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SUSTAINED VIGILANCE, ERRORS, AND JOB SATISFACTION IN A
POPULATION OF CRITICAL CARE AND EMERGENCY DEPARTMENT NURSES

by

SKIP G. MORELOCK

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
School of Nursing

K. Lynn Wieck, PhD., Committee Chair

College of Nursing and Health Sciences

The University of Texas at Tyler
November 4, 2014

The University of Texas at Tyler
Tyler, Texas

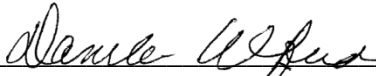
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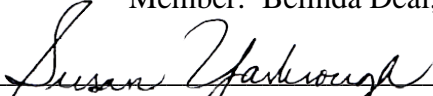
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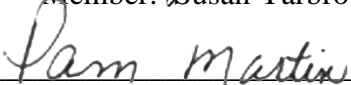
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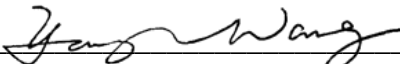

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Dedication

I dedicate this research to all the bedside nurses who have taught me and mentored me throughout my career. Words simply cannot express the gratitude and profound sense of awe I feel as I look back and see the differences that have been made in patients' lives because of these men and women who have dedicated their careers to serving the ill.

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Abstract

Despite the continuing efforts of health care organizations to provide a culture of safety, an unacceptable number of medication incidents and hospital errors continue to occur. This study focuses on these events as they relate to job satisfaction in the context of sustained vigilance required of acute care nurses. A constellation of variables contribute to errors including fatigue, stress, overload, protocol satisfaction, and practice risk. The study includes an intense examination of the physiological and psychological effects of night shift work. The results reflect a correlation between fatigue and errors with a less robust, though still statistically significant, association with job satisfaction and control of the practice environment.

Chapter 1

Introduction and General Information

Research Overview and Purpose

The overriding purpose of this research is to better quantify the relationships (if any) that may be present between the critical care nurses' work environment, job satisfaction, and nursing errors and to examine the nursing environment to determine the risks of practicing during the night shift. Research has either been inconclusive or absent when considering medication errors and job satisfaction. Rathert and May (2007) conducted a study which examined the perception of medication error frequency on a nursing unit and found that there was a statistically significant relationship when compared to the variable of poor job satisfaction ($p=.02$). While it is not possible to infer causality, it does beg the question of whether satisfied nurses are possibly more engaged, attentive, and less prone to commit errors. It is likely that many independent factors are ultimately responsible for job satisfaction and medication errors. Together, these factors form a composite schematic of nursing practice as viewed through the quality lens.

Job satisfaction is becoming increasingly important today. For many years the focus has been on patient satisfaction. This is not surprising since reimbursements are sometimes calibrated based on a facility's patient satisfaction scores. Despite this emphasis, nurses represent the centerpoint for a patient's overall clinical experience. Ensuring that the nurses are engaged and satisfied with their work environment might go a long way in ensuring that the patient has an equally good care experience. Additionally, it can be prohibitively expensive to recruit, train, and fully orient a critical care registered

nurse. Estimates range from \$16,000 to 80,000 per nurse depending on specialty, and this cost does not include advertising and reduced productivity (Hatler, Stoffers, Kelly, Redding, & Carr, 2011; Waldman, Kelly, Arora, & Smith, 2010). Multiply this by several nurses over several departments, and replacement of dissatisfied nurses can represent a significant expense to a facility's operating budget.

Night shift nursing is also examined in order to understand differences in practice between the day shift and night shift. Part of that understanding is the recognition that night shift nurses may be more prone to committing errors due to the debilitating effects of fatigue and drowsiness. Several nurse scientists are examining fatigue effect, and this research will add to the growing body of work regarding night shift nursing and a possible relationship with errors and job satisfaction. In addition, the possible physiological and psychological effects of night shift are introduced, analyzed and examined.

Introduction to the Articles

Article 1, *Health Ramifications of Night Shift Health Workers*, is an examination of the short- and long-term effects of working the night shift. Physiological effects, as well as psychological effects, are examined using the published works of many contemporary nurse scientists. Since most nurses will be required to work night shifts at some point in their careers (Kalisch, & Lee, 2009), this is a particularly important topic to study. Understanding night shift nursing and examining the relationship between errors and job satisfaction form a complementary body of work that puts nurses and nursing practice into the crosshairs of applied research. Using this knowledge enables researchers

to generate measurable hypotheses that may lead to potentially actionable solutions which can assist nurses to practice more safely.

Article 2, *Sustained Vigilance, Errors and Job Satisfaction in a Population of High-Acuity Nurses*, describes the research conducted with acute care nurses in an effort to gain understanding and insight into the various factors contributing to nursing errors as well as any possible relationship to job satisfaction. That nurses commit errors is well known, extensively researched, and widely reported. What is missing are research efforts that examine errors and job satisfaction with consideration of the need for high levels of vigilance and attention and the impact of fatigue using a population of intensive care and emergency department nurses. These variables are tested within the framework of a model originally designed to assess the maintenance of vigilance in first responders in emergency situations. While the connection to nursing may seem nebulous at first glance, the environment in which critical care and emergency department nurses function requires that a constant state of heightened vigilance be maintained in order to be able to assess small but critical changes to a patient's clinical status. This article provides the findings of a study of these acute care nurses related to variables which might affect their ability to function at optimal levels. The goal is to provide insights to improve nurse satisfaction and retention which, in turn, may provide a safer environment for patients.

The two included articles provide a context for discussion of strategies to help improve the environment in which critical care and emergency department nurses work. The nursing shortage and increased patient access have created an environment where optimal use of hospital services is paramount. Interventions to decrease errors can reduce

costs and improve patient outcomes. The outcomes of this study offer a direction for discussion and future interventions to provide a culture of safety where patients and nurses can thrive.

Chapter 2

Abstract

Professional nursing practice can be risky. Compounding the inherent risks in nursing are the expectations that nurses must provide a high caliber of care regardless of the circumstances. Many nurses report being fatigued while on duty and most of the nursing work force has spent at least a portion of their careers working the night shift. Shift work can predispose the nurse to the development of physical ailments as well as psychological ones. Many studies now show that working the night shift for even a short period can have long term physiological consequences that do not reverse even after leaving the night shift.

Health Ramifications of Night Shift Health Workers

Approximately fifteen million people in the United States work either a permanent night shift or work a night shift rotation as a part of their regular schedule (Price, 2011). Work can be hazardous to one's health, but we seldom think of engaging in professional nursing practice as a health risk. One of the most important health threats to current and future nurses is the demand that shiftwork places upon nurses, especially those nurses who primarily work the night shift. While the opportunities for the professional nurse are more varied than ever, a significant majority of nurses will at least begin their professional careers in hospitals. Not all nurses will work the night shift on a permanent basis, but most will spend some period of time where night shift work is required. This article will explore the possible physical and psychosocial consequences of working the night shift as well as explore strategies which may lessen the negative effects of night shift work.

Relevance of Night Shift Research

Research conducted during the past twenty years has led to a growing body of evidence regarding the hazards of night shift work. Studies have shown that working all night for as little as three shifts a month is associated with an increased likelihood of developing metabolic syndrome, a four-fold increase in the incidence of vascular events, and an increased chance of developing certain cancers (Borugian, Gallagher, Friesen, Switzer, & Aronson, 2005; Smith, & Eastman, 2012; Smith, Fritschi, Reid, & Mustard, 2013; Su, Lin, Baker, Schnall, & Chen, 2007; Szosland, 2010). Working night shifts over an extended period of time also carries implications for psychosocial health. By nature,

night shift work tends to be rigid in its application, locking the nurse into an inflexible situation where few options are apparent. This inflexibility makes it more difficult for night nurses to adapt to situations of last minute emergencies or family crises that can arise. As an example, it is generally more difficult to accommodate last minute staffing changes in a hospital on the night shift. During the normal business day, there are often resources available which can be reallocated to the area in need. Many of these resources are not readily available during non-traditional hours. Night shift can also prevent, or at least make more problematic, the spontaneous scheduling of activities with family and friends. Work and family balance may also suffer when a parent is working night shift. Estry-Behar et al. (2012) conducted research which examined work-life-family balance amongst nurses working in hospitals representing several different shifts. They found that working the night shift at least six shifts per month resulted in a higher incidence of sick calls ($OR\ 1.19, p<.05$) and a higher incidence of intent to leave the work setting ($OR\ 1.36, p<.001$). Feelings of having inadequate childcare while at work was also a strong indicator in the intent to leave the work setting ($OR\ 1.28, p<.001$). In addition, nightly twelve hour shifts increased worries about making mistakes by nearly 50%. Interestingly, these researchers found that even nurses who expressed satisfaction with working the night shift still had a higher incidence of negative physiological symptoms than their counterparts who worked only eight hour or twelve hour day shifts.

The risk to health is not limited to nurses who are working in a hospital environment; similar findings have been demonstrated in other fields which require worker presence around the clock. Begani, Begani, So'on, and Pokasui (2013) examined

110 security guards and found that a significant number (84%) suffered one or more ill effects from night shift work including gastrointestinal upsets, the development or exacerbation of sleep disorders, fatigue, and weight gain. The authors report that 47% continued to feel these effects after termination of the night shift work suggesting that long lasting physiological changes were occurring in these individuals which might be slow to revert to baseline status. A study of the body's resilience to night shift work could contribute useful information to how the body adjusts once the individual no longer works nights. Unfortunately, there is a dearth of longitudinal studies which examine the long term connection between night shift and physical ailments.

Recent research is also available which explores the relationship between nursing, shift work, satisfaction with work, and maintaining an acceptable quality of personal and family life. Much of this recent research appears to be emanating from Europe and Asia where the increase in the utilization of extended shifts is becoming increasingly common (Estryn-Behar et al., 2012). No recent United States-based studies were found which focused primarily on nurses and work life satisfaction, although many articles did include sections which explored the perceived impacts of shift work, extended shifts, and overnight work on family and social life. Shift work is a necessary part of the nursing care delivery system. Efforts to mitigate personal and social complications associated with night shift work are vital to the continued delivery of high-quality and error-free nursing care.

Potential Complications of Night Shift

Dietary and Nutritional Risks

Working the night shift necessarily upsets the normal dietary schedule in a world where established breakfast, lunch, and dinner times are fairly universal. Esquirol et al. (2009) conducted research which examined blood lipid and metabolic syndrome in both day and night shift nurses. Nurses working the night shift showed a significantly higher incidence of triglyceridemia ($p < .05$), lower levels of HDH cholesterol ($p < .01$), and more hyperglycemia ($p < .01$) than day shift nurses. The causative factors are not well understood, but they may be due to a much different pattern of eating which was occurring in the night shift nurses. It was found that PM shifters tended to eat between 10% and 30% smaller meals, but these meals were much higher in saturated fats. These metabolic effects persisted even when controlling for family history, resting blood pressure, and smoking habits. Zverev (2005) also studied eating patterns of night shift nursing workers. In this study, night shift nurses reported that they did not eat a full meal as often as day shift nurses ($p < 0001$). They also reported lower appetite ($p < .01$) and less satisfaction with their eating patterns ($p < .01$) than day shift nurses. Additionally, night shift nurses reported have a lower self-assessment of their general health than day shift nurses ($p < .001$).

Nurses as a group may also be predisposed to developing obesity and specifically night shift nurses may be at higher risk for increased BMI. Marqueze, Ullhoa, and Moreno (2013) report that although there was not a significant difference in weight gain between day and night shift workers, a majority (52%) of workers had reported a weight

gain in the past year. The authors again did not find a statistically significant difference in shifts. However, when the variable of smoking was tested, there was a significant difference in self-reported daily smokers between the day and night shifts ($p < 0.05$). Using linear regression, these authors found that night shift nurses increased their BMI at a significantly higher rate than the day shift nurses (.24kg/m² for night shift and .15kg/m² for day shift). Smith and Eastman (2012) found a smaller, but still statistically significant difference in the BMI of day and night shift nurses ($p = .04$). There did not appear to be a significant difference in the results when controlling for gender of the nurses. The presence of nutritional and dietary irregularities on night shift nurses does appear to have relevance, and the impact of these issues on the health and illness trends in night shift workers is also a concern.

