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# The Regional Study of Sleep-Related Behaviors of Nurse Anesthetists: Personal and Professional Implications: A Replication Study

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University of Southern Mississippi

THE REGIONAL STUDY OF SLEEP-RELATED BEHAVIORS: PERSONAL AND  
PROFESSIONAL IMPLICATIONS, A REPLICATION STUDY

by

Jarrood Paul Fontenelle

Abstract of Capstone Project  
Submitted to the Graduate School  
of The University of Southern Mississippi  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Nursing Practice

December 2015

## ABSTRACT

### THE REGIONAL STUDY OF SLEEP-RELATED BEHAVIORS: PERSONAL AND PROFESSIONAL IMPLICATIONS, A REPLICATION STUDY

by Jarrod Paul Fontenelle

December 2015

Universally, anesthesia providers are expected to be knowledgeable, astutely responding to clinical challenges while maintaining a prolonged vigilance for administration of safe anesthesia and critical care. A fatigued anesthetist is the consequence of cumulative acuity manifesting decreased motor and cognitive powers. This results in patient harm, impaired judgement, late and inadequate responses to clinical changes, poor communications, and medical errors. With increased expectations and medical-legal claims, anesthesiologists work to provide efficient and timely services, but are rendered sleep deprived themselves. It is the right time to address the issue of the health of anesthesia providers and the profession. The implications of sleep deprivation on patient safety are profound, and preventive strategies are essential. The governing bodies of anesthesia providers must ensure mandatory practices to prevent the adverse outcomes of fatigue related errors and patient compromise.

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2015

A REGIONAL STUDY OF SLEEP-RELATED BEHAVIORS: PERSONAL AND  
PROFESSIONAL IMPLICATIONS, A REPLICATION STUDY

by

Jarrod Paul Fontenelle

A Capstone Project  
Submitted to the Graduate School  
and the Department of Advanced Practice  
at The University of Southern Mississippi  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Nursing Practice

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December 2015

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## LIST OF ABBREVIATIONS

AANA	Association of Nurse Anesthetists
ASA	American Society of Anesthesiologists
CARF	Commission on Accreditation of Rehabilitation Facilities
CIQ	Cognitive Interference Questionnaire
CRNA	Certified registered nurse anesthetists
GOSC	General Outpatient Surgery Clinic
IRB	Institutional Review Board
MH	Major Hospital
OC	Orthopedic Clinic
SMAG	South Mississippi Anesthesia Group
SRF	Sleep-Related Fatigue
WG	The Watson-Glaser Critical Thinking Appraisal

## CHAPTER I

### INTRODUCTION

Fatigue is a health condition that can affect each and every one of us at some point in time. Fatigue is defined as an extreme tiredness, typically resulting from mental or physical exertion or illness (Merriam-Webster, 2010). This results when the body cannot produce enough energy to accomplish a specific task. Fatigue can be divided in three categories. The first type of fatigue is transient fatigue that is the inability to sleep or extended work hours. The second form of fatigue is cumulative fatigue which is short intervals of sleep over several days, and the third is circadian fatigue which is reduced performance during the circadian cycle, typically between the hours of 2 a.m. and 6 a.m. (Sinha & Tewari, 2013). Fatigue and sleep deprivation can combine to form very dangerous situations.

Numerous accounts of global catastrophes have been attributed to sleep-related fatigue (SRF) and have impacted professions such as trucking, aviation, maritime, and including but not limited to the medical field. Case in point, in 1989, the Exxon Valdes mega oil tanker ran aground off the coast of Alaska, spilling millions of gallons of oil. The major cause of the tragedy was a fatigued crew and limited radar equipment. This catastrophe was caused by poor decisions, causing billions in lawsuits and cleanup costs, not to mention the millions of sea creatures and wildlife that perished (“Waking up,” 2005). In 1986, the Chernobyl disaster in Ukraine occurred when a nuclear power plant exploded, killing 31 people and covering surrounding towns with nuclear fallout and radiation. Thousands are projected to have health-related cancers and complications from the subsequent release of radiation. In 1979, the Three Mile Island nuclear generating

facility in Pennsylvania suffered a partial meltdown where no fatalities occurred or health complications arose. Research indicated that this accident may not have occurred if the operator on duty was not sleep fatigued (Fushiki, 2013). These are just some of the many catastrophes our world has suffered and continue to clean up from due to individual SRF. There is a tremendous amount of literature that shows fatigue impairs human performance. Numerous studies spanning over 30 years show that fatigue increases anxiety, depression, confusion, anger, and decreases psychomotor performance (Gaba & Howard, 2002).

### Background of Problem

Health care delivery is a 24/7 operation providing care around the clock to a variety of patients. The fatigued provider has been an issue for both hospital and patient care organizations for many years. It is important to understand that reduction or elimination of sleep fatigue is of utmost importance in reducing the possibility of anesthesia medical errors and improved patient outcomes. Fatigue is caused by loss of sleep or disruptions in circadian rhythm, leading to a decreased performance. The adverse performance effects associated with decreased sleep include decreased attention-vigilance, impaired memory and decision-making, prolonged reaction time, and poor communication. Sustained wakefulness of 24 hours is the equivalent blood alcohol level of 0.1%, which is the illegal limit to drive (Biddle & Aker, 2011; Howard, Rosekind, Katz, & Berry, 2002).

There have been many studies on SRF, and multiple studies indicate that SRF affects an individual's mood, health, and function of life (Gurman, Klein, & Weksler, 2011). The effect of fatigue on an anesthesia provider has not been well documented

and/or studied. Anesthesia is a profession that strives for perfection, vigilance, and patient safety. Vigilance constitutes a major task that the anesthesia provider must pose (Murray & Dodds, 2003). This highly stressful occupation allows no margin of error. Anesthesia providers are expected to administer safe and quality anesthesia that yields favorable patient outcomes. Although SRF is accepted as the norm for anesthesia, it is mostly ignored and poses a significant problem for the practitioner and for patient safety (Sinha & Tewari, 2013).

The profession of anesthesia is a proud and elite profession. Anesthesiologists and certified registered nurse anesthetists (CRNAs) feel they are capable of performing their duties no matter the circumstances. Currently, there is a lack of research that involves anesthesia providers and their decreased sleep habits and disturbances from long, strenuous work hours (Howard et al., 2002). The underlying fact is that each and everybody in all professions develop some type of fatigue.

#### Significance of the Problem

SRF contributes to mental mistakes that lead to catastrophic events, complications, and death. The Exxon Valdez disaster created an estimated \$3 billion in damages, clean up, and lawsuits ("Waking up," 2005). Chernobyl cost the government and ultimately the taxpayers of Belarus and Ukraine in upwards of \$13 billion in cleanup cost and damages. Thousands of citizens were displaced from the accident. The cost of health complications from radiation fallout has been projected in the billions and estimates still continue to climb today. After 14 years, Three Mile Island cleanup was complete. The estimated cost was \$1 billion dollars (Fushiki, 2013). Billions of dollars have been spent on incidences that may have been prevented with some insight and

knowledge of SRF. A poll by the National Sleep Foundation indicated that one out of two drivers have driven while drowsy. One out of five drivers has fallen asleep at the wheel. Fatigue contributes to 100,000 crashes annually resulting in 76,000 injuries and 1,550 deaths (Howard et al., 2002).

In the 1990, SRF among anesthesia providers gained attention. A study by Gaba and Howard (2002) estimated that 50% of providers admitted to medical errors due to fatigue. In a New Zealand study of sleep-deprived anesthesia providers, 86% confessed to committing medication errors while 58% felt they had worked passed their safe and competent level of administering anesthesia (Gander, Merry, Miller, & Weller, 2000; Howard et al., 2002). Among other medical professions, residents who have worked over 24 hours have been shown to make 36% more diagnostic errors. The most alarming fact found was 300% of SRF preventable adverse events lead to patient deaths (Landrigan, Rothschild, & Cronin, 2004). Health concerns also plague anesthesia providers. Long, extended working hours have been shown to cause gastrointestinal and cardiovascular disease. Needle sticks and blood-borne pathogen exposures are the number one fatigue-related injury to anesthesia providers (Howard et al., 2002).

