THE EFFECTS OF NIGHT SHIFT WORK ON NURSES’ HEALTH AND QUALITY OF LIFE

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Sainab A. Warsame

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Abstract

of

THE EFFECTS OF NIGHT SHIFT WORK ON NURSES’ HEALTH AND QUALITY OF LIFE

by

Sainab A. Warsame

Due to the need for 24-hour coverage for patient care, it is common for a significant number of nurses to work the night shift. Numerous studies reveal how shift work affects physical, mental, and psychological health and how those who work regular night shifts may be placing their health and quality of life at risk. There is a gap in the research on the impact of years of night shift work on nurses’ health and quality of life. The purpose of this study was to examine the effects of night shift work on nurses’ quality of life, health outcomes, and overall perception of quality of life and health. A cross-sectional descriptive correlational design was used to examine if there was a relationship between the study variables. A sample size of 53 nurses participated in the study. Data were collected using the World Health Organization’s Quality of Life (WHOQOL) questionnaire (Harper & Power, 1998). The demographic survey included health outcomes. There were no significant correlations between years of night shift work, quality of life, health outcomes, or overall perception of quality of life and health.

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CHAPTER ONE
INTRODUCTION

Nurses working during the night shift often place their health and overall quality of life at risk. There is ample evidence-based research that identify the relationship between sleep deprivation from night shift work and nurses’ ability to perform tasks and adhere to patient safety (Johnson, Brown, & Weaver. 2010). In contrast, there appears to be lack of comparable research studies that focus on the physical (Ershler, 2007) and psychological effects that increased length of night work has on nurses. Thus, it was determined that a research study would further evaluate the proposed effects night work has on nurses’ health as well as quality of life.

Theoretical Framework

Callista Roy’s Adaptation Model (RAM) was used to provide further information regarding the broader affects of stress on the human body. Roy’s model emphasize that a person is in a constant interaction with the changing environment and to cope with the changing environment, one must use adaptive mechanisms (Nayback, 2009). Thus, Roy Adaptation Model identifies four methods used to adapt to the environment: physiological, self-concept, role function and interdependence. Roy’s Adaption Model will be discussed in-depth in Chapter Two.

Background and Significance

There are many myths and inquiries about how shift work affects the body and how those who work regular night shifts may be putting their health and quality of life at risk (Nasrabadi, Self, Latifi, Rasoolzadeh, & Emani 2009). Research shows that 35% of
hospital employees are expected to work during the night (Coffey, Skipper, & Jung, 1988). In 2007, the World Health Organization listed night shift as a likely causes of cancers (Benham, 2010). Additionally, many studies have associated working at night with an array of health issues and poor quality (Pan, Schernhammer, Sun, & Hu, 2011) (Totterdell, Spelten & Pokorski, 1995).

While, the impact of night shift has on nurses’ health has been speculated, no research has explored the extent of the perceived impact on nurses’ health and quality of life. Recently, most studies on night shift work have focused on sleep deprivation as it relates to psychomotor performance (Johnson, Brown & Weaver, 2010), fatigue (Kunert, King, & Kolkhorst, 2007), job-related stress and job performance (Coffey, Skipper, & Jung, 1988). A research study exploring the health and quality of life risk of night shift work was recognized as missing from the realm of studies in the subject matter. Therefore, a study on the identified problem was deemed beneficial, so that it may lead to further studies and propose interventions that counteract the negative effects night shift work may have on nurses.

The Problem

Nurses working the night shift were found to be more likely to suffer from endometrial cancer (Ershler, 2007), cardiovascular disease, diabetes (Pan, Schernhammer, Sun, & Hu, 2011) and reproductive problems (Totterdell, Spelten & Pokorski, 1995). Moreover, symptoms of psychological problems such as stress, emotional instability and relationship problems were also increased among night shift
nurses (Sveinsdottir, 2006). Overall, night shift nurses reported higher levels of poor quality of life (Schwartz & Roth, 2006). Presently, few research studies exist that identify and correlate the health and personal problems encountered by night shift nurses.

**Purpose of the Research**

The purpose of this study was to examine the effects of night shift work has on nurses’ health and quality of life. The study’s sample population was night shift nurses who currently work at Southern California hospitals.

**Research Question**

The research questions are: 1. “Is there a significant relationship between the length of night shift work and health outcomes” 2. “Is there a significant relationship between the length of night shift work and quality of life”?

**Research Variables**

To determine if there was a casual relationship between the variables; the following terms were defined as part the research study. The independent variable is the nurses’ length of time working night shift as determined by total number of years. The dependent variables are quality of life and health outcomes as reported by nurses working the night shift using the World Health Organization’s Quality of Life (WHOQOL) questionnaire and an additional health outcome questions on the demographic survey. In addition, other demographic such as age, gender, number/age of children at home, marital status and years of night shift work were determined to be possible contributing factors to nurses' poor quality of life and negative health outcomes.
CHAPTER TWO
LITERATURE REVIEW

A literature review on the effects of night shift work has nurses was conducted using the following databases: CINAHL, PubMed, Psych Info and Google Scholar. The following keywords were used: night shift work, nurses’ health, shiftwork, sleep deprivation, quality of life and the search was limited to peer-reviewed English articles. A total of sixty-three article abstracts that appeared relevant were reviewed; from that list twenty-two articles were selected for in-depth review and nine articles were selected to be included this study.