Illness and Disease Risks

Working the night shift creates a series of health challenges which may put the night worker at greater risk for illness and disease. Simply accessing normal preventive health services must be done at a time when the night shift worker would normally be sleeping. Studies questioning the possible health effects of non-traditional sleep patterns have appeared in the literature. In a cohort of registered nurses and other night shift workers, Vyas, Garg, Iansavichus, Costella, Donner, et al. (2012) conducted a meta-analysis of physiological effects of night shift work and found that night shift workers experienced a higher incidence of myocardial events (risk ratio 1.23, 95% CI [1.15 to 1.31]) and ischemic stroke (risk ratio 1.05, 95% CI [1.10 to 1.39]) than the general population. Admi, Tzischinsky, Epstein, Herer, and Peretz (2008) found that night shift

nurses had a higher incidence of developing diabetes ($p < .003$) and hypertension ($p < .0007$) when compared to their dayshift counterparts. The severity and chronicity of these types of health problems make it essential to determine if altered sleep patterns may be responsible for a predisposition to illness and disease in night workers.

Other studies have suggested that factors other than lack of sleep may be predisposing individuals to developing health issues from working the night shift. Su et al. (2007) found that it was the inability of an individual's blood pressure to return to baseline levels that might be causing the problems. The test cohort that experienced the highest incidence of blood pressure baseline anomalies were the night shift individuals ($p < .001$). The same group of authors also found that decreased heart rate variability, which is also more common among night shifters, is known to be an independent factor in increasing the risk of acute myocardial events. Additionally, the authors found that the test subjects experienced incomplete systolic and diastolic blood pressure recoveries ($p < .001$). There were, however, no significant differences when comparing the resting heart rates between day and night shifters. While fatigue may ultimately be shown to have some impact on these situations, an alternate theory is that the interruption of an individual's chronobiological cycle with the accompanying alterations in cortisol levels may be to blame (Bostock, & Steptoe, 2012). Other somatic events that seem to be linked to extended shift work are ischemic strokes (Brown et al., 2009), irritable bowel syndrome (Nojbov, Rubenstein, Chey, & Hoogerwerf, 2010), and certain cancers (Schernhammer, Razavi, Li, Qureshi, & Han, 2011). The risk of ischemic strokes were found by Brown et al. (2009) to increase at a rate of 4% for every five years of

consecutive night shift work. Nurses who had worked over 15 years on the night shift and had labeled themselves as smokers were at the highest risk ($p < .001$) when compared with non-smoking night shift nurses. Night shift nurses also seem to be more likely to develop gastrointestinal diseases. Nojbov et al. (2010) found that when compared to their day shift counterparts, night shift nurses experienced a higher incidence of irritable bowel syndrome ($p < .01$) and diarrhea ($p < .0001$). Perhaps diet can explain these differences, or there may be other triggers involved.

The incidence of cancer risk in night-shift employees has also been studied. Schernhammer et al. (2011) examined breast and skin cancers in female nurses. What they discovered was that the incidence of all types of skin cancers were decreased in the nurses who worked night shift ($p < .001$). There was a 14% lowering of the risk of skin cancers in the nurses compared with day shift nurses. Interestingly the authors did not find that the lack of exposure to sunlight explained this finding, but that lower levels of melatonin may be offering a protective effect from skin cancers. Abnormal levels of melatonin were also found by Borugian et al. (2005). Schernhammer et al. (2011) also researched rotating night shift work and breast cancer and found there was a 28% increase in the risk of developing breast cancer in nurses who worked for over 15 years. When adding the habit of smoking, there did not seem to be an increase in risk.

Lifestyle choices can certainly pose a risk for all persons, regardless of time of day or night that they work. However, the risk of problems associated with disruption of sleep patterns and lack of adequate sleep continue to be a prominent aspect of night shift research. The untoward effects of fatigue on nurses is one aspect of the health/illness

continuum which holds special relevance for those who work during traditional sleeping hours.

Fatigue and Error Risks

A growing concern related to night shift work is the possibility of an increased potential to become fatigued and make medical errors. Physiological changes can occur as a result of working the night shifts. Studies have reflected a slowing in reaction time (Haire, Ferguson, Tilleard, Negus, & Dorrian, 2012) and changes in decision-making performance (Schnyer, Zeithamova, & Williams, 2009) in the presence of fatigue. Since decision-making is such a critical part of nursing responsibility, this finding is of particular concern to health delivery systems. Further, reaction time related to slowed thinking is also a concern, especially in the emergency departments which often see their peak hours on the night shifts.

Fatigue appears, at least superficially, to be the most common physiological side effect of working night shifts. Scott, Rogers, Hwang, and Zhang (2006) report that between midnight and six in the morning, 65% of critical care nurses reported difficulty in maintaining wakefulness while 20% reported inadvertently sleeping. A little less than one-third (27%) of the night shift nurses in this study reported at least one clinical error and an additional 21% reported a near error. A near error is defined as an error that was detected prior to patient administration either by the nurse or by a co-worker. The risk for making an error nearly doubled when nurses worked longer than 12.5 hours ($p=.03$). Working over forty hours per week was also associated with an increased risk of nurses committing errors ($p=.01$) as well as an increased risk of near misses ($p<.001$).

In an Australian study of critical care night shift nurses, the primary predictor for error occurrence ($p < .01$) was nurses who reported frequently having to struggle to remain awake (Dorrian et al., 2008). They surmise that the night shift nurses sleep less than their day shift counterparts, and that the accumulation of lack of sleep may be contributing to the nurses struggling to remain awake. More specifically, every hour of sleep during the prior 24 hours resulted in a 10% reduction in the incidence of nurses struggling to remain awake. The main difference between this study and the one by Scott et al. (2006) was that the Australian nurses worked rotating shifts.

Historically nurses have struggled to determine if there is a relationship between fatigue and error-proneness. One of the first studies examining fatigue and nursing errors (Gold et al., 1992) showed that 35% of night nurses reported nodding off at least once during their shift, and 13% reported either a near miss or a medication error. Early theories posited that the overriding presence of fatigue in night shift workers might be the catalyst for the development of the various physiological manifestations (early onset of heart disease, metabolic syndrome, and increased incidence of ischemic strokes) which may afflict many night shift workers. More recent studies have cast some doubt on this idea. Instead, researchers are finding evidence that the frequent interruption in the chronocircadian rhythms with attendant cortisol level instability and the effects on natural melatonin levels may bear primary responsibility for physiological effects of night shift work (Atkinson, Fullick, Griney, & Maclaren, 2008; Harrington, 2013; Kantermann, Juda, Vetter, & Roenneberg, 2010; Smith, & Eastman, 2012). In an attempt to further isolate nursing performance and fatigue, Johnson, Brown, and Weaver (2010) measured

psychomotor performance of nurses using the D2 Test of Attention. The results indicated that the fewer hours of sleep reported by the nurses, the lower their scores on the test. A significant relationship was found between the scores on the D2 Test of Attention and the number of hours of reported sleep ($p < .01$). This effect persisted even when controlling for the nurse's age, years of experience, and gender. Despite this result, it is impossible to deduce from this study whether the decrease in psychomotor performance would result in an increase in clinical errors.

This effect of impaired attention and performance has also been documented in other fields and in other areas of nursing besides critical care. Fogt, Kalns, and Michael (2010) examined military personnel who worked night shifts and discovered that increased levels of fatigue resulted in decreased cognitive performance on the Stroop Color Word Conflict Test ($p < .0001$). In an attempt to determine the impact of impaired attention related to fatigue on productivity, Warren and Tart (2008) conducted a retrospective review of operating room charts to assess for errors both before and after implementing a system of fewer on-call shifts. Several error factors were tested including wound class, procedure, time out, counts, and pain scale. There was a positive correlation between the elimination of on-call shifts and charting errors ($r = .99$). The number of documentation errors decreased by 33% after implementation of the reduced call schedule. In addition to the physical toll that night shifts take on nurses' health and job performance, night nurses are also experiencing psychological and social issues related to shift work.

Psychosocial Effects of Night Shift Work

It is generally accepted that physiological symptoms which present as a result of night shift work presumably have their origins in the frequent disruption or desynchronization of the individual's circadian rhythm (Schernhammer et al., 2011; Szosland, 2010). Physiological manifestations of night shift work certainly capture the attention of many researchers, but what are not as obvious or as well-studied are the psychosocial effects which may occur as the result of frequent or sustained night shift work. Work-life balance is a commonly utilized construct that can be used to roughly assess overall satisfaction with one's life. Estryn-Behar et al. (2012) studied a cohort of 25,000+ nurses in Europe to examine the effects of nurses' shifts and the perceived impact on work and family life. Perhaps not surprisingly, the nurses who worked an eight or a twelve hour shift during the day reported more satisfaction with both work and family life. Nurses who worked eight-, ten-, twelve-hour shifts during the evening and night reported a higher incidence of difficulties with managing work and family life. Since a majority of nurses in this study were female (88.5%), and a significant percentage of these nurses' ages were between 18 and 45 years of age (76.7%), child care provision emerged as a common dissatisfier among the nurses in this research.

Women in general may not tolerate night shifts as effectively as their male counterparts. Women working the night shift report a higher injury rate than men, higher shift adjustment problems, more intolerance symptoms, and more interrupted sleep cycles (Swenson, 1999). The author points out that this is not a reflection of the inability of women to adapt to night shift work, but it is more likely related to the effort in balancing

work and family life. Balancing the timing and duration of shift work poses a challenge for many night shift workers.

One possible solution to the psychosocial problems that overnight shifts can pose is to schedule overnight shifts consecutively thereby allowing for more days off before and after the string of overnight shifts. Bambra, Whitehead, Sowden, Akers, and Petticrew (2007) studied a cohort of British nurses and found that when shifts were scheduled consecutively, the nurses reported greater satisfaction with work-life balance ($p < .001$) when compared with the control group whose shifts were spread out during the week. This type of scheduling is not without problems, however. As Rogers (2008) points out, working consecutive shifts in excess of twelve hours can result in significant impairment of a nurse's clinical judgment, and the scheduling of more than two consecutive twelve hour shifts can roughly double this risk. In addition to clinical judgment issues, the psychological toll of working night shifts is also being studied.

Working night shifts has also been associated with an increase in anxiety and depression (Bjorvatn, Dale, Hogstad-Erikstein, Fiske, Pallesen, & Waage, 2012). The research involved intensive care nurses in Norway and their self-perception of anxiety and depression as measured by the Hospital Anxiety and Depression Scale (HADS). Findings revealed that 14.8% of the general population of the critical care nurses scored above the baseline for anxiety and depression compared to 21.5% of the critical care nurses who worked the night shift. Scores for both of these groups, critical care nurses in general and those on night shift, were significantly greater than the scores for the general population of Norway ($p < .0001$). This study also reports that only 9% of the nurses in the

research cohort reported getting adequate sleep prior to shift start. Similarly a Brazilian study of rotating shift workers shows that 20% of men and 10% of the women in this study reported getting adequate sleep prior to starting their shifts (Padua, & de Abreu, 2012). Similar studies involving critical care nurses in the United States were not located, so it is unclear whether the same results would be observed. However, it seems reasonable to assume that getting inadequate sleep prior to going on duty and dealing with the sleep disruption of rotating shifts would be a problem regardless of geographical consideration.

Impact of Rotating Shifts

While research has shown some consistency in demonstrating the negative health consequences of working the night shift, those who work rotating shifts may be even more at risk. Rotating shifts are defined as shifts which are fixed for a period of time and then change to another fixed schedule for a period of time to meet the demands of a 24-hour workforce cycle. This can be further divided into clockwise rotation of shifts which would mean 7 am – 3 pm for a period of time, then 3 pm - 11 pm for a period of time, and then 11pm – 7 am for a period of time. Counter-clockwise shift rotation is also occasionally practiced in industrial settings and is especially prevalent in aviation (Cruz, Detwiler, Nesthus, & Boquet, 2003). A series of cohort studies by several researchers, both in nursing and in other fields, have demonstrated that working rotating shifts is contributory to the early development of ischemic stroke (Brown et al., 2009), significant weight gain with BMI increases (Suwazono et al., 2010), and certain cancers (Kubo et al., 2006). Smith and Eastman (2012) have gone as far as to suggest that rotating shifts

should be universally abolished or used only in temporary emergency situations because of the accentuated risks to health that they pose.

Rotating shifts have been associated with acute and chronic disease manifestations. Brown et al. (2009) conducted research on a cohort of female nurses to determine if rotating shift work could be a causal factor in the development of ischemic stroke. It was discovered that the time-adjusted hazard ratio increased incrementally as the number of years on the night shift increased. For those who had worked one to two years on rotating shifts, the hazard ratio was 0.96. After thirty years of rotating shifts work, the hazard ratio had increased to 1.47. This effect persisted after controlling for risk-adjusted age progression. Cancer prevalence may also be related to a rotating shift schedule. For example, Kubo et al (2006) examined a variety of rotating male shift workers in an effort to link the rotating shifts to the development of cancer. Even after adjusting for age, BMI, educational level, perceived stress, study area surveyed, family history, and marriage status, it was discovered that rotating shift workers were at significantly higher risk for developing prostate cancer when compared to regular day shift workers (relative risk = 3.0. 95% CI[2.7, 7.7]). For workers who worked only the night shift, there was a small, but not statistically significant, increase in the risk of prostate cancer. Physiologic manifestations appear to be a risk factor in studies of rotating shift workers.

