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Caffeine Usage and Effects on Quality of Life, Clinical Performance, and Safety Among Nurses

Alexander Carl Yanga
Dominican University of California

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**Caffeine Usage and Effects on Quality of Life, Clinical Performance, and Safety Among
Nurses**

Alexander Carl Yanga

Department of Nursing, Dominican University of California

NURS 4500: Nursing Research and Senior Thesis

Dr. Patricia Harris

February 4, 2023

Abstract

Background: The purpose of this investigation is to examine the effects of caffeine consumption on the nurse's quality of life. It also will explore the relationship between caffeine consumption, nurses' clinical performance, and patient safety. Nurses often endure long hours with demanding tasks to ensure client health and safety. Long work shifts and low margins for error can be taxing, which could result in fatigue, poorer sleep, and increased risk for mistakes. Caffeine is an accepted and effective option for combating fatigue and boosting alertness short term. Questions arise about whether caffeine is beneficial or if consumption causes a decrease in the nurse's clinical performance and safety over time.

Literature Review: A literature review was conducted to explore relationships between caffeine consumption, sleep, alertness, and education about caffeine usage. Primary articles, related to caffeine, nursing, sleep, fatigue, and alertness, were found using university databases. Overall patterns were found, including: a need for further education on high-energy drink usage; higher perceived stress and sleep disturbances with caffeine usage; and lower alertness levels with changes in sleep quality.

Proposed Study: The proposed study is a quantitative, comparative approach that will use an online self-reported survey to collect data. The targeted population includes working registered nurses. The sample involves 100 critical care nurses within Northern California's Bay Area hospitals. There will be questions, using a numeric scale, about their background, demographics, caffeine consumption habits, sleep habits, perception of clinical performance, perception of work fatigue and stress, and perception of clinical safety. Descriptive and comparative statistics will be used to examine connections between caffeine consumption and perceptions of sleep, stress, fatigue, clinical performance, and patient safety.

Clinical Significance: Results of this investigation may have potential for increasing knowledge about relationships between nurses' quality of life, caffeine use, clinical performance and patient safety.

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Problem Statement

Nurses who work in a clinical setting experience long shifts, consisting of eight to twelve hours, doing patient care, working with families, documentation, and collaborating within a team. Often in a demanding field, the work may inevitably take a toll on these individuals both short and long-term. Operating through fatigue and attempting to recover from the shift is essential to ensuring that nurses may perform their tasks timely, effectively, and safely throughout their careers. Because of this, healthcare professionals learn coping mechanisms and skills to combat the consequences of the rigorous workload. These self-care tactics can include adequate sleep time, optimal nutrition, and coordinated off-days during weekly scheduling. Although these are methods that are helpful for the quality of life for the nurse, caffeine is a substance often used to help the workers during their shifts to increase alertness and combat fatigue.

Caffeine, often found in coffee, tea, energy drinks, and soda, is a stimulant substance that gives the user increased energy and wakefulness by activating the central nervous system (MedlinePlus, 2021). Before or during a shift, nurses may consume caffeine in hopes of getting through the day. However, this substance is not a permanent fix for tiredness but does show temporary effectiveness in its intended purpose. While caffeine is overall safe for healthy individuals, the side effects are often overlooked with the long-term impact on quality of life not being clearly defined. In the choice of choosing to consume this substance in any given situation, it may seem that the benefits outweigh the cons in order for the nurse to get through their shift. There are various factors that may create difficulties with caffeine use such as the daily recommended limit of 400 mg, higher tolerance with more prolonged use, and withdrawal when abruptly stopped. With nurses using caffeine as a tool for workload survival, the question arises

whether caffeine is beneficial to their quality of life and clinical performance or creates complications down the line.

Background

According to the Centers for Disease Control and Prevention, caffeine is a stimulant drug widely used by approximately 80% of U.S. adults daily (2020). From coffee shops around many corners to highly advertised energy drinks and supplements, caffeine usage has been popularized and societally accepted as a factor towards productivity. Its intended effect of increased alertness makes it a common and legal substance in areas that involve any form of physical activity or mental focus. Despite caffeine being an effective stimulant, its side effects and contraindications may pose various downsides, especially for specific people. The side effects include restlessness, shakiness, insomnia, dizziness, headaches, tachycardia, dehydration, and anxiety (MedlinePlus, 2021). Examples of people who may not benefit from consuming caffeine include a person with a sleep disorder, anxiety, or high blood pressure. Although the effects of caffeine may differ from others due to sensitivity, dependency is another issue that requires the user to take higher doses to achieve similar results. A higher dependency on caffeine may lead a person to consume more than the recommended daily amount for healthy individuals and cause further health problems that may worsen the side effects. Furthermore, caffeine withdrawal makes it increasingly difficult to wean from this substance since abrupt stoppage brings unwanted symptoms such as headaches, fatigue, irritability, and difficulty focusing (Mayo Clinic Staff, 2022).

Healthcare is a demanding field that requires staff to work carefully and effectively to ensure the health and well-being of clients. The nurse's role is to provide for the medical needs of patients through collaboration within an interprofessional team, meticulous observation and timely response to health changes, and maintenance of consistent professionalism and

compassion while in the position of a caregiver. Undoubtedly, nurses can experience fatigue and burnout, which can affect the quality of their life and care toward others. Although it is often addressed to nurses that self-care outside of the clinical setting is an essential part of working in this role to stay healthy and reduce errors, the problem of exhaustion may still present itself when the nurse works their shifts. Many methods were explored from various studies that cover how workers may get through a shift while fighting fatigue (Centofanti et al., 2018). Examples include naps and caffeine consumption. In spite of naps serving as an effective tool for maintaining wakefulness, caffeine can sometimes become a favorable option due to the convenience of access and the speed at which its effect occurs. In this instance, it may be perceived that drinking caffeine is quicker than taking a nap to stay awake for a shift. Caffeine has become a popular option among nurses for its effectiveness in increased alertness. Considering that it is found in coffee, tea, sodas, and energy drinks, its commonness makes it very accessible, especially in places such as vending machines and cafeterias within the hospital.

