Interest Disclosure; and the MSU IRB Application and Approval Letter dated March 21, 2012 for the above named proposal.

Noting that all requirements for Criteria for IRB Approval of Research were met, Dr. Qureshi . approved this proposal by expedited review procedures and determined this study poses no more than minimal risk in accordance with 45 CFR 46.110 (Category 7) and IRB Expedited Review policy (2)(g). Approval is given as follows:

- to conduct the above mentioned study at MCHS-Mankato for one year, from May 21, 2012 to May 20, 2013, unless the IRB determines that it is appropriate to suspend or halt the study earlier
- to obtain the participant's signed consent, as approved 5/21/12 and enclosed, prior to obtaining waist-hip measurements.
- for this research proposal to be used by qualified and approved MCHS-Mankato investigators only
- to seek IRB approval to continue or close the study past the year granted.

A written report, requesting to either continue the study or to close the study, will be due prior to May 20, 2013 that, according to federal regulations and IRB policy, should include the following:

- 1) The number of subjects in the study
- 2) A summary description of the experience (benefits and adverse reactions)
- 3) Number of persons withdrawing from the study and the reasons for withdrawal
- 4) Summarize research activity and interim findings since initial review
- 5) A current risk-benefit assessment based on the results to date
- 6) Any new information or unanticipated risks found during the research
- 7) Investigator intent to continue the study or intent to close the study; if possible, please estimate the study completion date

LETTER RE: The Health Impacts of Nursing Shift Work -- A. Shandor  
Page two

It is your responsibility to report the end of the study to the Board. Also, any change in the consent or research protocol would need to be reported. Any reportable events that occur during the study at MCHS-Mankato should be reported to the Board as soon as possible, but no later than within five business days.

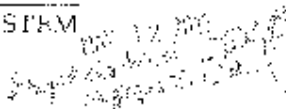
The deadline for submission to the IRB agenda is usually the 3<sup>rd</sup> Friday of each month. Thank you for your cooperation in complying with these reporting requirements.

Sincerely,

  
Karen M. Bergner, IRB Coordinator  
Institutional Review Board

/kmb

Enclosures: Investigator Checklist/Proposal and MCHS-Mankato Consent to Participate –  
approved 5/21/2012 by IRB Chair



**Mankato**  
 1025 March Street, P.O. Box 8678  
 Mankato, Minnesota 56003-8678  
 507-625-5381  
 507-625-2923 (TDD/HH)

**CONSENT TO PARTICIPATE IN:  
 The Health Impacts of Nursing Shift Work**

You are invited to take part in research about the health impacts of nursing shift work. You are a potential participant because you are working as a registered nurse at Mayo Clinic Health System - Mankato. The research is being conducted by Amanda Shuford and is endorsed by Minnesota State University, Mankato. We ask that you read this form before agreeing to participate in the research.

Participation is voluntary and responses will be kept anonymous. However, whenever one works with sensitive information there is always the risk of compromising privacy, confidentiality, and/or anonymity. Despite this possibility, the risks to your physical, emotional, social, professional, or financial well-being are considered to be "less than minimal." The survey information will be stored in a password protected computer and a password protected online account for less than 1 year by Amanda Shuford, researcher.

**Voluntary nature of study**

Your decision to participate or not to participate will not impact your current or future relations with MCHS or Minnesota State University, Mankato. You do not need to complete participation if you feel uncomfortable doing so. You have the option to not respond to any questions if so you choose. Submission of the completed survey will be interpreted as your informed consent to participate and that you affirm that you are at least 18 years of age. Submission of the survey will be interpreted as agreement to complete the survey, however signed consent will be obtained from each participant prior to obtaining waist-hip circumference ratio measurements.

**Purpose**

The purpose of the research is to see:

1. If there is a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by waist-hip circumference ratios (WHR)?
2. If there is a difference in the prevalence of stress-related health problems between night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?
3. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report surveys?

**Procedures**

We ask that you be willing to complete a questionnaire and have your waist and hip measured twice by the researcher. Participation in this survey should take less than 10 minutes.