Basic physiological stability appears to be interrupted or even compromised by working rotating shifts. Suwazono et al. (2010) compared the risk of BMI increases in male workers who worked rotating shifts. For those working at least five years, there was

a 5-10% increase in BMI when compared to workers who only worked the day shift. This important longitudinal study lasted fourteen years and helped establish rotating shifts as an independent risk factor for increasing BMI. Men and women who worked rotating shifts displayed a lower level of cortisol ($p < .05$) than the men and women who only worked the day shift (Korompeli, Sourtizi, Tzavara, & Velonakis, 2009). Specifically, these authors studied critical care nurses and rotating shifts. This same cohort also showed decreases in thyroid stimulating hormone ($p = .001$). The authors presume that these changes are occurring because of the disruptive sleep-wake cycle that rotating shift workers have to assume in order to rest prior to shifts. Numerous researchers have also found that decreased or unstable cortisol levels may be contributory to the development of various somatic conditions attributed to night shift work (Atkinson, Fullick, Griney, & Maclaren, 2008; Harrington, 2013; Kantermann, Juda, Vetter, & Roenneberg, 2010; Smith, & Eastman, 2012). The physiological threats to workers' health make recruiting and retaining night shift workers a challenge.

Rotating shifts have been associated with an increased dissatisfaction with the work environment and with perceived work-life imbalance (Estryn-Behar et al., 2012). From the extant research on rotating shifts, it does seem that they are more problematic than night shifts. Unfortunately, because of the requirement to provide round-the-clock services and the perceived fairness of rotating shifts (i.e. everyone has to take a turn), there is no indication that rotating shifts are decreasing in usage. Failure to apply the abundant evidence available to the realities of 24-hour health care delivery is certainly contributing to health and safety issues in today's hospitals.

Strategies to Lessen the Effects of Shift Work

While the existing research paints a somewhat bleak health picture of night shift nurses, there are positive aspects associated with night shift work. Chief among these are the freedom to schedule activities during the day time, a work environment generally free from distractions due to the presence of administrative personnel and visitors, less concern with organizational imperatives and politics, and enhanced pay benefits. Focusing on these positive incentives may help to recruit permanent night shift workers which would decrease the need for rotating shifts.

Hospital efforts to improve quality and reduce errors must address strategies for managing night shift work and problems that are associated with it. One of the most important problems for nightshift nurses is getting enough quality sleep prior to the beginning of the overnight shift. While adequate sleep is important regardless of the shift one works, there are special requirements which make sleep quantity and quality even more important to the night shift nurse. Chief among the strategies to improve sleep quality during daylight hours is maintaining a cool and dark sleeping environment. Research has shown that the ideal room temperature for sleeping is between 60 - 68°F. As the ambient temperature approaches 75°, the body has difficulty in cooling itself resulting in difficulty in sleep onset (Valham, Sahlin, Stenlund, & Franklin, 2012). Window coverings should be used to limit the amount of light entering the sleeping room. A fan or device that emits "white noise" can be used to help block out the normal sounds of day-to-day activities such as lawn mowers and traffic. While it may not always be practical, placing telephones in a silence mode will help assure a quiet sleeping

environment. Regardless of the interventions to improve sleep quality and quantity, the nurse who works the night shift is challenging a biologically-driven circadian clock which is compelling one to sleep at a time it is imperative to be awake and vice versa. The nightshift nurse is rejecting the natural inclination to sleep at night in favor of wakefulness. During this nighttime period, it is vital for the nurse to not only remain awake, but to sustain an increased level of vigilance so that high quality patient care is achieved for the duration of the shift. This drive against the natural inclination to sleep can lead to issues with the ability to sleep at all.

Insomnia is perhaps the most common complaint of night shift nurses (Bjorvatn et al., 2012). The reasons vary from shifting schedules, working alternate shifts, rotating shifts, and difficulty sleeping in the daytime. Even if one is able to get a full eight hours of day sleep, it cannot fully compensate for the circadian misalignment (Price, 2011).

The common complaints of insomnia, daytime sleepiness, and unplanned sleep episodes can be reduced by some basic strategies. Over-the-counter and prescription sleep aides can increase the length of sleep as well as reduce the amount of time it takes to fall asleep. However, side effects are common, and the long term use of hypnotics can foster physical as well as psychological dependence. This can be true even with over-the-counter medications and medications generally accepted by the Food and Drug Administration as safe (Keuroghlian, Barry, & Weiss, 2012). Some hospitals allow night shift workers to take short nap breaks or to do some form of rigorous exercise activity during breaks like climbing a flight of stairs or a brisk walk. It is also advisable to not leave tedious or repetitive tasks until the end of the shift when fatigue or diminished

awareness is more likely. Wearing dark glasses while returning home from a night shift may simulate the natural ending of a work shift toward the evening hours and help move into a more natural sleep cycle in spite of sleep initiation occurring in the morning or daylight hours (National Sleep Foundation, 2013). Additionally, masking the bright light of morning may help prevent the natural circadian phase of waking up from initiating. The biochemical pathway is not well understood, but it is thought that light, even in small amounts, may be enough to degrade the bioavailability of melatonin thus making it more difficult to fall and remain asleep (Li, Xu, Li, Guo, Liu, & Li, 2012). Judicious use of caffeinated drinks during the night work cycle can also help maintain wakefulness while minimizing delays in falling asleep after the shift is completed (Drake, Roehrs, Shambroom, & Roth, 2013).

A recurring question is how night nurses manage sleeping when they are not scheduled to work. Should the night nurse remain on the same sleep/wake pattern during days off or vacation as is necessary when working during the night hours? There are five main sleep strategies which have been identified in relation to sleep patterns for shift workers (Gamble, Motsinger-Reif, Hida, Borsetti, Servick et al, 2011). Most nurses adapt between these strategies depending on their needs and lives at the time. The authors admit to overlap between the strategies because of the inherent variability in sleep patterns and the difficulty in capturing discrete data. The *Night Stay* strategy is where the nurse simply adapts all aspects of life to the night shift. This was the rarest of strategies adopted (< 3% of the nurses in the study). The authors felt that only those who reside in a large metropolitan area, with a variety of twenty four hour services, could adopt this

strategy on a permanent basis. The most common strategy was the *No Sleep* strategy which meant that the nurse would arise at the usual morning hour on the day of the first night shift after time off, stay awake for the entire day, and then work a twelve hour shift without having slept beforehand. Since this involves staying up in excess of 24 hours, this strategy may have negative impacts on patient care delivery. Studies have shown that after as little as seventeen hours of no sleep, cognitive abilities function at the level of someone with a blood alcohol level of .05%, which is legally drunk in most states (Rogers, 2008). Other strategies adopted were the *Nap Proxy* which involves a one to two hour nap prior to night shift start, the *Switch Sleeper* where the nurse on days off wakes and sleeps at the usual non-working hours, and *Incomplete Shifter* in which the nurse tends to rise late and sleep late even on days off work. Since most night nurses use different or combined strategies to manage the demands of family and work, it is probably unreasonable to expect to have a one-size-fits-all sleep strategy to help night nurses manage their circadian challenges. But acknowledging that sleep pattern disruption is a problem and helping nurses to manage time and sleep issues is important to the safety and quality of the healthcare environment.

Conclusions and Recommendations

Based on the studies presented, some basic conclusions and recommendations are offered. Regarding diet and nutrition challenges, nurses who work the night shift appear to alter their eating habits in unhealthy ways. Eating higher fat meals, even if they are small meals, may have detrimental health effects. If hospital cafeterias cannot remain open with healthy options for the night shift, then refrigerated storage and healthy-choice

vending machines should be available. To combat the risk of acute and chronic illness, it is important for the night shift nurse to be cognizant of personal body needs and its ability to adapt. This awareness is especially important if the nurse is planning for long term night shift work. Not all night shifters are the same, and some seem better adapted than others. Getting regular physical checkups and availing oneself of hospital-sponsored clinics may help identify potential problems. Many hospitals now offer night shift nurses free health screenings at later hours so they do not have to interrupt their sleep time.

The issue of combating fatigue in an effort to prevent errors is of great consequence to nurses on the night shift. Nurses have a primary responsibility to their patients, but there is also a professional obligation that every nurse has to coworkers. If a coworker is having difficulty remaining alert, then colleagues should offer the nurse a respite by taking over their patients for a period of time. While in the past most hospitals had a “no sleeping while on duty” stance, many health care systems have now begun taking a second look at this archaic policy. The preponderance of current nursing research indicates that a brief nap may not only allay the effects of sleep deprivation, but it may also reduce the number of errors (Caruso & Hitchcock, 2010; Scott et al., 2006). While no one would suggest that sleeping at the nursing station in full view of patients and visitors would be acceptable, a short 10-15 minute nap in a break room or sleep room may serve to recharge the nurse thus increasing comfort and awareness and placing patients in a safer environment for the remainder of the shift.

Despite the increasing evidence that sustained night shift work has deleterious effects on a nurse’s health and negatively impacts social and family life, the fact remains

that the hospital care cycle is 24-hours per day. Hospitals have a duty to provide safe quality care around the clock, and this goal requires skilled nursing care on all shifts and available at all times. While most nurses will have the opportunity to work the night shift for a time, all nurses should be aware of the possible negative effects of night shift work. Nurses should not hesitate to protect themselves or their colleagues by using strategies which might lessen the effects of sleep disruption or fatigue and promote a culture of safety and security for both nurses and patients.

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Chapter 3

Abstract

In an effort to better understand the relationship between critical care nurses, emergency nurses and the environment in which they practice, a sample of 45 acute care registered nurses was surveyed to assess their viewpoints on fatigue, sleep quality, stress, errors, and job satisfaction in the clinical practice environment. There were statistically significant correlations between a nurse's self-reported skill and errors, stress level and errors, fatigue and errors, and control of practice setting and job satisfaction. These findings point to the need for further quantitative research in the realm of nursing errors and care environments that promote errors.

Sustained Vigilance, Errors, and Job Satisfaction in a Population of High-Acuity Nurses

The importance of maintaining a heightened state of vigilance for nurses working in high-acuity areas, such as emergency departments and critical care units, cannot be over-emphasized in this era of error awareness and process improvement. Much attention and resources are currently being expended to ensure the quality and safety of patients entrusted to the care of the nation's healthcare system. The nature of 24-hour care for complex patients takes its toll on front-line providers with particular concern about non-traditional shifts where support and resources are not as readily available. Many nurses who work night shift are fatigued, and current research demonstrates a possible link between fatigue and errors (Estryn-Behar, van der Heijden, Fry, & Hasselhorn, 2010; Meyer, & Lavin, 2013; Scott, Rogers, Hwang, & Zhang, 2006). The causes can be varied, but the failure of the critical care nurse to maintain a heightened state of vigilance may be a component of the problem. Krause (2012) drew attention to the idea of vigilance fatigue in law enforcement by framing it as a threat to public safety and personal well-being. The potential for information overload and performance-related pressure is also present in critical care units and emergency departments where lives are dependent on a sustained and heightened sense of vigilance. Exploring the relationship between sustained vigilance, errors, and fatigue in critical care and emergency nurses may serve to recalibrate the discussion to include new options for mitigating clinical errors by examining a multifaceted approach instead of viewing through a post hoc lens focused solely on the errors themselves. With over 100,000 reported deaths and patient injuries a

year due to practitioner error (Institute of Medicine, 1999), it is clear that efforts to prevent, or at least minimize, clinical errors is a worthy goal.

Purpose

The overall purpose of this research is to discover the various factors that influence the ways that critical care and emergency department nurses practice, and in this process of discovery, to explore contributors to errors or distractions in the practice environment. It must be stated at the outset that errors cannot be completely eliminated. Humans inherently make errors, and certain processes which are put in place to ensure safety may in fact contribute to errors. In order to better understand these factors, this research focused on the nursing environment and relies heavily on the nurses' willingness to self-disclose problems in their own practice environments and how they respond to these problems.

Literature Support

Shift Work and Fatigue

Since the well-known and intensely studied Institute of Medicine (1999) report on errors in relation to patient morbidity and mortality, healthcare systems have aligned much of their quality structures to identifying and solving the fault-laden processes and impediments to safe medication administration. When the follow up report (IOM) in 2007 failed to show that the problem of medical errors had been substantially reduced, hospitals began to further refine systems of medication delivery. While the accountability for patient care cannot be ceded to anyone but the primary nurse, the focus

is shifting from a culture of blame to a focus on full disclosure with the intent to find system or process errors which can be fixed (Singer, & Vogus, 2013).