Various factors may influence a nurse's quality of life and work performance. Some of these that will be examined within this study include circadian rhythm and sleep quality. For instance, looking closely at how these aspects may affect the nurse, a disrupted circadian rhythm may lead to overall tiredness throughout the day and decreased sleep quality. Because of this, the nurse may feel more tired as they work, placing a risk to their general well-being and the safety of their clients within the hospital. In the case of caffeine consumption, this substance may affect the person's overall energy level through the side effects of insomnia, dependency, and prolonged use. Although this stimulant is effective short-term for its higher alertness, the long-term effect on the nurse's quality of life and clinical performance will be explored throughout this study.

Research Questions

Does caffeine consumption improve or negatively impact the quality of life of hospital nurses in the long term as compared to not consuming caffeine? What effect does caffeine have on the nurse's clinical performance and safety during their shift as compared to nurses who do not consume caffeine?

Literature Review

The objective of the literature review is to examine the pattern and association between caffeine consumption, sleep quality, and alertness during work hours. These variables will be explored through various articles to reveal common patterns. The findings will also analyze the relationship between the hospital nurses' alertness during the shift and sleep characteristics without isolating caffeine as a factor.

Over twenty articles were found related to the topics of sleep, alertness, fatigue, nurses, and caffeine consumption. Ultimately, six primary articles were selected throughout the review through Dominican University of California's diverse selection of databases; these included Iceberg, CINAHL, and PubMed. Many search terms were used in different combinations, such as *caffeine, energy drinks, tea, coffee, soda, nurses, nursing students, alertness, fatigue or tiredness, sleep or sleep quality, and circadian rhythm.*

As previously mentioned, six primary research studies were chosen for this literature review that pertains to caffeine consumption, sleep quality, alertness, and fatigue among different nursing populations. These populations include working hospital nurses, nurse midwives, and nursing students. The literature review analyzes each article through its study design, findings, strengths, and limitations. Each study is organized into three categories corresponding to common themes identified within the articles. The first category discusses caffeine consumption

and perceptions of sleep. The second category covers the alertness levels of hospital nurses during working hours and their relation to sleep without specific consideration of caffeine as a factor. Finally, the third category examines nurses' perceptions and knowledge of caffeine usage. For a summary of each article, see Literature Review Table in Appendix A.

Caffeine Consumption and Perceptions of Sleep

The consumption of caffeine and sleep perceptions are addressed by three research studies in this category. The first article discusses coping mechanisms, such as napping and caffeine consumption, among Australian nurses and midwives against work-related circadian disruption. The second article examines energy drink consumption among U.S. nurses with reports of sleep and stress perceptions. Lastly, the third article explores caffeine consumption habits, sleep, and stress perceptions among undergraduate nursing students.

Article 1

Centofanti et al.'s study (2018), called *Coping with shift work-related circadian disruption: a mixed-methods case study on napping and caffeine use in Australian nurses and midwives*, discusses two methods nurses used to cope with tiredness during shifts. The sample included 130 shift-working nurses and midwives from two metropolitan hospitals in Australia between October 2015 and March 2016. The mean age was 44 and ranged between 21 and 67 years old. 115 females and 15 males participated in the study.

The study design was mixed method that used quantitative data from questionnaires and qualitative data from in-depth interviews. Participants were recruited through noticeboard flyers in hospitals, emails, and information sessions at nursing grand rounds. Online and hard copies of the Standard Shift Work Index questionnaires were available for the participants to complete. This survey included questions regarding their background demographics, health, caffeine

consumption, and sleep perceptions. Examples of questions on the survey were “If you normally take a nap/naps in addition to your main sleep, either at work or at home, at what time do you take it” and “How well do you sleep at night?” Other questions included information about the daily amount of caffeine consumed and physical health regarding cardiovascular or gastrointestinal symptoms. After the questionnaires, each person was offered to participate in a face-to-face interview using the Critical Incident Technique about their shift experience. The participant would describe a typical, "good," and "bad" shift from the start to the end of their day.

Out of 130 participants, 97 were included in the analysis since the remaining participants had incomplete surveys for data collection. Twenty-two of the participants completed the face-to-face interview. Centofanti et al. found that 70% of the sample reported using napping as a countermeasure for tiredness. Workers who napped reported having higher sleep flexibility than participants who did not nap. Furthermore, starting shift workers reported consuming between two to six cups of coffee, tea, or cola daily. Concerning sleep, it was found that higher caffeine consumption rates were positively correlated with higher self-reported sleep disturbance scores, worse psychological health symptoms, abdominal pain, and weight gain since the start of the shift (Centofanti et al., 2018). The study findings showed that caffeine has the possibility of being an effective countermeasure against fatigue and lack of sleep but still positively associated with psychological distress. This may be due to caffeine having effects and symptoms that replicate anxiety in higher doses. Another finding was the relationship between caffeine usage and higher sleep disturbance scores. Although caffeine usage may increase wakefulness but worsen the structure and continuity of daytime sleep, it may be possible that caffeine is used to compensate for high sleep disturbances (Centofanti et al., 2018).

Centofanti et al.'s article has many strengths within the study. It contains a moderate sample size of 97 participants who completed the study, which directly targets the intended population of interest. In regard to the study design, a mixed-method study allows the researchers to benefit from both qualitative and quantitative data to increase understanding of the studied topic. Finally, the researchers developed a decision tree based on the results to help individuals choose a countermeasure for work fatigue considering personal characteristics. Although Centofanti et al.'s study has many strengths and findings that improve knowledge on the subject, some limitations may come with the research. Most of the sample was female, many being advanced practice nurses, midwives. Thirty-three of the original participants did not complete the study, leaving a significant attrition of 24%. The sample size could include more male participants to see if there are any differences in the data based on a more diverse selection. The study could also take into account other caffeine sources outside of coffee, tea, or soda, such as energy drinks or energy shots. Despite the limitations, the study covers the main sources of caffeine often used by the targeted population.