**Risks**

The only risk associated with this research is that of privacy and confidentiality which will be maintained by replacing identifying information with numbers in the database, utilizing a discreet and private location, obtaining measurements over a single layer of clothing, having participants enter the WHR data in their survey to prevent the researcher from seeing individual



**Mankato**  
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survey entries, and storing data in a password locked computer and password protected online account. Each participant's signed consent form will be securely stored by the Principal Investigator Dr. Hans-Peter de Ruiter in a locked cabinet in a locked room in the Minnesota State University School of Nursing for five years. After this time these documents will be destroyed by the Principal Investigator.

**Benefits**

There are no direct benefits to participating in this study. However, this study may benefit future endeavors to minimize nursing shift work stress and its subsequent health effects.

**Compensation**

No compensation is provided in this study.

**Contact**

The researcher conducting this study is Amanda Shandor. If you have any questions about the research, please contact her via e-mail at shandor.amanda@mayo.edu, or by phone at 507-933-4677. If you have questions about the treatment of human subjects, contact the MSU IRB Administrator, Dr. Barry Ries, at 507-389-2321, Institutional Review Board, 115 Alumni Foundation, Minnesota State University, Mankato. If you would like more information about the specific privacy and anonymity risks posed by online surveys, please contact the Minnesota State University, Mankato Information and Technology Services Help Desk (507-389-6654) and ask to speak to the Information Security Manager.

*I have read the above information and understand that this survey is voluntary and I may stop at any time. I consent to participate in the study.*

\_\_\_\_\_  
 Signature of participant:

\_\_\_\_\_  
 Date

Participant received a copy.

*Expedited  
 IRB approval  
 MAY 12 2012*

MSU IRB LOG # 309929-2  
 Date of MSU IRB approval: 3/21/12

MCHS IRB LOG #  
 Date of MCHS IRB approval: 5/21/12



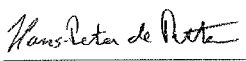
**Request for Proposal Approval by Institutional Review Board (IRB)  
Investigator's Checklist**

Title of Project: The Health Impacts of Nursing Shift Work

Investigators: Amanda Shandor Date: 4/6/2012

Address: 1018 South Front St New Ulm, MN 56073

Telephone: Investigator: 507-933-4677


If Student, Signature of Advisor needed: 

Specific Units/Clinics to be used: ED, 2MS, 3MS, 4MS, Peds, Womens, Psycy

Data Collection Period: Start Date: 5/27/2012 Stop Date: 4/6/2013

Submit two copies of your proposal to Karen Bergner, IRB Coordinator, Andreas Cancer Center /  
Med Oncology

Please include the following items in your submission for IRB approval:

Funding source: No outside funding has been obtained to support this research. 

**Description/Abstract:** (State objectives and specific aims. Describe concisely the research design and methods for achieving these goals. No longer than one page.)

Night shift RNs and rotating shift RNs may be at greater risk for acquiring health disorders and providing insufficient patient care as a result of chronic exposure to shift work stressors. The waist-hip circumference ratio (WHR) may prove to be a convenient and inexpensive measurement to identify nurses at risk for chronic stress exposure from shift work, and also for identifying those who need stress reduction interventions. The recognition of, and reduction in, shift work stress for nursing is important not only for the individual nurse, but for the community they care for as well.

**Purpose of the Study**

The purposes of this study are to 1) quantify and compare the levels of stress between night shift, day shift, and rotating shift registered nurses (RNs), and 2) to identify whether night shift, day shift, or rotating RNs experiences more health problems associated with chronic work stress when compared to each other.

**Research Questions**

The specific questions being addressed in this study are:

1. Is there a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by WHRs?
2. Is there a difference in the prevalence of stress related health problems between night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?
3. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report survey results?

**Methods**

This will be an explorative, descriptive pilot study evaluating subjective surveys, and objective measurements of waists and hip circumferences via a standard tape measure. It is intended to report any variations in the indicators and side-effects of work stress between dayshift, nightshift, and rotating shift registered nurses (RNs), as well as to identify nursing shifts at risk for stress related health disorders. The study will also provide information about the ease

of using the waist-hip-circumference ratio (WHR) tool for use in future evaluations of stress reduction implementations. This study will be directed at a sample of full-time and part-time RNs at one rural teaching hospital facility. Volunteers will be included regardless of age, sex, socioeconomic status, minorities, or other vulnerabilities.