One issue which is receiving attention is increased error proneness related to fatigue and shiftwork. Problems with fatigue are not limited to errors involving nurses and patients, but also an increased general risk to nurses. Fallis, McMillan, and Edwards (2011) have found that when compared to day shifters, night shift medical workers have an increased risk of needlesticks (odds ratio, 2.04). This same study found that a staggering percentage of night shift critical care nurses (95%) had reported motor vehicle related injuries or near misses while commuting home from a shift. It would seem that nurses either do not recognize the danger of fatigue or are willing to accept this as a part of working nights.

One of the causative factors involved in hospital errors that may be modifiable are those related to fatigue and shiftwork. Studies have shown that night shift workers have reported difficulty staying awake and have even reported intermittent episodes of sleeping (Scott et al., 2006). Length of shift was also shown to have a significant relationship to errors ($p < .01$). An early study by Gold et al. (1992) reported on nurses who admitted to nodding off during their shift (35%) along with either a near miss error or an actual error related to alertness (13%). The nightshift nurses in the Scott et al. (2006) study reported that one-third of them had made a clinical error and even more of them had reported an error that was detected prior to the actual mishap. Dorrian et al. (2008) found that a primary predictor for error occurrence in critical care nurses who

worked rotating shifts was drowsiness. It is clear that the issues of wakefulness, attention, and vigilance are very important to the quality of nursing care delivery.

Sustained Vigilance

The concept of sustained vigilance may be defined as the ability to remain alert to multi-source stimuli over prolonged periods of time (Sauter et al., 2013). Sustained vigilance infers a state of attention and tonic alertness relating to both the degree of arousal on the sleep/wake axis and the level of cognitive performance (Oken, Salinsky, & Elsas, 2006). The importance of sustained vigilance can be found in many trades and professions such as law enforcement, accident first responders, airline pilots, and nurses. Sustained vigilance has been discussed in terms of vigilance fatigue experienced by law enforcement officers (Krause, 2012) which may share similarities with the sustained vigilance expected by nurses. The first known scientific examination of sustained vigilance occurred during World War II when British researchers attempted to quantify how many consecutive hours a radar operator could safely guide, advise, and monitor pilots (Warm, Parasuraman, & Matthews, 2008).

Sustained vigilance in nursing refers to the constant awareness of the environment punctuated by alarms, call lights, intravenous pump alarms, and telephones while retaining the ability to immediately act on the patient's behalf. To function at this heightened level requires maintaining alertness which may be difficult in the presence of fatigue, such as when the nurse does not get enough sleep prior to shift start. In an attempt to isolate nursing performance and fatigue, Johnson, Brown and Weaver (2010) measured the psychomotor performance of nurses using the D2 Test of Attention. The

results were that the fewer hours of sleep reported by the nurses, the lower their scores on the test of attention ($p < .0001$). This effect persisted even when controlling for the nurses age, years of experience, and gender. Despite this result, it is impossible to deduce from this study whether the decrease in psychomotor performance would always result in an increase in clinical errors.

The negative effect of fatigue on attentiveness has also been documented in other fields and in other areas besides critical care nursing. Fogt, Kalns and Michael (2010) examined military personnel who worked night shifts and discovered that increased levels of fatigue resulted in decreased cognitive performance on standardized tests. Warren and Tart (2008) conducted a retrospective review of operating room charts to assess for errors both before and after implementing a system of fewer on-call shifts. Since on-call shifts were primarily night shifts, this study was assumed to be relevant for this literature review. The elimination of only one call shift per month resulted in shorter procedure times and fewer documentation errors.

The body of literature does seem to be in agreement that long shifts (greater than 12.5 hours) do contribute to error commission (Geiger-Brown, & Trinkoff, 2010 ; Richardson, Turnock, Harris, Finley, & Carson, 2007). In addition, rotating shifts may further exacerbate the effects of fatigue (Chang, Chen, Hsu, Su, & Liu, 2013) and sustained vigilance. However, there were no studies found which attempted to link level of nursing experience with the degradation of vigilance.

While offering insight into fatigue, errors, and physiological effects of fatigue on the ability to remain vigilant, many of these studies were conducted with fairly small

samples. This makes it difficult to know whether the results would be reproducible in another facility or with another cohort of research participants. Only one study reported the effect size. Clearly more well-designed and theoretical-based research is needed in this area.

Job Satisfaction

Recent studies provided evidence linking job satisfaction to variables such as healthy work environments, authentic leadership, and structural empowerment (Lambrou, Merkouris, Middleton, & Papastavro, 2014; Wong & Laschinger, 2012). There are few studies, however, which examined job satisfaction and many of the variables in the Sustained Vigilance model. Job satisfaction is important to consider not only because of the inherent cost in training a critical care or emergency department nurse, but there is evidence that improving a nurse's work environment might have the effect of reducing medication errors (Rathert & May, 2007).

Theoretical Framework

The Sustained Vigilance model (Figure 1; Appendix A) was conceived and developed by Meredith Krause (2012) for the FBI to describe the challenges encountered in law enforcement. It describes a complex and multifaceted relationship between the concept of sustained vigilance and three primary contributory factors: *attention*, *situational awareness*, and *decision-making*. Conceptually, the terms attention and awareness seem easy enough to define, yet both are very difficult to actually measure. In addition, decision-making is the culminating action from engaging in attention and awareness.

Even though the model was developed for use in law enforcement, there is potential application to the high-acuity nurse. As Krause (2012) describes individuals “engaged in sustained surveillance, threat detection, risk assessment, and decision-making under uncertainty” (p. 2) she also posits that fatigue may be one of the greatest contributing factors in the degradation of sustained vigilance. As was demonstrated in the literature review, there is ample evidence that not only are nurses fatigued, but that the presence of fatigue may be contributing to errors in clinical judgment.

The Krause (2012) model (Figure 1) shows that sustained vigilance is only achievable if several factors are in place. The three factors which contribute to sustained vigilance are *attention*, *situational awareness*, and *decision making*. Note the absence of arrows pointing to the main concept of sustained vigilance. This implies that there is feedback between the various parts of the model from the main concept to the supporting concepts and vice versa where the absence of any of the factors increases the risk of vigilance degradation. Vigilance degradation can also occur if the flow of information leads to faulty conclusions. The connection and applicability to nursing, and especially critical care nursing, are apparent. The expectation is that the astute and effective critical care nurse will remain vigilant at all times for changes in a patient’s clinical status. Nurses depend on the access and flow of information, and they anticipate not only changes in their patients’ conditions, but they also anticipate the therapeutic regimens (called heuristics by Krause) which each condition will require. This vigilance is most effective if there are an absence of distractors, adequate comprehension of the patient’s

clinical condition, the ability to rapidly assess risk, and the benefit of ready access to accurate information about the patient.

Krause's (2012) work explores the many variables which are associated with the maintenance of sustained vigilance. The variable of experience to a person's subject matter (nursing) in relation to job variables helps produce a more ideal level of vigilance. The concept of a nurse's level of experience has been examined by Benner (1982) in her seminal work "From Novice to Expert" where the range of applied nursing expertise moves from the novice who has limited experience in patient care situations to the expert who is able to anticipate, who possesses an intuitive grasp of a client situation, and whose performance is highly efficient. There may be value in studying interventions which could be formulated by testing if there are relevant relationships between a nurse's position on the Benner model and the level of sustained vigilance.

For the purpose of this study, the three aspects of the Sustained Vigilance Model were tested: *attention*, *situational awareness*, and *decision-making*. Krause notes that "basic physical requirements, such as rest and alertness, emerge as the core foundation on which more nuanced factors meet" (Krause, 2012, p3). Attentional capacity was conceptualized as relating to fatigue and sleep for this study; in addition, two factors related to attention, perceived cognitive underarousal (boredom) and overarousal (overload) have been used as indicators of *attention* (Fletcher, & Dawson, 2001). Due to the active nature of high acuity nursing, the concept of underarousal (boredom) was not measured in this study; however, "overload" was measured. *Situational awareness* was represented by perceived stress which has been linked to disruption of perception and

impaired memory (Farquharson et al., 2013). One's self-perception of skill level on Benner's (1982) range of skills was also considered to be part of awareness. Decision-making is the final aspect of this model. *Decision-making* is influenced by reliance on heuristics (standardized protocols) as well as risk tolerance. Risk aversion has been related to using a prevention strategy meant to avoid criticism or penalty associated with faulty conclusions or judgments in a work setting (Bullens, van Harreveld, Forster, & Higgins, 2013; Josephs, Larrick, Steele, & Nisbett, 1992). Risk perception as well as nurses' perceived control over their environment and perceptions of satisfaction with the heuristics (protocols) in the critical care units and emergency departments was used to address decision-making. The study tested the relationship of the Sustained Vigilance Model to the outcome variables: job satisfaction and self-reported errors.

Methods

Sample and Setting

The research cohort consisted of a convenience sample composed of high acuity nurses in critical care settings in a large metropolitan hospital system in the southern U.S. Sample size was estimated using G-Power 3.1.0 online program (Faul, Erdfelder, Buchner, & Lang, 2009). A priori analysis using a medium effect size $f=.15$, power of .80, and $\alpha=0.05$ yielded a desired sample size estimate of 77. A medium effect size was chosen based on Cohen's (1992) advice about effect size indices for multiple and partial correlations with between two and eight independent variables. This study has eight variables when all are included and six when the researcher-generated variables are excluded.

The total number of registered nurses who were eligible for participation in the research was 351. This group was invited to participate in the study. The initial examination of the raw data showed that 81 surveys were at least started. Twenty-six surveys were not included in analysis based on factors ranging from failure to complete critical elements/instruments of the survey to not finishing or ‘timing out’ of the survey. An additional ten surveys were excluded because they did not answer the question concerning self-disclosure of errors. The final yield was 45 fully completed surveys. These surveys were used for the final data analysis.

The inclusion criteria consisted of critical care nurses who were permanently assigned to work in one of the intensive care units or emergency departments in the research facilities. Demographic information was used to determine eligibility for inclusion. Any respondents who did not work at least 50% of hours in intensive care or the emergency department were not included in the study.

All interested participants were fully informed about the project including benefits and risks. The instruction and recruitment processes were managed by the principle investigator. Recruitment for the research study was conducted by the use of posters in the various intensive care and emergency departments. There were also announcements about the research in staff meetings and in the various unit-based councils. A link to the survey was distributed by email, and instructions signified that completion and submission of the anonymous survey implied consent to participate in the study. The survey was completely anonymous and hospital management did not know who participated and who did not.

Instruments and Data Collection

A series of instruments were compiled into an 80-question survey. Seven demographic questions were used to establish baseline information for the study. The instruments will be discussed using the Organizational Structure of Variables (Table 1; Appendix A).

Attention

The first instrument to measure *Attention* was the Brief Fatigue Inventory (BFI) (Mendoza et al., 1999). The BFI has been used since 1999 to identify and assess fatigue. The test is composed of nine items with respondents ranking the answers on a one to ten scale. The questions are used to assess the overall severity of the person's fatigue and its impact on various measures of everyday living such as general activity, mood, and socialization. Even though the test was originally designed for cancer patients, it has proven to be a valuable fatigue- measuring instrument in evaluating shift workers. Kunert, King, and Kolkhorst (2007) report that Cronbach's alpha for this instrument was .91.

To measure sleep quality and patterns, the Pittsburgh Sleep Quality Index (PSQI) was used. The PSQI contains 10 items which have multiple responses under some items, resulting in a total of 25 overall responses. It is an effective and easily-administered test which measures the pattern and quality of sleep in adults. It consists of seven domains on which the clients rate themselves. The PSQI has demonstrated internal consistency, and Smyth (2012) reports a Cronbach's alpha of .83 for the seven assessed domains of sleep.

Overload was also measured. A four question assessment developed and validated by Spector and Jex (1998) was employed to quantify the perceived *overload* of nurses related to their work. The reported Cronbach's alpha is .78.

Situational Awareness

Situational awareness was assessed by two methods: the first was by the application of the Perceived Stress Scale (PSS). Perceived *stress* is the subjective feeling that an individual perceives as a response to environmental demands (Cohen & Janicki-Deverts, 2012). The 10-item scale measures psychological stress associated with gender, age, education, income and employment status. The instrument has demonstrated reliability (alpha = .85) and consistency with standard life-event scores.