#### Statement of Purpose and Project Objective

The purpose of this capstone project is to identify SRF, factors that lead to SRF, and ways anesthesia providers attempt to correct SRF. The aim of this project is to study the sleep behaviors of a south Mississippi anesthesia group (SMAG) in order to understand possible fatigue at work. Good sleep habits and quality sleep will help reduce SRF and the possibility of medical errors. This capstone's objective is to identify poor sleep habits, make recommendations for healthier sleep practices, and suggestions on

preventing work-related medical errors due to SRF. SRF is a growing concern not just for anesthesia providers but for patient safety. Hopefully in shedding light on SRF, providers can begin to make changes in our practice geared towards providing greater patient safety and quality anesthesia care. It is my hope that this capstone bridges a gap from what was taboo to a channel of communication among practitioners, researchers, and policy makers.

### Review of the Literature

In a recent study by Biddle and Aker (2011), 40 million surgical cases a year are performed and practiced to the high standards of the American Society of Anesthesiologists (ASA) and American Association of Nurse Anesthetists (AANA) (Appendix A). These standards ensure the safe and appropriate patient care under the constant vigilance of a provider. Sleep is essential for both psychomotor and mental-task performance. A decrease in sleep alters that functionality leading to concerns related to sleep behavior and the negative consequence (e.g., medication errors, patient harm). Anesthesiologists and CRNAs during training abided by work hours set forth. However, once out in practice no standards apply and anesthesia providers can practice for extended hours, leading to sleep loss or deprivation. This sleep loss over time can decrease vigilance, resulting in degradation of anesthesia care (Biddle & Aker, 2011).

The purpose of Biddle and Aker's study (2011) was to quantify the sleep behaviors of CRNAs nationally, obtain insight from the data and to make conclusion about professional implications. Biddle and Aker (2011) used 10% of the active recertified and non-recertified AANA members. The survey was a hybrid survey that was composed of several published surveys used to study sleep behaviors and then

modified to pertain specifically to anesthesia. It was then sent to three academic CRNAs and three academic anesthesiologists for their input. Once all input was obtained and recirculated using Delphi technique, the instrument was sent back to the six academic advisors who unanimously deemed it a highly valid instrument (Biddle & Aker, 2011).

The results of the survey were interesting. Only 41% of the 3,170 surveys were completed. Of the surveys returned, 60.8% were women and 39.2% were men, ranging in age from 30 to 59 years of age. The survey reported 47% had difficulty falling asleep and 15.7% experienced sleepiness during cases. It was also noted that 35% experience chronic sleep disturbances with 25% of those using sleep aides. A staggering 48.8% of CRNAs witnessed colleagues asleep during anesthesia care (Biddle, 2011).

Biddle and Aker (2011) concludes that this national sampling of CRNAs revealed a large number of providers had sleep disturbances resulting in self-medication to sleep sometimes within hours of patient care. SRF is abundant within the anesthesia profession leading to sleep during patient care, cognitive impairment, and health issues. The data collected from this survey is testament to growing concern of our practice. Hopefully, more research and information will begin a dialogue among clinicians, researchers, administrators, and policy makers.

In the Netherlands, care for surgical patients increased, causing a change in the norm average age of 55 to increase to 57 for night shift duty. However, it was questionable if they were fit to perform nightly duties, and if it was safe for the patients (Meeusen, Hoekman, & Zundert, 2014). The human body's internal clock is programmed by the hypothalamus to sleep at specific times of day. Circadian rhythm dictates the two different times a day (1-4 p.m. and 3-7 a.m.) that the body increases the need for sleep,

therefore lowering levels of activity, vigilance, and performance leading to errors and accidents (Czeisler et al., 1999; Van Dongen, 2000). Increased fatigue in anesthesia providers results in accidents such as syringe swap, over and/or underdosing medications, and patient harm. The study aimed at understanding fatigue levels of older anesthesia providers to correlate demographic factors and fatigue levels.

In 2012, Dutch CRNAs were approached to participate in an online survey. Meeusen et al. (2014) used the Checklist Individual Strength Questionnaire to validate and measure fatigue. The multiple-choice questionnaire measured a 7-point Likert scale consisting of demographic and fatigue-related items. The four subscales used were subjective fatigue, physical activity, motivation, and concentration. Demographics were strictly used as control factors for statistical use.

The results yielded a 91% return of the survey. The gender consisted of 37 women and 68 men. Ages ranged from 50 to 61 and 85% performed on-call shifts. Unfortunately, no fatigue correlation between age and demographics could be ascertained for the data collected. What was deduced from the information is that Dutch CRNAs showed twice the level of fatigue compared to younger providers. No correlation was found between day and night shift fatigues (Meeusen et al., 2014).

In conclusion, Meeusen et al.'s (2014) study showed increase fatigability scores with CRNAs greater than 50 years of age. In addition, further studies must examine stress levels, break intervals, sleep habits, and knowledge of the risks of fatigue to clarify the association between fatigue and risk factors. The study and author hope to guide further research to aid in decreasing fatigue and provide awareness within hospitals of the negative impact on patient safety.



A pilot study was conducted by Murray and Dodds (2003) to understand fatigue due to sleep deprivation. The author expressed concerns that sleep deprivation decreases a person's ability to remain vigilant and is the precursor to critical incidents. A retrospective study done in a U.K. hospital found 11% of patient's experienced adverse events, which led to moderate disability or death (Vincent, Neale, & Woloshynowych, 2001). The reports were not investigated but fatigue was considered the probable element (Alberti, 2001). Vigilance is an important task of the anesthesia provider, thus monitoring subtle changes in patient care which requires sustained attention to detail.

Murray and Dodds's (2003) aim for the study was to investigate effects of sleep disruption performance of anesthetists after a night on-call using a driving simulator to assess performance. After ethics approval and consent, 11 consultant and trainee anesthetists were studied during 22 on-call nights. Those shifts were divided into disturbed and undisturbed. Subjects were tested between the hours of 1500 and 1700 before starting an on-call shift, and between 0900 and 1100 after the shift was over. No caffeine was allowed 1 hour before testing and subjects had to be awake 1 hour prior to taking the morning test to eliminate the effects of sleep inertia. Sleep diaries and wrist sensors were used to measure movements and sleep habits.

The driving tool Murray and Dodds (2003) used for vigilance was a computer-based divided attention steering simulator (Stowood Scientific Instruments, Oxford, United Kingdom). It was a driving display with road edges and a car bonnet. Subjects had to stay within the margins to avoid risked error. Numbers appeared in the four corners of the screen and the driver had to press a button on that side of the steering wheel once it appeared.

Data was collected from steering errors each test subject performed before and after night call, and from each third of the night. Analysis of the data demonstrated nonparametric between steering error and duration of sleep. All statistical analysis was done by a personal computer using the SPSS 9.0 statistical software package. All data was collected, analyzed, and conclusions were reached.

Results indicated that the undisturbed group showed significant decrease in steering errors post call while the disturbed group showed a slight increase in steering errors post call. Performance was lacking during circadian rhythm lulls mainly between 1-3 a.m. among both groups. Ultimately, the undisturbed control group had fewer driving errors than the disturbed group. In conclusion, alertness is compromised during night shift work and can contribute to medical errors.

Estryn-Behar et al. (2003) purposed a new study to perform a secondary analysis of a database in Europe that determined if nursing staff was affected by work schedules based on work/family balance, health, and safety. Ten nations across different geographical regions were sent a survey. Of the 77,681 surveys sent to nurses, 39,898 returned the survey sent from hospitals, nursing homes, and home care institutions. Measurements were obtained from satisfaction schedules based on work/family balance, health, and safety for the major variables, and a bivariate table was derived using Pearson's Chi square test. A multivariate analysis using the SPSS 12.0 software was used with 95% confidence interval.

The results concluded work/family balance for nursing on night shifts were satisfied with their private life. Alternative shifts were not satisfied because of late hours and unsupportive child care. Health concerns were of major concerns. Many nurses

were dealing with chronic fatigue, sleeping during shifts, and fear of making mistakes. What was deduced from the survey is that 50% of nurses who worked night shifts have a higher rate of burnout and increased worries of harming patients. Moreover, a legitimate concern for patient safety and the ability of performing nursing care have increased with extended work hours. Three percent of night shift nurses reported the administration of wrong medications and needle stick accidents.