Article 2

The second article is covered by Higbee, Chilton, et al. in 2020, titled *Nurses consuming energy drinks report poorer sleep and higher stress*. The population of interest included clinical nurses working in hospitals. Four hundred seventy-six nurses from a large South-Central U.S. hospital were recruited to participate in the research study. The sample of nurses mainly consisted of female nurses and workers with a Baccalaureate degree in Nursing.

Higbee, Chilton, et al. used a quantitative approach implementing a descriptive-comparison study design. The study methods included a survey shared with nurses via email within the hospital. Questions included their demographic background; caffeine

consumption habits, types, frequency, and size consumed; sleep characteristics; and perceived stress. The independent variables were energy drinks and caffeine consumption habits, while the dependent variables were sleep quality, sleep quantity, and perceived stress. After data collection, the participants were categorized into three groups for comparative analysis: energy drink consumers, caffeine-only, and no caffeine. Sleep amount and quality were measured with the Pittsburgh Sleep Quality Index as perceived stress was measured using the Nursing Stress Scale.

The study reported that 22.5% of the sample regularly consumed energy drinks, 68% consumed coffee, and 45.5% consumed caffeinated soda. Higbee, Chilton, et al. found that when analyzing this data on the participants' sleep characteristics, there is a significant relationship between energy drink consumption and sleep quality, sleep quantity, and perceived stress levels. Researchers also found a significant relationship between sleep quality and quantity. Moreover, there was a substantial difference between energy drink consumers and caffeine and noncaffeine consumers regarding sleep quality. There were no differences in sleep quality between the noncaffeine group and the caffeine consumer group. Because of these findings, there was an indication that energy drink consumers report poorer sleep quality and quantity than the other two groups. Additionally, the energy drink and caffeine consumer groups have higher indications for perceived stress than the noncaffeine consumers.

The strengths of the research article included a large sample size of 476 nurses that surpassed their recommended sample size of 246. Additionally, using a quantitative approach helps identify effective statistical differences between defined variables. The results gain knowledge on energy drinks and caffeine consumption within the population of nurses. Furthermore, the findings assisted in acquiring an understanding of the relationship between sleep characteristics, perceived stress, and energy drinks in nurses working in clinical settings

(Higbee, Chilton, et al., 2020). Although the study gained considerable knowledge related to its research focus, there are some limitations. A large portion of the sample consisted of female nurses, as 9.7% were male nurses. Regarding the survey, errors may occur since they were self-reported. The sample was only collected from one large hospital within the U.S. Although there are many types of caffeine sources, energy drinks, coffee, tea, and soda were only identified within the study. Lastly, the cause and effect of sleep quality and high-stress perception could not be determined by the study findings.

Article 3

Finally, the third article was authored by Higbee, Gipson, et al. in 2022, titled *Caffeine consumption habits, sleep quality, sleep quantity, and perceived stress of undergraduate nursing students*. In a population of undergraduate nursing students, the sample involved 272 participants from two different universities in the Western and Southwestern regions of the U.S. There were a total of 30 male and 242 female participants in the study.

Higbee, Gipson, et al. designed their research to be a comparative study using a quantitative approach. Methods of the study involved recruiting nursing students via email to participate in an online survey. Questions included their background, preference for staying up late or sleeping in, and their caffeine or energy drink consumption habits. Similar to the previous articles, the Pittsburgh Sleep Quality Index was used to measure sleep quality, and the Perceived Stress Scale to measure stress perception. After data collection, participants were categorized into three consumer groups: energy drink, caffeine only, and noncaffeine consumers.

Researchers found that energy drink consumers reported lower sleep quality than the caffeine only and noncaffeine groups. Along with this information, the energy drink group reported fewer sleep hours than the caffeine group. Furthermore, energy drink consumers also

reported higher levels of perceived stress than the noncaffeine group. Implications that Higbee, Gipson, et al. found were that about half of the sample had less than the recommended sleep of seven hours daily and that the students may have developed potentially harmful sleep habits during their university experience (2022). This could have been attributed to the need to combat fatigue and sleep with caffeine while students possibly not knowing the effect of energy drink consumption on sleep quality, stress level perception, and sleep amount.

Overall, the study has many strengths that add value to the research. The sample size is relatively large and taken from two universities and regions, adding regional diversity to the study. Moreover, the method of data collection using online surveys requires minimal participation and time commitment from a busy population, such as undergraduate nursing students. The article discussion also gains knowledge and adds further research questions to a population that often uses caffeine to combat fatigue in a highly demanding environment. Examples of these questions that may arise from this research include education for nursing students on caffeine effects, ingredients used in energy drinks, and awareness of the relationship between caffeine, sleep quality, and perceived stress. The article contains some limitations that are worth addressing. Although the sample has regional diversity related to using two different universities, it still lacks demographic diversity since the sample mainly consisted of White women. Additionally, the survey has some bias since the answers were self-reported. The use of non-random selection during sample collection may also contain bias that may not be entirely applicable to the entire student population. The subjectively reported items may threaten the study's validity since the participants were asked to rate the sleep items in the past month. (Higbee, Gipson et al., 2022). Despite the study design being effective at examining the variable relationships, it does not determine causation.

Looking at these three articles from a broader perspective, they address a pattern of sleep characteristics and perceived stress levels having a relationship with caffeine consumption. Higher caffeine consumption negatively affects sleep quality, sleep quantity, and stress levels. Although causation should be used cautiously from these findings, caffeine can still contribute as a factor in a nurse's quality of life and health.

Alertness of Hospital Nurses and Sleep

This category discusses the relationship between sleep and the alertness of hospital nurses without considering caffeine as a specific factor through two primary research articles. The first article examines the alertness levels of rotating shift nurses during an eight-hour shift in a South Korean hospital. The second article conducted a similar study but with fixed night shift nurses also in hospitals throughout Korea.

Article 1

Min et al.'s 2022 article, *Alertness during working hours among eight-hour rotating shift nurses: An observational study*, covers research regarding the declining patterns of alertness within this population. The sample includes 82 rotating-shift nurses in acute care hospitals in South Korea.