In this study nurses will be recruited voluntarily on the unit which they are working on to complete a real time self-report survey and WHR measurements on days of data collection. No e-mail will be sent out and no flyers will be posted. Volunteers will be recruited by handing out consent for participation forms in nursing units and break rooms on the days of data collection, prior to initiating data collection. Information about the study will primarily be disseminated via the consent form; however, additional questions about the study will be answered by the Co-Investigator, Amanda Shandor. Each participant will receive a copy of the attached consent form for participation prior to starting the survey or allowing for WHR measurements. Submission of the completed survey will be interpreted as their informed consent to participate in the survey and their affirmation that they are at least 18 years of age. Signed consent forms will be obtained as evidence of participants' informed consent to participate in the WHR measurements. Volunteers will be requested to participate in the study for no more than 10 minutes on the unit they are working during the days of data collection, which will most likely occur on weekends.

Previous research has concluded that a combination of subjective and objective data provides the most effective analysis of work stress and strain. Therefore, data for this study will be collected using two tools: the objective WHR tool and a subjective self-report survey. Volunteer day shift, night shift, and rotating RNs will be asked to participate in an anonymous self-report survey which will be available on a hospital provided laptop computer to be completed in real time on the nursing unit on days of data collection. Each individual nurse will also be physically measured, and remeasured for accuracy, at the waist and hip by only one data collector throughout the study to minimize human error. Waist circumference will be measured between the upper iliac crest and lower costal margin in the midaxillary line. Hip circumference will be measured at the maximum width of the buttocks, or gluteofemoral fold, along the midaxillary line. The nurses will be measured over a single layer of clothing with a tape measure in a private area of the hospital unit on which they are working. Individual waist and hip measurements will be entered into the computerized data collection system by each individual participant to whom that measurement belongs to maximize privacy. The survey was created by the Co-Investigator and has been included in the IRB application. The survey includes data about issues that may place nurses at increased risk for job stress, behaviors associated with exposure to stress, and health disorders affiliated with chronic work stress exposure. Participants will know that their part in the study has ended when they hit the submit button on the survey. A sheet of paper will be available for participants to supply their e-mail address if they would like to be notified of the anonymous, compiled results of the study upon its completion.

**Protocol Includes:**

- The research question or hypothesis. (Please see above.)
- Sample selection with inclusion/exclusion criteria
  - Inclusion criteria simply consist of being an RN working at Mayo Clinic Health Systems – Mankato either full-time or part-time on night shifts, day shifts, or rotating shifts. No exclusion criteria exist.
- Sample size determination (if appropriate for study design)
  - The goal for participation will be greater than 75 volunteers, with no more than 200 involved.
- Specific plan for recruitment of subjects (who, how, when, randomization)

The convenience sample will include full-time and part-time RNs who work day shifts, night shifts, and rotating shifts. Nurses will be recruited voluntarily in the nursing stations during the days of data collection. No incentives will be offered with this study.

- Method of safety review, criteria for stopping accrual of subjects (if appropriate)
 

Not applicable. There will be no rejection of volunteers who are willing to participate. Furthermore, participation lasts less than 10 minutes so no study participant should be asked to cease that participation prior to submitting their survey results and obtaining WHC ratios.
- Study procedures, including how hospital/clinic personnel will be used in this study and timetable. (Please see above.)
- Outcome evaluation (measures, statistical analysis)
 

Descriptive statistics will be used to describe the results. Analysis of WHR assessments will involve the comparison of the mean WHR results for day shift, night shift, and rotating shift RNs. The survey information will be tabulated in an Excel format to organize the results obtained from the self-report survey. A table of results will be constructed to compare the prevalence of shift work related diseases for employees on night shift, day shift, and rotating shifts.
- Discussion of risks and procedures to minimize risk.
 

Risks will be less than minimal and include privacy from bystanders. Anonymity will be maintained by excluding participant names from surveys; individuals will be represented by numbers instead in the excel database. Self-report surveys will be set up at a workstation in a private area of the hospital unit in which that RN is working in order to provide maximum privacy and limited visibility by bystanders. Furthermore, WHR measurements will be taken discreetly within that same private area of the hospital unit, over one layer of clothing, along the mid-axillary line, and with minimal visibility of the tape measure by bystanders. The information will then be secured in a password protected computer and in a password protected online site. The risks and benefits of this research will be presented to participants verbally prior to data collection, including their right to withdraw from the study at any time.
- Discussion of benefits
 

There are no individual benefits for participating in the study. However, there may be a benefit of increased awareness of shift work stress side effects, interventions to minimize those side effects, and a tool for quantification of work stress exposure for the nursing community as a whole.
- Copy of all instruments to be used for data collection.(include demographic forms, questionnaires and surveys.
 