In a small college community of Peoria, Illinois, Pilcher and Walters (1997) conducted a study to assess sleep deprivation on college students' cognitive performance. It is well known that 24 hours of sleep deprivation decreases performance levels and periods of inattention are unwanted effects of sleeplessness. The purpose of the study was to determine three things:

1. Does sleep loss lead to changes in self-reported levels of psychological variables related to actual performance?
2. Does sleep deprivation alter mood?
3. Does sleep deprivation alters people's ability to make an accurate assessment of their concentration, effort, and estimated performance?

The students were randomly assigned in block fashion to either the sleep deprived or nondeprived group. A total of 44 college students from Bradley University were selected from five psychology classes. The demographic was 26 women and 18 men, with an average age of 20.5. The setting of the study took place in the university sleep laboratory and library under supervision of research assistants. The experiment began on a Friday and concluded the following morning. Participants were instructed to sleep at least 8 hours the night before the study without using drugs or alcohol. Three

measurement tools were used in the study. The Watson-Glaser Critical Thinking Appraisal (WG) measured cognitive performance containing three portions: inference, recognition of assumptions, and deduction. Self-reported scales were used to measure mood, off-task cognitions, effort, concentration, and estimated performance. Mood was assessed by using the Profile of Mood States (POMS) scale. The scale provided a list of 65 words describing certain moods that participants rated based on their feelings. The Cognitive Interference Questionnaire (CIQ) was used to assess off-task cognitions. The CIQ was a list of thoughts participants had to state how often they experienced those thoughts while taking the WG. Pilcher and Walters developed a short psychological variable questionnaire using a Likert-type scale to measure self-reported estimates of effort concentration and estimated performance. The higher the number on the scale reflected a higher estimated performance level. All statistical data was analyzed using the SAS analytical software and self-reported data was analyzed using multiple analyses of variance (Pilcher & Walters, 1997).

The findings from the study indicated participants who were deprived of sleep for 24 hours did worse on the cognitive task than nondeprived. No significant difference was found in levels of off-task cognition between the two groups. Mood was extremely affected in the sleep-deprived group. Mood changes reported were of anger, irritability, and anxiety. Findings indicated increased fatigue and confusion were linked to decrease cognitive performance. Although sleep deprived participants did poorly on cognitive tasks, they rated their concentration and effort much higher than the other group. Pilcher and Walter's (1997) data concluded that college students are unaware of the harm and danger sleep deprivation can cause on cognitive ability.

The National Institute of Health (NIH) published a paper on the effects sleep deprivation has on distinct cognitive processes. Ratcliff and Van Dongen (2009) argued that sleep deprivation adversely affects cognitive functioning and the ability to perform tasks. The effects of sleep deprivation on detailed performance outcomes such as reaction time and decision processes have not been thoroughly researched. The study was to assess specific cognitive processes that sleep deprivation affects and how.

Ratcliff and Van Dongen (2009) randomly selected 25 participants from Washington State University. The demographics were 13 women and 12 men ranging in age from 22 to 38. All participants had to be healthy, drug free, without sleep disorders, and be a good sleeper to participate in the study. Sleep logs and wrist actigraphy were required the week prior to the study to assess sleep behaviors.

The design of the study was to test participants using a two-choice numerosity discrimination task model. This model displayed asterisks from 31 to 70 in a box on the computer screen. Participants were asked to answer “small” if the asterisks were less than 50 and “large” if there were more than 50. Results were immediate, displaying error or correct on the screen. Reaction time and correct answer were calculated.

Data was collected from the three sessions and examined by the diffusion model to explain cognitive processes involved in making simple choices. The model averaged the reaction times and proportions of large and small responses. Also, parameter estimates were computed and predictions rendered.

There were no major differences in the baseline sessions. In the sleep deprivation sessions, the participants showed extremely low level of accuracy compared to the control group. Response time increased for the sleep deprivation group. Once

participants were able to recover from their sleep deprivation, cognitive ability went back to baseline. Ratcliff and Van Dongen (2009) concluded that sleep deprivation affects many aspects of cognitive processing. Sleep deprivation affects attentional arousal and impaired central processing, which lead to decreased cognitive functioning.

Performance levels following lunch declines. Most fatigue-related accidents happen around midday due to daytime sleepiness (Mitler, Dawson, Henriksen, Sobers, & Bloom, 1988). Hayashi, Watanabe, and Hori (1999) opined that afternoon napping is common and it increases the general aspects of human functioning. The purpose of their study was to understand the effects of a 20 minute nap mid-afternoon on mood, performance, and EEG activity. The objective was to determine if a 20 minute nap would decrease the possibility of afternoon sleepiness.

A total of seven university students participated in the study (three male and four female). All had to be in good health with normal sleep habits. Participants were tested prior to the study with the Sleep Habit Inventory and Morning-Evening Questionnaire. This gave Hayashi et al. (1997) a baseline of sleep practices. Participants were placed at random into two groups: nap and no-nap. Each participated for 2 weeks in both groups. Naps were given at 1400 and stopped at 1420. If a volunteer awoke in-between that time, participants had to stay in bed until time was called. No alcohol or exercise was allowed during the study period. At 2200, participants reported to the laboratory to take performance tests.

A computer-generated program tested four performance tasks. The first was logical reasoning. Characters were displayed (AB or BA) on a computer screen. The participant was asked to note if A came before B or vice versa. The second was simple

addition calculations. Participants answered as many simple math questions in 3 minutes as possible. The third was a visual detection test. Alphanumeric sequences were displayed on a screen in rapid succession. The participant had to note if an A or 3 was in the sequence or not. Last was test was of auditory vigilance and pipe tones were used. Participants had to press a correct button when target stimuli were present and an incorrect button when they were not present. After all data was collected and analyzed, the findings were surprisingly interesting (Hayashi et al., 1999).

The findings showed tremendous positive effects on mood, performance, and EEG activity. After a 20 minute nap, vigilance levels increased for several hours post-lunch. Increased levels of performance in logical reasoning and calculations scores were also noted. No negative effects were noted with the napping group. Mood was slightly elevated with the napping group compared to the no-nap group. Although there were no significant changes in EEG activity, the findings displayed slightly higher levels with the nap group. The study concluded that a brief 20-minute nap has a positive effect on cognitive performance and daytime vigilance.

#### Theoretical Framework

The theoretical framework used for this capstone is the Orem's self-care deficit theory (Appendix B). Orem bases her theory on individuals wanting to self-care because each individual has the ability to perform self-care. Orem's (1959) belief and concern was a person's need for self-care in order to sustain life and health, recover from disease or injury, and cope with the effects. To simplify, Orem wanted individuals to overcome limitations.

Orem's self-care deficit theory consists of three interrelated theories. The first is the theory of self-care, which focuses on the inner self. The second theory of self-care deficit relates to the existence of the patients' families unable to care for the individual (patient). The third theory, nursing systems, focuses on the community and family dynamics. Orem originally based her theory on the elderly patients and their ability to care for themselves but Orem widened the scope of her theory as time progressed.

For this capstone, the intent of using Orem's self-care deficit theory is to provide theoretical justification for an increased understanding anesthesia providers' self-care sleep-related behaviors. It is paramount for anesthesia providers to understand SRF and the complications that may arise from sleep disorders.



## CHAPTER II

### METHODOLOGY

The purpose of this capstone project is to identify SRF, factors that lead to SRF, and ways anesthesia providers attempt to correct SRF. The aim of this project is to study the sleep behaviors of a SMAG in order to understand possible fatigue at work. Good sleep habits and quality sleep will help reduce SRF and the possibility of medical errors. This capstone's objective is to identify poor sleep habits, make recommendations for healthier sleep practices, and make suggestions on preventing work related medical errors due to SRF. This project is threefold. The first is to understand the sleep-related behaviors of a SMAG consisting of a major hospital (MH), an orthopedic clinic (OC), and a general outpatient surgery clinic (GOSC) to gain insight into poor sleep habits and implications of SRF. The second is to derive suggestions for healthier sleep practices within the group. The third is to suggest possible policy changes, which would include more frequent breaks and a mandatory 1-hour nap for the CRNA first call watch during shift. Understanding sleep-related behaviors within the group will aid in addressing concerns to prevent fatigue related errors. This researcher will take a leadership role in addressing fatigue and changing practices in the hopes of minimizing fatigue-related medical errors.