The researchers utilized a quantitative approach employing an observational study. Regarding the research method, each participant wore a Readiband wrist actigraph for 14 days to measure the nurses' time asleep and awake. Data was acquired for 10 of the 14 days after the 3-day learning period since the device needed to learn daily habits. Along with the wristband, the participants maintained a sleep diary to validate the data collected. Min et al. calculated the alertness scores based on the nurse's sleep-wake cycle from the data.

Remarkable findings from this study found that the overall alertness score of the nurses, including regular work hours and overtime, was around 82.66%. Having this score is equivalent to having a blood alcohol content of 0.05% and being in this low-risk zone (Min et al., 2022). A lower score indicates a higher risk for decreased reaction time and lower alertness. The night shift workers had a lower average alertness score than the day and evening shift workers. These findings implicate that less alertness during the shift could result in poorer clinical performance. There was also a pattern of declining alertness in all shifts during the start of the day but increased towards the middle of the day. By the end of the shift, the alertness score decreased as overtime shifts showed further declines.

Some mentionable strengths of Min et al.'s study are that it used a moderate sample size for the target population to study for alertness. It also used an objective approach to measure subjective data, such as sleep and alertness. The overall research highlights a potential problem for nurses that, if unaddressed or accounted for, may lead to poorer performance and risk to clinical safety. Although there are many strengths, some limitations are that the participants must wear a wristband continuously throughout the study. This may be uncomfortable since they must sleep and shower without removal. Caution should be noted when making associations with alertness and cognitive function since alertness scores within the results were measured through the Sleep, Activity, Fatigue, and Task Effectiveness model. Moreover, other factors, such as health conditions or caffeine usage, were not considered in the study that could have affected the participant's alertness and sleep characteristics.

Article 2

The second article is by Seong et al. in 2022, titled *Effect of sleep on alertness at work among fixed night shift nurses: A prospective observational study*. As the targeted population

was hospital nurses, the sample included 60 fixed night shift Medical-Surgical and Intensive Care Unit nurses working eight-hour shifts in hospitals throughout Korea.

The research design was a quantitative, prospective observational study. This particular article used similar methods as the previous study to replicate similar results (Min et al., 2022). Participants wore a Readiband wristband actigraph for 14 days to measure sleep-wake patterns. Again, nurses kept a sleep diary to validate the data from the actigraph. The alertness score was measured through this data to provide a predicted alertness score; a higher score indicated higher predicted alertness. The researchers also used the Pittsburg Sleep Quality Index to measure sleep quality.

The pertinent study findings were that the nurses' sleep patterns showed that time in bed, time asleep, and sleep latency were shorter during work days than on off-shift days. Alertness patterns steeply declined during work hours and remained lower than their starting baseline during overtime hours. A significant factor identified in the alertness score was sleep latency, which was indicated by the sleep patterns' effect on declining alertness. Through this, the nurses not receiving enough sleep would result in lower alertness during their shifts. Overall, the alertness score average of the nurses was 75.37, an elevated risk zone, indicating reaction time reduction. In addition, alertness declined hourly as the shift continued. Comparing these results to the previous study (Min et al., 2022), the fixed eight-hour night shift nurses in this sample have a greater risk of declining alertness than the rotating shift nurses.

The strengths of Seong et al.'s study are that it follows and repeats a previous study using similar methods and sample population to reveal any variation or similarities in results (Min et al., 2022). This can increase the reliability of this research. Further, subjective data was analyzed using objective tools to create measurable results. Because of this, predicted alertness scores can

be calculated based on the nurses' daily activities and sleep patterns. Overall, the study identified and discussed the findings of the relationship between sleep and alertness score effectively.

Limitations to this study are that the participants were required to wear the Readiband on their wrists for two weeks without removal. Similar to the previously discussed article, this may be uncomfortable during times of sleep and bathing. Additionally, convenience sampling was utilized to recruit the participants through a schedule management application, restricting the sample to younger ages. Due to this limitation, other recruitment methods could be implemented to attract a wider range of age groups. Regarding the study sample, diversity may lack since the majority were young female participants. Altogether, this study should be generalized with caution since the participants were mainly from this sample selection in a specific country. Other factors were not considered in this study, such as health conditions or caffeine consumption.

From the overall general perspective of these two articles, the indication is that there is a relationship between sleep characteristics and alertness. Having low sleep quality, lacking sleep, or disruption in circadian rhythm could affect alertness during the day, especially for working nurses. In an environment that often demands constant alertness, a decline in this factor can lead to detrimental outcomes related to clinical performance, patient safety, and an effective and safe work environment. Although the two studies did not specifically consider caffeine consumption as a factor in sleep and alertness, nurses are still a population that may often use this to combat fatigue and sleep deprivation. Exploring this specific category expands knowledge of the need for better countermeasures against fatigue to hopefully increase alertness and create healthy sleep habits despite working long hours.

Perception and Knowledge of Caffeine

This category explores the nurse's perception and knowledge of caffeine through one primary article. Phillips et al.'s 2021 study titled *Caffeine and high energy use and knowledge by nurses in three countries*, examines the knowledge and use of caffeine and energy drinks among nurses in three countries. The sample involves 182 licensed nurses in total; 65 nurses in Italy, 50 in Korea, and 67 in the U.S.

The study uses a descriptive quantitative approach for its design that focuses on gathering descriptive data rather than psychometric data since they are not measuring a construct. Looking at the study methods, each participant completed an online survey that was emailed to colleagues of the researchers or publicly posted for completion. Through this, snowball sampling was used as the nurses were encouraged to share the survey link with their nurse peers. The nurses in Korea completed the survey by paper. The questionnaire inquired about the nurse's background, caffeine and HED (high energy drink) consumption, and their knowledge about these caffeinated products.

Findings related to the study were that caffeine usage was high among the sample of nurses; 92% in Korea, 90.8% in Italy, and 88.1% in the U.S. Most of the participants agreed on the need for further education related to HED due to the possible knowledge gap of its additive ingredients and caffeine amount. The results and discussion of the article indicate an overall need for HED and caffeine consumption education for nurses.