A copy of the survey has been included in this application. A standard tape measure will be the only other tool utilized in this study.

**Conflict of Interest – Investigator(s):** Please complete, sign & date the attached form and submit.

**Investigator(s) have completed OHRP training through NIH or Mayo Health Systems:**

Yes  Date 7/2010 (Please submit proof of completion)

No

**Medical Record Review Only:** Yes  (if yes, you have completed the form)

No  (if no, complete informed consent section)

**Informed Consent: Include the Following Elements:**

(consent forms from commercial sponsors must be rewritten in the IRB format)

	Y	N/A
<input type="checkbox"/> A statement that the study involves research, an explanation of the purpose of the research, expected duration of subject's participation, description of procedures to be followed, & identification of any study drugs or procedures which are <b>investigational or experimental</b> .	X	
<input type="checkbox"/> A description of any reasonably foreseeable risks or discomforts to the subject.	X	
<input type="checkbox"/> A description of any benefits to the subject or to others.	X	
<input type="checkbox"/> A disclosure of appropriate alternative procedures or treatment.		X
<input type="checkbox"/> A description of the extent, if any, to which the confidentiality of records will be maintained and notes the possibility that the FDA may inspect the records.	X	
<input type="checkbox"/> An explanation of any compensation and/or medical treatments which may be available if injury occurs.		X
<input type="checkbox"/> An explanation of whom to contact about the research and subject rights and whom to contact about a research related injury.	X	
<input type="checkbox"/> A statement that participation is voluntary, that refusal will involve no penalty or loss of benefits to which the subject is otherwise entitled, and that subject may discontinue participation.	X	
<input type="checkbox"/> A statement that the treatment or procedure may involve risks to the subject (or embryo or fetus if the subject becomes pregnant) which are currently unforeseeable.	X	
<input type="checkbox"/> Circumstances under which participation may be terminated by the investigator without subject's consent.		X
<input type="checkbox"/> Any additional costs to the subject that may result from participation.		X
<input type="checkbox"/> Consequences of a subject's decision to withdraw from the research and procedures for the termination of participation by the subject.	X	
<input type="checkbox"/> A statement that any significant new findings during the course of research which may have an impact on the person's willingness to continue participation will be provided to the subject.		X
<input type="checkbox"/> A statement of the duration of the study.	X	
<input type="checkbox"/> Written at approximately a seventh grade reading level using second person language.	X	

---

Procedure for randomization should be clearly outlined. X

---

**Copy of Consent Forms**

Date copies submitted to IRB Coordinator: April 13, 2012

Reviewer \_\_\_\_\_ Date Sent \_\_\_\_\_ Date Returned \_\_\_\_\_

Reviewer \_\_\_\_\_ Date Sent \_\_\_\_\_ Date Returned \_\_\_\_\_

\_\_\_\_\_ IRB Approval Date

\_\_\_\_\_ Annual Report Date (if required)

Updated: 2/5/10

**Appendix C**

**IRB Letter of Approval - Minnesota State University**



March 21, 2012

Dear Hans-Peter de Ruiter, PhD:

Your proposed changes to your Minnesota State University approved research ([309929-2] The Health Impacts of Nursing Shift Work) have been accepted as of March 21, 2012. Thank you for remembering to seek approval for changes in your study.

If you make additional changes in the research design, funding source, consent process, or any part of the study that may affect participants in the study, you will have to reapply for approval. Should any of the participants in your study suffer a research-related injury or other harmful outcome, you are required to report them to the IRB as soon as possible.

The approval of your changes is attached to your original proposal; therefore, the original approval date has not changed. When you complete your data collection or should you discontinue your study, you must notify the IRB. Please include your log number with any correspondence with the IRB.

This approval is considered final when the full IRB approves the monthly decisions and active log. The IRB reserves the right to review each study as part of its continuing review process. Continuing reviews are usually scheduled. However, under some conditions the IRB may choose not to announce a continuing review or a modification.