It has been a growing concern to understand fatigue and the complications that arises from practicing fatigued. As a practitioner for years working both day and night shifts, I have been personally affected by SRF. Thankfully, no patient safety was compromised from that fatigue. However, I have witnessed many SRF behaviors from my colleagues and superiors in practice that lead to patient complications. After reading

this study and talking to Dr. Biddle, I knew this was what the capstone was going to address. The instrument derived from Dr. Biddle asks the appropriate questions in understanding groups sleep behaviors and if there is a personal or professional implications that may lead to fatigue-related medical errors or compromised patient safety. My intentions are to replicate this study with a SMAG.

### Design

The design of this project is to provide evidence based assessment approach in understanding SRF amongst a SMAG in order to make suggestions to aid in reducing the possibility of fatigue-related medical errors. After achieving Institutional Review Board (IRB) and hospital administration permission (Appendix C), the Questionnaire for the National Study of Sleep-Related Behaviors of Nurse Anesthetists will be mailed to the 47 anesthesia providers. With the questionnaire, the participants will have a detailed letter of instructions and a prepaid addressed stamped envelope. Participants will have 2 weeks to complete and return the questionnaire. All participants will remain anonymous and consent will be assumed upon receiving the questionnaires. Data will be analyzed, evaluations will be made, and suggestions will be given to Dr. Joe Campbell, chief anesthesiologist. Unfortunately, it is beyond this capstone project's ability (due to time constraints) to implement interventions, assess intervention relevance, and deduce the recommendation's effectiveness on decreasing fatigue related medical errors.

### Target Population

The population of this capstone will target anesthesia providers for a SMAG. A total of 47 participants (12 female, 35 male; age range 26-68 years) will complete the questionnaire. Participants will be part/full time employees at least one of the above

hospitals or clinics. With a high rate of return, this sample will provide a complete in-depth look at the sleep-related behaviors of the anesthesia providers of the anesthesia group. Among the 47 participants to be studied, 13 will be medical anesthesiologists and 34 CRNAs. All participants are board certified and licensed anesthesia providers. Anonymity will be granted to all participants. No sensitive data is addressed on questionnaire. There is no risk to the participants for completing the questionnaire, only a minor inconvenience from filling out the form. Benefits from the survey will aid in understanding sleep behaviors and ways to combat SRF. Data collected will be destroyed at the end of 1 year.

### Setting

The setting for this capstone project will be among three separate patient care facilities. Each deals with their own perspective surgeries and caseloads. The anesthesia providers work interchangeably among the three surgery centers. The MH is a level two trauma hospital in Hattiesburg, MS, serving the greater surrounding counties. The 512-bed facility is accredited by the Commission on Accreditation of Rehabilitation Facilities (CARF). On average, the hospital ER sees 81,000 patients with 27,000 admissions. Its physicians performed approximately 6,500 inpatient and 5,200 outpatient surgeries yearly. The OC is a 30-bed clinic located in Hattiesburg, MS. The CARF accredited surgery clinic on average over 5,000 orthopedic surgeries annually. The final clinic that is staffed by the anesthesia group is the GOSC. The GOSC serves the Hattiesburg, MS area with a multitude of surgeries from plastics, orthopedic, general, eye, pediatric ENT, and OBGYN surgeries. On average, the GOSC bills over 6,000 surgical cases annually.

In conclusion, the total caseloads among all three clinics are over 22,700 surgeries which can lead to severe anesthesia provider fatigue.

#### Detailed Procedure

This study used the Questionnaire for the National Study of Sleep-Related Behaviors of Nurse Anesthetists (Appendix D) composed by Chuck Biddle and John Aker. The survey instrument is a hybrid survey from previously published surveys used to study sleep behavior. It was tailored to specific anesthesia practice events and sent to six anesthesia professionals whose careers bridge the clinical/academic domains. Their suggestions, based on two rounds or DELPHI-edits, were incorporated into the final instrument. The instrument was resent to the same six reviewers, face validity was reassessed found to be universally high and noted no editorial changes in study tool design. Reliability was scored by an independent statistician who calculated the metrics ( $r=0.84$ ) and Cronbach's coeff. (0.86). It was concluded, based on the post-hoc analysis, that the survey tool had strong reliability and validity for the target population of anesthesia providers (Biddle & Aker, 2011).

The purpose of this capstone project is to identify SRF, factors that lead to SRF, and ways anesthesia providers attempt to correct SRF. The focus is to study the sleep behaviors of a SMAG in order to understand possible fatigue at work. The survey will contain 28 questions divided into 3 parts. The first part will be demographics (data about the participants), part 2 will be a Likert scale with numbers to circle, and part 3 will be open-ended questions for participants to write answers. The survey will take 10 minutes. The data will be contributing new information that can be used for research in the field of nurse anesthesia practice (Appendix E). No risks are expected to arise from participating

in this study. However, if participants felt uncomfortable responding to the questions, they may withdraw from participation in the survey. All data will be kept in the researcher's locked drop box, and data will be destroyed after a year from final defense.

Approval has been granted from Dr. Biddle for use of the National Questionnaire (Appendix F). Further post hoc evaluation of the instrument was sent via email as well. Descriptive statistics will be used to evaluate the quantitative data collected from the survey. Qualitative component of the data will be placed in several tables addressing pharmacological use, stimulants, and major categories or themes from open-ended questions. Unfortunately, the target population that will be studied is extremely small and will not represent the region as a whole. However, this project only intends to understand the sleep-related habits of the SMAG. Ideally, 100% completion of the questionnaire would provide a comprehensive outlook on sleep behavior of the anesthesia group. However, 40% (11 participants) confidence would give the project a relatively high relevance. In the event that there is not a 40% return rate, further follow up will be required. Each clinical site will be visited, and a pre-work meeting will be conducted to express the urgency of questionnaire completion. In addition, a mass email from Dr. Campbell to all anesthesia providers will be sent expressing the importance and urgency to return the questionnaire. Data will be collected and analyzed. Discussions will be formulated from the analyzed data and suggestions deduced. Findings and suggestions will be given to Dr. Campbell and Dr. Biddle. Detailed explanation of the data will be provided to clarify any misunderstandings.

### Project Timeline

The timeline and important submission dates are detailed in the project timeline table (Appendix G). Initial defense of capstone project will be completed July 22, 2015. Upon IRB approval, questionnaires will be mailed to the prospective participants. Tentative dates for data collection and analysis are addressed in the timeline table. Final completed oral defense of capstone project will be September 27, 2015 (Appendix H).

### Assumptions

The most vital assumption is that this capstone project will help to increase the awareness of SRF and the personal and professional implication it can bear on the individual CRNA and patient themselves. Also assumed is the belief that this small SMAG represents the vast number of CRNAs who practice in south Mississippi. In addition, there is an assumption that with increased knowledge of sleep behaviors, suggested healthier sleep habits, and frequent breaks/naps that CRNAs' will practice these things to decrease the effects of SRF. SRF is a growing problem for anesthesia providers, and we can assume one day fatigue will contribute to a medication error or critical patient outcome.

### Resource Requirements

Financial resources required for this project included cost for copy paper, envelopes, and three envelope slotted lock boxes. No additional financial means were needed to hire a DNP statistician to complete the statistical segment of the project. All statistical data were descriptive and easy to delineate. No undue time was required of the participants to fill out the survey. Participants were instructed to complete the survey in their spare time without rush.

## CHAPTER III

## RESULTS

Of the 47 surveys handed out to the SMAG, 26 (55%) completed the survey, and the data was delineated. All participants that completed the survey are of fulltime employment. The majority of the participants were men (77%) with women averaging the remaining 23%. The age range of respondents was captured with the majority of participants ranging in age between 30 and 49 years. Twenty three percent ranged in the next largest age range between 50 and 60. Table 1 explains the demographics of the participants.