Situational awareness was also examined by the nurses' self-assessment of their *skill levels* using Benner's Novice to Expert scale. Benner (1982) maintained that nurses must have a series of clinical experiences in order to attain the status of expert. There are several intermediate stages leading to the expert stage; they are novice, advanced beginner, competent and proficient. Nurses in this research were asked to rate their experience level using these five rankings.

Decision Making

The characteristic of Decision Making was assessed by application of the Nursing Work Index-Revised (NWKI) subscale (Aiken & Patrician, 2000). Perceived risk was also assessed using a three-item researcher-generated scale. A single researcher-generated question was used to determine the satisfaction of the nurses with standing protocols

available for nurse initiation in the high-acuity areas. Essentially the desired information was how satisfied nurses are with existing delegated medical orders.

Aiken and Patrician (2000) developed the NWRI as a rather lengthy battery of questions to better define how to measure the work that a nurse does. A subscale of this instrument is comprised of seven questions designed to quantify a nurses' *control of the practice*. It is this subscale that was used in this research. The alpha for the entire instrument is reported to be .96; and the alpha for the *control of the practice* subscale is reported as .84.

Nurses' perceptions of the risk involved in working in a high-acuity area was assessed by asking about their perceived risk of physical or emotional exhaustion, loss of licensure, and personal safety. The three items were measured with a five-point Likert scale from "Always" to "Never." It is proposed that a compounded effect would ensue from perceiving higher levels or risk from more areas, so a cumulative score was used by adding the three items together to arrive at a perceived risk score. The instrument has not been used previously, so no reliability or validity statistics were available.

The final parameter is a single item which was used to assess the critical care nurses satisfaction with protocols, standing orders, or delegated medical orders. The use and terms of standing orders or protocols is tightly controlled by the accrediting body for hospitals (The Joint Commission, 2012). Standing orders, protocols, or delegated medical orders are defined by The Joint Commission as a system of medical interventions that can be initiated by the Registered Nurse when select and specified criteria are met. The criteria are established either by a national certifying body or generally accepted as best

practice (The Joint Commission, 2012). Standing orders are written in advance by physicians with oversight by quality committees and are available for implementation by the nursing staff without direct physician approval at the time of implementation. This is, in effect, a measure of a critical care nurse's heuristics or how a nurse perceives the ability to address and manage an unplanned situation. One researcher-generated question regarding the nurse's perceived satisfaction of standing medical orders was used to measure this factor.

Outcome Variables

Outcome variables were job satisfaction and self-reported errors. Job satisfaction was measured by the Wieck Nurse Job Satisfaction Index (Wieck, Dols, & Northam, 2009). The reported alpha for this instrument is .85. The information on self-reported errors was gleaned from a question on the research questionnaire asking the nurses to identify how many errors they have made in the past 12 months.

The variables and the tests that measure them were combined into a questionnaire. This questionnaire also extracted important information such as the type of critical care area, the amount of time (in years) that they have worked the night shift, ethnicity of the nurse, years of nursing experience, and the age of the nurse. Any or all of these were considered as possible contributors to fatigue, sustained vigilance, job satisfaction, and errors.

The principle investigator, committee chair and statistical consultant had access to the data. The questionnaire responses were captured through Qualtrics, a web-based survey tool. The survey was opened and closed at specific times. Invitations to

participate were disseminated to the target population by email blasts and individual mailers sent to the nurses' physical mailbox at the hospital. Database creation and data collection began after the requisite approvals from the university and hospital IRB's and occurred over a 21 day period.

Research Questions

1. Is the *attention factor* of the Sustained Vigilance Model, as indicated by the Pittsburgh Sleep Quality Index, Brief Fatigue Inventory, and perceived job overload, related to job satisfaction and self-reported errors?
2. Is the *situational awareness factor* of the Sustained Vigilance Model, as indicated by perceived stress levels and Benner skills level identity, related to job satisfaction and self-reported errors?
3. Is the *decision-making factor* of the Sustained Vigilance Model, as indicated by control of practice, perceived risk level, and satisfaction with protocols, related to job satisfaction and self-reported errors?
4. Which variables in the Sustained Vigilance Model are the best predictors of job satisfaction and self-reported errors?
5. Is there a difference between day shift and night shift nurses related to fatigue, sleep quality and perceived overload?

Design Statement with Rationale

This research is best characterized as a cross sectional exploratory study. The research participants were composed exclusively of registered nurses. The study was conducted in four critical care units and two emergency departments from two hospitals

with similar service lines and patient demographics. The research participants also worked a majority of their productive hours in critical care. These hospitals each have emergency departments and an array of specialized critical care units. Each of these entities is located in the Dallas-Fort Worth area.

Of the 45 surveys completed, 40.4% were male and 55.3% were female. Of the 73 eligible male nurses in the research units, 26% participated while only 9.3% of eligible female nurses participated. In other words, male nurses contributed significantly and disproportionately to the final dataset. This was unexpected since the number of male RN's in the research units comprise only 20.1% of the total number of nurses. It is unknown why so many more male nurses chose to participate in this survey. It seems, at least anecdotally, that male nurses tend to gravitate towards the niche nursing areas such as critical care, emergency care, nurse anesthesia, and flight nursing. This could be a plausible reason why the number of male nurses in the critical care areas studied represents so much of the total, far higher than the current estimated 7.0% male nurses in the current nursing work force (American Association of Colleges of Nursing, 2013). The nurses working the night shift also responded to the survey in a higher number than their day shift counterparts. Almost half of the nurses responding (47%) were within the youngest age range, i.e. 20-30 years. The years of experience ranged from 1 to 38 years. The predominate ethnicity was Caucasian (47%) and African-American (26%). There were surprisingly few Hispanic/Latino participants (4%). Educational data of the research cohort revealed that the nurses were overwhelmingly educated at the BSN level (77%). While almost half of the nurses did not report any type of advanced certification, the most

common certification reported was the Certified Critical Care Nurse (CCRN) credential held by 29.8% of the respondents. The nurses in this study rated themselves as novice (6.6%), advanced beginner (17.7%), competent (31.3%), proficient (24.4%), expert (20%). Full demographic data is available in Table 2; Appendix A.

Results

Research questions one through three were designed to identify correlations between the variables of the Sustained Vigilance model and self-reported errors and job satisfaction. Since assumptions of normality of data were not fully met, the non-parametric test Spearman's rho was selected to test the relationships. Statistically significant correlations were found when comparing fatigue and errors ($r_s = .48$ $p = .001$), stress level and errors ($r_s = .41$ $p = .005$), and Benner skill level and errors ($r_s = .31$, $p = .037$). Additionally, statistically significant correlation was found between control of practice and job satisfaction ($r_s = .42$; $p = .003$) See Table 3 for a complete breakdown of analysis.

Research question four explored which variables in the Sustained Vigilance Model were the best predictors of job satisfaction and self-reported errors. This question required the use of regression to test the relationships and predictive strength of the variables. Although the assumptions to meaningfully use multiple regression are quite rigorous, the dataset met most of the assumptions with the exception of heteroscedasticity in the plot of residuals. After bootstrapping the variable of *errors*, there was still heteroscedasticity present. The variable of *errors*, with its attendant outliers and non-normal distribution, was therefore transformed using logarithmic transformation. The resulting variable, after the removal of two outliers and transformation, was more

normally distributed and the resulting Kolmogorov-Smirnoff test was non-significant.

The regression analysis proceeded using the transformed variable.

Since there were significant correlations for errors and fatigue, stress level, and Benner skill level as revealed in the analysis of the first three research questions, multiple regression should provide greater clarity to the scope of influence of these three predictors (fatigue, stress level, and Benner skill level). The findings were significant for fatigue and Benner skill level ($R^2 = .331$, $F(3) p = .001$) (See Table 4; Appendix A). The relationship between fatigue and errors was directly proportional since as fatigue scores increased, the errors did as well. Benner skill level was inversely proportional to errors in that higher skill levels were associated with lower reported errors. In summary, the predictive model explained 33% of the variance for the research sample. The other regression was run with job satisfaction as the outcome variable. Since the only correlation with job satisfaction found in research questions one through three was the variable control of practice, it was decided that a simple regression would satisfactorily test the relationship. The output reveals a significant result ($R^2 = .166$, $F(1,43) p = .006$) (See Table 5; Appendix A) with 16.6% of the variance in job satisfaction scores explained by the amount of control the nurses felt they had over their practice. This was not unexpected since recent research by Bogaert, Timmermans, Weeks, van Heusdan, Wouters, and Franck (2014) also showed that the more the nurse can control the care environment or have input into the framing of their practice, the more satisfied they are with their jobs.

The final research question was a comparison between day shift and night shift nurses when considering the variables of fatigue, sleep, and work overload. Since the requisite assumptions were not met, the non-parametric, Mann-Whitney U test was utilized to assess this research question. There was a significant difference between day and night shift when comparing sleep ($U = 120, p=.017$). Other results of this research question can be found in Table 6; Appendix A. Additional tests differences between the day and night shift for errors, protocol satisfaction, and control of practice were run, but no significant differences between the two shifts were discovered.

Discussion of Findings

The results of this study are intriguing and could serve as a catalyst for future studies involving nursing skill levels and errors. The finding that higher perceived skill level on the Benner scale was associated with fewer errors had been anticipated by Dr. Benner. When initially contacted about the proposed study, she felt that there might be a significant association between skill and errors. She based this on the likelihood that new nurses to the acute care setting, especially in the first six months of practice, are still learning electronic charting systems, the facilities policies and procedures for medication administration, medications commonly given in the emergency and critical care settings, and mastering the automated medication dispensing systems (email communication with Dr. Patricia Benner, 8/20/2014). Unfortunately, the survey instrument did not include an option for the research subjects to select '0' indicating no errors. This oversight possibly prevented a stronger and more inferable correlation between skill level and errors. Although there were several significant findings in the post hoc analysis of data, the

small sample size makes generalizing the results to the larger population of critical care and emergency nurses problematic because of the enhanced possibility of a Type I error. The results, though, do point out the need for further refined and focused testing in the areas of job satisfaction and errors.

Research question one tested the relationships between sleep, fatigue, work overload, job satisfaction and errors. Fatigue was positively associated with errors at a statistically significant level ($p=.001$). This result was essentially a validation of the earlier field work done by Ann Rogers which showed that fatigued nurses are more prone to errors (Rogers, 2008).

Research question two examined the relationships between stress level and skill level when compared to job satisfaction and errors. The skill level was assessed using Benner's Novice to Expert model. It was felt that even if the scale were not known by the participants, the titles are sufficiently described so that any nurse should be able to self-assess and assign a self-ranking. This question also yielded significant results with both stress and skill level being correlated with errors ($p=.005$; $p=.037$). Stress and burnout have been shown to influence errors (Beckstead, 2002; Robinson, Overstreet, Charney, Vytal, & Grillon, 2013). What was not discovered were prior studies which directly compared errors to self-assessed nursing skill level. It would seem reasonable to infer that an inexperienced nurse would make more errors than a nurse with familiarity and years of demonstrated clinical competence. Saintsing, Gibson and Pennington (2011) proffered the argument that recently graduated novice nurses were at a higher risk of making clinical errors because of poor academic preparation, inability to effectively communicate

with other caregivers, and poor understanding of equipment and procedures, but this study did not offer a direct comparison with more advanced level nurses. It would seem that more research is called for in this area as the implications for safer nursing practice are important.

Research question three examines control of practice, practice risk, and protocol satisfaction with job satisfaction and errors. The only statistically significant finding was a positive correlation between nurses' control of practice and job satisfaction ($p=.003$). This makes sense in that the ability to influence one's working environment has been found to increase job satisfaction in the non-nursing world (Tsai, 2011) as well as the healthcare world (Weston, 2010). While it might seem that nurses would be quite limited in actually changing the practice culture in an individual unit, with the growth and increasing influence of unit-based councils, hospitals are more likely to incorporate suggested changes in an effort to increase job satisfaction, retain high quality nurses and to make nurses happier.

Research question four employed multiple regression to assess the influences of various variables to job satisfaction and errors. While generalizing the results is risky, due in part to the small sample size, it was found that a nurse's skill level and fatigue were significant contributors to errors ($p=.001$) and accounting for 32% of the variance. Simple regression was used to test the influence of control of practice with job satisfaction. It was found that that control of practice was a significant influence on job satisfaction ($p=.006$) with 16.6% of the variance explained by control of practice. Nurses should realize the collective power and influence that they possess and be prepared to

leverage that into creating practice environments that help assure nurse satisfaction while meeting the needs of the patient and the organization. Again, the small sample size along with issues of heteroscedasticity, which could not be corrected with bootstrapping, seriously limits the generalization of this model to a larger population. Nevertheless, the importance of new graduate orientation programs in hospitals is supported by this study. Efforts to familiarize new nurses with equipment and procedures seems like money well spent in the cause of error reduction. Furthermore, the relationship of fatigue to errors must continue to be addressed. Efforts to reduce fatigue have been slow to materialize because it is a problem with no easy solution. However, hospitals must continue to search for ways to reduce fatigue in all workers while continuing to seek workable systems to deliver services round the clock. Providing sleeping rooms or furnishing break rooms with comfortable furniture where nurses can nap seems to be one of the easiest and most cost effective ways to address this problem. Nurses must also be encouraged to be accountable for their own practice and recognize what their limits are. If they are too fatigued to render safe care, nurses must tactfully decline working extra shifts or extended shifts.