The strengths highlighted in Phillips et al.'s article are that the study uses a relatively medium sample size that directly targets the intended population. Because of this, it expands knowledge on a topic that contains limited literature: HED use among nurses. The participant's commitment to the study is not extensive since it can be completed quickly through an online

survey. Furthermore, the researchers collect data from similar sample populations from three different countries to examine any similarities and differences. Overall, the study can be generalizable to a similar demographic population of nurses. Limitations of the study include that the participants may have some bias to the data since the survey is self-reported. Part of the data from the entire sample was not included in the analysis since a few surveys were left incomplete due to participants skipping questions. There is some limitation to generalizability for the nursing population in different regions of the world and other types of nurses.

Looking at this article and category from a broader outlook, the consumption of caffeine, or energy drinks in this case, seems to be a rising trend before and during work hours. Often a demanding field with long working shifts, fatigue is inevitable due to affected sleep and alertness. Caffeine can be seen as the next best option for a short-term fix for wakefulness and a boost in energy when examined at face value. This category highlights the need for further education for nurses about HED or caffeine use since it is consumed without having full knowledge of its ingredients and effects. Despite it being effective or ineffective as a substance, education remains important for the nurse to make their judgment whether to consume or not based on how it may affect the quality of life and work performance.

Discussion

In summation of the various articles explored within each category, the examined studies add value and knowledge to the overall research question. The first category, caffeine consumption and perception of sleep, investigated the nurse's, midwife's, and nursing student's perspectives on these variables. The findings within the three associated articles had a common factor of a relationship between caffeine consumption and sleep. As caffeine consumption increased, the perception of sleep quality and amount decreased. The second category, alertness

of hospital nurses and sleep, addressed the relationship between sleep and alertness among hospital nurses without factoring in caffeine. Alertness during work hours would decrease with lower sleep quality, lower sleep amount, and disrupted sleep-wake cycles. The third category, perception and knowledge of caffeine, contained one article that studied the nurses' perceptions of caffeine consumption and energy drinks.

Reviewing the common strengths between each article, most contained adequate sample sizes, which could aid generalizability. The studies containing surveys allowed for ease of completion from the participants, requiring minimal commitment to the study. Some articles benefited by creating decision trees, replicating studies, and using samples from different regions of the world. Common limitations within the studies are that the samples were not often diverse due to the participants mainly being young women. Additionally, some studies are not determinant of causal relationships despite showing relationships between defined factors. Although the participants may benefit from surveys because of their faster completion times, there may be biases due to them being self-reported.

These studies in each category ultimately add knowledge about the relationship between the various factors and show potential for affecting each other. Caffeine consumption impacts sleep, as a factor influencing quality of life, and sleep has a relationship with alertness. Outcomes of different levels of alertness have the potential to affect a nurse's clinical safety based on reaction time, judgment, and fatigue. If caffeine can play a role in this cycle, can changing its dosage influence the outcomes?

When looking at caffeine within nursing practice, emphasis is placed on the nurse's individual choice of whether to consume or abstain. Despite the impact caffeine may have on sleep and alertness, these factors undoubtedly affect the quality of life and clinical performance.

Taking into consideration the third category finding the need for further education on caffeine sources, such as high-energy drinks, it may be important to ensure the nurse has gained sufficient knowledge prior to consumption. A nurse may be unaware of what they may be consuming which may contribute to poorer sleep habits.

Research Proposal

Upon putting together the research findings from the various articles within the literature review, relationships between caffeine consumption, sleep, and alertness were found. Caffeine consumption is associated with poorer sleep quality and higher sleep disturbances, as decreased sleep is correlated with lower alertness scores during shifts. Although, some questions arise from gaps identified within the literature. Because caffeine consumption affects sleep which may affect alertness, will this affect clinical safety and performance? Do the perceptions of critical care nurses about their clinical performance and ability to maintain patient safety differ between those who consume caffeine and those who do not? If there are differences between the groups, what are those distinctions?

The proposed study examines the perception of caffeine consumption on patient safety and clinical performance among nurses. Related to the literature review findings, sleep and alertness have a relationship that is very important to both the nurse's quality of life and clinical outcomes. Considering caffeine as a factor in sleep and alertness, manipulating this stimulant may cause change within a nurse's clinical practice. Although it may be difficult to replicate a study to directly change how much a nurse may consume caffeine for a given shift, it may be worth exploring their perception of their safety and performance with and without caffeine consumption during their shift. The outcomes of this study will hopefully offer knowledge on whether caffeine is a substance that increases or inhibits clinical performance and safety. The

perception of the nurse is important to include in the proposed study, since how they would feel during and outside of their shift matter in the field of nursing. If the discoveries related to the study lead to a perception that caffeine consumption negatively impacts clinical performance and safety, this may create new questions about the need for education and interventions to control caffeine consumption.

Theoretical Framework

The theoretical framework that aligns with this research article is based on Kurt Lewin's Change Theory of Nursing. Change theory is a three-stage, unfreezing-change-refreeze, model in which the person rejects their previous learning and replaces it with new content (Nursing Theory, 2023). The unfreezing process includes finding ways to help people overcome old, counterproductive patterns. Afterward, the change stage takes place which involves changing the thought, feelings, or behavior into a more productive one. Then, the refreezing stage is where the new habit is formed and practiced as the "standard operating procedure."

In the case of caffeine consumption, the nurse may take the approach of changing the way caffeine is perceived. Initially, the nurse may view caffeine as an effective countermeasure against fatigue. Using the unfreezing-change-refreezing model, we can change the perception of caffeine consumption to potentially revise the way it is consumed. Caffeine, as discussed in the literature review, can be adjusted to be viewed in a way that may be taxing on sleep, affecting alertness during clinical shifts. Regarding this specific proposal, the study aims to be at the initial stage of Lewin's Change Theory model, the unfreezing process.

Primary Research Aim

The primary research aim is to examine the nurse's perception of their clinical safety and performance with or without caffeine consumption during that shift.

Study design

The study design will use a quantitative approach as a comparative study. Through this, an online survey will be used to collect data from the sample.