Table 1

*Respondent Gender and Age from Surveys Distributed to a South Mississippi Anesthesia Group Selected to Represent the CRNAs' Sleep-Related Behaviors of South Mississippi*

Gender	≤29	30-39	40-49	50-59	60+
Male (%)	4	27	23	15	8
<i>N=20</i>					
Female (%)	0	12	12	0	0
<i>N=6</i>					

This project's next major quantitative findings are illustrated in Table 2. Surveys show that 58% of responders has difficulty falling asleep and many of those have sought out non-pharmacological and pharmacological sleep aids to maintain sleep. In Table 3, reported sleep aids participants have expressed using them to fall asleep. Incomplete sleep patterns can lead to an increase rate of daytime sleepiness, especially during work hours. Among the completed surveys, 69% of the participants experience sleepiness

during work. What was established is the majority of participants are only just satisfied with the sleep quality they experience. Amazingly, only 23% of participants would seek out medical collaboration to suggest and support healthy sleep patterns.

Table 2

*Responses to Major Quantitative Questions*

Question	Response	Response	Response
Average time to bed	Btw 9-10 39%	Btw 10-11 42%	Btw 11-Mn 19%
How long to sleep onset	≤ 10 min 47%	> 10 min 42%	30-90 min 11%
Awakenings during sleep	≤ 2 65%	≥ 3 35%	
Daytime naps (duration)	5-30 min 27%	30-60 min 23%	> 60 min 15%
Overall sleep quality	Good 30%	Okay 58%	Poor 12%
Difficulty falling asleep	Rare 42%	Sometimes 58%	
Use of sleep medication	Rare 73%	Sometimes 23%	Often 4%
Nightmares → awakening	Never 89%	Sometimes 12%	
Sleep walking	Never 100%		
Restless legs syndrome	Never 81%	Sometimes 19%	
Snoring	Rare 31%	Sometimes 42%	Often 27%
Teeth grinding	Never 65%	Sometimes 27%	Often 8%
Wake up too early	Rare 54%	Sometimes 35%	Often 12%
Wake up excessively tired	Rare 8%	Sometimes 77%	Often 15%
Sleepy during work day	Rare 19%	Sometimes 69%	Often 12%
Sleep disrupted—child care	Yes = 19%	No = 81%	
Self-Rx to stay awake	Yes = 19%	No = 81%	
Consider seeing sleep doc	Yes = 23%	No = 77%	



Table 3

*Reported Sleep Aids*

Pharmacological Aids
Melatonin
Alcohol
Nyquil
Ambien
Tylenol PM
Benadryl
Unisom
Lunesta
Mechanistic aids
CPAP

Interestingly, a small majority of participants reported that they use wakefulness aid at times of sleepiness during work hours. However, 69% of those studied feel tired during work. It would seem reasonable that at this time of sleepiness professionals would do something to stay vigilant and focused. Table 4 illustrates some of the reported wakefulness aids used by CRNAs. In addition to those reported, the wakefulness aid industry is a billion dollar market with a wide variety of products.

Table 4

*Wakefulness Aids Reported by Participants.*


---

Caffeine (soft drinks, energy drinks)  
 Coffee/tea  
 5 Hour Energy Shot

---

The qualitative component of this study emerged from the suggestions and comments made during the open-ended question segment of the survey. Those answers were collected and delineated. Three major categories of sleep exacerbating, concerns for safety, and suggestions for SRF were established. Table 5 illustrates some views participants expressed. Of those studied, 39% expressed falling asleep during a surgical case. 81% state they have seen colleagues' engaging in sleep related behavior (head nods, eyes shut) during anesthesia delivery. Interestingly enough, 81% convey not being tired driving home after long shift or call. Funny enough, one may wonder if the 81% sleeping during anesthesia care are the 81% not tired when driving home. All joking aside, SRF is a major safety issue anesthesia providers must understand and stop denying.

Table 5

*Major Categories/Themes Emerging From Open-Ended Questions*

---

**Issues provoking or exacerbating sleep loss**

- Shift work, day to night shifts, call backs from home
- Snoring bed partner
- Domestic issues: Child care, ill partner

**Issues indicating concern for patient and personal safety**

- Falling asleep during anesthesia care
- Feeling sleepy during work hours
- Falling asleep while driving home from long shifts
- Denial about sleep related fatigue
- Chronic sleep loss

**Suggestions for dealing with sleep-related fatigue**

- Work hour restrictions
  - More scheduled breaks
  - Later cases
  - 1-hour naps for call CRNA
-

## CHAPTER IV

### SUMMARY

#### Discussion

The comparison between this project and Dr. Biddle's study was almost identical. Unfortunately, this project did not have the vast collection that the initial study produced. However, the project revealed similar results and conclusions found in Dr. Biddle's study. Both studies revealed a continued pattern of sleep related behaviors that are not conducive to satisfactory sleep. Similar to the first study, the majority of the drugs used to stay awake and fall asleep were reported in this capstone project. The conclusion revealed from both studies is that fatigue is a significant concern for anesthesia providers.

Workplace sleep behavior can directly affect patient safety. Patients are considerably interested in safety topics within the healthcare system. Patients considered SRF a severe threat to individual care. How often does a patient ask a surgeon how many drinks has he had before surgery or if he/she had a good night of sleep? They may be joking, but the point is professional fatigue is a significant concern for patients. Patients expect professionals to be rested and on top of their game when performing surgery of providing anesthesia. Unfortunately, statistical surveys portray a different picture.

According to studies and historical tragedies, SRF causes billions of dollars in medication malpractice and global tragedies. We have learned from the Exxon Valdez and Chernobyl incidents that sleep behavior and fatigue can lead to disaster. After review of the surveys and table results, readers will formulate their own conclusions from the data. Several findings need to be addressed. First, this study revealed that 27% of participants use sleep aids to maintain sleep in addition to alcohol consumption. Second,

standards need to be set and expectations of professionals be addressed to unify a standard of care to aid in safe practices for patient safety.

#### Interventions

Based on the data findings, the following interventions were provided to the anesthesia group. A presentation was offered to the participating anesthesia group to inform them about the findings and possible interventions to improve sleep habits. In addition, recommendation for healthy sleep habits and sleep aid knowledge was provided to the group. Also, findings from the study were shared with Dr. Biddle to increase the data base of sleep-related behaviors of CRNAs.

#### Limitations

This project had several limitations hindering the completeness the researcher was striving for from the study. The project goal was to understand the sleep behaviors of southern anesthesia providers to represent the whole. Although having a large rate of return, the sample size of participants reassured the project's limitation. In addition, the timeline of the project limited the elaborative answers the researcher was expecting. Participants were only given a week to fill out and return. With additional time, participants could have reflected and elaborated more on the questions asked. However, the project did reveal a multitude of information from the anesthesia providers that did complete the survey.

#### Implications for Certified Registered Nurse Anesthetist Practice

The most important implication for CRNAs to understand due to SRF is patient safety. CRNAs must understand poor sleep habits and practices can lead to decreased vigilance, poor judgement, and unsafe patient care. The call schedule adds extra income

for providers aiding in the desire to work more shifts at the expense of sleep deprivation. Denial from the problem of SRF among anesthesia providers must be addressed. Adjustments need to be made to assure safe patient care. Sleep aids used to provide good sleep can also lead to continued sleepiness throughout the day. Education must be provided to fully understand the effects of sleep aids and SRF. Lifestyle changes are the most beneficial changes a practicing anesthesia provider must do to overcome SRF. However, more research must be done.

#### Implication for Research

Additional research must be done to understand the significance of SRF on CRNAs. Larger studies should be conducted to appreciate the total impact of impaired sleep behaviors on patient safety. In addition, an extended timeframe for participants would aid in a more comprehensive elaboration of open-ended questions. Furthermore, multivariable quantitative statistical data would reflect more personal research data. Personal interviews would give that distinct knowledge into SRF and sleep behavior. Research needs to be geared toward understanding fatigue of CRNAs to promote healthy and safe practices for patient satisfaction. In addition, a presentation should be given at an AANA conference to bring awareness of SRF to anesthesia providers. Furthermore, a mentoring program can be established to continue research and education on SRF and its implications for patient safety.