The final research question compared the day and night shifts with the variables studied in the other research questions. The only reportable difference was in the units sleep scores ($U = 120, p=.017$). While this was an expected finding, there were no other statistically significant results for any of the other variables including errors or fatigue. Again, the relatively small sample size may have influenced this finding, and a larger sample size might have revealed reportable differences.

The survey also included an open-ended qualitative question designed to encourage nursing input about what would make their jobs easier to perform. Of the 45 surveys completed, 39 added comments about their jobs. Perhaps not surprisingly, the most common recommendation from the research cohort was greater availability of nursing leadership. The next most common recommendation was less emphasis on core measures and quality metrics. Respondents also wished for more rigorous education for inexperienced nurses, and many lamented the lack of time to properly orient, educate, and assess nurses' critical care skill sets. Other recommendations were for there to be fewer novice nurses placed on the night shift, and the tripling of Intensive Care level patients was also mentioned as a strong negative and a detriment to providing care. Some of these recommendations seem to be eternal. In 1958, Grivest found that 63% of the 132 staff nurses surveyed reported annoyances in their work situation. They felt that management took only average measures to correct the hazards leading to accidents and were particularly dissatisfied with rotation to evening and night shifts. It is interesting that many of the staff nurse concerns have not changed that much over the past sixty years. The current study shows the importance of continually assessing the work environment of nurses to try to improve the care delivery process and patient outcomes.

Conclusions and Recommendations

While the results of the research were interesting, the lack of responses tempered the reliability and generalizability of the data. Future research could benefit from a shortened survey with fewer instruments and more focus on errors, sleep, and fatigue. The survey completion rate was only 55%. A shorter survey should help increase

participation rates. Nurses in acute care areas have complex patients requiring sophisticated nursing care. The complexity of the care delivery and the need for sustained vigilance make it less likely that these nurses will participate in unit-based research studies which may take time away from the patient. Furthermore, the ability to collect data online has added exponentially to the number and frequency of surveys that nurses receive with requests for participation. Clark (2008) found that some persons' prior experiences with research acted as a barrier to their future participation in research studies.

Based on the results from the analyses, further testing is warranted for all the statistically significant findings which were discovered. The complex and rapidly evolving healthcare climate requires that any possible ramifications to patient care, and specifically patient safety, should be thoroughly investigated by rigorous methods. That reported errors were found to be inversely correlated with nurses' skill should prompt nursing educators and administrators who hire these nurses directly into critical care or emergency environments be acutely aware that novice nurses may be more error-prone than an experienced nurse. New teaching techniques to help orient the novice nurse to the critical care and emergency departments should be developed without having to negotiate layers of hospital bureaucracy. Ensuring the safety aspects of the educational approach to nursing is important, but it can be stifling and effectively prevent or discourage the development of novel approaches to educating the novice nurse. Since nurses are now graduating and matriculating from the school setting directly to the critical care environment, it is no longer safe to assume that new acute care nurses will come to the

setting with one to two years of basic medical-surgical experience. Investing the time needed to move the new graduate safely and competently along Benner's continuum of novice to expert could prove beneficial to the nurse, the hospital, and most of all, to the patients.

Fatigue, as an independent precursor or as a direct cause of errors, continues to surface in nursing research. Additional research into nursing fatigue and its role in errors should be further quantified and refined in order for evidence-based and actionable interventions to be developed. Patient safety is too important to simply relegate to a status of inevitability because we assume that fatigue is an inherent part of being a nurse, especially an evening or night shift nurse. Hospitals must accept that nurse fatigue is an important area for policy development. Hospital leadership must partner with frontline nurses to continue to develop, implement and evaluate strategies to decrease fatigue and errors.

Other recommendations include examining the root causes of nurse job dissatisfaction and seeking ways to eliminate or control those causes. Recruiting, hiring, and orienting a critical care nurse involves significant expense both monetarily and in time resources. Identifying causes of job dissatisfaction may help reduce unit erosion and encourage qualified nurses to remain engaged and active on their units. Permitting nurses to have greater control of their practice environment seems to be an easy solution, especially since many national recognition designations depend on the nurses' perception that they can influence and tailor their nursing environment to best suit their practice and their patients.

Finally, this research should be replicated by other nurse scientists. The sample size was small, and the survey which captured these results had design flaws that have been identified. It is acknowledged that findings may not be generalizable to the greater population of critical care and emergency nurses. Nevertheless, the significance of findings linking fatigue to errors and experience have implications for nurses who are expected to maintain an environment of sustained vigilance for hours on end as they fulfill their job duties. Future studies related to the impact of sustained vigilance and the threat of vigilance fatigue are vital to the continued delivery of quality care in acute care settings.

Strengths and Limitations

Since it was not feasible to conduct a true probability sampling, it was necessary to use a convenience sample obtained by recruiting respondents who were readily available and volunteered to be research candidates. It is unknown whether these results can be generalized to a wider population of critical care nurses or nurses from other clinical areas. It is noted that this does expose the study to a risk of compromised internal validity. The research is strengthened by the fact that the research questions can be quantitatively assessed and that minimal personal information was required in order to participate which should have bolstered participation. Nevertheless, a severe limitation is the low return rate and a sample size which did not meet the desired number of responses. Current research suggests that nurses are hesitant to volunteer for research if there is a reasonable chance that their participation may be discovered or if identifying information could be used in a litigious fashion (White, 2012). Therefore, much effort was made to

ensure the privacy of all participants. The use of researcher-generated questions is always a risk. However, by using regression, which is a highly robust statistical test, the risk is decreased and valuable insights can be gained by the results. This research plan was straightforward as to the data collection, and replication by another researcher should not pose any undue difficulties. One possible issue with replication was the location of sampling. Since this research was conducted at teaching hospitals, the pool of eligible candidates was considerably larger than will be available at most other facilities. There were inherent validity issues with this research since a convenience sampling of nurses were used for the analysis as opposed to a true random sampling. This affected any possible generalizations toward the larger population of critical care nurses. The potential pool of qualified participants was approximately 300. There was also a danger of nurses not wanting to complete another survey since invitations to participate in surveys have increased with the ease of online data collection. The desire for data has been directed towards all consumers, including nurses, and may influence their willingness to participate in another survey. Research fatigue may have been a factor in the low response rate. Other potential issues which could complicate and threaten the research are lack of comfort level with research by key nursing leaders in the intensive care units, the educational level of the staff nurses, and unanticipated unit changes in practice (Chlan, Guttormson, Tracy & Bremer 2009). What also must be considered a limitation is that the instruments used to measure the variables did not consistently capture the results in the same time frame. For example, the BFI measures fatigue experienced by the nurse for the past week while the questions which assessed errors asked for the number of errors

committed over the past year. The time-bound inconsistencies do increase the chance of a Type I error when interpreting the results. Additionally, two of the validated instruments which were used in this research did not show a high reliability in this setting. The Perceived Stress Scale alpha was .42 and the Nurse Job Satisfaction Index revealed an alpha of .43. It is unknown why these validity markers were so vastly different from previously reported reliability levels in this setting for these two instruments.

Summary

This research examined sustained vigilance in high acuity nurses. It must be said that nurses will continue to care for patients in a continuous cycle. This means that for the foreseeable future, nursing staff will be required to work during the overnight hours to ensure the safety and well-being of patients. With this reality, there is always a chance that errors due to fatigue and burnout will occur, and that nurses may be working amid threats to their ability to sustain vigilance. While night shift work cannot be eliminated, this research may open up new avenues of exploration into the issues that can occur when working long overnight hours and possibly yield new and more effective strategies for managing night shift work so that the impacts to both patient and nurse are reduced. The concept of sustained vigilance in the hospital setting is a new and apt descriptor of what is expected of acute care nurses. Just as happens to police officers who are expected to sustain a high level of vigilance to protect the public and themselves, the threat of burnout and errors is ever present. Using the notion of sustained vigilance is a unique and clear way to present the challenges of working in high intensity environments like critical care and the emergency department. This study can contribute to the

vernacular in which we discuss the challenges of recruiting and retaining high-functioning nurse professionals whose dedication to positive patient outcomes must also be seen within the context of their own self-preservation. Factors which encourage or impede the nurse's ability to remain vigilant must be studied and managed to ensure the best outcomes for the nursing profession and the patients whose lives are at stake.

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Chapter 4

Summary of Work

Article 1, *Health Ramifications of Night Shift Health Workers*, provided a literature review of night shift work including both physiological and psychological effects from working this shift. The primary aim was to cast a wide net over several industries and see what research was being done regarding people doing night shift work and their physiological and psychological responses to it. There seems to be a general consensus that working the night shift can be hazardous to a nurse's health and well-being. Of particular concern are the performance of critical care and emergency nurses while being fatigued and the inherent difficulty of maintaining a heightened state of sustained vigilance while working the night shift. What has been known in other fields for a considerable length of time is that sleep deprivation and fatigue cause error rates to rise. Based on the latest nursing research, the same conclusions can be reached that nurses who are fatigued are at a higher risk of committing an error. Whether the sleep deprivation itself is a primary cause or the physiological and psychological pathologies from night shift work might be the ultimate drivers of errors is not completely known.

The second article, *Sustained Vigilance, Errors, and Job Satisfaction in a Population of High-Acuity Nurses*, involved research designed to measure the effects of several variables on job satisfaction and errors. Article 2 complements the findings in Article 1 since fatigue and errors do seem to be linked, and the research in Article 2 also supported this link. The link between fatigue and errors was discussed on a macro level in Article 1 and was supported in Article 2 using a smaller study sample. Further research

should more completely illuminate these factors and perhaps solidify these relationships so that next steps may move toward mitigating strategies to try to actually intervene to solve or reduce the problem of errors and fatigue.

The Next Steps: Future Research Plans

Future research will include trying to determine how the variables of fatigue, sleep, and errors interact with each other in a longitudinal study. The topic is important, and there may be practical actions which might be revealed to decrease the influence of fatigue and sleep on errors. There may also be as yet unidentified factors which may contribute to nursing errors. The fact that errors are continuing despite numerous safety features that have been put in place is alarming. Additional research will also include the further refining of any relationship between a nurse's skill level, fatigue and errors.

It seems clear that conducting this research at other health care organizations would fine-tune the results in order to either support or negate what is connected to the commission of errors in the study. To help ensure a larger number of participating nurses, the research tool would be revised to include a much shorter sleep survey instrument which might mitigate early withdrawal from the study due to research fatigue or time issues. Other tool improvements would be to utilize a more objective means of finding errors either by using the self-report method used in the research, but adding a choice of '0' to capture nurses who self-report making no errors, or by gaining access to the hospital's event reporting system which tracks patient care errors in a more objective way. A hospital's event reporting system might also provide more comprehensive data although there are consent and privacy issues that would need to be considered.

This study provided an initial view of the error potential situation in acute care nurses working in acute care units. Using the Sustained Vigilance Model provided a different lens through which to view the challenges in an acute care setting related to fatigue. What is certain – hospitals will continue to function around the clock. No advances in technology will obviate the need for astute and clinically competent nursing care on all shifts. In order to prepare for this continuing challenge, fatigue, errors, and their contributing factors need to be identified and implementable solutions crafted. Professional nurses must also own and embrace their unique accountability to the patient and their contribution to patient care and be prepared to take assertive steps to create and maintain an ideal healing environment. It may not be possible to address and remediate all the issues which contribute to compromised vigilance and attendant errors in critical care and emergency nurses, but in order to secure safer patient care, the effort must be undertaken.