Population and Sample

The population of the study would target registered nurses. The sample would include working registered nurses in the Intensive Care and Medical-Surgical Unit from at least ten hospitals within Northern California's Bay Area. A sample size of at least 100 participants would be helpful in data collection. Recruitment would involve emailing the nurses an invitation to participate in the study by completing a self-reported survey. The inclusion criteria are that the participants must be working registered nurses in critical care units in the hospital, at least 18 years of age, and working at least 20 hours weekly.

Recruitment

The nursing manager of the local hospital will be contacted to obtain permission to attend a unit meeting and explain the study to the nurses. The researcher's contact information will be provided and nurses who are interested in participating can email the researcher.

Ethical Considerations

Considering the ethics of the proposed study there is not a vulnerable population involved in the sample. Majority of the population targets working registered nurses. To protect the participants, confidentiality and privacy will be emphasized. Since the study will be shared via email, it will be up to the participant's voluntary participation to complete the survey. The participant's data will remain confidential. Informed consent for this online survey will be provided by the participant with the understanding that submitting the survey constitutes consent permission for the researcher to use the data. If the information, such as personal data or IP

addresses, collected identifies the participant, the information will still be kept strictly confidential for the person's safety. The description of the study would be explained through an email sent out to potential participants while providing contact information on further details regarding the specific study. If participants choose to opt out of the study, they are granted the option to do so by not completing the survey, and their information and data will not be saved or collected. Prior to conduction, an application regarding the study will be submitted to the Dominican University of California's Internal Review Board to ensure the ethicality and protection of the selected sample.

Research method

The online survey will be mailed to the nurses who have contacted the researcher. Questions would include various information about the nurse, such as their age, gender, shift times, and how often they work weekly. Questions regarding caffeine consumption would include how much caffeine they consume daily, how much caffeine they consume before or during the shift, the type of caffeine sources, their knowledge about energy drinks, and their perceived need for education regarding the effects of caffeine. The other questions would address the nurse's perception of sleep quality, quantity, disturbances; fatigue; alertness; and stress level during and outside the shift. In addition, the remaining questions would include their perceptions of their clinical performance and patient safety.

The participants would answer each question using a numeric rating scale ranging from 1 to 5; 1 being the least rated or agreement with the question and 5 being the most rated or agreement with the question. The question regarding the type of caffeine source the nurse consumes would be answered using multiple choice to put the participants in different groups for

comparison. For example, the groups would include energy drink consumers, caffeine consumers, and non-caffeine consumers groups.

Analysis

Data analysis of the collected information would use various tools to view the overall sample patterns and variable relationships. Descriptive statistics would be used to describe the sample's demographics and background information for information such as age range, common genders, and mean years of work experience. Regarding the comparison of the relationship between the variables, many tools may be used to analyze the data. Simple linear regression may be employed to determine the relationship between caffeine consumption and individual variables such as sleep amount, sleep disturbances, fatigue, perceived alertness, clinical performance, and patient safety. Other nonparametric statistical analysis tools may be utilized to better describe potential findings. Examples include Spearman's Rho and Kendall's Tau. Because there are many variables affected by the study methods, nonparametric tools may be an appropriate option for analysis.

Conclusion

Caffeine consumption has the possibility of affecting clinical outcomes among nurses. From the research question addressing how caffeine may affect the quality of life of hospital nurses, the literature review findings aimed the answers toward alertness and sleep characteristics. Although the discussions among the articles found that caffeine can affect sleep as sleep can affect alertness during work hours, there are still gaps in research regarding caffeine's direct effects on clinical performance and safety in the long term.

Applying this to clinical practice, the nurse's performance within the hospital setting and the safety of their patients is of the highest priority. Findings ways to improve and maintain these

factors will be beneficial for both staff and clients. Despite caffeine being the short-term solution for increasing alertness and fighting fatigue during long shifts, how viable is this option for extended use? If caffeine seems to be a temporary fix, other alternatives to fatigue management are worth investigating to ensure sustainable practice.

The proposed research may offer knowledge about caffeine within the profession of nurses. Although it may not be the end-all solution for improved clinical performance and patient safety, this aims to be the step toward sustainable interventions against fatigue and declining alertness among nurses. The proposal also aims to highlight the potential problem that caffeine is a temporary fix used as a long-term solution. If the perspective of caffeine shifts from a first-line solution to a “last resort” substance, other interventions, such as naps, may be revisited to become the optimal alternative.

From the proposal and literature review findings, various gaps still exist within the research. The proposal aims to provide a further understanding of nurses’ perceptions of caffeine consumption habits and clinical performance. Future research can conduct studies to test actual performance and clinical safety in place of the perception, manipulating caffeine usage as a variable within a simulated patient scenario. Another area of study that will be worth investigating is the educational aspect of caffeine. Can education about high-energy drinks and the effects of caffeine affect the nurse’s choice of consumption? An experimental study may be conducted to see if giving this education to nurses would change the amount of caffeine they consume and their alertness levels during work hours.

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Appendix A - Literature Review Table