#### Implication for Education

What is not expressed or disclosed when accepting enrollment into an anesthesia program is the possibility of SRF and stress of the profession. Nurses come from a background of working 8-12 hours and then going home for the night. Some nurses do

have to be on call and stress does accompany those individuals. However, the majority of nurses do not take calls. Education about lifestyle changes and stress must be taught to the possible anesthesia provider during school. In addition, stress relaxation techniques and support need to be added in the curriculum. A well-educated CRNA about SRF and possible complications to professional and personal health will lead to better anesthesia practice and patient safety.

### Conclusion

In conclusion, this replication study of sleep-related behaviors has just scratched the surface of the problem anesthesia providers seem to dismiss. SRF is a growing problem not only for providers but the very patients we care for. Research and education need to be instilled into the very foundation of our practice. The ultimate goal is the protection and quality care we provide to patients and their families.

## APPENDIX A

## LITERATURE REVIEW TABLE

## A Regional Study of Sleep-Related Behaviors: Personal and Professional

## Implications, A Replication Study

Citations	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
Biddle & Aker, 2011	To examine a large random national group of CRNA's sleep-related behaviors to understand if SRF can lead to critical medical errors.	After approval from the Vagina Commonwealth University, a computer generated random sample of 10% of current active, recertified and nonrecertified AANA members was obtained. Members were divided over 7 regions including Puerto Rico and Hawaii.	Of 3,170 surveys randomly mailed to CRNAs worldwide, 1,284 were completed. 60.8% women, 39.2% were men. 85% were fulltime employed and ranged in age from 30 and 59 years of age.	A hybrid survey instrument was constructed after being sent to 3 academic CRNAs and 3 academic anesthesiologists to modify the survey to prompt relevant questions specifically tailored to CRNAs to provide optimal input about their practice. The survey used both open and closed ended questions.	1,284 out of 3,170 surveys were returned. The information was quantified into descriptive statistics and displayed in tables of information	47% reported difficulty falling asleep, 15.7% fell asleep during a case, 25% use sleep aids, 48% reported visualizing a colleague engaged in sleep-related behavior
Murray & Dodds, 2003	The aim was to investigate the effect of sleep disruption on the performance of anesthetists after a night of on-call work using a driving simulator to assess performance	Subjects were tested between 1500 and 1700 before starting an on-call shift, and between 0900 and 1100 after the shift was over. No caffeine was allowed 1hr before testing and subjects had to be awake 1hr prior to taking	After local research ethics committee approval and written consent, 11 consultant and trainee anesthetists were studied over 22 on-call nights. Those shifts were divided	The driving tool used for vigilance was a computer-based divided attention steering simulator (Stowood Scientific Instruments, Oxford, UK). Consist of a computer based driving display with edges of a winding road and the bonnet of a car.	This was done by collecting steering errors for each subject before and after night call, total duration of sleep, and duration of sleep for each third of the night. Analysis of data demonstrated nonparametric between	The undisturbed group showed significant decrease in steering errors post call. The disturbed group showed a slight increase in steering errors post call.



Citations	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
		the AM test to eliminate the effects of sleep inertia. The subjects kept a sleep diary to document interruption with sleep and wore a wrist sensor to measure movements.	into disturbed and undisturbed .	Subject had to maintain within the margins or risked error. Numbers appeared in the four corners of the screen and the driver had to press a button on that side of the steering wheel once it appeared.	steering error and duration of sleep. Comparisons were made and data expressed as median. All statistical analysis was done by a personal computer using SPSS 9.0 statistical software package.	
Estry- Behar et al., 2003	The purpose of the study was to perform a secondary analysis of a data base in Europe collected in 2003 to determine if paramedical staff is affected by work schedules based on work/family balance, health and safety.	Ten nations across different geographical regions were sent a survey	Of the 77,681 surveys sent to nurses 39,898 returned from hospitals, nursing homes, and home care institutions.	Measurement was the satisfaction of work schedule based on work/family balance, health, and safety	For the major variables a bivariate table was derived using Pearson's Chi square test. A multivariate analysis using SPSS 12.0 software was used with 95% confidence interval.	When it comes to work/family balance nursing night shifts were satisfied with their private life. Alternative shifts were not satisfied. Health concerns aim high with nurses working 12hr day and night shifts as well as alternative schedule, extended work shifts have high burnout rates and frequent worries about making mistakes. 12hr shifts aid in reducing work/home conflicts but

Citations	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
Meeusen et al., 2014	The aim was to explore subjective fatigue on older CRNAs and derive any correlation between demographic factors and fatigue levels	Send a validated questionnaire distributed to all Dutch hospitals.	The sample for the study was all the Dutch CRNAs totaling 115 50 years and older.	The Checklist Individual Strength Questionnaire was used to measure fatigue by daily work. 20 items measured on a 7 point likert scale using four subscales of subjective fatigue, physical activity, motivation, and concentration.	Subscale scores were obtained by summing the individual scores while the total score was by summing those scores. The demographic items were used as control factors for statistical analysis using SPSS version 16.0	have increased concerns on patient safety, 3% of reported wrong medications and needle sticks are prone to 12hr and greater hrs worked. No correlation found between demographics and fatigue, Dutch CRNAs older than 50 showed twice higher levels of fatigue compared to healthy younger CRNAs, fatigue was greater with long working hours and less or limited breaks
Pilcher & Walters, 1997	The purpose of the study was to determine 3 things. Does sleep loss lead to changes in self-reported levels of psychological variables related to actual	The students were randomly assigned in block fashion to either the sleep deprived or nondeprived group	44 college students from Bradley University were selected from 5 psychology classes. 26 were women and 18 were men with a	Three tools were used. The Watson-Glaser Critical Thinking Appraisal (WG) to measure cognitive performance which contained three portions: inference,	All statistical data was analyzed with SAS	The study indicated participants that were deprived of sleep for 24hrs did poorly on the cognitive task than nondeprived. No significant difference in