Pan, Schernhammer, Sun, & Hu (2011) conducted a study to assess the direct correlation between type 2 diabetes and women who work rotating night shifts. Researchers sampled two 5-year cohorts from previous studies (NHS 1 1976 and NHS 2 1989) and used follow up questionnaires along with a comparison group of women who did not report working night shift. Researchers then utilized statistical methods (time-dependent Cox Proportional hazards models). Findings were out of their sample size of 121,704 in NHS 1 6,165 developed type 2 diabetes. In NHS 2, out of the sample size of 116,677 type II diabetes was found in 3,961. Researchers concluded “an extended period of rotating night shifts work is associated with a modestly increased risk of type 2 diabetes in women which appears to be partly mediated through body weight.” (p. 1). Thus, concluding that working night shifts was directly correlated with a risk of obesity and metabolic syndrome and which are also closely linked to type II diabetes.

Nasarbandi, Self, Lattifi, Rasoolzadeh, & Emami (2009) conducted a study of
nurses in Iran who work night shift and the common perceptions associated with working the night shift. The study was a qualitative interview of eighteen nurses from four different general education hospitals. Data was collected using a semi structured interview and was analyzed by content analysis—that includes coding the data and constructing themes and patterns to draw meaning. Significant findings in this research was that there were socio-cultural impacts of night work such as missing from their children’s lives and not being active parents and spouses. Additionally, health related impacts were found such as fatigue and stress. Lastly, the researchers found that nurses who worked the night shift gained more independence and experience as nurses.

Totterdell, Spelten, & Pokorski (1995) investigated the effects of night shift and psychological changes during the menstrual cycle. Using a sample size of twenty-four nurses, a pooled time series analysis and self-reporting conducted covering a period of twenty-eight days. Participants who worked the rotating shift logged in responses on a hand held computer every two hours in regards to their moods and symptoms. The significant finding in the research was that there was a strong correlation of a relationship between the type of shift worked and the phase of the menstrual cycle. Furthermore, it was concluded that “the level of alertness was found to be weaker in the end of the nights during the premenstrual phase as opposed to the other phase and shifts” (p. 1003). The researchers concluded, “This study provides limited evidence that the temporal stress of night work may alter some aspects of nurses experience of the menstrual cycle” (p 1004).

Benham (2009) investigated sleep, stress and associated health related models. A multiple regression study was conducted using two hundred and eighteen female and
male nurses to complete a survey inquiring about self perceived stress, sleep and health measures. The instruments utilized for this study were Perceived Stress Scale, the Cohen-Hoberman Inventory of Physical Symptoms and the Epsworth Sleepiness Scale. Findings from this study suggested that there was a strong association between stress and illness and lack of good sleep quality and greater daytime sleepiness was associated with poorer health.

Johnson, Brown, & Weaver (2010) conducted a non-experimental correctional study (n=289) to assess sleep deprivation and its relationship to psychomotor performance of nurses who worked the night shift. The instrument used in the study was a demographic questionnaire that measured the shift, years of experience and the length of years the nurses worked the night shift. The psychomotor performance was measured utilizing the d2 Test of Attention. Findings indicated fifty-six percent of nurses were sleep deprived with the mean hours of sleep of the participants of 3.9 hours per day. Furthermore, the study found both the sleep deprived nurses had poor psychomotor performance scores supporting the notion that night shift work may result in impaired attention and lack of concentration possibly causing them to make errors.

Muecke (2005) published a literature review of research articles published between 1992 and 2002 to examine the effects of sleep and fatigue has nurses’ ability to cope with the rigorous work hours and the impact it might have on how they may care for their patients. The inclusion criteria were research articles about nurses and nursing, and contained the keywords; shiftwork, rosters, intensive care, fatigue, sleep deprivation and sleep studies. Based on the review of literature findings, sleep
deprivation and fatigue caused by night shift work can lead to major physiological and psychological effects for nurses which may have an affect on patient safety and the quality of care provided. These effects appear to be more profound in nurses over 40 years of age.

Using a cross sectional design Sveinsdottir (2006) conducted a correlational study \( (n=43) \) to compare the quality of sleep, occupational health, work environment illnesses, and job satisfaction among day shift, rotating shifts and night shift nurses. The study revealed no relationship between health effects or quality of sleep in association with one particular shift. However, nurses who worked the day/night rotating shift reported more stressful work environment, more strenuous work and had less control of their work pace. Additionally, rotating shift nurses also reported using more pain medications compared to nurses on day or shift.

Admi H, Tzischinsky O, Epstein R, Herer P, Lavie P. (2008) published a descriptive correlational study to assess the relationship between health problems and sleep disorders of nurses. Using a sample size of 738 nurses, study compared many factors including examining the difference between female and male nurses and night and day shift nurses. Also, the relationship between shift work and organizational errors and incidents and absenteeism from work were compared. The study yielded the following findings; female nurses complained more about health problems than males nurses. The study compared non-adaptive (unable sleep, multiple awakenings from sleep) versus adaptive nurses in their involvement in adverse incident, rates absenteeism and sleep problems; study did not show the non-adaptive group to have higher rates of the fore-
mentioned problems than the adaptive group. Moreover, the study revealed that most nurses who experience a difficult time with a particular shift are likely to make the decision to transition into the shift that is in an alignment with their lifestyle.

**Major Variables Defined**

**Night shift.** Johnson, Brown, & Weaver (2010) defined a full shift as 40 hours per week. This definition for night shift was adopted for this study. However, nurses may work less than 40 hours and still be considered full time if they work 3 shifts in one week of at least 12 hours each. For the purpose of the study, nurses who work 36 hours or more per week were will be considered full time.