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|--|--|---|--|---|---|---|--|
| Phillips, K. E., Kang, Y., Kang, S. J., Giroto, C., & Fitzpatrick, J. J. (2021). Caffeine and high energy drink use and knowledge by nurses in three countries. <i>Applied Nursing Research</i> , 58, 151414. 10.1016/j.apnr.2021.151414 | To examine the knowledge and use of caffeine and high-energy drinks among nurses in three countries. | 182 licensed nurses total; 65 nurses in Italy, 50 in Korea, and 67 in the US. | A descriptive, quantitative study; focused on gathering descriptive data rather than psychometric data since they are not measuring a construct. | <p>Each nurse that participated in the study completed a survey regarding caffeine and HED use along with their knowledge of them.</p> <p>Survey conducted via online survey software (Survey Monkey and Google survey) that was emailed to colleagues or publicly posted for completion.</p> <p>Snowball sampling used; nurses were encouraged to share the survey link with other nurses.</p> <p>Nurses in Korea completed the survey by paper. Data was entered into SPSS.</p> | <p>Caffeine usage was high among nurses; 92% in Korea, 90.8% in Italy, and 88.1% in the U.S.</p> <p>Most of the nurses agreed on needing further education about HED due to the knowledge gap of caffeine content (Italy 72.3%, US 83.6%, Korea 60%).</p> <p>Over half of the Korean (58%) and US (56.7%) nurses stated that their colleagues used HED during their shifts.</p> | <p>Study used a relatively medium sample size that directly targeted the intended population within this quantitative study. Covers a topic that has limited literature: HED among nurses</p> <p>Completion of study is convenient for sample due to it being an online survey</p> <p>Uses the same nursing population in different countries to examine any similarities and differences that may occur regionally.</p> <p>Generalizable to similar demographic populations or</p> | <p>Nurses chosen for the study volunteered to complete a self-reported survey online that may skew the data since the questions are answered based on their bias.</p> <p>Some data do not add up to 100% due to the participants of the study skipping some questions within the survey.</p> |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|--|---|--|--|--|--|--|---|
| | | | | | | location of different types of nurses. | |
| <p>Centofanti, S., Banks, S., Colella, A., Dingle, C., Devine, L., Galindo, H., Pantelios, S., Brkic, G., & Dorrian, J. (2018). Coping with shift work-related circadian disruption: A mixed-methods case study on napping and caffeine use in Australian nurses and midwives. <i>Chronobiology International</i>, 35(6), 853-864. 10.1080/07420528.2018.1466798</p> | <p>To examine how nurses and midwives use countermeasures such as caffeine and napping to cope with work shift tiredness and how they relate to physical and psychological health.</p> <p>To also develop tools to help nurses and midwives make effective strategic decisions.</p> | <p>130 shift-working nurses and midwives. Avg age of 44 between 21 and 67. Included 115 females and 15 males from two metropolitan hospitals in Australia between October 2015 and March 2016. 22 of the nurses and midwives were voluntarily interviewed.</p> | <p>A mixed-method study that uses quantitative data through questionnaires and qualitative data through in-depth interviews.</p> | <p>Participants recruited through noticeboard flyers in hospitals, email, and information sessions at nursing grand rounds.</p> <p>Hard and online copies of the Standard Shiftwork Index of the questionnaires provided to participants to complete.</p> <p>Participants offered to do face-to-face interview after completion.</p> | <p>97 participants included in the analyses and 22 of those participants completed interviews.</p> <p>70% reported napping (30% after morning shift, 22% before night shift, 16% during 45-min night shift break). Sleep flexibility was reported to be higher with napping as compared to non-nappers.</p> <p>Reported starting shift work consuming 2 cups of coffee/tea/cola daily. Higher caffeine consumption positively correlated with higher self-reported sleep disturbance scores and worse psychological health symptoms.</p> | <p>Study has a moderate sample size of 130 participants that directly targets the intended population.</p> <p>Being a mixed-method study allows this study to benefit from qualitative along with quantitative data.</p> <p>Contains a developed decision tree based on the findings to help individuals choose countermeasures for shift fatigue.</p> | <p>The majority of sample were females attributed mainly to midwives.</p> <p>The recruitment of the study was limited due to the population coming from only two hospitals.</p> <p>Needs to take into account other caffeine sources such as energy drinks.</p> |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|--|--|---|---|---|--|--|---|
| <p>Higbee, M. R., Chilton, J. M., El-Saidi, M., Duke, G., & Haas, B. K. (2020). Nurses Consuming Energy Drinks Report Poorer Sleep and Higher Stress. <i>Western Journal of Nursing Research</i>, 42(1), 24-31. 10.1177/0193945919840991</p> | <p>To examine the relationship between sleep quantity, sleep quality, and perceived stress with energy drink/caffeine consumption in clinical nurses.</p> <p>To also examine the sleep quality, quantity, and perceived stress of nurses who drink energy drinks vs. nurses who drink other caffeine sources or no caffeine.</p> | <p>476 clinical nurses recruited from a large hospital in South-Central US.</p> <p>Sample mainly consisted of female nurses and nurses with BSN.</p> <p>Criteria included working 10-12 hr shifts, full/part-time of at least 24 hrs weekly, 18+ years old, and able to read/speak English.</p> <p>66.8% day shift, 28.8% night shift, and 4.4% rotating shift.</p> | <p>Quantitative study; descriptive-comparison design.</p> | <p>Independent variables: energy drinks and caffeine consumption habits. Dependent variables: sleep quality, sleep quantity, and perceived stress.</p> <p>A survey shared via email with 2 follow-up reminders. Survey included consumption habits, types, frequency, and size of caffeinated drinks consumed.</p> <p>Participants put into 3 groups (energy drink consumers, caffeine-only, no caffeine) for comparative analysis.</p> <p>Sleep amount and quality measured using the Pittsburgh Sleep Quality Index. Perceived stress measured with</p> | <p>Reports: 22.5% regularly consumed energy drinks, 68% consumed coffee, and 45.5% consumed caffeinated soda.</p> <p>Significant relationship between energy drink consumption and sleep quality, sleep quantity, and perceived stress levels. Significant relationship between sleep quantity and sleep quality.</p> <p>Significant difference between energy drink consumers and caffeine consumers and noncaffeine group. No difference between caffeine consumer group and noncaffeine group related to sleep quality.</p> | <p>Study used large sample size (476 nurses) than their recommended sample size (246).</p> <p>Used a quantitative approach that finds effective statistical differences between defined variables.</p> | <p>A large portion of the sample size consisted mainly female gender. 9.7% were male nurses.</p> <p>Possible bias/errors due to self-reports on survey</p> <p>Only addressed two sources of caffeine (coffee and soda) during the study.</p> <p>Study conducted at only one hospital within the US.</p> <p>Cause and effect of sleep quality and stress perception not determined by findings</p> |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|---|---|---|--|---|--|--|---|