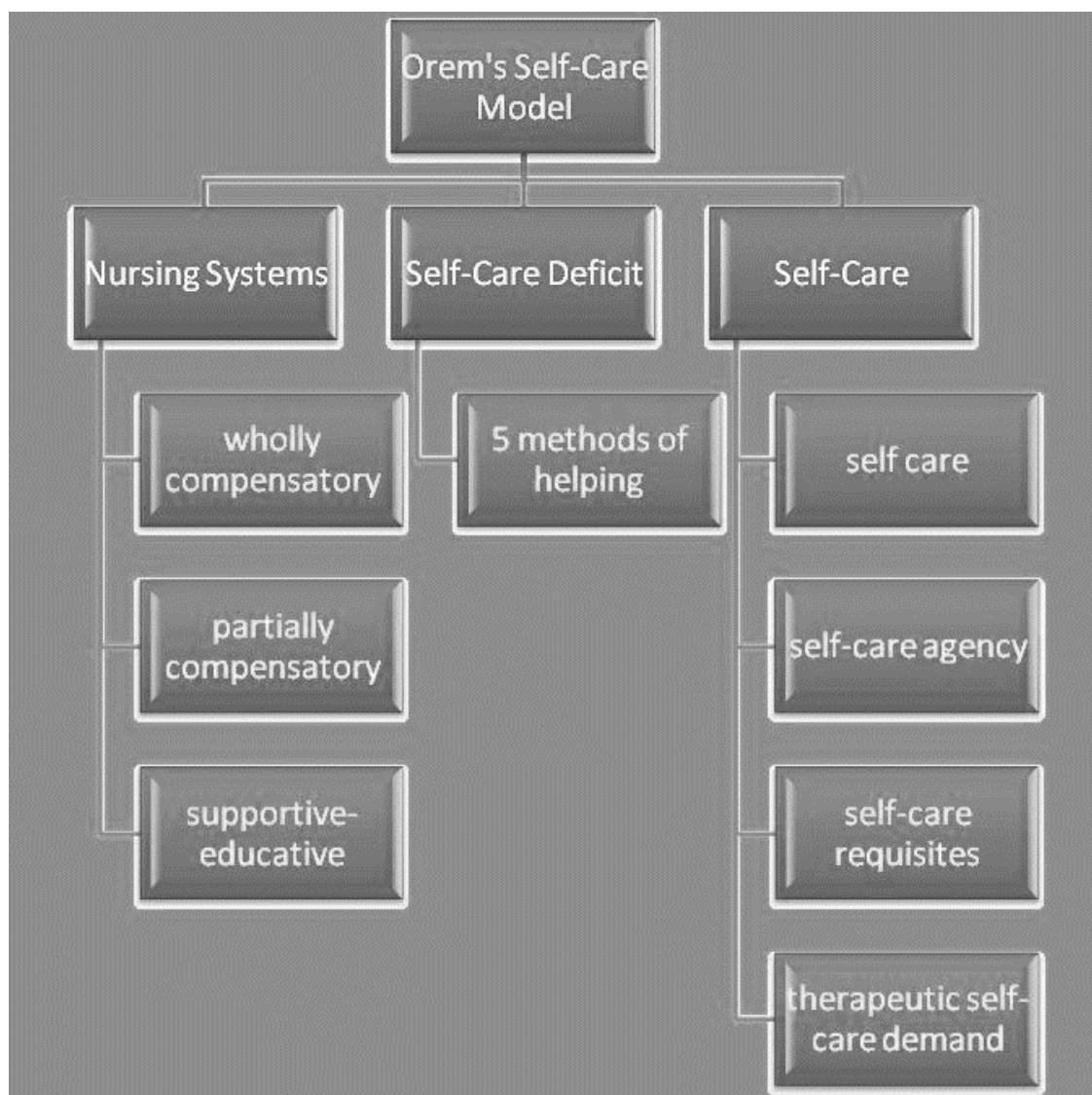
Citations	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
	performance, to determine if sleep deprivation alters mood, and if sleep deprivation alters people's ability to make an accurate assessment of their concentration, effort, and estimated performance		mean age of 20.5yo. the study took place in the university sleep laboratory and library	recognition of assumptions, and deduction. Self-reported scales were used to measure mood, off-task cognitions, effort, concentration, and estimated performance. To assess mood the Profile of Mood States (POMS) scale was used. The Cognitive Interference Questionnaire (CIQ) was used to assess off-task cognitions while participants completed the WG. Philcher developed a short psychological variable questionnaire using a Likert-type scale to measure self-reported estimates of effort concentration, and estimated performance.		levels of off-task between the two. Mood was extremely affected in the sleep deprived group. Findings indicated increased fatigue and confusion. Decrease Performance was linked to this fatigue. Mood changes reported were of anger, irritability, and anxiety.
Ratcliff & Van Dongen , 2009	The purpose was to assess what specific cognitive processes sleep deprivation affects and how.	Diffusion model quantitative design	25 participants , 13 women and 12 men age range, 22-38, had to be in good health and drug free with no sleep	Tested on a two-choice numerosity discrimination task model	Data was collected before sleep deprivation for a baseline, post sleep-deprivation, and recovery session. Data was fit in the	They were no major differences in the baseline sessions. In the sleep-deprivation session the participants showed

Citations	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
			disorders. Setting was Washington State University		diffusion model for examination.	extremely low level of accuracy compared to the control group. Response time increased for the SD group. Once participants were able to recover cognitive ability went back to baseline.
Hayshi et al., 1999	The purpose of the study was to understand the effects of a 20 minute nap mid- afternoon on mood, performance, and EEG activity	quantitative	7 university students participated in the study (3 male and 4 female) sleep habits were tested with the Sleep Habit Inventory and Morning- Evening Questionnaire	A computer generated program tested four performance tasks. The first was logical reasoning where pairs of characters were displayed (AB or BA). The participant was asked to note if A came before B or vice versa. The second was addition where participants had to answer as many simple math questions in 3 minutes. The third was a visual detection where alphanumeric sequences were displayed on the screen in rapid succession and the participant had to note if an A or 3 was	EEG data was analyzed by Fourier transformation spectral analyzer (model 7T18A, NEC-Sanei). Statistical analysis was evaluated by newman- Keuls method and Greenhouse & Geisser's epsilon	The results showed tremendous positive effects on mood, performance , and EEG activity. Vigilance levels increased after post- lunch napping. A nap improved performance in logical reasoning and calculations scores. No negative effects were observed from the statistical data of the napping participants

Citation s	Purpose/ Problem	Design	Sample Setting	Measurements	Data Collection	Major Findings
				in the sequence or not. Last was auditory vigilance. Pip tones were used and participants had to press correct when target stimuli were present and incorrect when not present		

## APPENDIX B

## THEORETICAL FRAMEWORK MODEL



Reprinted from Orem, D. E. (1959). *Guides for developing curricula for the education of practical nurses*. Washington, DC: Government Printing Office.

## APPENDIX C

**INSTITUTIONAL REVIEW BOARD**

118 College Drive #5147 | Hattiesburg, MS 39406-0001

Phone: 601.266.5997 | Fax: 601.266.4377 | [www.usm.edu/research/institutional.review.board](http://www.usm.edu/research/institutional.review.board)**NOTICE OF COMMITTEE ACTION**

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.  
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 15081401

PROJECT TITLE: A Reginal Study of Sleep-Related Behaviors: Personal and Professional

PROJECT TYPE: New Project

RESEARCHER(S): Jarrod Fontenelle

COLLEGE/DIVISION: College of Nursing

DEPARTMENT: Advanced Practice

FUNDING AGENCY/SPONSOR: N/A

IRB COMMITTEE ACTION: Expedited Review Approval

PERIOD OF APPROVAL: 08/31/2015 to 08/30/2016

**Lawrence A Hosman, Ph.D.****Institutional Review Board**

## APPENDIX D

QUESTIONNAIRE FOR THE NATIONAL STUDY OF SLEEP-RELATED  
BEHAVIORS OF NURSE ANESTHETISTS

Dear Anesthesia Colleague,

We invite you to participate in a National Sleep Study of anesthetists, the first of its kind. Sleep is crucial to personal and professional well-being and your participation in this study will help us assess the overall nature of sleep and associated behaviors in nurse anesthetists. Thank you very much for completing the following questionnaire.

1. My age is: 21-29 30-39 40-49 50-59 60+  
 My gender is: Male Female  
 I have been a CRNA for: <5 years 5-10 years >10 years  
 I work primarily in what state: \_\_\_\_\_  
 I work: Full Time Part Time
  2. When do you go to bed on the average weekday?  
 Before 8pm 8-9p 9-10p 10-11p 11-midnight after midnight
  3. How long does it usually take you to fall asleep?  
 5 minutes 5-10 minutes 10-30 minutes 30 minutes more than 1 hour
  4. How many times do you usually wake up during the night?  
 0 1-2 3-4 5-6 more than 7
  5. If you take daytime naps, how long are they?  
 5-10 minutes 15-30 minutes 30 minutes-1 hour > 1 hour
  6. How do you evaluate your overall sleep quality?  
 Excellent good satisfactory poor very poor
  7. How do you evaluate your sleep quality before the average work day?  
 Excellent good satisfactory poor very poor
- For questions #8 – 23, please use the following rating scale  
 How often during the week: 1: never or almost never  
 2: sometimes  
 3: often
8. Do you go to bed at an unusual time (later than usually) at night?  
 1 2 3
  9. Do you have difficulty getting to sleep at night?  
 1 2 3
  10. Do you drink coffee late in the evening?  
 1 2 3
  11. Do you use sleeping aids?  
 1 2 3 If so, please list what you  
 use: \_\_\_\_\_
  12. Do you wake up because of hunger or because you feel compelled to eat?  
 1 2 3
  13. Do you wake up because of nightmares?  
 1 2 3



14. Do you wake up because of talking during sleep?

1      2      3

15. Do you wake up because of walking during sleep?

1      2      3

16. Do you wake up because of leg movements or disagreeable leg sensations?

1      2      3

17. Do you snore?

1      2      3

18. Do you grind your teeth while asleep?

1      2      3

19. Do you wake up too early and have difficulty in getting back to sleep?

1      2      3

20. Do you feel excessively tired when waking up?

1      2      3

21. Do you feel sleepy during the day?

1      2      3

22. Do you feel sleepy during your normal work hours?

1      2      3

23. Do you feel sleepy in during your non-working hours, free time?

1      2      3

24. Do you ever use any medications to help you stay awake during the day?

Yes / No

If yes, what do you use? \_\_\_\_\_

25. Have you seen or considered seeing a sleep medicine specialist for a sleep related disorder? Yes / No

26. Is your sleep regularly disrupted due to childcare issues (such as breastfeeding, bedwetting, nightmares)? Yes / No

27. Open-ended questions: please feel free to elaborate.

a) Have you ever fallen asleep during a case in progress?

b) After a long day or a call shift, have you or a colleague you know been involved in or nearly had a motor vehicle accident that was attributed to sleepiness?

c) Have you witnessed a colleague who has fallen asleep during a surgical case in progress?

d) Do you have any comments of a personal or professional nature regarding the issue of sleep that you would like to share?