**Health Outcomes.** The definition of health outcomes will include whether the participant has a given health condition diagnosed since working the night shift. Possible diagnosed conditions include but not limited to the following physical and psychological conditions: hypertension, diabetes, depression/anxiety, asthma, cancers, weight gain/loss, thyroid problems and reproductive problems or other.

**Quality of Life.** The definition of quality of life is multidimensional but it compasses the following components; physical, emotional, social and material wellbeing as well as measure of development and activity (Felce & Perry, 1995). The World Health Organization’s Quality of Life (WHOQOL) (Appendix B) scale was selected to measure the following four factors: physical health, psychological health, social relationships and environmental health.

**Demographic Variables.** The following demographic variables were selected based on previous studies. Age refers to chronological age and gender what is self-
reported by the participant as being a male or female. Age and number of children at home inquires about how many children and the age range of children that reside with the participant. Lastly, marital status refers to the relationship status of the participant as being single, married, divorced or widowed.

**Theoretical Framework.** As discussed in Chapter One, Roy’s Adaptation Model was utilized in this study. The individual’s adaptive system involves both internal stimuli and environmental stimuli; the person strives to adapt to the changing environment. Important concepts within RAM include; stimuli, coping process, adaptive modes, and behavior (Nayback, 2009). **Stimuli**- environmental stressor such as night shift work, forces the nurse to react the stress. **Coping processes**- attempts to find coping mechanisms indicating some level of tolerance for the night shift or signifying a need for a change from the current shift. Coping abilities can be genetically acquired or a learned process (Nayback, 2009). **Adaptive Modes**- the individuals physiological, self-concept, role function and interdependence contribute to the coping process and the ultimate response to the stressor (Villareal, 2003). **Behavior**- the end result to the stressor; positive response or ineffective response (Villareal, 2003) that will lead to poor quality of life and/or negative health outcomes.
Summary

The literature reviewed for the purpose of this research indicates that there are a variety of effects associated with working the night shift as a nurse. Although, some associations such as sleep deprivation, stress, and fatigue were directly correlated others such as medical errors are loosely associated and may be accounted for by other variables. However, there is an association with negative effects cited such as sleep deprivation and stress that could have an impact on the quality of life and health.
Furthermore, the body’s response to night shift work is found to reduce the effectiveness of the immune system, making nurses more susceptible to illness. Subsequently, research for the most part is dated and needs to further view the nurses’ ability to perform their duties without being a detriment to patient care. Most of the research indicates some level of negative outcomes associated with working night shift, specifically, on nurses’ health and quality of life. While, there is an ample amount of research citing association between certain diseases and night shift work, there is still no definite evidence for a cause and effect relationship. However, what needs to be further explored is; if there a significant relationship between hours per week of night shift work over time and health outcomes and quality of life as reported by night shift nurses. While, there is an ample amount of research identifying the relationship between certain health problems and night shift work, a study is warranted to further explore if there a significant relationship between the number of years working full time on the night shift, health outcomes and quality of life among night nurses.
CHAPTER THREE

METHODOLOGY

Introduction

Millions of Americans work the night shift on a regular basis and recent evidence shows that there are negative health risks and poor quality of life associated with night shift work (Schwarts and Roth, 2006). Due to the need for 24-hour coverage for patient care, it is common for a large population of nurses to work the night shift; thus, possibly their health and quality of life.

The impact of night shift work on nurses has been questioned in numerous studies, thus, the health and personal outcomes it has on nurses need to be investigated. (Nasrabadi, Self, Latifi, Rasoolzadeh & Emani, 2009). Several studies show evidence of a relationship between adverse health affects and quality of life among nurses resulting from extended period of night shift work (Sveinsdottir, 2006). The purpose of the study is to better understand the number of years working the night shift and quality of life of nurses working the night shift. Findings from this study and others may point to the need for health education and preventive strategies for nurses to decrease adverse health outcomes and increase their quality of life. It is essential for organizations to provide resources and a work schedule that decreases the adverse effects of working the night shift and supports the nurses’ ability to engage in self care strategies to maintain both physical and mental health in order to have a positive impact on patient outcomes.

Research question

The research questions are 1. Is there a significant relationship between length of
time working the night shift and quality of life?”

2. “Is there a significant relationship between the length of time working the night shift and health outcomes?”

**Identification of Setting**

Participants were approached in person and/or contacted through email by the principal investigator to partake in the study. A Facebook page was created and utilized to post information explaining the purpose of the study including any risks, benefits and obtaining the results. Furthermore, a link through Survey Monkey was available for participants to take the survey. The study participants were encouraged to inform their colleagues and friends about the study. Once on the Survey Monkey link, participants were directed to the consent information page (Appendix D), where they agreed to partake in the study. The participants were prompted to complete the World Health Organization’s Quality of Life (WHOQOL)-BREF survey (Appendix B). Finally, they were asked to complete a baseline demographic questionnaire containing questions relating to health outcomes since working the night shift (Appendix C).