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Appendix A. Tables and Figures

Table 1. Organizational Structure of Variables with Definitions

Factor	Conceptual Definition (ref)	Operational Definition	Instrument to Measure	Reliability and Validity
Attention				
Fatigue	A state of physical or mental exhaustion (Mendoza, et al., 1999).	Score on the Brief Fatigue Inventory	Brief Fatigue Inventory (Mendoza, et al., 1999)	Alpha=0.91 One factor accounted for 76% of variance (r-square=.76). Alpha obtained in this study = .91
Sleep Quality and Patterns	The nurses quality of sleep is defined as that nurses' perception of how well they slept (Smyth, 2012).	The individual's score on the Pittsburgh Sleep Quality Index	Pittsburgh Sleep Quality Index (PSQI)	Alpha= .83 Alpha obtained in this study = .89
Perceived Overload	The result of an overstimulation from various biological, psychological, or environmental cues (Labedo & Awotunde, 2007).	The measure of cognitive load on an individual during a particular timespan	4-item assessment of work overload (Spector & Jex, 1998)	Alpha = .78 Alpha obtained in this study = .82
Situational Awareness				
Perceived Stress	The highly subjective feeling that an individual perceives as a response to environmental demands (Farquharson, et al., 2013).	Perceived Stress will be measured by the application of the Perceived Stress Scale	Perceived Stress Scale	Alpha = .85 Alpha obtained in this study = .42
Perceived Skill Level	Competence or proficiency or the ability to consistently to perform a task well (Attewell, 1990)	Individual nurses self-assessment of skill level using Benner's Scale	Benner Novice to Expert Scale (Benner, 1982)	Not available

Appendix A. Tables and Figures (Continued)

Table 1. Organizational Structure of Variables with Definitions (Continued)

Decision Making				
Perceived Risk	The process of quantifying the probability of a harmful effect to individuals or populations from nursing activities (Hughes, 2008).	The composite score on the untested Perceived Risk Scale	Perceived Risk Scale (researcher generated)	Researcher generated; composite score; three items with a 5-pt Likert; range 3-15. Alpha = .84
Control of Practice Setting	The degree of the bedside nurses participation in the selection of equipment, scheduling, and input into how nurse-sensitive parameters are measured (Aiken & Patrician, 2000).	The nurses' control over the practice environment will be assessed by the application of the NWRI 'Control Over Practice Setting' subscale.	NWRI subscale: Control Over Practice Setting	Reported alpha for the entire instrument is .91 and .82 for the 'Control Over Practice Setting' subscale. Alpha obtained in this study = .65
Protocol (Heuristics) Satisfaction	The degree to which the nurse judges the efficacy and ease of implementation of standing delegated medical orders (Dodd-McCue, et al., 2005).	Determined by self-assessment by using questions asking the nurse to rate protocol satisfaction in a Likert format.	Nurses response to purposeful questions gauged to measure the satisfaction with existing protocols	Not determined; Researcher generated; single item question with 5-pt Likert; range 1-5.
Outcome Variables				
Job Satisfaction	A positive affective orientation toward work and the organization (Taunton, 2003)	Score on Nurse Job Satisfaction Index	Nurse Job Satisfaction Index (Wieck, Dols, & Northam, 2009)	Alpha=0.85 Alpha obtained in this study = .43
Errors	<i>Errors</i> refer to either the omission or commission of a disallowed or non-efficacious act (Cleary-Holdforth and Leufer, 2013)	Errors will be assessed by a question which will ask for disclosure of errors made.	Self-reported errors	Not available

Appendix A. Tables and Figures (Continued)

Table 2. Demographics

Gender	M	F	No Answer
	40.4%	55.3%	4.3%

Ethnicity	African-American	American Indian/ Native Alaskan	Asian/ Pacific Islander	Caucasian	Hispanic/ Latino	No Answer
	25.5%	10.6%	8.5%	46.8%	4.3%	4.3%

Age	20-30	31-40	41-50	51-60	>60	No Answer
	44.6%	24.4%	8.8%	13.3%	4.4%	4.5%

Education	Associate	BSN	Bachelors in other field	MSN	Post-Masters	Diploma
	7.0%	76.6%	2.1%	2.1%	2.1%	0%

Shift	AM	PM	No Answer
	42.6%	55.3%	2.1%

Certification	CCRN	RN-C	CEN	Other	No Cert.
	29.8%	4.3%	14.9%	4.3%	46.7%

Skill Level	Novice	Advanced Beginner	Competent	Proficient	Expert
	6.6%	17.7%	31.3%	24.4%	20%

Appendix A. Tables and Figures (Continued)

Table 3. Results of Correlation of Outcomes with Predictors

Variables	Job Satisfaction	Nurse Errors	N
Sleep (as measured by question 6 of the PSQI)	NS	NS	45
Fatigue (as measured by the BFI)	NS	$r=.48$ $p=.001$	45
Work Overload	NS	NS	45
Stress Level	NS	$r=.42$ $p=.005$	45
Benner Skill Level	NS	$r=-.31$ $p=.037$	45
Control of Practice	$r=.43$ $p=.003$	NS	45
Practice Risk	NS	NS	45
Protocol Satisfaction	NS	NS	45
Note: The variable <i>error</i> was transformed and analysis was run using Spearman's rho			

Appendix A. Tables and Figures (Continued)

Table 4. Regression Model Summary for Job Satisfaction and Control of Practice

Simple Regression	Model	R square	Adj. R square	Sig	df	N
Control Of Practice	1	.166	.146	.006	1	43
	Other variables did not contribute to the findings					

Appendix A. Tables and Figures (Continued)

Table 5. Regression Model Summary for Errors and Fatigue, Stress, Skill

Regression run after excluding 4 outliers	Model	R square	Adj. R square	Sig	df	N
Fatigue and Benner Skill Level	1	.319	.280	.001	3	41
Stress Level	Did not contribute to the findings					

Appendix A. Tables and Figures (Continued)

Table 6. Mann-Whitney U Test for Shift Comparisons

Variables measured for	<i>U</i> value	<i>p</i> value	N
AM shift/PM shift			
Fatigue	172	NS	45
Sleep	119	.017	45
Work Overload	222	NS	45

Appendix A. Tables and Figures (Continued)

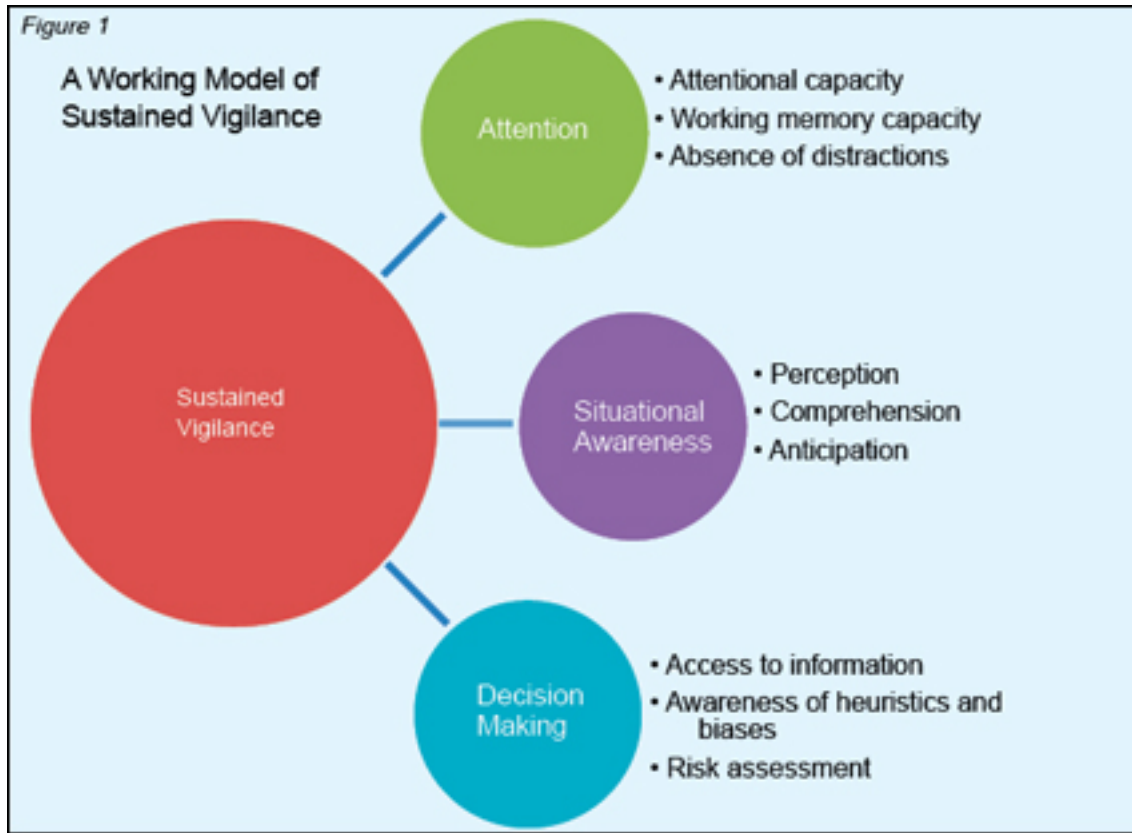


Figure 1. Krause's Sustained Vigilance Model (used with permission)

Appendix B. Survey

Survey answers for questions 1 through 8 will be for the extraction of baseline demographic data. Survey answers for questions 9 through 14 will be in a Likert-format and questions.

1. What areas of adult critical care nursing have you worked in the past 12 months?

Cardiovascular ICU General ICU Surgical ICU
 Neurovascular ICU Medical ICU

If none of the above – please specify which critical care you have worked _____

Do you work at least 50% of your hours in an intensive care unit and/or emergency department? yes no (if no, survey will automatically move to “submit”.)

2. How long have you been a Registered Nurse? _____

3. What shift do you work? _____

4. How long have you worked that shift? _____

5. What is your age? _____

6. What is your ethnicity?

African-American American Indian/Native Alaskan Asian/Pacific Islander
 Caucasian Hispanic/Latin No Answer

7. What is your highest level of education?

Associates Diploma Bachelors in Nursing other Bachelors
 Masters in Nursing Masters in another field Post-Masters degree work

8. Do you possess specialty certification(s)

CCRN NEA-BC CEN RN-C _____ Other (please list)

Appendix B (Continued)

- 9 How much overtime do you accumulate during a typical week of work? _____
10. How many times during a shift do you typically feel drowsy to the point of “nodding off”? _____
- 11 How many hours of sleep do you typically get prior to shift start? _____
12. Using Benner’s Scale from Novice to Expert: Where do you rate yourself?
__Novice __Advanced Beginner __Competent __Proficient __Expert
13. How many medication errors have you made in the past twelve months?
__1 __2 __3 __4 __5 __6+

Appendix B (Continued)

BRIEF FATIGUE INVENTORY

Brief Fatigue Inventory										
STUDY ID# <input style="width: 80%;" type="text"/>	HOSPITAL# <input style="width: 80%;" type="text"/>									
Date: <input style="width: 20%;" type="text"/> / <input style="width: 20%;" type="text"/> / <input style="width: 20%;" type="text"/>	Time: <input style="width: 60%;" type="text"/>									
Name: <input style="width: 30%;" type="text"/> Last <input style="width: 30%;" type="text"/> First <input style="width: 30%;" type="text"/> Middle Initial										
Throughout our lives, most of us have times when we feel very tired or fatigued. Have you felt unusually tired or fatigued in the last week? Yes <input type="checkbox"/> No <input type="checkbox"/>										
1. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your fatigue right NOW.										
0	1	2	3	4	5	6	7	8	9	10
No Fatigue										As bad as you can imagine
2. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your USUAL level of fatigue during past 24 hours.										
0	1	2	3	4	5	6	7	8	9	10
No Fatigue										As bad as you can imagine
3. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your WORST level of fatigue during past 24 hours.										
0	1	2	3	4	5	6	7	8	9	10
No Fatigue										As bad as you can imagine
4. Circle the one number that describes how, during the past 24 hours, fatigue has interfered with your:										
A. General Activity										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
B. Mood										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
C. Walking ability										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
D. Normal work (includes both work outside the home and daily chores)										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
E. Relations with other people										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
F. Enjoyment of life										
0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes
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Appendix B (Continued)

The Pittsburgh Sleep Quality Index (PSQI)

Subject's Initials _____ ID# _____ Date _____ Time _____ PM__ AM__

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

Not during past month _____	the Less than once a week _____	Once or twice a week _____	Three or more times a week _____
--------------------------------	------------------------------------	-------------------------------	-------------------------------------

b) Wake up in the middle of the night or early morning

Not during past month _____	the Less than once a week _____	Once or twice a week _____	Three or more times a week _____
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c) Have to get up to use the bathroom

Not during past month _____	the Less than once a week _____	Once or twice a week _____	Three or more times a week _____
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d) Cannot breathe comfortably

Not during past month _____	the Less than once a week _____	Once or twice a week _____	Three or more times a week _____
--------------------------------	------------------------------------	-------------------------------	-------------------------------------

Appendix B (Continued)

e) Cough or snore loudly

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

f) Feel too cold

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

g) Feel too hot

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

h) Had bad dreams

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

i) Have pain

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

j) Other reason(s), please describe_____

How often during the past month have you had trouble sleeping because of this?