I wish you success in your research. If you have any questions, feel free to contact me at [patricia.hargrove@mnsu.edu](mailto:patricia.hargrove@mnsu.edu) or 507-389-1415.

Cordially,

Patricia Hargrove, Ph.D.  
IRB Coordinator

Mary Hadley, Ph.D.  
IRB Co-Chair

**Appendix D**  
**Consent for Participation**



**CONSENT TO PARTICPATE IN:  
The Health Impacts of Nursing Shift Work**

You are invited to take part in research about the health impacts of nursing shift work. You are a potential participant because you are working as a registered nurse at Mayo Clinic Health Systems - Mankato. The research is being conducted by Amanda Shandor and is endorsed by Minnesota State University, Mankato. We ask that you read this form before agreeing to participate in the research.

Participation is voluntary and responses will be kept anonymous. However, whenever one works with email/the internet there is always the risk of compromising privacy, confidentiality, and/or anonymity. Despite this possibility, the risks to your physical, emotional, social, professional, or financial well-being are considered to be 'less than minimal.' The survey information will be stored in a password protected computer and a password protected online account for less than 1 year by Amanda Shandor, researcher.

**Voluntary nature of study**

Your decision whether or not to participate in this research will not affect your current or future relations with Mayo Clinic Health Systems or Minnesota State University, Mankato. You do not need to complete participation if you feel uncomfortable doing so. You have the option to not respond to any questions that you choose. Submission of the completed survey will be interpreted as your informed consent to participate and that you affirm that you are at least 18 years of age.

**Purpose**

The purpose of the research is to find:

4. Is there a difference in expressed stress between RNs working night shifts, day shifts, or rotating shifts as indicated by waist-hip-circumference ratios (WHR)?
5. Is there a difference in the prevalence of stress related health problems between night shift, day shift, and rotating shift RNs as indicated by subjective self-report survey results?
6. And, are there more stress associated behaviors apparent in a particular nursing shift as indicated by subjective self-report surveys?

**Procedures**

We ask that you be willing to complete a questionnaire and have your waists and hip measured twice by the researcher. Participation in this survey should take less than 10 minutes.

**Risks**

The only risk associated with this research is that of privacy and confidentiality which will be maintained by replacing identifying information with numbers, utilizing a discreet and private location, obtaining measurements over a single layer of clothing, having participants enter the WHR data in their survey to prevent the researcher from seeing individual survey entries, and storing data in a password locked computer and password protected online account.

**Benefits**

There are no direct benefits to participating in this study. However, this study may benefit future endeavors to minimize nursing shift work stress and its subsequent health effects.

**Compensation**

No compensation is provided in this study.

**Contact**

The researcher conducting this study is Amanda Shandor. If you have any questions about the research, please contact her via e-mail at [shandor.amanda@mayo.edu](mailto:shandor.amanda@mayo.edu). If you have questions about the treatment of human subjects, contact the MSU IRB Administrator, Dr. Barry Ries, at 507-389-2321, Institutional Review Board, 115 Alumni Foundation, Minnesota State University, Mankato. If you would like more information about the specific privacy and anonymity risks posed by online surveys, please contact the Minnesota State University, Mankato Information and Technology Services Help Desk (507-389-6654) and ask to speak to the Information Security Manager.

**MSU IRB LOG #**

**Date of MSU IRB approval:**

**Appendix E**

**Letter of Support from Mayo Clinic Health System – Mankato**



**Mankato**  
1025 Marsh Street, P.O. Box 8873  
Mankato, Minnesota 56002-8873  
507 625 4031  
507 385 2925 TDD/TTY

1025 Marsh Street  
Mankato, MN 56001

February 24, 2012

To Whom It May Concern,

The Mayo Clinic Health Systems Mankato is aware of the proposed Minnesota State University, Mankato Graduate Thesis Research project, *The Health Impacts of Nursing Shift Work*. I understand that the involvement of our hospital in assisting you to accomplish this project includes nursing assistance, space, questionnaires, and provision of a laptop computer.

As the Vice President of Operations- Inpatient Nursing, I have read through your research proposal and support the involvement of our hospital facility and nursing staff in this project. I look forward to working with you.

Sincerely,

A handwritten signature in cursive script that reads 'Christine Daly'.

Christine Daly, RN  
Vice President Operations- Inpatient Nursing  
Mayo Clinic Health Systems  
Southwest Minnesota Region