**Research Design**

A cross-sectional descriptive correlation design was utilized for this study to examine if there was a relationship between the years of working night shift, quality of life and health outcomes. The World Health Organization’s Quality of Life (WHOQOL) (Harper & Power, 1998) questionnaire was used to measure the participants’ perceptions of their health and quality of life as it relates to working during night shift.
Population and Sample

A nonprobability convenience sample was recruited to participate in the study; using a snowball sampling recruitment method. The participants were encouraged to notify others who may be interested or eligible for the study. The study was approved by CSUSM the Institutional Review Board (IRB). Night shift nurses who work at local hospitals were recruited and those existing participants were encouraged to recruit others from among their acquaintances and coworkers. The inclusion criteria for participants will be; 1) registered nurses 2) work night shift for least 36 hours per week, and with a minimum of 1 year experience 3) 18 years of age and speak proficient English.

Using power analysis, a power of 0.80, an alpha level of 0.05 and an effect size of 0.30 determined a sample size of 36 nurses. An additional 20% was added for those failing to complete the survey, thus, determining the number of participants the investigator needs for the study to be 43 nurses (Appendix A).

Measurement Methods

Baseline demographic questions was collected prior to completing The World Health Organization’s Quality of Life (WHOQOL) instrument (Appendix B). An abbreviated version of the WHOQOL-BREF containing a 26 items questionnaire. The items included in the questionnaire range from “rating quality of life”, “satisfied with health” and “physical pain.” The participants also self-rated their overall quality of life and health using a Likert type scale from 1 (very poor) to 5 (very good) (Harper, A. & Power, M., 1998). The WHOQOL-BREF instrument contains four main domains; each assesses a particular part of the person’s life to gather a general sense of their quality of

Jang, Hsieh, Wang, & Wu, (2004) found the WHOQOL to have reliability in terms of test-retest and internal consistency. With a Cronbach alpha values of (a=.74–.78) in all domains except in the social relationships domain (a=.54). Furthermore, the instrument showed a good to excellent internal and external validity indicating that the instrument had the ability to generalize the findings to the target population (Skevington, Lotfy, & O’Connell, 2004). In addition, a demographic questionnaire was administered to the participants to collect basic background information including health outcome questions inquiring about health conditions diagnosed since working the night shift.

Data Collection Process

A snowball sampling method of data collection was employed to obtain a minimum 43 nurses who work the night shift. Approval was obtained from the University IRB. Information flyers were distributed, potential participants were approached and/or contacted by the principal investigator to partake in the study. A link to Survey Monkey was available for participants on information regarding the study, and consent to participate in the study. Moreover, the study participants were encouraged to inform their colleagues and friends about study.
Coding and Scoring

The WHOQOL-BREF contains 26 item questionnaire and each question is scored from 1 to 5 on a response scale, which is set as a five-point ordinal scale (Vahedi, 2010). According to the guidelines, the WHOQOL-BREF is grouped into 4 domains of quality of life (physical health, psychological health, social relationships and environment). The scores are determined by the mean score of all items in each domain which equal the domain score. Additionally, there are two questions that measure the overall perception of quality of life and overall perception of health. These questions are scored separately based on a response; from poor to very good perception of quality of life and not satisfied with health to very satisfied with health. Furthermore, question 3, 4 and 26 were reversed coded to transform negatively framed question to positively framed question. The higher scores signify better quality of life and perception of good health. (Harper, A. & Power, M., 1998).

Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 20 and responses were analyzed using ordinal level measurement, in which scale items derived include subjective responses of participants such as “agree”, “somewhat agree” and “strongly disagree” (Plitcha & Kelvin, 2013). A health outcomes question was included in the demographic questionnaire inquiring if the participant had received a medical diagnoses among the following conditions: hypertension, diabetes and weight gain/weight loss, reproductive problems, thyroid disorders and cancer since working the
night shift. In addition, the nurses’ number of hours per week of night shift work were collected and later multiplied by the total number of years. Spearman’s correlational analysis was conducted to determine the relationship between years of night shift, overall quality of life, overall perception of quality of life, health outcomes and overall perception of health. The following variables in Table 1 are part of the study.

Table 1: Research Variables

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<td>Quality of life</td>
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<tr>
<td>Age</td>
<td>Health outcomes</td>
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<td></td>
<td>Perception of quality of life</td>
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<td>Perception of Health</td>
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Limitations

The data was collected from nurses of hospitals in Southern California, thus, cannot be generalized to nurses of hospitals in other cities. In addition, there may be a tendency of participants to give socially desirable answers, which might produce false results.

Ethical Considerations

Prior to the commencement of the research study, approval from the University IRB was granted. Participants were recruited via an email or/and in person and information flyers were distributed to targeted participants. Prior to completing the surveys, the participants signed a consent form.
CHAPTER FOUR

RESULTS

Introduction

Chapter four presents the study results of statistical data analysis. The results are organized to answer the research question “Is there a significant relationship between the length of night shift work on quality of life and “Is there a significant relationship between length of night shift work and health outcomes”?

The data was analyzed using Statistical Package for Social Sciences (SPSS) version 20 for frequency distribution including mean, median and mode. In addition, the data was further analyzed using the Spearman Rho' to determine relationship between variables. While there is disagreement on which correlation method to use on ordinal Likert scales that are added across multiple scale values, the Spearman’s method was selected over Pearson’s. The technique carries the additional advantage of discounting concerns over non-normally distributed data. (Chen & Popovich, 2002).

Data Collection and Preparation

Data was collected over a period of three months, in which the survey was made available for the participants using Survey Monkey a secure online tool. The participants were provided with the link to access the survey through their email or via a Facebook page dedicated to posting information about the study and daily reminders to complete the survey. After all responses were collected, the resulting data from the survey was exported into Excel spreadsheet and the data was analyzed using ordinal level
measurement. A Spearman Rho correlation was used to determine if a relationship existed with nurses’ number of years of night shift work and quality of life and health outcomes.