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

6. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during past month_____	the Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-------------------------------	-----------------------------------	------------------------------	------------------------------------

Appendix B (Continued)

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- No problem at all _____
- Only a very slight problem _____
- Somewhat of a problem _____
- A very big problem _____

10. Do you have a bed partner or roommate?

- No _____
- Bed partner or room mate _____
- Partner/roommate in other room _____
- Partner in same room, but not same bed _____
- Partner in same bed _____

If you have a roommate or bed partner, ask him/her how often in the past month you have had . . .

a) Loud snoring

Not during	the Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

b) Long pauses between breaths while asleep

Not during	the Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

c) Legs twitching or jerking while you sleep

Not during	the Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

d) Episodes of disorientation or confusion during sleep

Not during	the Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

e) Other restlessness while you sleep; please describe_____

Not during the	Less than	Once or twice	Three or more
past month_____	once a week_____	a week_____	times a week_____

Appendix B (Continued)

PERCEIVED OVERLOAD SCALE

(Spector & Jex, 1998)

1. How often do you have to do more work than you can do well?
 Always Frequently Occasionally Seldom Never
2. How often is there a great deal to be done?
 Always Frequently Occasionally Seldom Never
3. How often does your job require you to work very fast?
 Always Frequently Occasionally Seldom Never
4. How often does your job require you to work very hard?
 Always Frequently Occasionally Seldom Never

Appendix B (Continued)

PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last month.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
 Never Almost Never Sometimes Fairly Often Very Often
2. In the last month, how often have you felt that you were unable to control the important things in your life?
 Never Almost Never Sometimes Fairly Often Very Often
3. In the last month, how often have you felt nervous and “stressed”?
 Never Almost Never Sometimes Fairly Often Very Often
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
 Never Almost Never Sometimes Fairly Often Very Often
5. In the last month, how often have you felt that things were going your way?
 Never Almost Never Sometimes Fairly Often Very Often
6. In the last month, how often have you felt that you could not cope with all the things you had to do?
 Never Almost Never Sometimes Fairly Often Very Often
7. In the last month, how often have you been able to control irritations in your life?
 Never Almost Never Sometimes Fairly Often Very Often
8. In the last month, how often have you felt that you were on top of things?
 Never Almost Never Sometimes Fairly Often Very Often
9. In the last month, how often have you been angered by things that were outside of your control?
 Never Almost Never Sometimes Fairly Often Very Often
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
 Never Almost Never Sometimes Fairly Often Very Often

Appendix B (Continued)

RISK SURVEY

Do you feel that your current work setting poses a risk to you regarding:

1. Risk of physical or emotional exhaustion due to fast pace of unit.
 Always Frequently Occasionally Seldom Never
2. Risk of making a mistake which might affect my nursing license?
 Always Frequently Occasionally Seldom Never
3. Risk to your\ personal safety?
 Always Frequently Occasionally Seldom Never

Appendix B (Continued)

CONTROL OVER THE PRACTICE SETTING SUBSCALE (Aikens, 2000)

1. Adequate support services allow me to spend time with my patients
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
2. Enough time and opportunity to discuss patient care problems with other nurses
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
3. Enough registered nurses on staff to provide quality patient care
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
4. A nurse manager who is a good manager and leader
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
5. Enough staff to get the work done
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
6. Opportunity to work on a highly specialized unit
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree
7. Patient assignments foster continuity of care
__Strongly Agree __Somewhat Agree __Somewhat Disagree __Strongly Disagree

Appendix B (Continued)

Protocol Satisfaction

1. How satisfied are you with existing medical protocols?

Very Satisfied

Satisfied

Neutral

Somewhat Dissatisfied

Very Dissatisfied

Appendix B (Continued)

Nurse Job Satisfaction Index ©

K. Lynn Wieck, PhD, RN, FAAN – 2008

Overall, how satisfied are you with your current position?	Highly SATISFIED	Generally SATISFIED	Generally DISSATISFIED	Highly DISSATISFIED
How likely are you to recommend your current employment setting to your nurse colleagues as a desirable place to work?	Highly LIKELY	Somewhat LIKELY	Somewhat UNLIKELY	Highly UNLIKELY
Knowing what you know now, if you had to decide all over again whether to take the job you have now, what would you decide?	Would definitely take the same job	Would probably take the same job	Would probably NOT take the same job	Would definitely NOT take the same job.

To what extent are you fairly rewarded considering the responsibilities you have?	Not at all	To a slight extent	To some extent	To a considerable extent	To a very great extent
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Appendix C. Institutional Review Board – University of Texas at Tyler



THE UNIVERSITY OF TEXAS AT TYLER
3900 University Blvd. • Tyler, TX 75799 • 903.565.5774 • FAX: 903.565.5858

Office of Research and
Technology Transfer

Institutional Review Board

March 13, 2014

Dear Mr. Morelock,

Your request to conduct the study: *Sustained Vigilance, Medication Errors, and Job Satisfaction in a Population of High Acuity Nurse*, IRB #Sp2014-77 has been approved by The University of Texas at Tyler Institutional Review Board as a study exempt from further IRB review. This approval includes a waiver of signed, written informed consent, and is conditional upon meeting any human subjects review board requirements in the institutions in which you will be recruiting and collecting data. In addition, please ensure that any research assistants are knowledgeable about research ethics and confidentiality, and any co-investigators have completed human protection training within the past three years, and have forwarded their certificates to the IRB office (G. Duke).

Please review the UT Tyler IRB Principal Investigator Responsibilities, and acknowledge your understanding of these responsibilities and the following through return of this email to the IRB Chair within one week after receipt of this approval letter:

- Prompt reporting to the UT Tyler IRB of any proposed changes to this research activity
- **Prompt reporting to the UT Tyler IRB and academic department administration will be done of any unanticipated problems involving risks to subjects or others**
- Suspension or termination of approval may be done if there is evidence of any serious or continuing noncompliance with Federal Regulations or any aberrations in original proposal.
- Any change in proposal procedures must be promptly reported to the IRB prior to implementing any changes except when necessary to eliminate apparent immediate hazards to the subject.

Best of luck in your research, and do not hesitate to contact me if you need any further assistance.

Sincerely,

Gloria Duke, PhD, RN
Chair, UT Tyler IRB

Skip Morelock 3/14/2014

EQUAL OPPORTUNITY EMPLOYER

Appendix D. Institutional Review Board – Baylor Health Care System



IRB Approval – Expedited Review of Skip Morelock
New Study To:
Copy to: Skip Morelock
Date: April 24, 2014
Re: 014-066
Sustained Vigilance, Errors, and Job Satisfaction in a Population of High-Acuity Nurses
Reference Number: 074851

Your new proposal was reviewed by a designated member of Baylor IRB Red via expedited review.

This study was determined to be eligible for expedited review as it involves no greater than minimal risk to the subjects and fits into the following category(ies) from the 1998 approved list:

Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

This review included the following components: Study Application

Form Name	Outcome
Study Application	Approved as Presented

A handwritten signature in blue ink that reads "Lawrence R. Schuller MD". The signature is written in a cursive style and is centered on a light blue background.

Appendix E. Permission to Use the Brief Fatigue Index



February 20, 2013

Mr. Skip Morelock
The University of Texas-Tyler 3408 Nickel Creek Plano, TX 75025

Re: Authorization to use the Brief Fatigue Inventory

Dear Mr. Morelock:

I am pleased that you have considered using the Brief Fatigue Inventory® (BFI) in your upcoming study. The study description you provided indicates appropriate use of the BFI. You are hereby granted permission to use it in your study, Night Shift Errors. Please note that:

- Your use of the BFI is limited only to the study specified above; to use the BFI in additional studies, you must reapply online at www.mdanderson.org/departments/prg > Symptom Assessment Tools > The Brief Fatigue Inventory (BFI).
- You are permitted to reproduce the copy of the BFI that is included with this Letter of Authorization; however, you must not remove the copyright notice.
- The BFI may not be modified or translated into another language without the express written consent of the copyright holder, Charles S. Cleeland, PhD, except as follows:

The first question (Have you felt unusually tired or fatigued in the last week?) may be omitted without further permission.

Permission to otherwise alter or to translate the instrument may be sought by contacting me at symptomresearch@mdanderson.org or by mail. Failure to comply may result in legal action.

We would greatly appreciate your sending us a summary of your study results after the completion of your project, so that we can continue to evaluate the performance of our instrument.

Sincerely,

Charles S. Cleeland, PhD

McCullough Professor of Cancer Research and Chair

Department of Symptom Research

A handwritten signature in black ink, appearing to read "Charles S. Cleeland", enclosed within a rectangular box.

Appendix F. Permission to Use the Pittsburgh Sleep Quality Inventory

Original Message-----

From: Buysse, Daniel [<mailto:BuysseDJ@upmc.edu>]
Sent: Monday, February 17, 2014 7:49 AM
To: Morelock Skip
Subject: RE: PSQI Request

Dear Skip,

You have my permission to use the PSQI for your research study. You can find the instrument, scoring instructions, the original article, links to available translations, and other useful information at www.sleep.pitt.edu under the Instruments tab. Please ensure that the PSQI is accurately reproduced in any on-line version (including copyright information). Please be sure to cite the 1989 paper in any publications that result.

Please note that Question 10 is not used in scoring the PSQI. This question is for informational purposes only, and may be omitted during data collection per requirements of the particular study.

This copyright in this form is owned by the University of Pittsburgh and may be reprinted without charge only for non-commercial research and educational purposes. You may not make changes or modifications of this form without prior written permission from the University of Pittsburgh. If you would like to use this instrument for commercial purposes or for commercially sponsored research, please contact the Office of Technology Management at the University of Pittsburgh at 412-648-2206 for licensing information.

Good luck with your research.

Sincerely,

Daniel J. Buysse, M.D.
Professor of Psychiatry and Clinical and Translational Science
University of
Pittsburgh School of Medicine
E-1127 WPIC
3811 O'Hara St.
Pittsburgh, PA 15213
T: (412) 246-6413
F: (412) 246-5300
buyssedj@upmc.edu

Appendix G. Permission to Use Job Satisfaction Index



2203 Red Bird Lane
Brookshire, TX 77423
www.drwieck.com

K. Lynn Wieck RN, PhD, FAAN
Professor
The University of Texas at Tyler
College of Nursing

office 281.375.8155
fax 281.375.8154
lynn@drwieck.com

November 15, 2013

TO: Skip Morelock, PhD candidate, The University of Texas at Tyler
FROM: K. Lynn Wieck, RN, Ph.D., FAAN

It is my pleasure to grant you permission to utilize the *Wieck Nurse Job Satisfaction Index*® in your research and class work. I am attaching a copy with this correspondence which includes citation and psychometrics information.

Thank you for your interest in this important topic of attracting and retaining nurses. We have found the *Wieck Nurse Job Satisfaction Index*® to be an excellent instrument for making general comments about the preferences of the different generations in today's nursing workforce regarding their perceptions of their satisfaction with their current job. Please note that this is not a career satisfaction instrument; it relates to their current work position only. It has helped us make recommendations to hospital administrators, human resources executives, and nurse managers to assist them in leading and managing an intergenerational workplace with a focus on retention. I wish you good luck in your studies.

Respectfully,

A handwritten signature in cursive script that reads 'K. Lynn Wieck'.

K. Lynn Wieck, Ph.D., RN, FAAN
Chief Executive Officer
Management Solutions for Healthcare

Nursing Professor
The University of Texas at Tyler College of Nursing

Primary Investigator: Cultivating Leadership in the Emerging Workforce Research Program

Primary Investigator: What Nurses Want: The 2007 Nurse Incentive Project

BIOGRAPHICAL SKETCH

NAME Skip G. Morelock	POSITION TITLE Clinical Manager, Critical Care, Telemetry, and Dialysis at Baylor University Medical Center, Garland, TX
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INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Howard Payne University Brownwood, TX	Bachelor of General Studies	1985	Biology and Psychology
Regents College Albany, NY	Associate of Applied Science	1992	Nursing
University of Texas - Dallas Richardson, TX	Masters in Public Administration	2004	Public Administration
University of Texas - Arlington	Bachelor of Science in Nursing	2010	Nursing

Positions:

2013 - current	Baylor University Medical Center - Garland	Clinical Manager – Critical Care, Telemetry and Dialysis
2010 - 2013	Las Colinas Medical Center	Director – Critical Care
1997 - 2010	University of Texas Southwestern Medical Center	Clinical Manager – Critical Care