| | | | | Nursing Stress Scale. | Indication that energy drink consumers have poorer sleep quality and quantity than the other two groups. Energy drink and caffeine consumers indicate higher perceived stress than noncaffeine consumers. | | |
| Higbee, M. R., Gipson, C. S., & El-Saidi, M. (2022). Caffeine Consumption Habits, Sleep Quality, Sleep Quantity, and Perceived Stress of Undergraduate Nursing Students. <i>Nurse Educator</i> , 47(2), 120-124. 10.1097/NNE.0000000000001062 | To examine caffeine consumption habits and energy drink/caffeine use among nursing students and its impact on perceived stress and sleep. | 272 undergraduate nursing students (30 male and 242 female) from two different universities (Western and Southwestern regions of the US). Large amount of the participants were mainly White women. | Quantitative Study; comparative study design | Nursing students recruited via email to answer self-reported online survey questionnaire regarding their background, preference for staying up late/sleeping in, and caffeine/energy drink consumption. The Pittsburgh Sleep Quality Index used to measure sleep quality. Perceived Stress Scale was used to | Participants put into 3 consumer groups: energy drink, caffeine only, and noncaffeine. Energy drink consumers reported lower sleep quality than caffeine only or noncaffeine groups. Energy drink group reported less sleep hours than caffeine group. Energy drink consumers reported higher levels of | Used a sizeable sample size from two different universities/regions of the US. Targeted population that commonly consumes caffeine: undergraduate students. Survey easy to complete via online questionnaire with minimal time commitment from participants. | Despite the study design being effective at viewing the relationship between variables, does not determine if variables are causal relationships (caffeine vs. sleep and stress) The results may have bias due to non-random selection and self-report. Self-report of items such as stress or sleep quality may put validity at stake. |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|--|---|--|---|--|---|---|--|
| | | | | measure stress perception. | perceived stress than noncaffeine group. Implication: sample had less than recommended sleep leading to poorer sleep habits such as caffeine use without knowing the effects. | | Participants consisted majority White women. A diverse sample would be needed. |
| Min, A., Hong, H. C., Son, S., & Lee, T. H. (2022). Alertness during working hours among eight-hour rotating shift nurses: An observational study. <i>Journal of Nursing Scholarship</i> , 54(4), 403-410. 10.1111/jnu.12743 | To examine declining alertness patterns in rotating-shift nurses during hours of work across different types of shifts. | 82 rotating-shift nurses in acute care hospitals in South Korea. | Quantitative Study; observational study measuring time sleep/awake using Readiband wrist actigraph. | Each participant wore Readiband wrist actigraph for 14 days continuously. Data acquired for 10 days after initial 3 days for device to learn sleep habits and activity. Alongside, participants kept sleep diaries to validate the data from the actigraph. Alertness scores calculated from the Readiband data. High alertness score indicated higher alertness; lower score indicated a | On average, overall score of participants was around 82.66%. Night shift workers had lower average alertness scores than day and evening shift workers. Could indicate less alertness possibly resulting in poorer performance. Start of day showed decline in alertness with all shifts and an increase towards mid-day. Scores then decreased toward the end of the shift. Overtime shifts showed a further decline in alertness scores. | Used a moderate sample size with adequate target population to study for alertness. Used an objective approach to measure subjective data such as alertness and sleep. Highlights potential problems for nurses (alertness) that could lead to poorer performance or clinical safety. | Participants required to wear wristband for 14 days continuously without removal. May be uncomfortable for participants, especially during bathing or sleeping. Alertness score measured through the Sleep, Activity, Fatigue, and Task Effectiveness model; caution needed when making associations between alertness and cognitive function Other health conditions of the |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|---|---|---|---|--|---|--|---|
| | | | | lower alertness score. | | | participants such as sleep disorders or anxiety were not included which may have had an effect on the study. |
| <p>Seong, J., Son, S., & Min, A. (2022). Effect of sleep on alertness at work among fixed night shift nurses: A prospective observational study. <i>Journal of Advanced Nursing</i>, 78(10), 3197-3206. https://doi-org.dominican.idm.oclc.org/10.1111/jan.15180</p> | <p>To find declining work alertness patterns with fixed night shift nurses and sleep pattern effects on decreasing alertness.</p> | <p>60 fixed night shift Med-Surg and ICU nurses working eight-hour shifts in hospitals throughout Korea. Mean age of 27.08.</p> | <p>Quantitative study; prospective observational study design using objective data measuring relationship between sleep patterns and declining alertness.</p> | <p>Participants observed between Sept 2020 and March 2021 for 14 consecutive days.</p> <p>Nurses wore Readiband actigraph that measured sleep-wake patterns. Sleep diary kept through a mobile link to validate data from wristband.</p> <p>Alertness measured through data collected from Readiband with predicted alertness scores. Higher score indicated higher predicted alertness.</p> <p>Sleep quality measured via Pittsburgh Sleep Quality Index.</p> | <p>Nurses' pattern of sleep included time in bed, time asleep, and sleep latency being shorter during work days than off-shift days.</p> <p>Alertness patterns found steep decline during work hours; remained down during overtime hours.</p> <p>Sleep latency found to be large factor in alertness score as indicated by sleep parameters' effect on declining alertness.</p> <p>Avg alertness score of nurses in elevated risk zone (75.37) with 34% reduction in reaction time. Alertness declined</p> | <p>Follows and replicates a study that was previously conducted with similar methods and sample population to reveal variation or similarities in results; can increase reliability.</p> <p>Subjective data was analyzed through objective tools to create measurable results.</p> <p>Clearly identified and discussed findings of the relationship between sleep and alertness score.</p> | <p>Participants required to wear Readiband on wrist for 2 weeks throughout the study without removal.</p> <p>Recruitment of participants involved convenience sampling through a schedule management app. Recruitment should include online and offline methods to include a wider range of age groups.</p> <p>Majority of sample were young female participants.</p> <p>Study may not be generalizable.</p> <p>Other factors were not considered, such as caffeine</p> |

| Authors/Citation | Purpose/Objective of Study | Sample - Population of interest, sample size | Study Design | Study Methods | Major Finding(s) | Strengths | Limitations |
|------------------|----------------------------|--|--------------|---------------|--|-----------|-----------------------------------|
| | | | | | <p>hourly as the shift continued.</p> <p>Comparing results from previous study (Min et al., 2022), fixed night shift 8hr nurses are at greater risk of declining alertness than rotating shifts.</p> | | consumption or health conditions. |