Sample

The final sample size was 66 participants with mostly completed data but 13 cases were dropped due to missing 20% or more responses to individual items leading to a total of 53 nurses. The study solely focused on the quality of life and health of night shift nurses, to determine if quality of life and health outcomes had any relationship to years of working night shift. Participants were night nurses recruited via direct contact, Facebook, email or by snowball effect.

All variables were examined for normal distribution using mean, mode and median. The majority of the participants’ gender was reported as female, (88.7%) and male 11.3%. The participants’ age ranged from 22-60 years of age, with most participants between 45-60 years of age with a mean age of 54 years and median age of 55 years. The marital status of participants was: 50% percent of respondents were married, 22.6% were single and 15.1% reported living with a significant other. For number of children at home, 64.2% reported no children at home and 28.3% had 1 to 2 children at home (Table 2). More than half of the respondents worked nightshift (Table 3) for one to five years (57.1%). Only 21% had worked nightshift for over 15 years with a mean average of 7.36 and median of 7.7 years.
Table 2

Demographics of sample

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Frequency (n)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>47</td>
<td>88.7%</td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>11.3%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>27</td>
<td>50.9%</td>
</tr>
<tr>
<td>Divorced</td>
<td>5</td>
<td>9.4%</td>
</tr>
<tr>
<td>Living w/ Another</td>
<td>8</td>
<td>15.1%</td>
</tr>
<tr>
<td>Single</td>
<td>12</td>
<td>22.6%</td>
</tr>
<tr>
<td>Children at Home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>34</td>
<td>64.2%</td>
</tr>
<tr>
<td>1-2</td>
<td>15</td>
<td>28.3%</td>
</tr>
<tr>
<td>3-5</td>
<td>8</td>
<td>7.6%</td>
</tr>
</tbody>
</table>

n=53
Table 3

Years of Working Nightshift

<table>
<thead>
<tr>
<th>Years of Nightshift</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>57.1%</td>
</tr>
<tr>
<td>6-10</td>
<td>21.4%</td>
</tr>
<tr>
<td>11-15</td>
<td>11.9%</td>
</tr>
<tr>
<td>16-20</td>
<td>2.4%</td>
</tr>
<tr>
<td>21-25</td>
<td>2.4%</td>
</tr>
<tr>
<td>26-30</td>
<td>2.4%</td>
</tr>
<tr>
<td>31-35</td>
<td>0.0%</td>
</tr>
<tr>
<td>36-40</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

Results by Research Questions

The purpose of the study was to examine if there is a significant relationship between 1) the length of night shift work, on quality of life and 2) the length of night shift work and health outcomes. In an effort to further identify relationships between variables, address the researcher examined if RNs self-reported health conditions and responses to the WHOQOL-BREF questionnaire had any correlations to the years of nightshift work.

As part of the WHOQOL-BREF instrument, respondents were asked to rate their overall quality of life (Table 4) and overall perception of health (Table 5). The results were as follows: Sixty-three percent stated having "good" or "very good" quality of life and 14% answered to “poor” or “neither good or poor” quality life. For perception of
health, approximately 52% percent of respondents reported being “satisfied” or “very satisfied” with their health, while, 27% stated they were either “dissatisfied” or “neither satisfied or dissatisfied” with their health (Table 5).

Table 4

Perception of Quality of Life

<table>
<thead>
<tr>
<th>Quality of Life</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>1.5%</td>
</tr>
<tr>
<td>Neither good nor poor</td>
<td>12.1%</td>
</tr>
<tr>
<td>Good</td>
<td>45.5%</td>
</tr>
<tr>
<td>Very Good</td>
<td>18.2%</td>
</tr>
</tbody>
</table>

n=51

Table 5

Perception of Health

<table>
<thead>
<tr>
<th>Quality of Health</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissatisfied</td>
<td>16.7%</td>
</tr>
<tr>
<td>Neither satisfied or</td>
<td>10.6%</td>
</tr>
<tr>
<td>dissatisfied</td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>39.4%</td>
</tr>
<tr>
<td>Very Satisfied</td>
<td>12.1%</td>
</tr>
</tbody>
</table>

n=52

In addition to completing the WHOQOL-BREF instrument, participants were also asked to answer a baseline demographic questionnaire. The purpose of the demographic questionnaire was to identity health problems diagnosed among participants since working the night shift. Regarding self-reported health problems; anxiety (21.40%) was the most prevalent, followed by depression (19%) and weight gain (19%). An analysis was conducted between reported length of night shift work and health conditions (Table 6). No correlation was found between years of night shift and health problems.
Additionally, the relationship between age and health conditions were examined (Table 7). A correlation was found between age and thyroid disorders and weight loss.