28. Are there any other sleep personal or professional related comments that you would like to share?

## APPENDIX E

THE ESSENTIALS OF DOCTORAL EDUCATION FOR ADVANCED NURSING  
PRACTICE AND RELATED OUTCOMES

DNP Essentials	DNP Capstone Essentials Outcomes
Essential I: Scientific Underpinning for Practice	SRF in anesthesia is a growing concern in the practice today. With a dialogue among clinicians, researchers, administrators, and policy makers, SRF can be addressed to make changes.
Essential II: Organizational & System Leadership for Quality Improvement & System Thinking	Multiple articles express the dangers of SRF causes among professions. By understanding SRF in anesthesia, we can make significant changes in providing safe and competent patient care.
Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice	Successful implementation of this survey will aid in the understanding of SRF among the anesthesia group of FGH. Further studies will need to be conducted to understand the possibilities of medical errors due to SRF in this facility. However, this data will be deduced and recommendations provided.
Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	This capstone project has analyzed and evaluated areas of SRF to aid in quality improvement. Using information systems and technology, the information compiled will transform the practice of anesthesia in adopting new ways of preventing SRF medical errors.
Essential V: Healthcare Policy for Advocacy in Healthcare	This capstone will provide a wealth of information on the sleep-related behaviors of the anesthesia staff at FGH. A pilot study would have to be done to assess the benefits of more frequent breaks for anesthesia personnel in long cases as well as a 1 hour nap for the 1 <sup>st</sup> on call anesthesia provider during his/her shift in prevention of SRF medical errors.
Essential VI: Inteprofessional Collaboration for Improved Patient and Population Health Outcomes	Interprofessional collaboration is imperative among clinicians to providing safe patient outcomes. SRF must be addressed among OR staff and adjustments made to providing quality healthcare.
Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health	This capstone project provides an understanding of SRF among a small group of anesthesia providers. It addresses bad sleep habits and coping mechanisms for achieving sleep. With the understanding of sleep-related behaviors in anesthesia, suggestions can be made for healthier sleep practices and in turn allow for a healthier lifestyle.
Essential VIII: Advanced Nursing Practice	As and APN in the field of anesthesia, the knowledge gained from this capstone will benefit me in educating, designing, implementing, and evaluating sleep healthy practices for increase wellness of practitioners and overall enhance the quality of healthcare.

## APPENDIX F

## ACCEPTANCE LETTER FOR USE OF QUESTIONNAIRE

hello jarrod,

attached is the original sleep study questionnaire that we used.

as you will see there are closed and open-ended questions. i have to tell you, professionally/confidentially.... there were replies to the last (open ended) question on the survey... that i elected not to include in the final, published paper. scary stuff. probably 15 or so responses that indicated use of "propofol infusion device at home to facilitate getting some sleep" or "functional impairment at work requiring self medication with stimulants" and such.

i have been in anesthesiology a long while, approaching 30 years. the sleep thing as an potential mechanism for eroding patient safety has always troubled me. this area (with respect to anesthesia providers) is still in great need of illumination. the terrain largely still darkened/foggy.

good luck with your project. it is a laudable one. i still think back to study and many of responses continue to unnerve me. i wonder what has become of those who wrote them.....

if i can be of any further assistance to you.....please feel free to contact me.

chuck

ps... below are some of R/V [considerations.it](#) has always been a policy of mine to conduct such analyses in any work that i do, so providing you with this data is effortless.

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 804 828 9808 (Dept)

*"Our Passion is Making Patient Safety Real"*

## APPENDIX G

## PROJECT TIMELINE TABLE

Month	Activities
July 20	Give capstone proposal draft to Dr. Anderson
July 23	Formal proposal of capstone project.
July 24, 2015	Submit application for degree form, update plan of study, exit survey, submit graduate reader form, submit title page for approval.
July 27- August 14, 2015	After IRB approval from USM, mail out sleep-related questionnaire to the 47 perspective participants for the study.
August 15- September 1, 2015	Gather up surveys and begin descriptive statistical analysis of the data
September 2015	Complete project evaluation, findings, suggestions, and discussions. Submit to Chair.
September 27, 2015	Submit completed capstone to the committee Final capstone defense
October 5, 2015	Submit completed results of Oral defense form of capstone project to graduate school auditor
October 9, 2015	Submit final capstone project for proofing and approval by chair to graduate school.
October / December 2015	Finished capstone and graduate

## APPENDIX H

### QUESTIONNAIRE FOR STUDY

**Dear Anesthesia Colleague,**

We invite you to participate in a National Sleep Study of anesthetists, the first of its kind. Sleep is crucial to personal and professional well-being and your participation in this study will help us assess the overall nature of sleep and associated behaviors in nurse anesthetists. Thank you very much for completing the following questionnaire.

1. My age is:	21-29	30-39	40-49	50-59	60+
My gender is:	Male		Female		
I have been a CRNA for:	< 5 years		5-10 years		> 10 years
I work primarily in what state:					
I work:	Full Time		Part Time		
2. When do you go to bed on the average weekday?	Before 8 pm	8-9 pm	9-10 pm	10-11 pm	11-midnight After midnight
3. How long does it usually take you to fall asleep?	5 minutes	5-10 minutes	10-30 minutes	30 minutes	> 1 hour
4. How many times do you usually wake up during the night?	0	1-2	3-4	5-6	> 7
5. If you take daytime naps, how long are they?	5-10 minutes	15-30 minutes	30 minutes to 1 hour	> 1 hour	
6. How do you evaluate your overall sleep quality?	Excellent	good	satisfactory	poor	very poor
7. How do you evaluate your sleep quality before the average work day?	Excellent	good	satisfactory	poor	very poor
<b>For questions #8-23, please use the following rating scale</b>			<b>How often during the week:</b>		
	<b>1: never or almost never</b>		<b>2: sometimes</b>		<b>3: often</b>
8. Do you go to bed at an unusual time (later than usually) at night?	1		2		3
9. Do you have difficulty getting to sleep at night?	1		2		3
10. Do you drink coffee late in the evening?	1		2		3
11. Do you use sleeping aids? If so, please list what you use:	1		2		3
12. Do you wake up because of hunger or because you feel compelled to eat?	1		2		3
13. Do you wake up because of nightmares?	1		2		3
14. Do you wake up because of talking during sleep?	1		2		3
15. Do you wake up because of walking during sleep?	1		2		3
16. Do you wake up because of leg movements or disagreeable leg sensations?	1		2		3
17. Do you snore?	1		2		3
18. Do you grind your teeth while asleep?	1		2		3
19. Do you wake up too early and have difficulty in getting back to sleep?	1		2		3
20. Do you feel excessively tired when waking up?	1		2		3
21. Do you feel sleepy during the day?	1		2		3
22. Do you feel sleepy during your normal work hours?	1		2		3
23. Do you feel sleepy in during your non-working hours, free time?	1		2		3
24. Do you ever use any medications to help you stay awake during the day? If yes, what do you use?			Yes		No
25. Have you seen or considered seeing a sleep medicine specialist for a sleep related disorder?			Yes		No
26. Is your sleep regularly disrupted due to childcare issues (such as breastfeeding, bedwetting, nightmares)?			Yes		No
<b>27. Open-ended questions: please feel free to elaborate.</b>					
a) Have you ever fallen asleep during a case in progress?			c) Have you witnessed a colleague who has fallen asleep during a surgical case in progress?		
b) After a long day or a call shift, have you or a colleague you know been involved in or nearly had a motor vehicle accident that was attributed to sleepiness?			d) Do you have any comments of a personal or professional nature regarding the issue of sleep that you would like to share?		
28. Are there any other sleep personal or professional related comments that you would like to share?					

**Figure.** Questionnaire for the National Study of Sleep-Related Behaviors of Nurse Anesthetists

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