**Table 6**

*Years of Night and Health Conditions*

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>.16</td>
<td>.26</td>
</tr>
<tr>
<td>Diabetes</td>
<td>.11</td>
<td>.46</td>
</tr>
<tr>
<td>Depression</td>
<td>.02</td>
<td>.91</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.23</td>
<td>.09</td>
</tr>
<tr>
<td>Asthma</td>
<td>.04</td>
<td>.75</td>
</tr>
<tr>
<td>Weight Gain</td>
<td>.19</td>
<td>.17</td>
</tr>
<tr>
<td>Weight Loss</td>
<td>-.13</td>
<td>.35</td>
</tr>
<tr>
<td>Thyroid</td>
<td>.09</td>
<td>.51</td>
</tr>
<tr>
<td>Reproduction</td>
<td>.03</td>
<td>.86</td>
</tr>
<tr>
<td>Cancer</td>
<td>.19</td>
<td>.18</td>
</tr>
</tbody>
</table>

*p < .05

**Table 7**

*Age and Health Conditions*

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>r</th>
<th>p level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>.23</td>
<td>.09</td>
</tr>
<tr>
<td>Diabetes</td>
<td>-.01</td>
<td>.46</td>
</tr>
<tr>
<td>Depression</td>
<td>.10</td>
<td>.5</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-.03</td>
<td>.81</td>
</tr>
<tr>
<td>Asthma</td>
<td>.12</td>
<td>.41</td>
</tr>
<tr>
<td>Weight Gain</td>
<td>.13</td>
<td>.34</td>
</tr>
<tr>
<td>Weight Loss</td>
<td>-.27</td>
<td>.05*</td>
</tr>
<tr>
<td>Thyroid</td>
<td>.31</td>
<td>.02*</td>
</tr>
<tr>
<td>Reproduction</td>
<td>.002</td>
<td>.99</td>
</tr>
<tr>
<td>Cancer</td>
<td>.09</td>
<td>.54</td>
</tr>
</tbody>
</table>

*p < .05

A bivariate correlation analysis (Spearman’s Rho) was conducted to test the Ho:
Rho=0; determining if there was a significant relationship between years worked night shift and the WHOQOL-BREF domains. Years working nightshift was not found to be significantly correlated with any of the WHOQOL-BREF Domains (Table 8).

**Table 8**

*Correlation of Year on Night Shift and WHOQOL-BREF Domains*

<table>
<thead>
<tr>
<th>Domain</th>
<th>n</th>
<th>Spearman’s r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Health</td>
<td>53</td>
<td>0.04</td>
<td>0.77</td>
</tr>
<tr>
<td>Psychological Health</td>
<td>53</td>
<td>0.14</td>
<td>0.34</td>
</tr>
<tr>
<td>Social Relationship</td>
<td>34</td>
<td>0.11</td>
<td>0.62</td>
</tr>
<tr>
<td>Environment</td>
<td>53</td>
<td>0.11</td>
<td>0.43</td>
</tr>
</tbody>
</table>

*p≤ .05

To ensure no possible correlations were missed, further correlation analysis were completed to look for any significant finding between the domains. First, overall perception quality of life and overall perception of health (Table 9 & 10) were each examined against years of nightshift work, and the WHOQOL-BREF domains. Years of night shift work was not correlated with overall perception of quality of life and perception of health. A moderate correlation was found with each of the four domains of the instrument and with the overall perception of quality of life and perception of health. This outcome is expected, as the correlations between domains indicate the validity of the instrument (WHOQOL-BREF).
Table 9
*Overall Perception of Quality of Life*
Correlations with Years of Night Shift, Domains, and Perception of Health

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of Night Shift</td>
<td>.21</td>
<td>.33</td>
</tr>
<tr>
<td>Dom 1: Physical</td>
<td>.37</td>
<td>.00*</td>
</tr>
<tr>
<td>Dom 2: Psychological</td>
<td>.41</td>
<td>.00*</td>
</tr>
<tr>
<td>Dom 3: Social Relationships</td>
<td>.37</td>
<td>.03*</td>
</tr>
<tr>
<td>Dom 4: Environment</td>
<td>.58</td>
<td>.00*</td>
</tr>
<tr>
<td>Perception of Health</td>
<td>.63</td>
<td>.00*</td>
</tr>
</tbody>
</table>

*p< .05

Table 10
*Perception of Health Correlations with Years of Night Shift, Domains, and Overall Perception of Quality of Life*

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of Night Shift</td>
<td>.14</td>
<td>.33</td>
</tr>
<tr>
<td>Dom 1: Physical</td>
<td>.42</td>
<td>.00*</td>
</tr>
<tr>
<td>Dom 2: Psychological</td>
<td>.38</td>
<td>.00*</td>
</tr>
<tr>
<td>Dom 3: Social Relationships</td>
<td>.58</td>
<td>.00*</td>
</tr>
<tr>
<td>Dom 4: Environment</td>
<td>.62</td>
<td>.00*</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>.63</td>
<td>.00*</td>
</tr>
</tbody>
</table>

*p< .05

Summary
Among participants in the sample; anxiety, depression, and weight were the most self-reported diagnosed conditions since working the night shift. No significant correlations were found between years of night shift work, quality of life, health outcomes, and overall perception of quality of life and perception of health. There was an
inverse correlation found between age and thyroid disorders and weight gain. Age was not related to lower perception of quality of life and perception of health. The above findings are further discussed in the next section.
CHAPTER FIVE
DISCUSSION

Introduction

The findings of this study indicate that quality of life and health outcomes are not associated with years working the night shift. It is generally reported in the literature that some features of night shift work such as fatigue, sleep deprivation, altered circadian rhythm can influence the well being and health problems experienced by night workers. Both Benham, (2009) and Svweinsdottir (2006) identified in their respective studies that stress and lack of good sleep were most often associated with poor health.

Major findings by Research Questions

The sample consisted of 53 nurses who worked the night shift, with more than half of the respondents working nightshift for one to five years (57.1%). The average of the participants in study was 54 years of age. Participants in the study identified being diagnosed with the health conditions of anxiety, depression and weight gain. Furthermore, age was correlated with health conditions such as weight loss and thyroid disease.

The first research question for this study was: “Is there a significant relationship between the length of night shift work and quality of life”. In relationship to the above question, the study did not find a correlation between quality of life and working the night shift. Quality of life was determined by the scores for each domain of the
WHOQOL instrument, with higher scores indicating better quality of life in a particular area (physical, psychological, social and environmental).

In examining the question of overall perception of quality of life, 63% of participants reported having a “good” or “very good” quality of life, which was not significantly correlated to the years of night shift work. These results support findings by Dingley (1996) on how nurses work around their unnatural work schedules and continue to adapt to night shift while maintaining their quality of life outside of work. Further investigation with nurses who work the day shift may be beneficial in comparing potential differences in overall perception of quality of life.

The second research question: “Is there a significant relationship between the length of night shift work and health outcomes?” No correlation was found between length of night shift work and health outcomes. In support of this finding, overall perception of health was rated by 52% of the respondents as being “satisfied” or “very satisfied” with their health. While the study results are not conclusive due to the small sample size, the years on nightshift of the participants needs further investigation; as 57% of the nurses in this sample have only worked 1-5 years of nightshift. It is possible the study did not recruit sufficient number of nurses with greater years of nightshift work which needs further investigation.

A significant correlation of -.27 was found between age and weight loss indicating that as age increases weight loss decreases. This was not correlated to quality of life or years working the night shift. This finding is consistent with the medical literature that weight loss is more difficult as age increases due to level of activity,
thyroid levels and diminished metabolic activity. This might be accounted for by the higher incidence of thyroid disorders occurring with females and the chances of developing the disorder increasing with age.

Nurses in the study reported the health problems of anxiety (21.40%) as the most prevalent, followed by depression (19%) and weight gain (19%). However, these diagnosed conditions were not directly correlated to working the night shift. Benham (2009) found that nightshift work may be linked to stress, depression and other health problems because of the disruption of certain biological processes. Future studies need to consider measuring for anxiety and depression as a variable among nurses working the nightshift and the relationship to quality of life and health outcomes as in this study no correlations were found using the survey. Reliable and valid instruments to measure anxiety and depression in future studies are needed to further explore this finding.

The overall perception of quality of life among participants in this study was found to be high, thus, indicating night shift work was not a significant predictor in determining their quality of life. Nurse’s perspective is essential and each individual nurse should work the shift that is best suited for his/her lifestyle. For some nurses, personal, family and financial incentives make working the night shift initially more appealing but those who can not tolerate working during the night eventually transition into day shift. While, those who continue to stay for a long duration tend to adapt and find ways to make work-life more meaningful. According to findings by Admi, et al. (2008), specific work shift did not cause high rates of health problems and sleep deprivation, instead other factors such as age and gender were found to be contributors.
Their findings were similar to the findings in this study, as years of night shift work were not correlated to quality of life and health outcomes. The overall perception of quality of life and health was noted to be high, thus, signifying other factors may need to be examined as probable contributors to quality of life and health of night shift nurses.

**Theoretical Framework**

Roy’s Adaptation Model served as the theoretical framework for the study. The theory describes a person’s process of coping and adaptation to internal and external stimuli or stressors. The person’s coping is an attempt to adapt to an ever-changing environment (Nayback, 2009). Previous research has identified a multitude of stressors affecting the physiologic and psychological mode of nurses working the night shift. This study examined the stress of working night shift and its effect on health outcomes and quality of life. The nurses who participated in this study however, reported being satisfied overall with their health and quality of life, which may indicate that the nurses in this sample have developed adaptive and effective coping skills to the stress of working the night shift. Based on the results of the study, participants responded adaptively to the environmental stressors of night shift work and created an outcome that is suitable for their lifestyle.

**Limitations**

A larger study would have been preferable to show statistical significance and ensure a proper representation of the population. A small percentage of the participants either did not complete the survey or skipped too many questions; thus, their responses were omitted.
Generalizability

This study is limited to nurses who work a full time night shift schedule with 3 days of work and 4 days off. In addition, a minimum of one-year experience as a registered nurse were required in order to partake in this study.

Recommendations for Future Research

While individual differences and preferences play an important role in adjusting to night shift work, the possible impact of night shift work on nurses should not be overlooked. The sample population in this study worked 12-hour shifts of 3 days on and 4 days off. Therefore, findings in this study may indicate that 12 hour shifts are better suited for nurses’ quality of life and health, thus, studies comparing the two can result in an additional understanding of which shift length may benefit nurses’ quality of life and health.

The sample population was not found to be negatively impacted by night shift work based on their reported overall perception of quality of life and health. Moreover, years of night shift work did not appear to correlate with their quality of life and health. Although, respondents reported anxiety and depression, there was no correlation found between working the night shifts and general health outcomes and quality of life. Nonetheless, improving other areas of life affected by nightshift work such psychological conditions of anxiety and depression as indicated by this study need further investigation. Further research examining the relationship between gender, age, anxiety, depression, and years working the night shift is warranted. Screening and health education for these 2 health problems may be indicated for nurses working the night shift.
The majority of the participants in this study had 1-5 years of night shift experience and the effects of night may not be apparent during this period. Ideally, a longitudinal study would potentially differentiate if quality of life and health outcome changes occur overtime or increased number of years working the night shift.

Future research is indicated to examine quality of life and health outcomes between night shift nurses, day shift nurses as well as swing shift nurses. Additionally, the longevity of these shifts should be analyzed between 8 hour and 12 hour increments. Other variables such as geographical location, and length of time working night shift need further examination as they relate to quality of life and health outcomes.
Appendix A: Power analysis for sample size.
**WHOQOL-BREF**

The following questions ask how you feel about your quality of life, health, or other areas of your life. I will read out each question to you, along with the response options. Please choose the answer that appears most appropriate. If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last four weeks.

<table>
<thead>
<tr>
<th>1. How would you rate your quality of life?</th>
<th>Very poor</th>
<th>Poor</th>
<th>Neither poor nor good</th>
<th>Good</th>
<th>Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. How satisfied are you with your health?</th>
<th>Very dissatisfied</th>
<th>Dissatisfied</th>
<th>Neither satisfied nor dissatisfied</th>
<th>Satisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

The following questions ask about how much you have experienced certain things in the last four weeks.

<table>
<thead>
<tr>
<th>3. To what extent do you feel that physical pain prevents you from doing what you need to do?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>An extreme amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. How much do you need any medical treatment to function in your daily life?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. How much do you enjoy life?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. To what extent do you feel your life to be meaningful?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. How well are you able to concentrate?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. How safe do you feel in your daily life?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. How healthy is your physical environment?</th>
<th>Not at all</th>
<th>A little</th>
<th>A moderate amount</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Mostly</th>
<th>Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Do you have enough energy for everyday life?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Are you able to accept your bodily appearance?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Have you enough money to meet your needs?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. How available to you is the information that you need in your day-to-day life?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. To what extent do you have the opportunity for leisure activities?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Very poor</th>
<th>Poor</th>
<th>Neither poor nor good</th>
<th>Good</th>
<th>Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. How well are you able to get around?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Very dissatisfied</th>
<th>Dissatisfied</th>
<th>Neither satisfied nor dissatisfied</th>
<th>Satisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. How satisfied are you with your sleep?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. How satisfied are you with your ability to perform your daily living activities?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. How satisfied are you with your capacity for work?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. How satisfied are you with yourself?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Seldom</th>
<th>Quite often</th>
<th>Very often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. How often do you have negative feelings such as blue mood, despair, anxiety, depression?</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix C: Consent to Participate in Research

CONSENT TO PARTICIPATE IN RESEARCH

Invitation to Participate

Sainab Warsame MSN (c) graduate student at California State University San Marcos, is conducting a research study examining the effects of night shift work has on nurses’ health and quality of life. You must be working at least 36 hours a week and have worked as a registered nurse for at least 1 year to partake in this study. Participants who do not meet the inclusion criteria will be excluded from participating in the study.

Purpose

The purpose of this study is to learn what effects night shift work has nurses’ health and quality of life.

The study objective:
1. Is to examine if there is a significant relationship between the length of time working the night shift and negative health outcomes/quality of life.

Description of Procedures

The procedure involves completing an online demographic form and a 26-Item WHOQOL-BREF questionnaire. The time to complete the online forms will take approximately 20 minutes. The research will be conducted using SurveyMonkey.com. The participants will either have the survey link mailed to their email or access the survey link via facebook page. SurveyMonkey.com is a secure online tool and responses will be collected anonymously.

Risks and Inconveniences

There are minimal risks attached to this study. There is potential of tracking email addresses on the response but the investigator will disable the storage of email addresses/facebook pages and collect responses anonymously. In addition, the study could pose minor emotional discomfort and inconveniences due to the time required to participate in the study.
Confidentiality

Your responses will be confidential and we will not collect identifying information such as your name, email address or IP address. To avoid loss, the research records will be kept private. All data will be stored in a password protected electronic format in a secured computer belonging to the principal investigator; only the research team will have access to the records.

Voluntary Participation

Taking part in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide to participate, you are free to withdraw at any time.

Benefits

Although there is no direct benefit to you for participating in this study, your participation will likely assist in finding health related impact caused by night shift, if any. Furthermore, a study on the identified problem may lead to further studies and propose interventions that counteract the negative effects night shift work has on nurses.

Questions

If you have any questions about the study, you may contact the researcher, Sainab Warsame BSN RN PHN, MSN(c) at warsa001@cougars.csusm.edu, 858-344-5893. You may also reach the researcher’s faculty advisor, Nancy A. Coffin-Romig, DNSc, PMHCNS-BC 760-750-7555, nromig@csusm.edu. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at 760.750.4029.

☐ I agree to participate in this research study.
Appendix D: Demographic Questionnaire

Demographic Questionnaire

What is your age?
1. 25 or under
2. 26-40
3. 41-55
4. 56 or older

What is your gender?
1. Female
2. Male

Number of years as a night shift registered nurse
1. 1-5 years
2. 6-10 years
3. 11-15 years
4. >16 years

Number of children at home
1. None
2. 1 child
3. 2-3 children
4. 4 or more children

Age of children at home (circle all that apply)
1. Infant
2. Toddler
3. School age
4. Teenager

What is your current marital status?
1. Divorced
2. Living with another
3. Married
4. Separated
5. Single
6. Widowed

Have been diagnosed with any of the following conditions since working the night shift? (circle all that apply)
1. Hypertension
2. Diabetes
3. Depression/anxiety
4. Asthma
5. Weight gain/loss
6. Thyroid problems
7. Reproductive problems
8. Cancers
References


Pan, A., Schernhammer, E.S., Sun, Q., & Hu, F.B. (2011). rotating night shift work and


